TEACHERS' REFERENCE

for

COMPETENCY BASED ASSESSMENT

CLASS VII SCIENCE

Bhutan Council for School Examinations and Assessment (BCSEA)

Thimphu: Bhutan

2015

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BACKGROUND

As mandated under Performance Compact Charter 7 of *Accelerating Bhutan's Socio-economic Development (ABSD),* one significant initiative undertaken by the Bhutan Board of Examinations (BBE) was to develop *Teachers' Guide on Competency Based Assessment (CBA)* for selected subjects for various class levels in 2010 (10th Plan).

Teachers' Reference for Competency Based Assessment (TRCBA) books were first developed for Classes V, VII and IX in three subjects (Dzongkha, English and Mathematics) and introduced to all the secondary schools in 2011. Meanwhile, the erstwhile BBE was renamed as the Bhutan Council for School Examinations and Assessment (BCSEA) after as an autonomous body and it was later delinked from the Ministry of Education (MoE) with effect from April 2011.

In the following year, a survey was carried out on the usefulness of these books in teaching-learning. Subsequently, based on the feedbacks received from the teachers in the field, the Ministry of Education endorsed the recommendations to further develop the CBA books as teachers' reference guides for other subjects across the school curricula with an intent to improve both the standard and delivery of quality education in the country.

Broad objectives of CBA are to:

1. *enhance and improve teaching learning assessment of student competencies in schools at various class levels,*
2. *enables teachers to frame their own creative (modular) assessment tools using the booklet as reference guides, and*
3. *provide sample questions/model answers in the guide books inclusive of infusion of the GNH values wherever applicable while framing the questions for different student levels..*

INTRODUCTION

It is essential that teachers have prior understanding of what competency based assessment (CBA) actually means. It is the process of collecting evidence and making judgments on whether students have demonstrated the required learning competency that will allow them to move to the next competency level in a study course.

Competency is the ability of a student to apply content knowledge and skills in and/or across the content area(s). It means that assignments are linked to the competencies that they are designed to assess and student performance is reported in a way that tracks students' mastery of the competencies that have been identified for each course.

CBA is focused on assessing the learning outcomes (competencies) that are linked to students' needs in real life situations involving portfolios, experiential learning in field experiences, demonstration in varying contexts, role play, etc. It defines educational goals precisely in measurable descriptions of knowledge, skills, and behaviors which students should possess at the end of a course of study.

- *Competencies consist of a set of essential skills, knowledge, attitudes, and behaviors required for effective performance of a real-world task or activity.*
- *Competencies within different contexts may require different sets of skills, knowledge and attitudes.*

However, teachers will need to gradually shift their focus from emphasizing on the content learning of the curriculum to assessing the development of student competencies in classroom teaching-learning situations.

Teachers constantly need to revisit and re-think about what they teach, how they teach, and evolve the ways in which they can help the students to demonstrate mastery over what they have learned and interact with the larger world around them.

The term *assessment* refers to the process of obtaining information about student learning outcomes to:

- *assess through formal/informal observations of students' performance, demonstration of skills and knowledge, portfolio-based assessments, tests, project works, oral questioning and analysis of student records, and*
- *guide educational policy decisions about students; to inform students, their parents, teachers, or other audiences about their progress, strength and achievements.*

The key to competency based assessment is based on actual skills and knowledge that a student can demonstrate in the workplace or other contexts. CBA in this case will lead to functional approach to science education emphasizing life skills and evaluating mastery of those skills in terms of achieving student proficiency in science learning.

Purpose of the book

This booklet comprises model questions and their answers that can be used to assess competencies across all the learning strands. It is intended to serve as a guide for teachers to help them in the classroom teaching and also be an item bank from which they may draw questions to assess students' competencies in Science as specified in the strands and learning objectives of the Science curriculum.

However, it is cautioned that the questions and answers given in the booklet are in no way prescriptive; they are rather intended to serve as guides, suggestions, or prompts for the improved construction and designing of the questions and answers that assess students' learning competencies.

How to use this book

The questions and answers in this booklet may be used:

1. as a reference when developing teaching and assessment plans in history lessons with suggested classroom activities and the resources,
2. while planning to assess the student competencies in classroom practice, collecting evidence of learning for assessment and to make immediate connections to assessment and reporting,
3. to assess student competencies (achievements or failures) in the formative or summative learning in the form of class tests, term tests, etc.,
4. as models/samples of reliable questions/answers testing competencies for the construction of questions that may be required for the assessment of skills through other texts, and
5. to review the value of using assessment criteria and be able to use them to grade work and give constructive feedbacks.

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UNIT I: LIFE PROCESSES

CHAPTER 1

CELLS

1. CELLS - THE BUILDING BLOCKS OF LIFE

Learning Outcomes
At the end of the lesson, a student should be able to:

1.1.1 Describe cells as the building blocks of life,
1.1.2 Explain unicellular and multi-cellular organisms,
1.1.3 Observe a plant and an animal cell and
1.1.4 Take precautions while carrying out the experiment.

Assessment Items

Question 1. **[Remembering]**
Cell is the building block of all living organisms. The study of cell is known as
A biology.
B zoology.
C cytology.
D histology.
Answer: *C cytology*

Question 2. **[Remembering]**
The organelle responsible for colourful fruits, flowers and leaves are
A nucleus.
B plastids.
C ribosomes.
D golgi bodies.
E
Answer*: B plastids*

Question 3. **[Remembering]**
The non-living rigid layer made up of cellulose is the
A vacuole.
B cell wall.
C cytoplasm.
D mitochondria.
Answer: *B cell wall*

Question 4. [**Applying**]

Select the most appropriate sequence to correctly fill in the blanks.

Table1.1

a	*b*	*c*	*d*	*e*
function	*structure*	*living things*	*organelles*	*specialized*

*Cells are the basic building blocks of all …*1*…. They provide …*2*……. for the body, take in nutrients from food, convert those nutrients into energy, and carry out …*3*….functions. Cells have many parts, each with a different …4…. Some of these parts, called …*5*…., are specialized structures that perform certain tasks within the cell.*

	1	2	3	4	5
A	a	b	d	a	c
B	e	b	d	a	c
C	d	c	b	a	e
D	c	b	e	a	d

Answer: *D c b e a d*

Question 5. **[Analysing]**

Why does a student need to make sure that the edge of the coverslip touches the drop of water before setting the coverslip onto the slide?

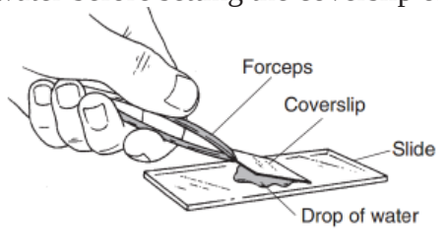


Figure 1.2

A to clean the slide
B to reduce air bubbles
C to increase evaporation
D to prevent the coverslip from breaking

Answer: *B to reduce air bubbles*

Question 6. **[Analysing]**

Why are human beings multi-cellular organisms?

Answer: *Human beings are multi-cellular organisms because they are made up of many cells.*

Question 7. **[Applying]**

A student observed brain cells of a mouse under a microscope and drew a diagram as shown in the Figure 1.3.

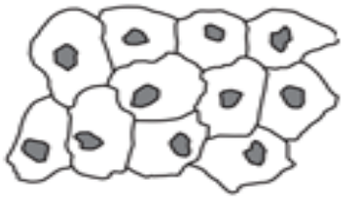


Figure 1.3

What is the shaded structure shown in each cell?

A nucleus
B cytoplasm
C centrosomes
D mitochondria

Answer*: A nucleus*

Question 8. **[Applying]**

The diagram given below shows four parts of the microscope labelled as 1, 2, 3, and 4.

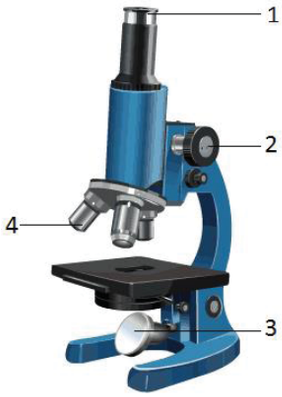


Figure 1.4

i. Name the parts (1-4) and write their functions.

Answer: 1: *eye piece - to look through*
2: adjusting knob - for precise focussing
3: mirror - to reflect the light
4: objective - to magnify the object

ii. Which part of the microscope is used to bring the image of the object on the slide into focus?

A 1
B 2
C 3
D 4

Answer: *B* *2*

Question 9.
Write **TRUE** or **FALSE** against each statement. **[Remembering]**

1. Only nucleus of a cell represents the protoplasm. (*false*)
2. Cells in an animal can live independently. (*false*)
3. The outermost covering in a plant cell is called cell wall. (*true)*
4. The nucleus is filled with a dense semi-fluid called nucleoplasm. (*true*)
5. Cell membrane is also known as freely permeable membrane. (*false*)

Question 10. **[Understanding]**
What is the importance of staining a specimen before observation under the microscope?
Answer: *Most cells contain structures that are transparent and without colour, which makes visualization difficult, even with the aid of a microscope. Cell staining make cell more distinct and clearly visible.*

Question 11. **[Applying]**
List down the steps to set up a microscope.

i) Place the microscope firmly on the well-lighted space. Do not keep it near the edge of the table.
ii) Bring the lowest magnification objective over the center of stage by rotating the nose-piece.
iii) Look through the eye-piece and adjust the plane of the mirror until you see a well-lighted microscopic field.
iv) Bring back the lowest magnification objective lens. While doing so, do not look through the eye-piece, look from side of the microscope.
v) Now, look through the eye-piece and slowly turn the fine adjustment knob till the object is in focus.

Question 12. **[Understanding]**
Which structure is found only in an animal cell?

A cytoplasm
B centrosome
C golgi bodies
D cell membrane

Answer: *B centrosome*

Question 13. **[Analysing]**
Why is it important to observe the specimen under low power of microscope first before resolving to high power?
Answer: *It is to help in focussing the specimen better.*

Question 14. **[Analysing]**

By looking at the different pictures in Figure 1.5, identify whether the organisms are single-celled or multi-celled. Justify your answer with **two** characteristics.

1 2 3 4

Figure 1.5

Answer:

Picture 1 and 3 are single celled organisms because they are made up of one cell, carrying out functions of the organism.	*Picture 2 and 4 are multi-celled organisms because they are made up of many cells working together to complete different functions within the organism. They have definite shapes.*

Question 15. **[Applying]**

The Figure 1.6 shows a group of cells. Make an outline drawing to show how the cells would appear under the microscope if a thin section A-A is cut and mounted on a slide.

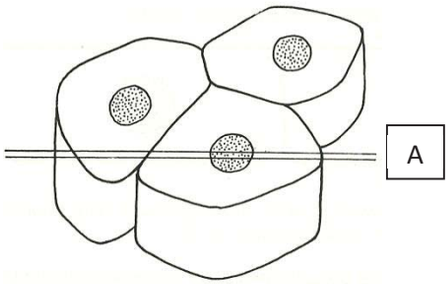
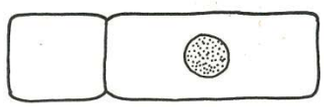


Figure 1.6

Answer: *The section would appear like this*



2. WHAT IS INSIDE A CELL

Learning Outcomes

At the end of the lesson, a student should be able to:

2.2.1 Identify the basic structures of an animal cell and a plant cell and
2.2.2 Differentiate between animal and plant cells.

Assessment Items

Question 1. **[Understanding]**

A substance has to pass through the different parts of a plant cell before reaching the nucleus. Which ONE of the following shows the correct path?

A cell membrane, cytoplasm, cell wall
B cytoplasm, cell wall, cell membrane
C cell wall, cytoplasm, cell membrane
D cell wall, cell membrane, cytoplasm

Answer: *D cell wall, cell membrane, cytoplasm.*

Question 2. **[Understanding]**

A cell that consist of a mitochondria, ribosomes and plastids is a cell of a

A fish.
B crow.
C housefly.
D sunflower.

Answer: *D sunflower*

Question 3. **[Understanding]**

Which part of the cell in Figure 2.1 is shown with the arrow?

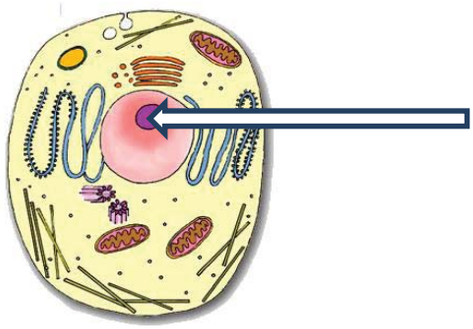


Figure 2.1

A nucleus
B nucleolus
C nucleoplasm
D nuclear membrane

Answer: *B nucleolus*

Question 4. **[Understanding]**

Which part of the plant cell in Figure 2.2 is the mitochondrion?

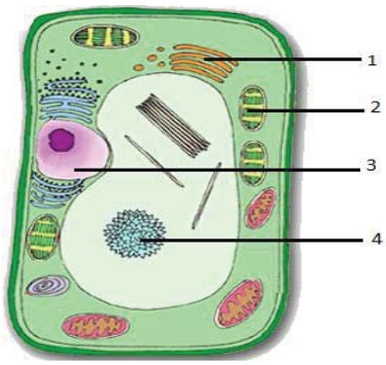


Figure 2.2

A 1
B 2
C 3
D 4

Answer: *B 2*

Question 5. **[Analysing]**

Rose petal cells differ from dog cells because they possess

A vacuole.
B leucoplast.
C chromoplast.
D centrosomes.

Answer: *C chromoplast*

Question 6. **[Applying]**

Look at the following cross word puzzle in Figure 2.3 and find **SIX** cell organelles.

M	R	Y	R	T	I	O	E	T	B	O	E
Z	I	V	I	H	U	I	M	Y	O	P	M
K	F	T	B	T	O	K	O	P	S	Y	O
C	Y	T	O	P	L	A	S	M	O	S	S
L	H	Y	S	C	P	C	O	D	M	O	O
H	Y	O	O	E	H	U	R	S	E	R	R
T	U	P	M	L	O	O	T	F	O	T	T
P	S	U	E	L	C	U	N	Z	R	N	W
C	O	Q	T	W	I	W	E	D	E	E	T
E	P	A	Y	A	O	B	C	N	R	R	V
L	W	S	U	L	E	C	Y	J	C	I	N
H	N	D	O	L	C	S	O	K	K	E	A

Figure 2.3

Answer: MITOCHONDRIA, RIBOSOME, CYTOPLASM, CELL WALL, NUCLEUS, CENTROSOME

Question 7. **[Applying]**

Complete the crossword with the help of the clues given below:

Across

1. This is necessary for photosynthesis.
3. Term for component present in the cytoplasm.
4. The living substance in the cell.
6. Units of inheritance present on the chromosomes.

Answer: 1: CHLOROPHYLL, 3: ORGANELLE, 4: PROTOPLASM, 6: GENES

Down

1. Green plastids.
2. Empty structure in the cytoplasm.
5. It separates the contents of the cell from the surrounding

Answer: 1: CHLOROPLAST, 2: VACUOLE, 5: MEMBRANE

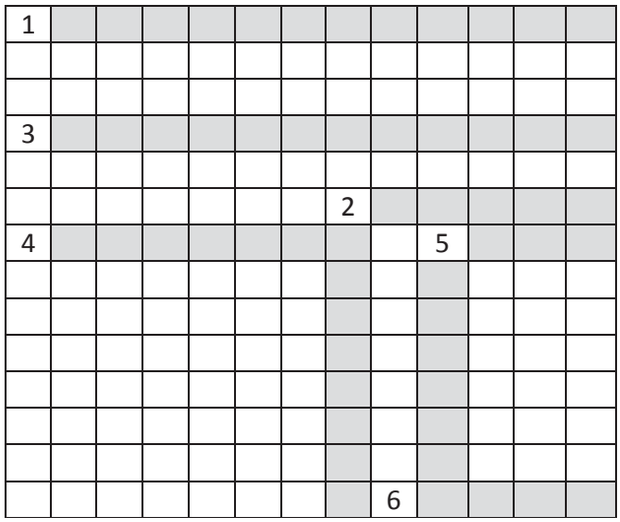


Figure 2.4

Question 8. **[Applying]**

The diagram in the Figure 2.5 represents an enlarged view of a plant cell. Several cell structures have been labelled.

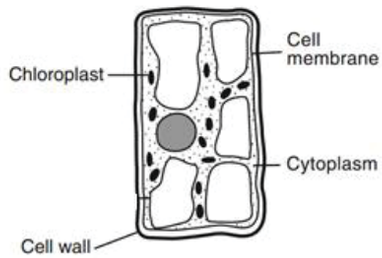


Figure 2.5

i. Identify **TWO** labelled structures that show this cell is a plant cell.
Answer: *The presence of cell wall and chloroplast indicates that it is a plant cell.*

ii. Identify one structure in this plant cell that is not labelled in the diagram.
Answer: *The structure which is not labelled is vacuole.*

Question 9. **[Analysing]**

Match each item in column A against the correct item in column B. Rewrite the correct matching pairs.

Column A	Column B
1. Rod-shaped	a. cell membrane
2. Semi-permeable	b. cytoplasm
3. Semi-liquid	c. mitochondria
4. Rigid structure	d. centrosomes
5. Star shaped	e. vacuole
6. Contain cell sap	f. cell wall
	g. nucleus

Answer: *1(c), 2(a), 3(b), 4(f), 5(d), 6(e)*

Question 10. **[Creating]**

Write a brief story using the words below:

mitochondria	nucleus
cytoplasm	vacuole
chloroplast	endoplasmic reticulum
cell wall	cell membrane
golgi bodies	

Example: *As you enter into a thick jungle, you come across a big wall (cell wall). There is no guard so you freely pass……..*

Question 11. **[Creating]**

Write an Acrostic Poem using the word below:

[Note: An acrostic poem is one where you choose a word or name and use each letter in the name as the beginning of a word or line that tells something about that person or topic].

Example:

- *I= I*
- *T= Trust*
- *A = And*
- *L = Love*
- *Y = You*

- C
- E
- L
- L
- S

Question 12.

Design a cell of an animal which produces its own food like plants. **[Creating]**

Answer: *Open ended response, students come up with relevant design*

CHAPTER 2

HUMAN AS ORGANISM

1. FOOD AND NUTRIENTS

Learning Outcomes

At the end of the lesson, a student should be able to:

2.1.1 Explain the terms nutrition and nutrients,
2.1.2 Identify the different types of nutrients with examples,
2.1.3 Carry out the food tests and
2.1.4 List down and explain diseases caused by deficiency of proteins, minerals and vitamins.

Assessment Items

Question 1. **[Remembering]**

Eating cheese can prevent

A rabies.
B rickets.
C cholera.
D diarrhoea.

Answer: *B rickets*

Question 2. **[Analysing]**

Why are fats considered an important nutrient?

A They repair injured parts of the body.
B They provide genetic information.
C They maintain bone density.
D They give us energy.

Answer: *D They give us energy.*

Question 3. **[Applying]**

Kinley is diagnosed as anaemic. You can recommend him to take food rich in

A iron.
B iodine.
C calcium.
D fluorine.

Answer: *A iron*

Question 4. **[Understanding]**

Name the following:

i) The process of eating, digesting and using food by our body. (*nutrition*)
ii) A specific substance present in food. (*nutrient*)
iii) A disorder which results from not eating the right amount of nutrients. (*malnutrition*)
iv) A part of our diet which regulates digestion. (*roughage*)
v) This nutrient does not provide energy but its absence can cause death. (*water*)

Question 5. **[Understanding]**

Look at the picture given below and identify the deficiency disease.

Figure 2.1.

A Kwashiorkor
B Marasmus
C Beriberi
D Rickets

Answer: *A Kwashiorkor*

Question 6. **[Understanding]**

Marasmus is characterised by

A pot belly.
B loose folds of skin.
C mental retardation.
D ugly patches on skin.

Answer: *B loose folds of skin*

Question 7. **[Understanding]**

Identify the nutrients present in the respective food items given below:

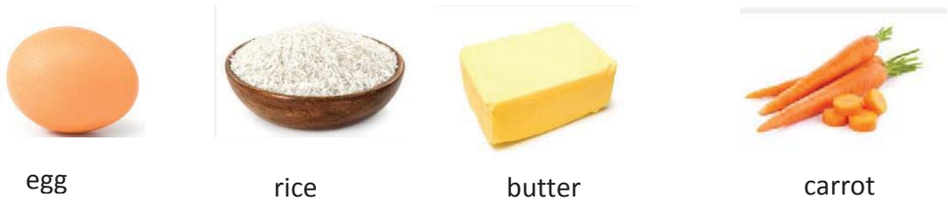


Figure 2.2

A protein, carbohydrates, fat, vitamin
B vitamin, protein, carbohydrates, fat
C carbohydrates, fat, vitamin, protein
D protein, fat, vitamin, carbohydrates

Answer: *A protein, carbohydrates, fat, vitamin*

Question 8. **[Applying]**

Phuntsho and his friends carried out an experiment using iodine solution, dropper and wheat flour. When he poured the iodine solution on the wheat flour, it changed to bluish black.

Which group of food is being tested in the above experiment?

A fat
B protein
C vitamins
D carbohydrates

Answer: *D carbohydrates*

Question 9. **[Analysing]**

Match each name of the minerals in column I against its deficiency disease in column II.

Column I	Column II
1. Iron	a. poor growth of bones and teeth
2. Iodine	b. tooth decay
3. Calcium	c. simple goitre
4. Flourine	d. anaemia

	1	2	3	4
A	d	b	c	a
B	d	c	b	a
C	a	c	d	b
D	d	c	a	b

Answer: *D 1 (d), 2 (c), 3 (a), 4 (b)*

Question 10. **[Analysing]**

When we add few drops of dilute HNO_3 on an egg white (albumin), it changes to yellow colour. What conclusion can you draw from the above activity?

A It contains calcium.
B It contains protein.
C It contains vitamin.
D It contains fat.

Answer: *B It contains protein.*

Question 11. **[Remembering]**

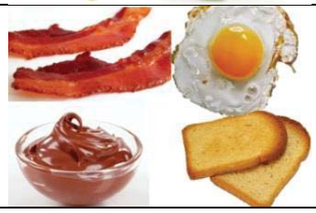
Write **TRUE** or **FALSE** against each statement.

i. Pork is an example of energy giving food. (*true*)
ii. Milk supplies maximum protein to our body. (*true*)
iii. Iodine solution is used to test the presence of fats in the food. (*false*)
iv. Roughage helps our body to digest food. (*false*)

Question 12. **[Applying]**

The following table 2.1 shows some meals with an item missing. Study and write which food item and its nutrients is necessary to make each meal a balanced diet.

Table 2.1

Sl No	Food item	Diagram	Missing food item and nutrition
1	• boiled potato • cabbage • carrot		……
2	• pizza (cheese and tomato topping)		……
3	• boiled rice • grilled lamb chop • bacon		……
4	• chicken drumstick • peas		……
5	• lettuce • spring onions • bread		……
6	• fried egg • bacon • toast • pudding		……

Answer: *1. Fish (protein) 2. Salad (vitamins and minerals) 3. Carrots (vitamins and minerals) 4. Potatoes (carbohydrates) 5. Eggs (protein) 6. Green beans (vitamins and minerals)*

Question 13. **[Understanding]**

Which mineral does each of the following food supply?

Table 2.3

Food supply	Mineral
a) Sea food	……
b) Milk	……
c) Table salt	……

Answer: *a) iodine b) calcium c) sodium*

Question 14. **[Analysing]**

Why do children need more protein than adults?

Answer: *Children are in the growing stage and they need more body building food.*

Question 15. **[Understanding]**

What will happen if you consume only rice and potatoes in your diet all the time?

Answer: *If we consume only rice and potatoes in our diet we might suffer from malnutrition. Our body need all the nutrients in right amount. Rice and potatoes are rich in carbohydrates only and do not provide other nutrients.*

Question 16. **[Analysing]**

Which food offers you more energy? Support your answer with a reason.

i**.** 100 grams of coconut oil or 100 grams of wheat flour.

Answer: *100 grams of wheat flour gives more energy because wheat is rich in carbohydrate*.

ii**.** One egg or one tea spoon of butter.

Answer: *One tea spoon of butter gives more energy because it is rich in carbohydrate.*

Question 17.

"Nationwide Vitamin B complex supplement for students

Measure being taken to prevent further outbreaks of peripheral neuropathy in schools

Nutrition: …

A press release from the health ministry stated that, in the last two decades, Bhutan has seen a series of peripheral neuropathy outbreak among students.

"The affected students of Gomphu LSS showed breathlessness, chest pain, palpitations, tingling sensation and numbness in lower limbs, which were symptomatic of nutritional deficiency illness," the release stated. "A detailed investigation by the health team inferred that the outbreak was due to deficiency of vitamin B1 or Thiamine in the students' diet."

On October 29, representatives from the health and education ministries met with the Prime Minister to discuss issues regarding the outbreak and its immediate interventions.

"Of the several interventions discussed, Lyonchhoen instructed immediate supplementation of Vitamin B-complex to all students for November and December, in order to prevent any possible outbreaks," the ministry's press release states……" ***(Coursety: kuenselonline.com*** *NOV 19, 2014)*

Answer the following questions with reference to the press release, Nationwide Vitamin B complex supplement for students.

i. What could be the reason for the peripheral neuropathy in the school? Mention the symptoms of this disease. [**Understanding]**

Answer: *The peripheral neuropathy in the school was caused by the lack of vitamin B. The symptoms are breathlessness, chest pain, palpitations, tingling sensation and numbness in lower limbs.*

ii. If you were one of the investigating teams, what diet would you suggest to the school to prevent the disease? **[Applying]**

Answer: *In order to prevent this disease we would encourage the school to include meat, whole grain, cereals, nuts, dried beans, peas and soybeans which contain high amount of vitamin B1. We would also recommend that parboiled rice and animal lean proteins such as poultry and beef, be included in the diet.*

iii. Do you think Vitamin B-complex supplement for students would prevent the peripheral neuropathy disease in all the schools in Bhutan? Is the government doing enough to prevent this disease? **[Evaluating]**

Answer: *open ended*

iv. Design a poster on healthy eating habit and its effects. **[Creating]**

Answer: *Teacher can give some information on healthy eating habits.*

Question18. **[Evaluating]**

Vitamins are more important than carbohydrates. Do you agree? Justify.

Answer: *Yes, vitamins are more important because without vitamins we would not be healthy.*
No, without carbohydrates, we would have no energy to do work.

2. THE HUMAN SKELETON

Learning Outcomes

At the end of the lesson, a student should be able to:

2.2.1 Draw and label the main parts of human skeleton and
2.2.2 Describe the main parts of the human skeleton and state their functions.

Assessment Items

Question 1. **[Remembering]**

All the bones in our body make up the

A bone system.
B bone structure.
C skeletal system.
D skeletal structure.

Answer: *C skeletal system*

Question 2. **[Remembering]**

Without the bone marrow, bones would not be able to

A store sulphate.
B store calcium.
C produce nerve cells.
D produce blood cells.

Answer: *D produce blood cells*

Question 3. **[Understanding]**

Figure 2.1

Which region of the skeleton system is shown in the above diagrams?

A sternum
B pelvic girdle
C pectoral girdle
D vertebral column

Answer: *D vertebral column*

Question 4. **[Understanding]**

Look at the diagram given below and label the parts 1, 2, 3, 4 and 5.

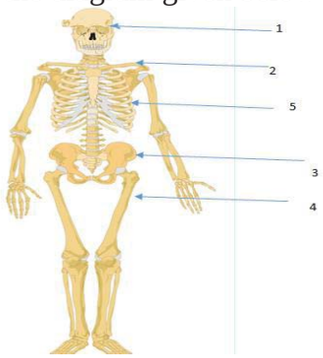


Figure 2.2

Answer: *1-skull, 2-pectoral girdles, 3-pelvis girdles, 4-femur, 5-ribs*

Question 5. **[Analysing]**

Jamphel met with an accident on her way to Bumthang. She was immediately admitted in Thimphu hospital for an X-ray and the result was shown as given below:

Figure 2.3

a. Which part of the bone is injured in the figure?
   Answer: *Backbone/vertebrae*
b. Is this fracture similar to that of breaking limb bones? Justify your answer.
   Answer: *No, because breaking of backbone/vertebrae might damage spinal cord and the injury might last life long, whereas breaking of limb bone can be healed with time.*

Question 6. **[Remembering]**

The vertebrae

A forms the skull.
B forms the rib cage.
C protects the spinal cord.
D support the bones of the forelimbs and hindlimbs.

Answer: *C protects the spinal cord*

Question 7. **[Remembering]**

Bones are made of

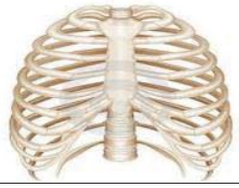
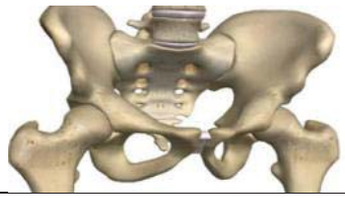
A protein, calcuim and phosphorus.
B vitamins, salt and cholrine.
C carbohydrate and iron.
D fats and carbon.

Answer: A *protein, calcuim and phosphrous*

Question 8. **[Analysing]**

Match the pictures in column A against column B.

Table 2.4

Sl.No	Column A	Column B
1		a. protects abdominal organs
2		b. protects brain
3		c. protects spinal cord
4		d. protects lungs
		e. protects liver

Answer: *1-b, 2-c, 3-d, 4-a*

3. THE HUMAN RESPIRATORY SYSTEM

Learning Outcomes
At the end of the lesson, a student should be able to:

2.3.1 Distinguish between breathing and respiration,
2.3.2 Draw and label the parts of human respiratory system,
2.3.3 Describe the different parts of human respiratory system and state their functions and
2.3.4 Discuss the ill effects of smoking.

Assessment Items

Question 1. **[Understanding]**
Wangmo has been a heavy smoker for the last five years. Which one of Wangmo's systems may be affected by smoking?
A nervous
B respiratory
C circulatory
D reproductive
Answer: *B respiratory*

Question 2. **[Remembering]**
The large number of alveoli provides rapid exchange of
A nitrogen and oxygen.
B nitrogen and hydrogen.
C carbon dioxide and oxygen.
D carbon dioxide and hydrogen.
Answer: *C carbon dioxide and oxygen.*

Question 3. **[Understanding]**
The Figure 3.1 is put up at the school gate for the public. What message does it convey?

Figure 3.1

A Smoking is allowed.
B Smoking is prohibited for all.
C Sale of tobacco is not allowed.
D Children are prohibited from using tobacco.
Answer: *B Smoking is prohibited for all.*

Question 4. **[Understanding]**

Look at the Figure 3.2 and answer the questions that follow:

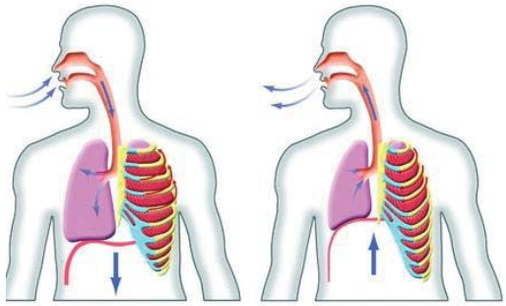


Figure 3.2

i. Name the process.

A digestion
B breathing
C circulation
D trasnpiration

Answer: *B breathing*

ii. How is this process different from respiration? [**Applying]**

Answer: *Breathing is a process where living organisms take in O_2 and give out CO_2 where as respiration is a cellular process where O_2 combines with food to give energy.*

Question 5. **[Applying]**

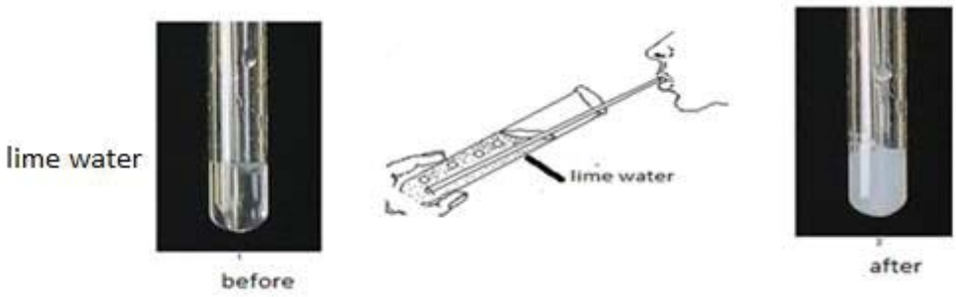


Figure 3.4

Kinzang carried out an experiment using different materials as shown in Figure 3.4
The aim of the experiment was to test that the exhaled air contains

A oxygen.
B nitrogen.
C water vapour.
D carbon dioxide.

Answer: *D carbon dioxide*

Question 6. **[Applying]**

Re-arrange the jumbled letters given in the word bank and fill in the blanks appropriately.

yarxln	aidmgraph	anasl	laevlio

1. The other name of voice box located at the upper end of the trachea is called…… (*larynx*)
2. The respiratory system begins with nose which lead to large air filled space called……chamber. (*nasal*)
3. Inhaling and exhaling of air is the result of contraction and expansion of …… (*diaphragm*)
4. The bronchioles are fine structure of bronchi which end as the air sacs known as……. (*alveoli*)

Question 7. **[Applying]**

The diagram given below is incorrectly labelled. Re-draw the diagram and label it correctly.

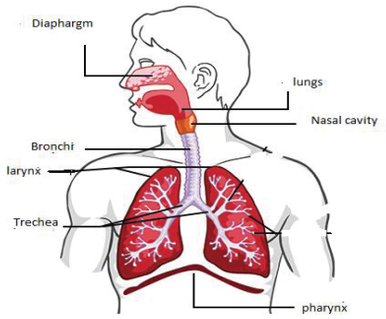
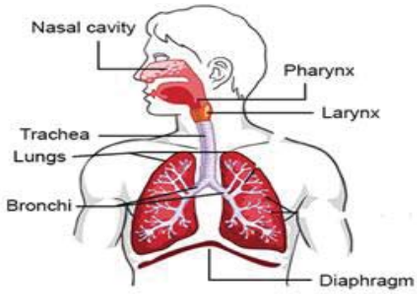


Figure 3.5

Answer:

The correctly labelled diagram is shown below:



Question 8.

Look at the diagrams A and B given in Figure 3.6 and answer the following questions:

A B

Figure 3.6

1. Name the Organ **[Remembering]**

Answer: *Lungs*

2. Why do you think diagram A looks different from diagram B? **[Analysing]**
Answer: *They are different because the lung in diagram A is affected by smoking and it is black in colour.*

3. What caused diagram A to appear different from diagram B?
Answer: *It is due to the presence of a poisonous substance called tar which is present in the cigarette.*

4. What conclusion can you draw by looking at the two diagrams? **[Understanding]**
Answer: *From the above diagrams we can conclude that smoking has negative effects on lungs.*

Question 9. **[Evaluating]**
"…. the 82nd session banned the sale of tobacco throughout the country. It was also resolved that a 100 percent duty would be levied on all tobacco products being brought into the country for personal consumption…." ***(Kuenselonline.com JUNE 5, 2013)***

Do you think, 'Banning of tobacco in our country will uplift the health of people in the long run'? Justify with ONE point.
Answer: *Yes, banning of tobacco will improve the health of the people because it will prevent tobacco related diseases.*
No, because there are other factors like alcohol and junk foods which equally affect our health.

Question 10. **[Understanding]**
In the diagram given below, which letter correctly represents the part of the respiratory system where the gaseous exchange takes place?

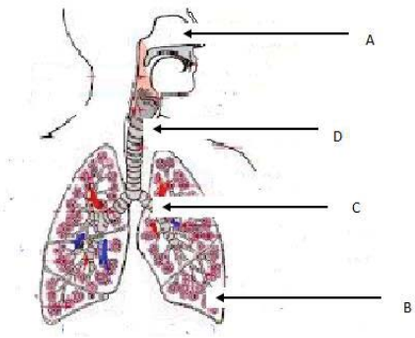


Figure 3.7

Answer: *B*

4. THE HUMAN REPRODUCTIVE SYSTEM

Learning Outcomes

At the end of the lesson, a student should be able to:

2.4.1 Identify the parts of the male and female reproductive systems,
2.4.2 Write the different stages in the menstrual cycle,
2.4.3 Define fertilization and explain the sequences involved and
2.4.4 Discuss the risks of teenage pregnancy.

Assessment Items

Question 1. **[Remembering]**

The site of fertilization in a mammal is

A ovary.
B uterus.
C vagina.
D fallopian tube.

Answer: *D fallopian tube*

Question 2. **[Understanding]**

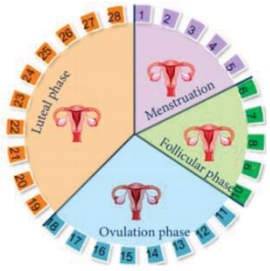


Figure 4.1

According to the Figure 4.1, which **ONE** of the following is **INCORRECT** about menstruation?

A The beginning of menstruation is called menarche.
B Mensuraration is the outflow of lining of the uterus.
C Menstruation is the outflow of blood.
D It lasts for 6 to 8 days.

Answer: *D It lasts for 6 to 8 days.*

Question 3. **[Analysing]**

The correct sequence of foetus development based on the Figure 4.2 is

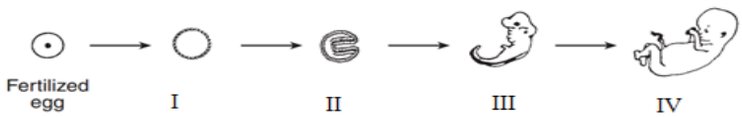


Figure 4.2

A gamete → zygote → embryo → foetus
B gamete → embryo → zygote → foetus
C Embryo → Zygote → gamete → Foetus
D zygote → embryo → foetus→ gamete

Answer: *A gamete → zygote → embryo → foetus*

Question 4. **[Analysing]**

The Figure 4.3 shows four animals.

Figure 4.3

What do all four animals have in common?

A They feed on same food.
B They reproduce sexually.
C They reproduce asexually.
D They have similar means of locomotion.

Answer: *B They reproduce sexually.*

Question 5.

The Figure 4.4 shows the ages at which changes associated with puberty take place in boys and girls.

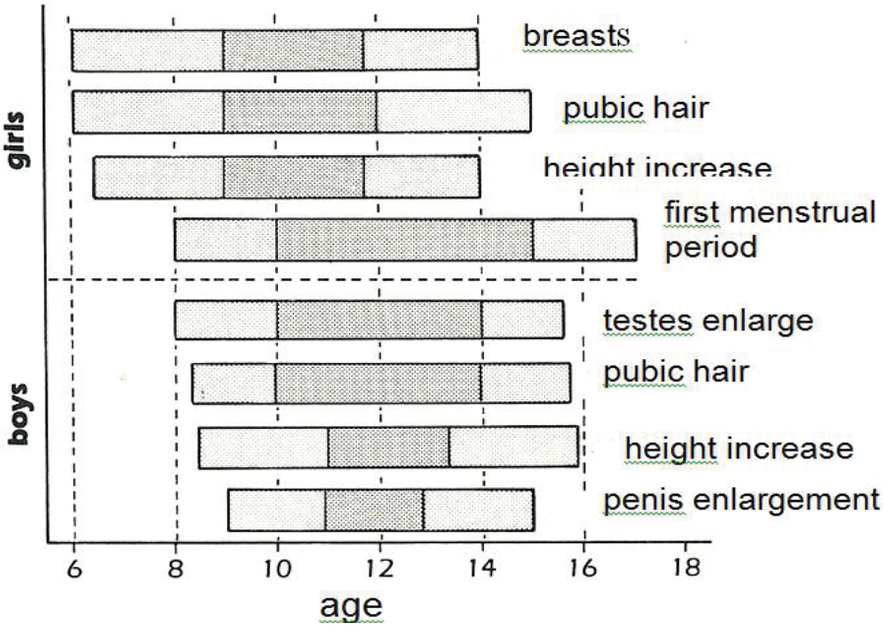


Figure 4.4

i) What is the most common age at which boys undergo changes in puberty?

[Understanding]

Answer: *The most common age at which boys undergo the changes in puberty is at 11 to 13 years of age.*

ii) Is it unusual for a girl of 9 years to start her first menstrual period?

[Understanding]

Answer: Yes.

iii. On average, is it boys or girls who first show the onset of puberty?

[Understanding]

Answer: *Girls*

Question 6. **[Analysing]**

Study the Figure 4.5 very carefully. Match column A, column B and column C accordingly. Column A has to be matched correctly to the labelling given in Figure 4.5.

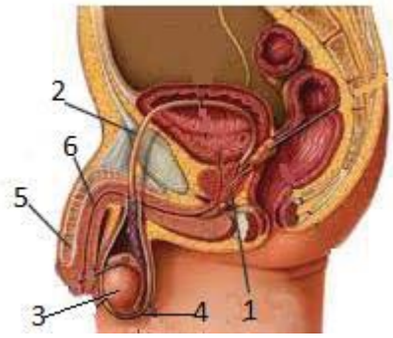


Figure 4.5

Table 4.5

Column A	Column B	Column C
1	vas deferens	tube through the penis carrying sperm to the outside of the body
2	testes	pouch enclosing the testes keeping the sperm at an optimum temperature for development
3	prostate gland	the largest of several glands which add lubricating and other fluids to the sperm
4	penis	adaptation for internal fertilization of the female
5	scrotum	produces sperm and the hormone testosterone
6	urethra	tube carrying sperm away from the testes

Answer:

Column A	Column B	Column C
1	*prostate gland*	*the largest of several glands which add lubricating and other fluids to the sperm*
2	*vas deferens*	*tube carrying sperm away from the testes*
3	*testes*	*produces sperm and the hormone testosterone*
4	*scrotum*	*pouch enclosing the testes keeping the sperm at an optimum temperature for development*
5	*penis*	*adaptation for internal fertilization of the female*
6	*urethra*	*tube through the penis carrying sperm to the outside of the body*

Question 7.
The Figure 4.6 shows the process of sexual reproduction:

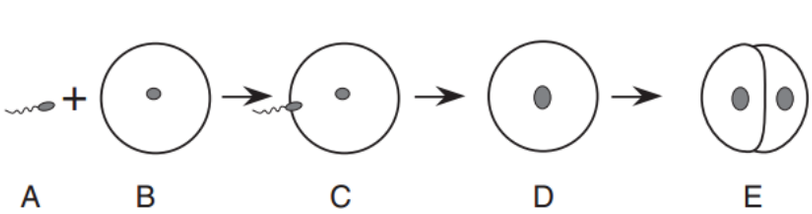


Figure 4.6

With reference to the figure given above answer the following questions:

i. Identify the sex cell shown at A. (*Sperm*) **[Understanding]**

ii. Identify the sex cell shown at B. (*Ovum*) **[Understanding]**

iii. Identify the reproductive process that is occurring at C. **[Understanding]**

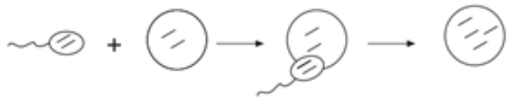
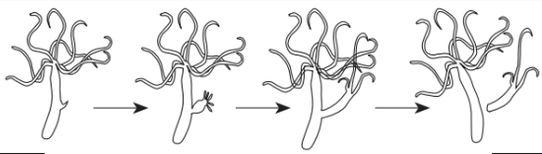
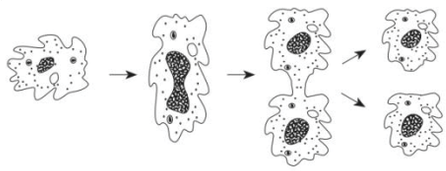
Answer: *The reproductive process that is occurring at C is fertilization.*

iv. What information in the diagram supports that the process is sexual reproduction? **[Analysing]**

Answer: *It is clearly shown that the fusion of male sex cell and female sex cell is occurring at the stage C. Or The process is sexual reproduction because stage C shows the fusion of male and female sex cells.*

Question 8. **[Analysing]**

The diagrams in the second column of the chart below show various forms of reproduction. Circle the form of reproduction (asexual or sexual) given in the third column.

Sl No.	Forms of reproduction	Form of reproduction
1		ASEXUAL/ SEXUAL
2		ASEXUAL/ SEXUAL
3		ASEXUAL/ SEXUAL

Answer: *1. Sexual 2. Asexual 3. Asexual*

Question 9.
Study the graph in Figure 4.7 and answer the questions that follow:

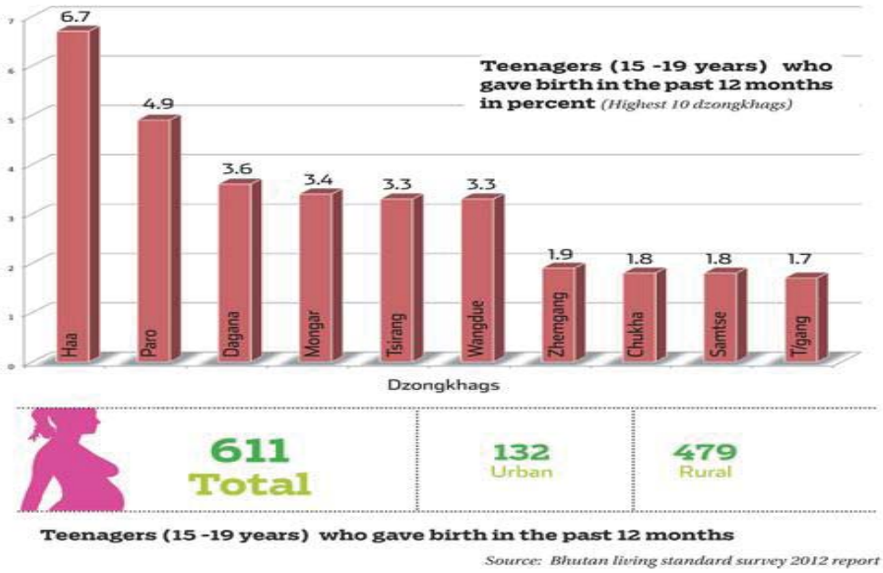


Figure 4.7 ***kuenselonline.com*** *MAY 10, 2013*

i. Which dzongkhag has the highest rate of teenage pregnancy? **[Understanding]**

Answer: *The highest rate of teenage pregnancy is in Haa dzongkhag.*

ii. What could be your hypothesis for the high rate of teenage pregnancy in rural than urban areas? **[Creating]**

Answer: *Lack of awareness on contraceptive, little or no guidance from elders on the significance of the menstural cycle and unplanned sex.*

iii What conclusion can you draw from the above graph? **[Analysing]**

Answer: *-Teenage pregnancy is higher in the rural areas than in the urban areas.*

- Teenage pregnancy is a seroius problem in Bhutan which can lead to health complication such as miscarrages with the teenage girls.

-Any other relevant answers

Question 10. **[Understanding]**

Before fertilisation occurs, the sperms have to travel from the testes to ovum in the female organs.

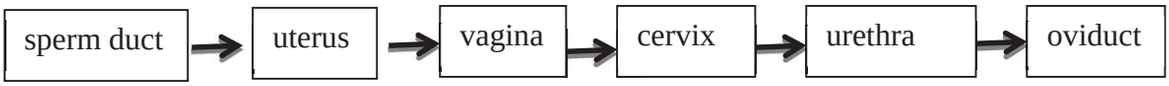


Figure 4.8

What is wrong with the path of the sperm shown in Figure 4.8? Explain your points by putting it in the correct order.

Answer: *The uterus serves as the site for embryo development. The vagina is the tube which recives the sperm. The cervix connects the uterus to the vagina. The oviduct is the tube which connects the ovary to the uterus . Therefore the correct path of the sperm is sperm duct, vagina, cervix ,uterus and oviduct.*

Question 11. **[Creating]**

When an ovum and sperms are observed under the microscope, it is seen that the sperms always swim towards the ovum. What hypothesis can be drawn to explain this observation?

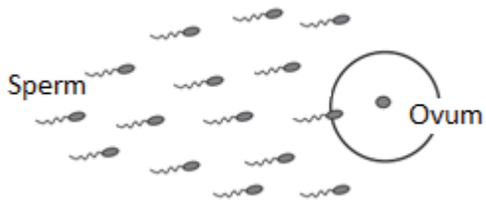


Figure 4.9

Answer: *The ovum produces chemicals which attract the sperms to swim towards it.*

5. HUMAN NERVOUS SYSTEM

Learning Outcomes
At the end of the lesson, a student should be able to:

2.5.1 Name the main parts of human nervous system and write their functions,
2.5.2 Make the model of human brain and
2.5.3 Tell the importance of nervous system.

Assessment Items

Question 1. **[Remembering]**
Name the **TWO** structures which make up the nervous system.
I muscles
II spinal cord
III brain
IV blood

A I only
B I and II
C II and III
D III and IV
Answer: *C II and III*

Question 2. **[Understanding]**
Which part of the person's brain is affected in Figure 5.1?
A pons
B cerebrum
C cerebellum
D medulla oblongata
Answer: *C cerebellum*

Figure .5.1 ***A drunk man***

Question 3. **[Understanding]**
Pema is very creative, good at reasoning and solving problems. The site of intelligence is located in the
A cerebrum.
B spinal cord.
C cerebellum.
D medulla oblongata.
Answer: *A cerebrum*

Question 4. **[Analysing]**
Find the odd man out from the following pair.
A Motor nerves**:** Carry impulse from organ to brain.
B Mixed nerves**:** coordinates involuntary activities.
C Sensory nerves**:** carry impulse from brain to parts of body.
D Spinal cord**:** arise from brain and runs along the vertebral column.
Answer: *D Spinal cord: arise from brain and runs along the vertebral column.*

Question 5. **[Analysing]**

Match each function in column A against its structure in column B. Rewrite the correct matching pairs.

Column A	Column B
1. Medulla oblongata	a. memory and reasoning
2. Spinal cord	b. balance and muscular co-ordination
3. Cerebellum	c. control of heart beat and breathing
4. Cerebrum	d. carries message from skin to brain
5. Neuron	

Answer: *1(c), 2(d), 3(b), 4(a)*

Question 6. **[Applying]**

A teacher brought chopped fruits like grapes, oranges, apples and mangoes. The teacher then asked Deki to close her eyes and taste the fruits as shown in the diagram below.

Figure 5.2

Answer the following questions based on the above activity.

i. Which part of the brain recognizes the fruits' taste? (*Cerebrum*)

ii. Name the nerves involved in carrying the impulses from the tongue to the brain. (*Sensory nerves*)

Question 7. **[Evaluating]**

'Bigger the size of head more the intelligence, smaller the size of head lesser the intelligence'.

Do you agree or disagree? Support your answer with **TWO** points.

Answer: *(Open ended)*

I agree because bigger the head there will be more neuron in the brain.

I disagree because intelligence has no connection with the size of a head.

Question 8. **[Creating]**

Make a model of a human brain with the resources available.

Answer: *open ended*

6. HEALTH AND DISEASES

Learning Outcomes
At the end of lesson a student should be able to:

2.6.1 Explain health and the different types of diseases and
2.6.2 State the different components of personal health and hygiene and explain their functions.

Assessments items

Question 1. **[Remembering]**

Which of the following states the transmission of HIV?

A Sharing plates.
B Hugging an infected person.
C Having sexual intercourse with an infected person.
D Using a towel that has been used by an infected person.

Answer: *C Having sexual intercourse with an infected person.*

Question 2. **[Understanding]**

Figure 6.1

Using a mask as shown above in the figure could prevent

A genetic disease.
B hereditary disease.
C communicable disease.
D non-communicable disease.

Answer: *C communicable disease*

Question 3. **[Understanding]**

In boarding schools students are advised not to share clothes and bed. This is to prevent the spread of

A ring worm.
B tape worm.
C hook worm.
D round worm.

Answer: *A ring worm*

Question 4. **[Understanding]**

State **THREE** ways by which the AIDS virus can be transmitted.

Answer: *AIDS can be transmitted by*

1. *using a syringe needle that has been used by an infected person.*
2. *receiving a blood transfusion (or blood products) from an infected person.*
3. *sexual intercourse (heterosexual or homosexual) with an infected person.*

Question 5.

Study Figure 6.2 to answer questions i to iii.

Figure 6.2

i. Predict the disease in the Figure 6.2. (*Athlete's foot*) **[Understanding]**

ii. Which one of the following can be used to treat the disease in the above figure? **[Understanding]**

A weedicides
B insecticide
C fungicide
D pesticide

Answer: *C fungicide*

iii. Mention **TWO** ways to prevent this disease. **[Applying]**

Answer:

1. *Washing feet every day and letting it dry before putting on shoes and socks.*
2. *Avoid sharing shoes and socks.*

Question 6. **[Understanding]**

Sangay has fever, cough with sputum and pain in the chest. These are some of the symptoms of

A cholera.
B typhoid.
C diarrhoea.
D tuberculosis.

Answer: *D tuberculosis*

Question 7.
Study the Figure in 6.3 and answer the questions that follow:

Figure 6.3

i. Why is the water not fit for drinking? **[Analysing]**

Answer: *The water is not fit for drinking because it is contaminated.*

ii. Give **TWO** examples of diseases caused by such water. **[Applying]**

Answer: *Typhoid and cholera.*

iii. How can we prevent the spread of such diseases? **[Applying]**

Answer: *The spread of such diseases can be prevented by effective disposal of sewage and purification of drinking water.*

Question 8. **[Analysing]**
Arrange the following events in an appropriate order to explain the spread of a parasite worm.

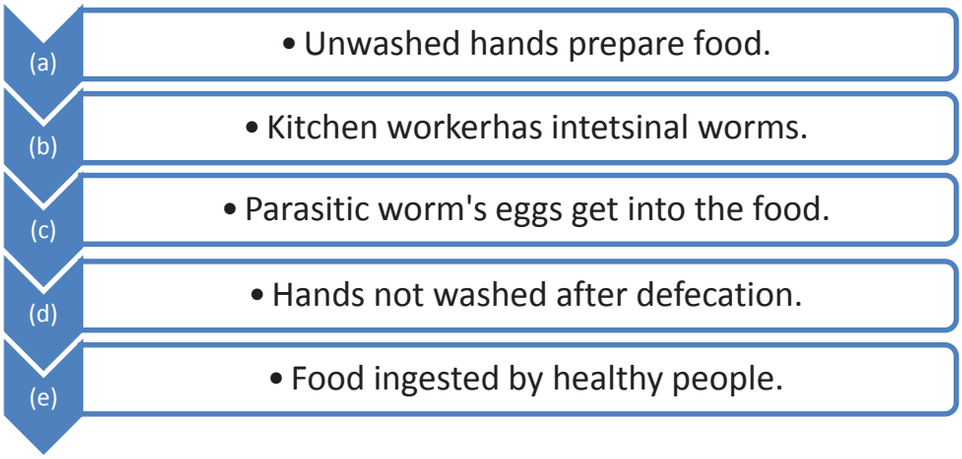


Figure 6.4

Answer: *The most likely order of events is as follows: (b), (d), (a), (c), (e)*

.

Question 9. **[Creating]**
Students are assigned to find out ways to prevent and protect from getting communicable or non-communicable diseases?

Answer: *They can design posters, role play, walk for health with slogans, etc.*

CHAPTER 3
GREEN PLANTS

1. PHOTOSYNTHESIS

Learning Outcomes

At the end of the lesson, a student should be able to:

3.1.1 Explain the process of photosynthesis,
3.1.2 Find out the factors necessary for photosynthesis and
3.1.3 Explain the importance of photosynthesis.

Assessment Items

Question 1. **[Remembering]**

The labelled part of the plant that carries out photosynthesis is the

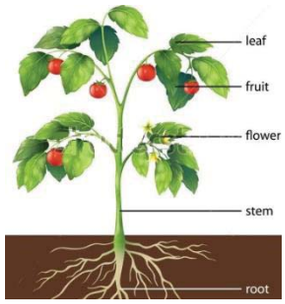


Figure 3.1.

A flowers.
B fruits.
C leaf.
D root.

Answer: *C leaf*

Question 2. **[Analysing]**

Studies on different kinds of green plants have not revealed any specialized organ systems for digestion.

Based on the above statement, you can conclude that green plants

A cannot digest carbohydrates.
B carry on intracellular digestion.
C receive all their organic nutrients from the air.
D secrete hormones that hydrolyse foods outside of the plant.

Answer: *B carry on intracellular digestion.*

Question 3. **[Remembering]**

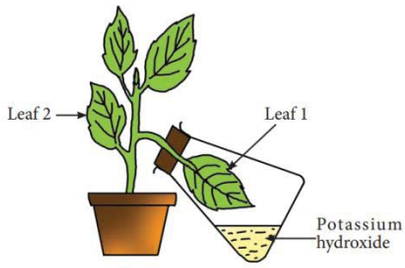


Figure 3.2

The experiment in Figure 3.2 is to find out whether carbon dioxide is necessary for photosynthesis.
What substance can be used instead of potassium hydroxide in the conical flask?

A calcium chloride
B sodium chloride
C sodium hydroxide
D calcium hydroxide

Answer: *C sodium hydroxide*

Question 4. **[Understanding]**

The diagram below gives information about carbon dioxide and oxygen in the atmosphere. Based on the diagram answer the question that follows:

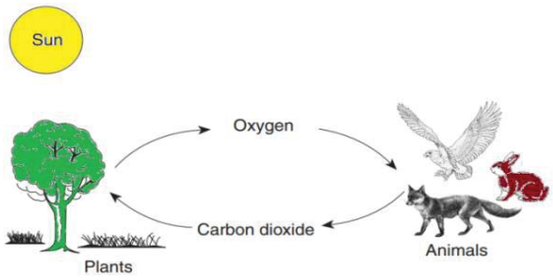


Figure 3.3

What is the name of the process that produces oxygen?

A photosynthesis
B metamorphosis
C fertilization
D respiration

Answer: *A photosynthesis*

Question 5. **[Understanding]**

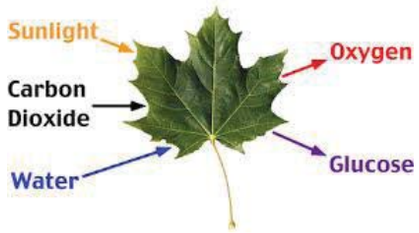


Figure 3.4

Which word equation best represents the above process?

A glucose → alcohol + carbon dioxide

B maltose + water → glucose + glucose

C glucose + oxygen → carbon dioxide + water

D carbon dioxide + water glucose + oxygen + water

Answer: *D carbon dioxide + water → glucose + oxygen + water*

Question 6. **[Applying]**

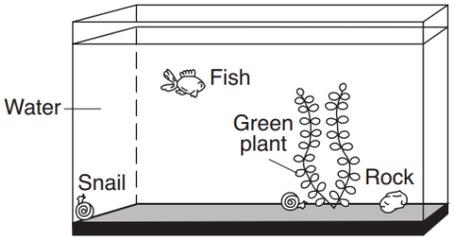


Figure 3.5

The process of photosynthesis carried out by the green plant in the figure 3.5 above depends on the

A number of decomposers in the water.

B number of saprophytes in the water.

C amount of molecular oxygen in the water.

D amount of light that penetrates through the water.

Answer: *D amount of light that penetrates through the water*

Question 7. **[Applying]**

Select the most appropriate word from the options given below to complete the following paragraph.

respiration, circulation, photosynthesis, fermentation

A green plant can make all the substances it needs. It builds up carbohydrates by the process of*....1*..... In this process it combines *water* from the *soil* with *carbon dioxide* from the *air* to form *glucose*. The *energy* needed for this process comes from *...2*.....which is absorbed by the *chlorophyll* in the *chloroplasts* of leaf *cells*. The waste product of the process is *oxygen*.

Answer: *1(photosynthesis), 2(respiration)*

Question 8. **[Analysing]**

A leaf is destarched from a plant and tested with iodine as shown below.

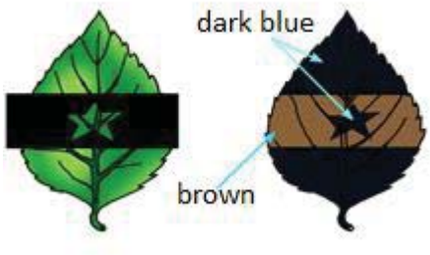


Figure 3.6

The dark blue colour is due to the presence of

A starch.

B protein.

C minerals.

D chlorophyll.

Answer: *A starch*

Question 9.

Study the Figure 3.7 and answer the following questions:

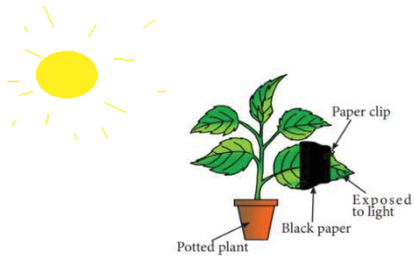


Figure 3.7

i. How would you destarch the leaves of a potted plant? **[Applying]**

Answer: *If a potted plant is kept in darkness for 48 hours, all the starch in its leaves should have been converted to sugars and conducted out of the leaves.*

ii. How would you check that the destarching has been effective? **[Applying]**

Answer: *To check on the destarching, one of the leaves or part of a leaf should be tested with iodine to make sure if leaf is free from starch.*

iii. What control would you use in the experiment? **[Analysing]**

Answer: *The control is the leaf, or part of the leaf, which has not been exposed to light and does not contain starch. Alternatively, if the exclusion of light from the leaf is thought to be the experiment, the parts of the leaf exposed to light constitute the control.*

iv. What do you infer from the experiment? **[Understanding]**

Answer: *The inference is that light is necessary for photosynthesis.*

Question 10. **[Analysing]**

Why can't animals make their own food from carbon dioxide, water and sunlight?

Answer: *It is because animals don't have chloroplasts in their cells like plants do. These things are required to make food and energy through a process called photosynthesis.*

Question 11. **[Evaluating]**

Is it possible for a plant to photosynthesize and respire at the same time?

Answer: *Yes, a plant respires all the time. Therefore, during daylight photosynthesis and respiration go on at the same time.*

No, photosynthesis will not take place at night.

Question 12. **[Creating]**

Imagine the life on the earth without photosynthesis.

Answer: *open ended*

2. NUTRIENTS FOR PLANTS

Learning Outcomes

At the end of the lesson, a student should be able to:

3.2.1 Compare micronutrients and macronutrients,
3.2.2 Explain the importance of primary and secondary nutrients with examples and
3.2.3 Compare the advantages of using organic fertilizers over chemical fertilizers.

Assessment Items

Question 1. **[Understanding]**

Drolma's pea plants show premature falling of leaves. An agriculture officer advised her to add

A ammonium nitrate.
B potassium nitrate.
C manure.
D urea.

Answer: *C manure*

Question 3. **[Applying]**

An example of a micronutrient is

A phosphorous.
B magnesium.
C manganese.
D potassium.

Answer: *B magnesium*

Question 4. **[Understanding]**

Identify the missing nutrients in the diagram given below:

Figure 2.1

A magnesium
B phosphorus
C potassium
D nitrogen

Answer: *D nitrogen*

Question 5. **[Applying]**

Which of the following is **NOT** a method to increase soil nutrients?

A crop rotation
B field fallowing
C adding fertilisers
D burning the waste

Answer: *D burning the waste*

Question 6. **[Analysing]**

Air contains 78% of nitrogen but it is not useful to the plants. Give one reason.

Answer: *It is of no use to the plants unless it is converted to nitrates which can be absorbed by the roots.*

(Use the table below to answer question 7.)

Table 2.1 Effect of potassium on Cucumber Yield

	Plot 1	Plot 2	Plot 3	Plot-4
Size(meter^2)	1.0	1.1	1.0	0.9
Amount of potassium applied(grams)	1.0	10.0	100.0	1000
Number of cucumbers	2	4	7	1
Average mass of each cucumber(grams)	113	181	227	31

Question 7. **[Applying]**

Gyeltshen wanted to determine if increasing the amount of potassium in his garden would yield bigger cucumbers. He arranged four plots and mixed each with a different concentration of potassium.

Which statement best explains the fourth plot yielded the poorest result?

A Weeds must have choked the cucumbers.
B Too much potassium damaged the cucumber.
C Any time potassium is added to soil poor results occur.
D The smaller plot accounted for the low cucumber yield and mass.

Answer: *B Too much potassium damaged the cucumber.*

Question 8. **[Understanding]**

State whether the statement given below are **TRUE** or **FALSE**.

Table 2.2

	Statement	True/ False
i.	The examples of primary nutrients are nitrogen, phosphorus and potassium.	……..(*true*)
ii.	Deficiency of potassium leads to premature falling of leaves.	……..(*false*)
iii.	Calcium in plants helps in the developments of pollen.	……..(*true*)
iv.	The examples of secondary nutrients are calcium, magnesium and sulphur.	……..(*true*)

Question 9. **[Evaluating]**

Read the paragraph on organic farming.

"...A few years back, when the Samdrupjongkhar Initiative, a civil society organisation, was established, Tshering and a few other farmers from different villages were sent to an institute in Dehradhun, India to be trained in organic farming for a month.Now almost three years since the training, Tshering has implemented productively what he learned. "I mix cow dung with leaves, soil and cows' urine to make it more rich," he said, adding that then he leaves the composite for more than 20 days before using it in his vegetable gardens..."

(***Courtesy: kuenselonline Aug. 13, 2014)***

i) The above is a result of government recommending our farmers to practise organic farming. Predict some of the pros and cons of organic farming. **[Analysing]**

Answer: *Pros- organic farming does not contain any harmful chemicals, it has more nutritional value and it is environmentally friendly.*

Cons- the production of organic farming will be less and it requires intensive labour forces.

3. RESPIRATION IN PLANTS

Learning Outcomes

At the end of this lesson, a student should be able to:

3.3.1 Explain the process of respiration,
3.3.2 Distinguish between aerobic and anaerobic respiration,
3.3.3 Carry out experiments to find out the gases used and given out during respiration and
3.3.4 Write down the use of anaerobic respiration.

Assessment Item

Question 1. **[Remembering]**

In which cell structure does respiration occur?

A nucleus
B golgi bodies
C mitochondria
D cell membrane

Answer: *C mitochondria*

Question 2. **[Understanding]**

Anaerobic respiration plays an important role in commercial purpose. It is used in the following process **EXCEPT**

A curing of leather.
B manufacture of alcohol.
C manufacture of vinegar.
D formation of curd from milk.

Answer: *A curing of leather*

Question 3. **[Analysing]**

Which type of respiration would you consider more efficient – aerobic or anaerobic? Why?

Answer: *Aerobic respiration is more efficient as it produces more energy than anaerobic respiration.*

Question 4. **[Analysing]**

Which ONE of the following would be an acceptable evidence that respiration has taken place in a living tissue?

A oxygen being taken in
B oxygen being given out
C glucose being produced
D water being produced

Answer: *A oxygen being taken in*

Question 5. **[Analysing]**

Which **TWO** of the following statements are incorrect?

I Anaerobic respiration uses oxygen to release energy from food.
II Aerobic respiration releases oxygen from food during oxidation.
III Aerobic respiration converts food to carbon dioxide and water.
IV Anaerobic respiration releases energy from food without using oxygen.
A I and II.
B I and IV.
C II and III.
D III and IV.

Answer: *A I and II*

Question 6.

In the laboratory students set up an experiment as shown in Figure 3.1. Look at the diagram carefully and answer the questions that follow:

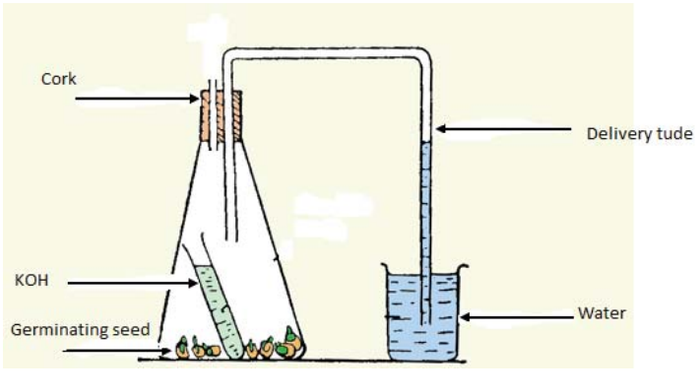


Figure 3.1

i. What is the aim of the experiment? **[Understanding]**

Answer: *To prove that oxygen is used in respiration.*

ii. What is wrong with the above experiment? **[Understanding]**

Answer: *The cork has a hole which allows air to pass in and out.*

iii. Why is potassium hydroxide used in the experiment? **[Analysing]**

Answer: *To test that the carbon dioxide is released during respiration.*

Question 7. **[Applying]**

Complete the following equation.

i. $C_6H_{12}O_6$ + …….. $\longrightarrow$ $6CO_2$ + ……+ Energy

Answer: $C_6H_{12}O_6 + 6O_2 \longrightarrow 6CO_2 + 6H_2O$ + Energy

4. GERMINATION

Learning Outcomes

At the end of the lesson, a student should be able to:

3.4.1 Define the terms dormancy and germination,
3.4.2 Describe the different parts of a seed,
3.4.3 Explain the different types of germination,
3.4.4 Investigate the conditions required for germination and
3.4.5 Tell the appropriate timings for the sowing of different seeds.

Assessment Items

Question 1. **[Remembering]**

Germination is epigeal in

A rice.
B beans.
C wheat.
D maize.

Answer: *B* *beans*

Question 2. **[Remembering]**

Germination is hypogeal in

A mango.
B cotton.
C castor.
D pappya.

Answer: *A* *mango*

Question 3. **[Understanding]**

Seed dormancy allows the seeds to

A store food.
B develop healthy seeds.
C prevent the seed from becoming rotten.
D overcome unfavourable climatic condition.

Answer: *D* *overcome unfavourable climatic condition*

Question 4. **[Remembering]**

The Figure 4.1 represents a bean seed that has been cut into half to show its various structures.

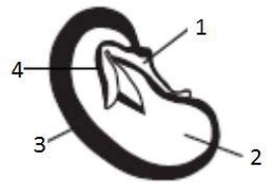


Figure 4.1

i. Which number represents the stored food that the new plant will use for early development?

A 1

B 2

C 3

D 4

Answer: *B 2*

ii**.** The parts labelled 1,2,3,4 are

A. plumule , cotyledon, seedcoat, radicle

B. plumule ,seedcoat, radicle, cotyledon

C. plumule ,radicle , cotyledon, seedcoat

D. plumule , cotyledon, radicle , seedcoat

Answer: *A plumule , cotyledon, seedcoat, radicle*

Question 5.

Test tubes A, B, and D were kept in a warm place and test tube C was placed in a fridge.

The seeds in test tube B germinated after 3 days but other seeds failed to germinate.

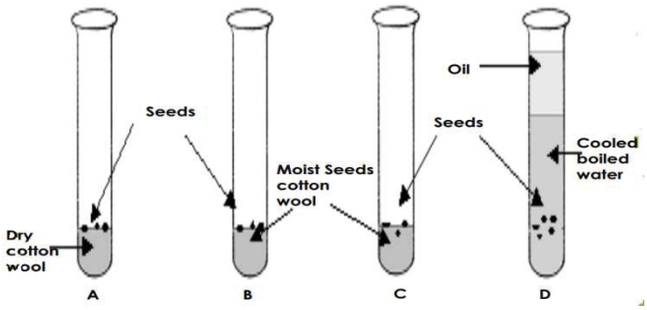


Figure .4.2

Based on the above experiment answer the following questions:

i. Why did the seeds in test tube A fail to germinate? **[Analysing]**

Answer: *Seeds in test tube A failed to germinate because there was no water.*

ii. Why did the seeds in test tube C fail to germinate? **[Analysing]**

Answer: *Seeds in test tube C failed to germinate because it was placed in a fridge where the seeds were exposed to low temperature.*

iii. Why was cooled boiled water used in test tube D? **[Analysing]**

Answer: *Cooled boiled water was used in test tube D to remove oxygen.*

iv. What can you conclude from the experiment? **[Evaluating]**

Answer: *The experiment shows the water and favourable temperature are required for germination of seeds.*

Question 6.

Sowing times are a guide only and will vary depending on the region and the climate.

Figure 4.3 ***Courtesy: http://www.thompson-morgan.com/vegetable-seed-sowing-guide***

With reference to the guide for sowing seeds, answer the following questions:

i. Why are different seeds sown at different seasons? **[Analysing]**
Answer: *Different seeds are sown at different seasons because every seed requires optimum growing temperature ranges and soil conditions.*

ii. Seeds are mostly sown in the month of February, March and April. Why? **[Analysing]**
Answer: *Seeds are mostly sown in February, March and April because most of the seeds grow well in warm conditions (spring season in Bhutan) than in cold conditions (January and December). Most of the seeds do not grow well in extreme cold or hot conditions.*

Question 7. **[Understanding]**

The function of the cotyledon is to provide food for the embryo. Explain why the cotyledon is not needed once the bean plant matures.

Answer: *Once the bean plant matures it can prepare its own food through the process of photosynthesis.*

CHAPTER 4

LIVING THINGS AND THEIR ENVIRONMENT

1. ADAPTATION AND VARIATION

Learning Outcomes

At the end of the lesson, a student should be able to:

4.1.1 Define adaptation with examples,
4.1.2 Differentiate between hibernation and aestivation,
4.1.3 Explain the terms variation, evolution and species and
4.1.4 Explain the importance of adaptation and variation.

Assessment Items

Question 1. **[Understanding]**

Figure 4.1.

The type of adaptation shown in the above figure is for

A locomotion.
B evolution.
C defence.
D food.

Answer: *D food*

Question 2. **[Analysing]**

During summer snakes are found abundantly in hot places but hardly any in winter because they under go

A aestivation.
B hibernation.
C adaptation.
D evolution.

Answer: *B hibernation*

Question 3. **[Understanding]**

The diagram below shows two organisms.

Cat ***Rat***

Figure 4.2.

Which phrase below best describes the classification of these two organisms?

A same kingdom, same species
B same kingdom, different species
C different kingdoms, same species
D different kingdoms, different species

Answer: *B same kingdom, different species*

Question 4. **[Applying]**

The Figure 4.3 shows an example of

A variation.
B evolution.
C camouflage.
D competition.

Answer: *B evolution*

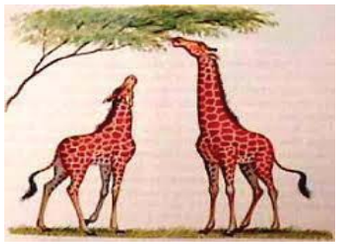


Figure 4.3

Question 5. **[Understanding]**

What are the special features of eagles that enable them to survive on Earth?

Answer:*Their powerful beaks and claws to capture preys and larger wings to stay in the air. Their eyes allow them to accurately judge distance when swoopingin on prey.*

Question 6. **[Evaluating]**

"Variation is necessary for living organisms". Do you agree or disagree? Support your answer with justifications.

Answer: *Agree-Variation is important for living organisms to adapt to the changing environment and to help them survive on earth.*

Disagree- Variatation is not important because in the due course of time the original features of an organism is lost.

Question 7. **[Applying]**

The eyes of the owl and the rabbit shown in the picture below give each animal a different advantage. The front-facing eyes of an owl allow the bird to accurately judge distance when swooping on prey. The side-facing eyes of rabbit allow the animal to detect the motion of possible predators.

Figure 4.4

Figure 4.4

What characteristics of the animals does the above passage describe?

A Involuntary responses to stimuli.
B Disruptions of the natural balance.
C The interdependence of living things.
D Adaptations for survival under certain conditions.

Answer: *D Adaptations for survival under certain conditions.*

(Study the picture given below and answer question 7.)

Figure 4.5

Question 8. **[Remembering]**

Fill in the blanks.

i. The inactive state in summer to overcome extreme heat is called..... (*aestivation*).

ii. A ..... is adapted to live in desert. (*camel*).

iii. The capacity of the living organisms to change and to be able to survive in a different environment is called ..... (*adaptation*).

iv. When individuals are different, it is called ..... (*variation*).

v. ..... is the creation of new species. (*evolution*).

vi. Organisms that look alike, mate and reproduce fertile off-springs among themselves are called ..... (*species*).

2. ECOSYSTEM AND ITS COMPONENTS

Learning Outcomes

At the end of the lesson, a student should be able to:

4.2.1 Describe ecosystem and its components,
4.2.2 Distinguish between natural and man-made ecosystem with examples,
4.2.3 Draw and explain food chain with examples,
4.2.4 Define ecological pyramid,
4.2.5 Draw and explain food web with examples,
4.2.6 Draw food chain and food web,
4.2.7 Explain the importance of ecological balance and
4.2.8 Discuss the threats caused to the environment due to human interference in Bhutan.

Assessment Items

(Figure 4.5 shows the relationships between the number of producers and consumers in two food chains. Study the food chains carefully and answer the questions 1 and 2.)

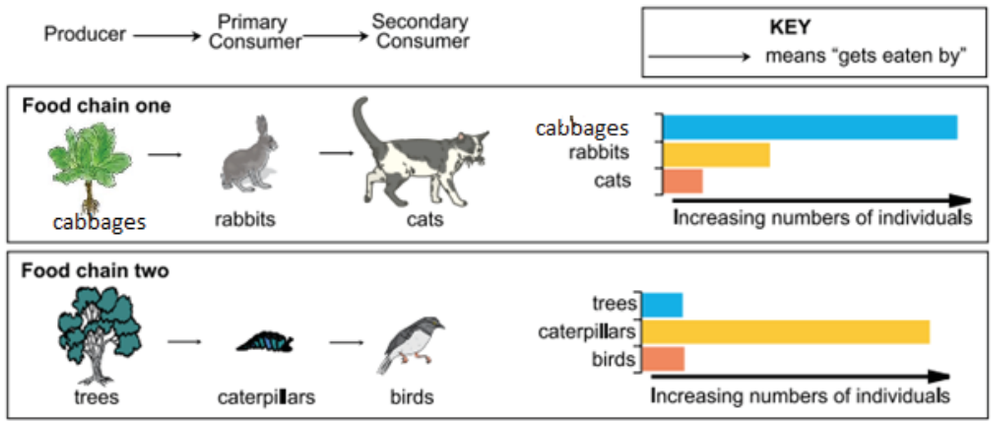


Figure 4.5

Question 1. **[Analysing]**

Which one of the following statements is supported by the information given above?

In a food chain

A there are more primary consumers than secondary consumers.
B there are more primary consumers than producers.
C primary consumers are larger than secondary consumers.
D primary consumers are usually insects that eat plants.

Answer: A *there are more primary consumers than secondary consumers*

Question 2. **[Analysing]**

Which one of the following statements is **TRUE** about trees and cabbages in figure 4.5?

A They absorb energy from a host animal.

B They get energy from eating living plants.

C They use energy from the sun to make food.

D They get energy by breaking down dead plants and animals.

Answer: *C They use energy from the sun to make food.*

Question 3. **[Analysing]**

An animal that is threatened with extinction is endangered. The mallee fowl is a native animal that is endangered. Foxes, rabbits, cats and sheep are animal species introduced to Australia by humans. Introduced species can endanger native animals. Introduced animal may be predators or compete with native animals for food.

The diagram shows the main food web for a mallee fowl habitat.

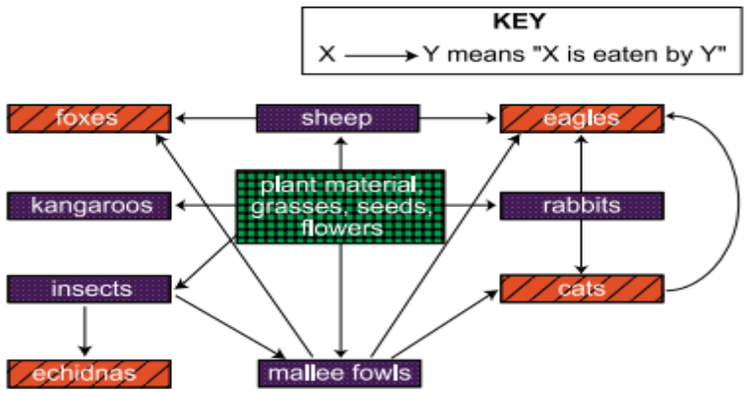


Figure 4.6

What is the purpose of the text box colour coding in the food web?

The colours distinguish among

A plants, animals and insects.

B plants, plant eaters and meat eaters.

C native species and introduced species.

D endangered species and introduced species.

Answer: *B plants, plant eater and meat eaters*

Question 4. **[Applying]**

Read the case study below and answer the questions.

"…On one side of the highway, the flatlands give way to a dense forest. It is from here that elephant herds emerge to torment Peljorling village, destroy their crops and, in some instances, even damage houses and take lives.

This human-wildlife conflict has been going on for so long it has changed the way Peljorling villagers cultivate the fertile parcel of land. It has reached a stage where villagers wonder how long they can live with it….

…Farmers said the soil there is fertile for any kind of crop. "Only if it wasn't for elephants, monkeys and wild boars," farmers said.

Pointing to the fallow lands around, Mani Kumar Gurung, said, at this time of the year, the village would be adorned with green and healthy corn plants. "Not being able to harvest the hard work, people no more plant corn," he said. "What little is planted is for cattle fodder. It's ripped before it bears corn and fed to cattle…"

Courtesy: Kuenselonline, APR 30, 2013

i. What could be the possible reasons for this human-wildlife conflict?

Answer: *The possible reasons could be because of destruction of their habitats through forest fire, clearing of lands for agriculture, building of cities, etc.*

ii. To overcome this conflict, the villagers decided to kill the wild boars. What impact would this have on the ecosystem?

Answer: *The predators which prey on the wild boars would have no food and could start preying on domestic animals.*

Question 5. **[Understanding]**

Explain how the use of a chemical designed to kill cricket could reduce the population of snake.

Answer: The use of a chemical designed to kill cricket will lead to the decrease in number of frog that feeds on cricket and similarly the number of snake decreases which feeds on frogs.

Based on the energy pyramids and food chains in Figure 4.7 and Figure 4.8, answer the questions that follow:

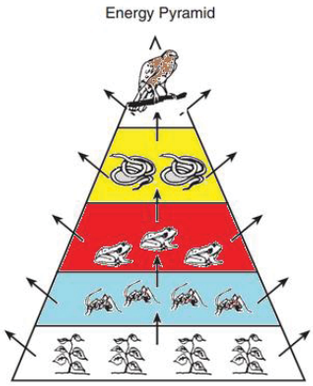


Figure 4.7

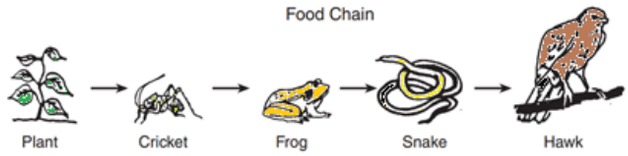


Figure 4.8

Question 6. **[Applying]**

Choose the most appropriate words from the brackets to fill in the blanks.

i. If plants die during a summer drought, the cricket population would most likely …….. (decrease, increase, remain the same) = (*decrease*)

ii. If the number of frogs increase, the snake population would most likely……. (decrease, increase, remain the same)= (*increase*)

iii. If another predator that preyed on snakes was introduced into the ecosystem, the hawk population would most likely…… (decrease, increase, remain the same) = (*decrease*)

iv. The role of the snake in this food chain is……(carnivore, herbivore, producer) = (*carnivore*)

Question 7. **[Analysing]**

The Figure 4.9 shows a community of mice, snakes and wheat plants.

Figure 4.9

What would happen to this community if people killed the snakes?

Answer: *The population of mice would increase because there are no snakes. The increase in mice would cause the amount of wheat plant to decrease. There would be more mice and less wheat plants. Finally there would be no wheat plants and all the mice will eventually die.*

Question 8.

Based on the figure 4.10 that shows a partial food web, answer the questions that follow:

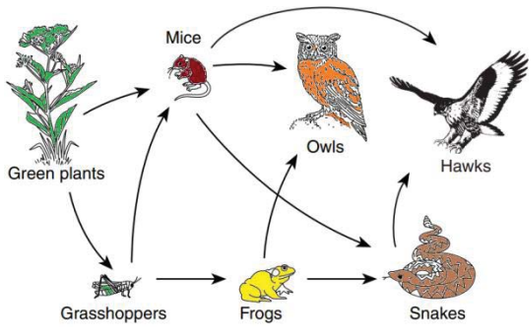


Figure 4.10

i. How are the feeding relationships of the mice different from the feeding relationships of the other organisms in this food web? **[Applying]**

Answer: *Mice are omnivores, which feed on both plants and animals whereas other organisms either feed on plants or animals.*

ii. 'The energy for all the organisms in this food web can be traced back to the Sun'. Explain the given statement in your own words. **[Understanding]**

Answer: *It means that all the living organisms are directly or indirectly dependent on plants for survival and plants depend on sun for preparation of food. Therefore, sun is considered to be the ultimate source of energy.*

iii. Both owls and hawks eat mice. Explain why the removal of mice from this food web would likely affect hawks more than owls. **[Analysing]**

Answer: *The removal of mice from this food web would likely affect hawks more than owls because owls have more feeding options than the hawks.*

iv. Green plants, grass hoppers, frogs, snakes and hawks make the food chain with five trophic levels. Based on this knowledge, create your own food chain in a grassland and a pond.

[Creating]

Trophic level	Grassland	Pond
Primary producer		
Primary consumer		
Secondary consumer		
Tertiary consumer		
Quaternary consumer		

Question 9. **[Analysing]**

Match each item in column A against the correct item in Column B. Rewrite the correct matching pairs.

Column A	Column B
1. plants and light	a. biotic
2. animals and water	b. abiotic
3. plants and animals	c. autotrophs
4. rice plants	d. decomposers
5. bacteria and fungi	e. natural ecosystem
6. sea	f. man-made ecosystem
7. potatoes field	
8. rain	

Answer: *3(a), 4(c), 5(d), 6(e), 7(f), 8(a)*

UNIT II: MATERIALS AND THEIR PROPERTIES

CHAPTER 5

CLASSIFYING MATERIALS

1. PARTICLE THEORY OF MATTER

Learning Outcomes

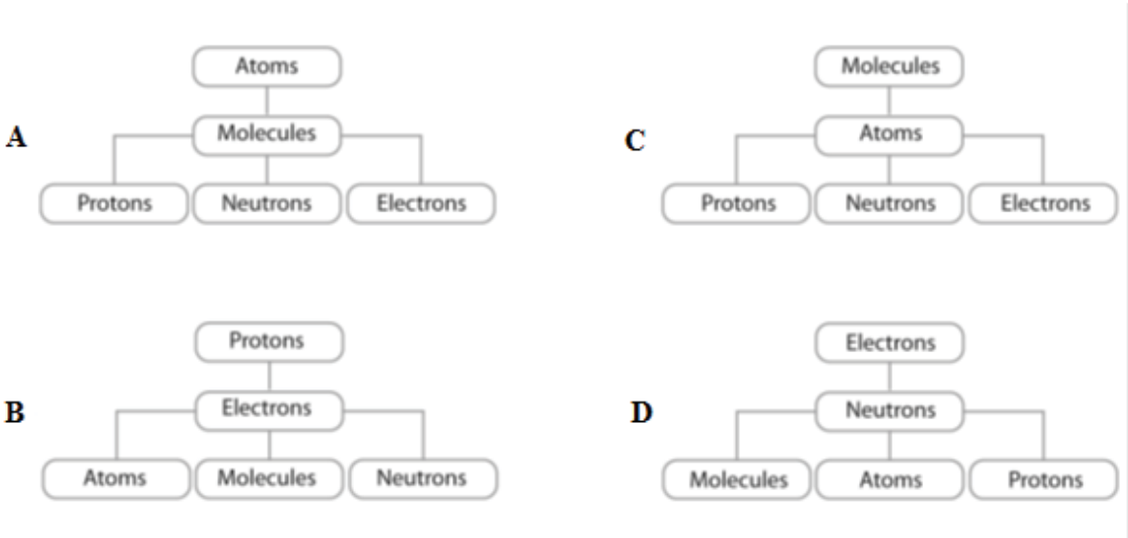
At the end of the lesson, a student should be able to:

5.1.1 Explain the particle theory,
5.1.2 Describe the characteristics of solid, liquid and gas based on particle theory of matter,
5.1.3 Explain the inter-conversion of matter,
5.1.4 Explain diffusion and gas pressure and
5.1.5 Explain the role of diffusion.

Assessment Items

Question 1. **[Understanding]**

Which one of these diagrams given below **BEST** represents the structure of matter, starting with the more complex particles at the top and ending with the more fundamental particles at the bottom?



Answer: *C*

(The figure 5.1 is to be used with Question 2.)

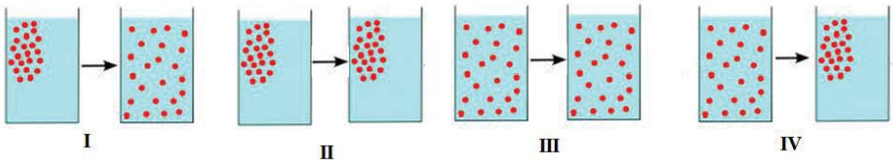


Figure 5.1

Question 2. **[Understanding]**

Which one of the above diagrams **BEST** describes diffusion?

A I
B II
C III
D IV

Answer: *A I*

Question 3. **[Understanding]**

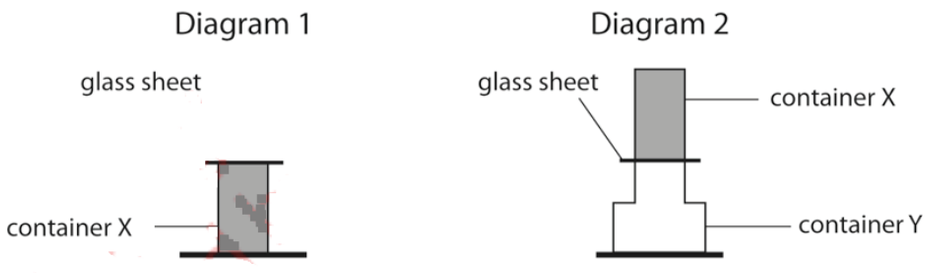
The fragrance of flowers spread in air due to

A osmosis.
B diffusion.
C sublimation.
D gas pressure.

Answer: *B diffusion*

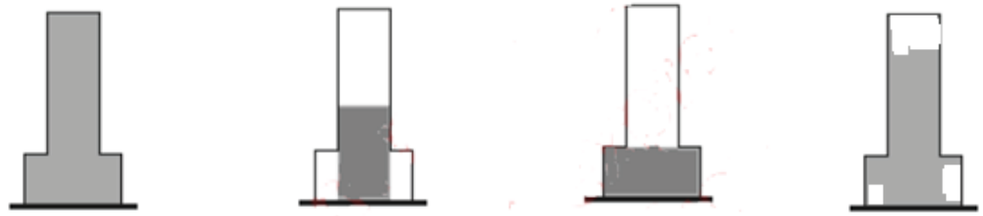
Question 4. **[Applying]**

Diagram 1 shows a container marked X that is filled with a material that could be a solid, liquid or gas. The container has been sealed with a glass sheet. Container X is placed upside down on an empty container Y, as shown in Diagram 2.



After removing the glass sheet, how will the diagram look if the container X contained a gas?

Diagram 3 Diagram 4 Diagram 5 Diagram 6



A Diagram 3
B Diagram 4
C Diagram 5
D Diagram 6

Answer: *A Diagram 3*

Question 5. **[Understanding]**

A car runs over a can and crushes it completely. The atoms in the can

A are broken.
B are flattened.
C remain the same.
D split into neutrons.

Answer: *C remain the same*

Question 6. **[Understanding]**

Which of the following statements describe the particle theory of solid?

I. Particles are closely arranged due to strong force of attraction.
II. It does not have definite shape and volume.
III. Particles possess the least kinetic energy.
IV. Intermolecular force is weak.

A I and II
B I and III
C II and III
D II and IV

Answer: *B I and III*

Question 7. **[Analyzing]**

Pema poured 250 mL of water into different containers as shown in the figure 5.2.

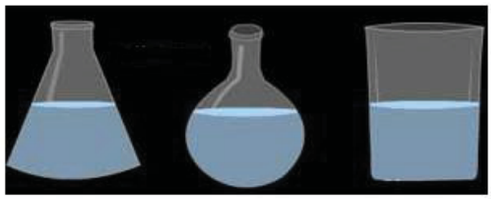


Figure 5.2

What conclusion can you draw from Pema's investigation?

A Liquid has definite shape.

B In liquid, particles are loosely packed.

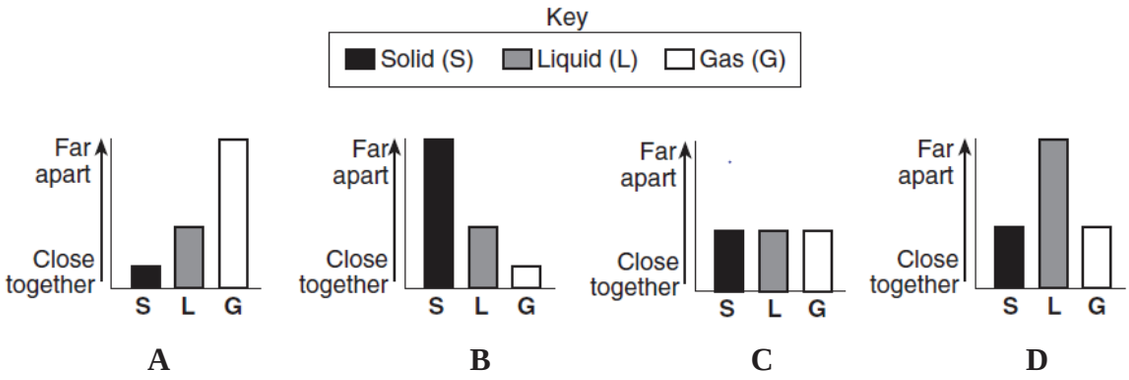
C Intermolecular force in liquid is strong.

D Liquid takes the shape of the container.

Answer: *D* *Liquid takes the shape of the container.*

Question 8. **[Understanding]**

Which graph **BEST** represents the relative distance between the particles of most substances in their solid, liquid, and gaseous states?



Answer: *A*

Question 9. **[Applying]**

Fill in the blanks with the appropriate word(s).

i. The ……. …….. increases when butter melts(*intermolecular space*).

ii. The particles in carbon dioxide are always in ……. …….. (*random motion*).

Question 10. **[Remembering]**

Write **True** or **False** against each statement given below.

i. Intermolecular spaces are maximum in liquid. *(false)*

ii. Gas pressure helps us to ride bicycle. *(true)*

iii. Perfume spreads from the region of high concentration to the region of low concentration. *(true*)

iv. Petrol evaporates at high temperature. *(false)*

v. Diffusion takes place with the help of stirring. (*false)*

Question 11. **[Analyzing]**

Match each item in **column A** against the correct one in **column B**. Rewrite the correct matching pairs.

Column A	Column B
1. Sublimation	a. drying of wet clothes
2. Evaporation	b. formation of clouds
3. Condensation	c. decrease in the size of naphthalene ball
4. Melting	d. change of candle wax to liquid
5. Freezing	

Answer: *1(c), 2(a), 3(b), 4(d)*

Question 12. **[Remembering]**

Figure 5.3 exhibits inter-conversion of the three states of matter. Complete the triangle by labelling the arrows marked A, B, C and D.

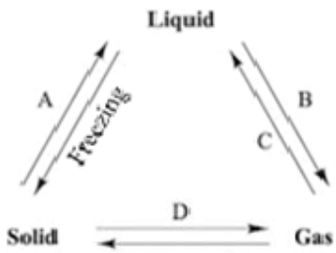


Figure 5.3

Answer:

A *Melting/Fusion*

B *Evaporation/ Vaporization*

C *Condensation*

D *Sublimation*

Question 13.

Study figure 5.4 and answer the questions that follow.

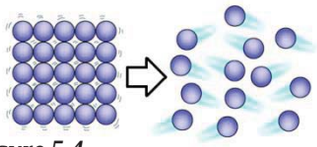


Figure 5.4

i.

ii. Name the change of state shown in the figure. **[Understanding]**

Answer: *Melting*

iii. What condition is required for the above process to take place? **[Understanding]**

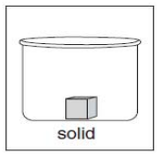
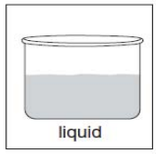
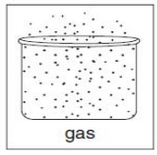
Answer: *Heat*

iv. Explain the above process in terms of kinetic theory of matter. **[Understanding]**

Answer: *On heating, particles in a solid gain energy and overcome the force of attraction. This increases the intermolecular spaces and solid starts expanding and changes into liquid.*

Question 14. **[Applying]**

The drawings on the top row of the chart given below represent water in its three states (solid, liquid, and gas) in open containers. Complete this chart by answering the questions in each row.

			
Does this phase of matter have a definite shape? Write **Yes** or **No** in each box.			
Does this phase of matter have a definite volume? Write **Yes** or **No** in each box.			
How do these phases rank in order of the relative speed of their particles? Rank them **1, 2, 3,** with 1 having the slowest particles and 3 having the fastest particles.			

Answer:

Yes	*No*	*No*
Yes	*Yes*	*No*
1	*2*	*3*

Question 15. **[Applying]**

Rearrange the correct words in the spaces provided as shown in the example.

asdnetoocnin	**malisutnoib**	**nioatcufqeil**	**aopevatrnoi**

Example: Condensation

Answer: *sublimation* *liquefaction* *evaporation*

Question 16. **[Applying]**

From the cross word puzzle given below, find out and write seven applications of air pressure in our daily life.

P	A	R	U	B	B	E	R	S	U	C	K	E	R
B	R	C	D	E	F	G	H	I	T	Y	C	B	F
S	D	E	F	O	X	Z	M	L	J	O	G	V	M
F	F	Y	S	Y	R	I	N	G	E	K	H	K	O
O	Z	C	J	S	H	J	Y	R	V	F	L	M	N
U	D	F	R	A	U	Q	V	P	G	C	O	K	L
N	F	T	L	D	B	R	E	A	T	H	I	N	G
T	J	I	G	G	S	P	E	R	S	E	T	R	D
A	K	L	A	I	D	O	R	C	H	S	K	L	R
I	L	H	G	Y	A	U	W	R	O	F	P	T	O
N	B	J	S	M	Q	T	B	L	P	O	K	G	P
P	R	F	O	D	L	X	Q	P	Q	X	K	F	P
E	D	D	Z	T	P	U	P	P	V	Z	U	E	E
N	E	B	I	C	Y	C	L	E	P	U	M	P	R

Answer:

P	A	**R**	**U**	**B**	**B**	**E**	**R**	**S**	**U**	**C**	**K**	**E**	**R**
B	**R**	C	D	E	F	G	H	I	T	Y	C	B	F
S	D	**E**	F	O	X	Z	M	L	J	O	G	V	M
F	F	Y	**S**	**Y**	**R**	**I**	**N**	**G**	**E**	K	H	K	O
O	Z	C	J	**S**	H	J	Y	R	V	F	L	M	N
U	D	F	R	A	**U**	Q	V	P	G	C	O	K	L
N	F	T	L	D	**B**	**R**	**E**	**A**	**T**	**H**	**I**	**N**	**G**
T	J	I	G	G	S	P	**E**	R	S	E	T	R	**D**
A	K	L	A	I	D	O	R	**C**	H	S	K	L	**R**
I	L	H	G	Y	A	U	W	R	**O**	F	P	T	**O**
N	B	J	S	M	Q	T	B	L	P	**O**	K	G	**P**
P	R	F	O	D	L	X	Q	P	Q	X	**K**	F	**P**
E	D	D	Z	T	P	U	P	P	V	Z	U	**E**	**E**
N	E	**B**	**I**	**C**	**Y**	**C**	**L**	**E**	**P**	**U**	**M**	**P**	**R**

Question 17. **[Applying]**

List down **five** examples of diffusion that we see in our daily lives.

Answer: *Transpiration, spreading of perfume, burning of incense stick, using salt in the curry, preparing tea, dissolving sugar/salt in water, exchange of respiratory gases in cells, diffusion of blood etc.*

Question 18. **[Analyzing]**

Water freezes in cold places in winter. Give reason.

Answer: *During winter, the particles of water lose kinetic energy which decreases the intermolecular spaces between the particles, thus bringing particles close to each other forming ice.*

Question 19. **[Creating]**

Design an experiment to show that gas expands on heating.

Answer:

Materials required:

- ✓ *Balloons*
- ✓ *Bottles*
- ✓ *Hot water*
- ✓ *Tray*

Procedure:

i) Take two bottles filled with water.
ii) Put balloons over the mouth of bottles.
iii) Immerse the bottles in tray containing hot and cold water respectively.
iv) Observe the change.

Observation: *The bottle immersed in hot water shows the expansion of balloon. The other bottle does not show any change.*

Conclusion*: This experiment proves that gas expands on heating when the gas particles gain more kinetic energy.*

Question 20. **[Applying]**

Lightening, gas clouds, jelly and neon lights are examples of

A gas.
B solid.
C liquid.
D plasma.

Answer: *D plasma*

2. ELEMENTS AND THEIR SYMBOL

Learning Outcomes

At the end of the lesson, a student should be able to:

5.2.1 Define the terms element and symbols with examples and
5.2.2 Draw and explain the atomic structure of an atom.

Assessment Items

Question 1. **[Remembering]**

The symbol of potassium is

A Po.
B Pt.
C K.
D P.

Answer: *C K*

Question 2. **[Understanding]**

Our bones and teeth contain calcium. What is the symbol for calcium?

A C
B Cl
C Ca
D Co

Answer: *C Ca*

Question 3. **[Understanding]**

If the element $_4X^9$ is Beryllium, the element $_6Y^{11}$ will be

A boron.
B carbon.
C sodium.
D beryllium.

Answer: *B carbon*

Question 4. **[Analyzing]**

Figure 5.1 shows a part of the periodic table. What does the element Y in the table represent?

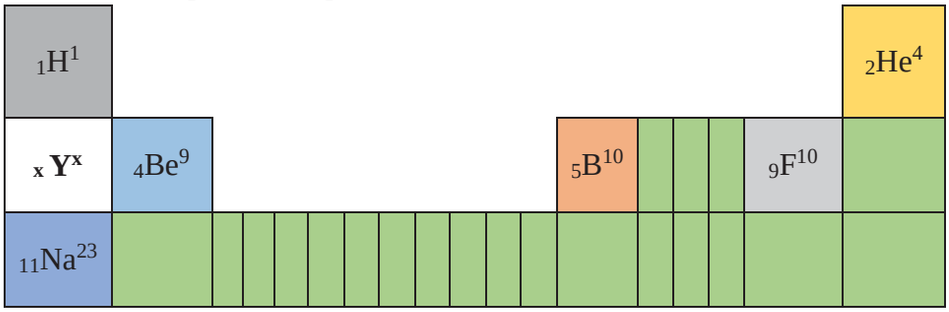


Figure 5.1

A beryllium
B lithium
C sodium
D boron

Answer: *B lithium*

Question 5. **[Understanding]**

Which one of the following shows the correct sequence of elements arranged in decreasing order of their atomic number?

A H → He → Li → Be →B
B He → Be → C → O → Ne
C Ca → K → Ar → Cl→ S
D Ne → Na → Mg → Al → Si

Answer: *C Ca → K → Ar → Cl→ S*

Question 6. **[Understanding]**

A pure substance made up of different atoms is an element. Elements can be found in nature or can be made artificially.

The above statement does **NOT** correctly describe an element because it

A occurs naturally.
B has identical atoms.
C is a pure substance made up of one type of atoms.
D is a pure substance made up of several types of atoms.

Answer: *D is a pure substance made up of several types of atoms*

Question 7. **[Analyzing]**

Study the elements as shown in the box. We can conclude that elements are arranged in the increasing order of

$_1V^1$	$_2W^4$	$_3X^7$	$_4Y^9$	$_5Z^{11}$

A atomic size.
B atomic mass.
C atomic number.
D molecular weight

Answer: *C atomic number*

Question 8.

Assume that an element **X** has the atomic structure as shown in figure 5.2.

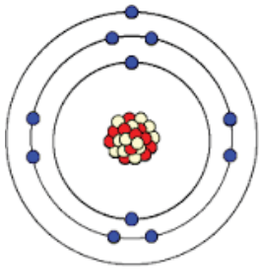


Figure 5.2

i. What is its atomic number? (*11*) [**Understanding**]
ii. Name the element? (*Na*) [**Remembering**]
iii. What could be the next element? (*Mg*) [**Understanding**]

Question 9.

Dorji was asked to show a general representation of an element with its atomic number and mass number. He drew the structure as shown below:

$_AX^Z$

i. Why is the structure incorrect? **[Analyzing]**
ii. What do the letters A and Z represent? **[Understanding]**
iii. Draw the correct general representation of an element? [**Applying**]

Answer:

i. The atomic number (Z) should be written as subscript and mass number (A) should be written as superscript.
ii. A-Mass number, Z-Atomic number
iii. $_ZX^A$

Question 10. **[Remembering]**

Complete the following sentences choosing the correct word(s) from the word bank given in the box.

Mg	**mass number**	**neutrons**	**Mn**	**atomic number**	**electron**

i. The symbol of the element Manganese is …… (*Mn*)

ii. Elements in the periodic table are arranged in an increasing order of their……. (*atomic number*)

iii. The nucleus of an atom consist of protons and ……... (*neutrons*)

Question 11. **[Applying]**

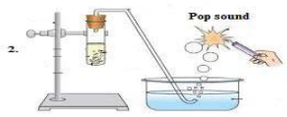
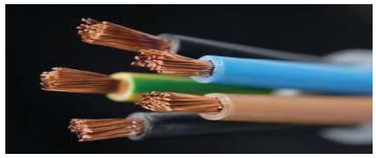
Complete the following table by filling in the spaces provided.

Sub atomic particles	**Location**	**Charges**
Electron	a.----------	b.----------
c.----------	Nucleus	Neutral
Proton	d.----------	Positive

Answer: *a. Shell, b.Negative, c. Neutron, d.Nucleus*

Question 12. **[Applying]**

Use the picture hints given in table 5.3 to complete the crossword.

 1. Coal	 2. Experiment to produce gas
 4. Floats and reacts violently in water	 5. Yellow powder
 7. Balloons filled with hot air	 6. Unreactive gas for advertisement
 8. Used in electric wires	 3. Burst into flame with water

Answer:

		2. H							
		y							
		d		3 P					
1. C	a	r	b	o	n				
		o		t					
		g		a					
		e		s				5. S	
		n		4. S	o	d	i	u	m
	6. N			i				l	
7. h	e	l	i	u	m			p	
	o			m				h	
	n							u	
			8. C	o	p	p	e	r	

Question 13. **[Evaluating]**

Symbols make the study of elements easier. Do you agree or disagree? Give reasons.

Answer:

Agree

- *Makes the study of elements simple and easy*
- *Easier to write/Saves time*
- *Forms the basis of chemical equations*
- *Easier to remember*

Disagree

- *Difficult to remember both names and symbols*
- *Difficult to understand*
- *Some symbols are confusing, for instance, the symbol of some elements does not match with their names.*

Question 14. **[Creating]**

Divide children into four groups and provide them with the following task:

- ✓ Group 1- hydrogen, helium, lithium, beryllium, boron
- ✓ Group 2- carbon, nitrogen, oxygen, fluorine, neon
- ✓ Group 3- sodium, magnesium, aluminum, silicon, phosphorous
- ✓ Group 4- sulphur, chlorine, argon, potassium, calcium

*Compose **mnemonics** to learn the names of the elements given in groups. Share their mnemonics in the class.*

Possible Answer:

Group 1- Ha, He, Lilly, Beby, Boy

Group 2- Chimi, Never Opts For, Neon

Group 3- Sonam, Married, Alu, Sithu, PhuB

Group 4- Stop, Clowning, Around, Please, Cathy

3. METALS AND NON-METALS

Learning Outcomes

At the end of the lesson, a student should be able to:

5.3.1 Differentiate between metals and non-metals with examples and
5.3.2 State the uses of metals.

Assessment Items

Question 1. **[Remembering]**

Non-metals are mostly

A malleable and ductile.
B shinyand sparkling.
C solid and strong.
D not lustrous.

Answer: *D not lustrous*

Question 2. **[Understanding]**

All of the following are correct matching pairs **EXCEPT**

A **Malleability:** can be beaten into sheets
B **Lustrous:** can be polished and shiny.
C **Ductility:** can be broken into pieces.
D **Sonority:** can produce sound.

Answer: *B Ductility: can be broken into pieces.*

Question 3. **[Understanding]**

Which one of the following objects is a non-metal?

A 

B 

C 

D 

Answer: *A*

Question 4. **[Understanding]**

The figure 5.1 shows a barbed wire fence. What property of metal allows us to make the barbed wires?

Figure 5.1

A brittleness
B ductility
C malleable
D lustrous

Answer: *B ductility*

Question 5. **[Understanding]**

What property of metal is used in figure 5.2?

Figure 5.2

A sonority
B ductility
C malleability
D conductivity

Answer: *A sonority*

Question 6. **[Applying]**

The following figure represents the wide uses of metals. Which of the following properties do they possess?



Figure 5.3

I. Ductility
II. Malleability
III. Lustrous
IV. Dullness

A I, III and IV
B I, II and IV
C I, II and III
D I, II,III and IV

Answer: *C* *I, II and III*

Question 7. **[Understanding]**

Wangpo used aluminum foil to make the plates and toy as shown in figure 5.4. Which property of the metal helped him to design the objects?


Figure 5.4

A sonority
B ductility
C malleability
D conductivity

Answer: *C* *malleability*

Question 8. **[Understanding]**

A metal spoon and a wooden spoon are used to stir a pot of hot soup. After few minutes, the metal spoon feels hotter than the wooden spoon. What explains these phenomena?

A Metal is always hotter than wood.
B Metal conducts heat better than wood.
C Metal conducts electricity better than wood.
D Metal heats up the soup better than the wood.

Answer: *B* *Metal conducts heat better than wood.*

Question 9. **[Analysing]**

Aluminum is primarily used in aeroplanes because

A of its strength.
B it is inexpensive.
C it is a light metal.
D of its high melting point.

Answer: *C it is a light metal*

Question 10. **[Understanding]**

The table below outlines some physical properties of five different substances (A, B, C, D and E). Read the table carefully.

Substances	**A**	**B**	**C**	**D**	**E**
Physical state at room temperature	Solid	Solid	Liquid	Liquid	Gas
Appearance/colour	Shiny grey	White	Silver	Colourless	Colourless
Conducts electricity	Yes	No	Yes	Yes	No

Which of the substances can be classified as metals?

A Substance A and Substance C
B Substance B and substance D
C Substance C and substance E
D Substance A and substance D

Answer: *A Substance A and Substance C*

Question 11. **[Understanding]**

The table below shows the properties of two materials.

Properties of Material 1	**Properties of Material 2**
Conducts heat quickly It is a solid Does not dissolve in water Attracted by magnets	Conducts heat slowly It is solid Dissolves in water Not attracted by magnets

Which statement about material 1 and 2 is **MOST** likely to be correct?

A Material 1 is glass, and material 2 is clay.
B Material 1 is copper, and material 2 is wood.
C Material 1 is iron, and material 2 is sugar.
D Material 1 is cork, and material 2 is gold.

Answer: *C Material 1 is iron, and material 2 is sugar*.

Question 12. **[Analyzing]**

Match each substance given in column A against its uses in column B. Rewrite the correct matching pairs.

Column A	Column B
1. Gold	a. thermometers
2. Iron	b. wrapping food
3. Carbon	c. jewelry
4. Copper	d. machinery
5. Mercury	e. fuel
	f. electric wires

Answer: *1(c), 2(d), 3(e), 4(f), 5(a)*

Question 13. **[Analyzing]**

We cannot classify an object into metal or non-metal using only one property. Support the statement.

Answer: *To be classified into metals and non-metals any object needs to qualify most of the important properties of metals and non-metals, such as malleability, ductility, sonority, lustrous For example: Glass is lustrous, but not ductile and malleable.*

Question 14. **[Understanding]**

Look at figure 5.5 and answer the questions that follow:

Figure 5.5

i. List down any **TWO** properties of figure 5.5.

ii. Which property(s) of pot is useful to its function?

Answer:

i. Malleable, lustrous, sonorous, conductor of heat and electricity.

ii. Since the pot is strong and a good conductor of heat and electricity, it helps in cooking food.

Question 15. **[Analyzing]**

Compare object A and B in figure 5.6 on the basis of their properties given in the table.

Object A

Object B

Figure 5.6

Properties	Object A	Object B
Appearance		
Hardness		
Malleability		
Ductility		
Conduction of heat		
Conduction of electricity		
Metal or Non- metal		

Answer.

Properties	Object A	Object B
Appearance	Shiny/Lustrous	Dull/ non lustrous
Hardness/ softness	Hard	Soft
Malleability	Can be beaten into thin sheets	Cannot be beaten into thin sheets
Ductility	Can be drawn into wires	Cannot be drawn into wires
Conduction of heat	Good conductor of heat	Bad conductor of heat
Conduction of electricity	Good conductor of electricity	Bad conductor of electricity
Metal or Non- metal	Metal	Non Metal

Question 16. **[Creating]**

Design a bell for your school. Mention the choice of your material, sketch your design with the help of a diagram and give reasons for your choice.

Answer: *Choose metal like iron, zinc, brass (alloy of copper and zinc) as they produce deep distinctive sounds and come up with any sketch.*

CHAPTER 6
MATERIALS AND CHANGE

1. PHYSICAL CHANGE

Learning Outcomes

At the end of the lesson, a student should be able to:

6.1.1 Define physical change with examples,
6.1.2 State the law of conservation of mass and
6.1.3 Carry out experiments to investigate physical change.

Assessment Items

Question 1. **[Remembering]**

What does matter retain during a physical change?

A size
B state
C identity
D texture

Answer: *C identity*

Question 2. **[Applying]**

Ngawang tears a piece of paper into smaller pieces, as shown in figure 6.1.

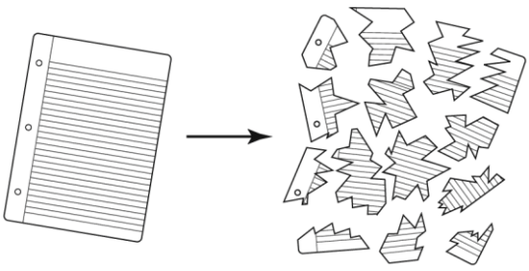


Figure 6.1

Tearing of paper is an example of a

A change in mass.
B physical change.
C chemical change.
D change in energy.

Answer: *B physical change*

Question 3. **[Understanding]**

Anaerobic bacteria digests animal waste and produce biogas **(Change A)**. The biogas is then burned as a fuel **(Change B).**

Which of the following statement is correct?

A Change A is a chemical change.
B Change B is a physical change.
C Both change A and B are chemical changes.
D Both change A and B are physical changes.

Answer: *C Both change A and B are chemical changes.*

Question 4. **[Understanding]**

Damchoe demonstrated a physical change with sugar cubes. Which one of the following processes will help to make the change happen quickly?

A Heating the sugar cubes.
B Freezing the sugar cubes
C Dehydrating the sugar cubes with sulphuric acid.
D Crushing the sugar cubes and dissolving it in water.

Answer: *D Crushing the sugar cubes and dissolving it in water.*

Question 5. **[Applying]**

i. 5 grams of salt is dissolved in 100 mL of water to form a salt solution. The solution is heated and water is boiled away. How much salt would remain in the container?

A 2.5g
B 5g
C 105g
D 500g

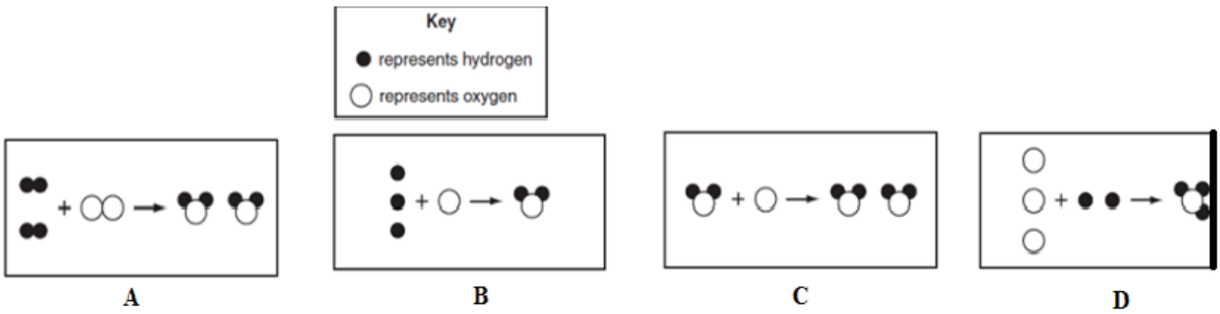
Answer: *B 5g*

ii. This experiment proves a law. Name it.

Answer: *The law of conservation of matter.*

Question 6. **[Understanding]**

Which one of the following model **best** describes the law of conservation of matter?



Answer: *A*

Question 7. **[Analyzing]**

The figure 6.2 shows a change that occurs in matter.

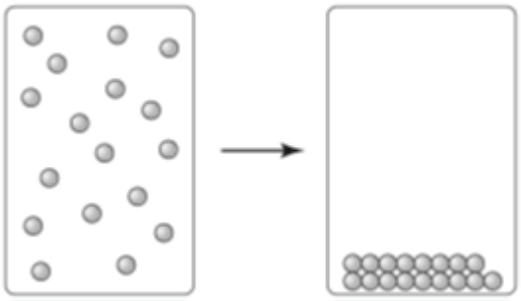


Figure 6.2

The figure 6.2 shows a physical change because the

A particles get smaller.
B particles get compressed.
C volume of the matter decreases.
D composition of the matter stays the same.

Answer: *D composition of the matter stays the same*

Question 8. **[Understanding]**

Which one of the following changes can be reversed?

A Burning of candle.
B Blowing of balloons.
C Baking cake in an oven.
D Mixing of flavors in the cake.

Answer: *B Blowing of balloons.*

Question 9. **[Remembering]**

Write **True** or **False** against each statement.

i. Changing the size and shape of pieces of wood is a physical change. (*true*)

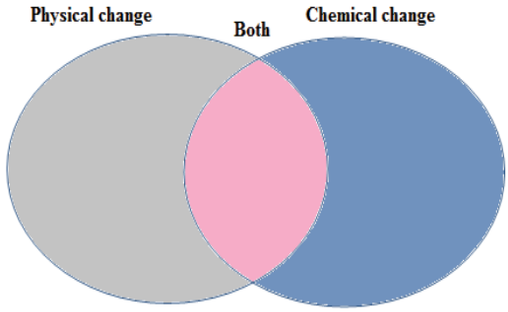
ii. In a physical change new products are formed. (*false*)

iii. During a chemical change, matter retains its state. (*false*)

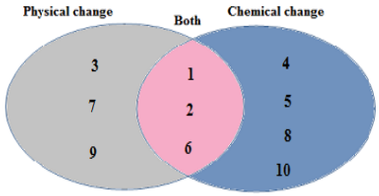
Question 10. **[Analyzing]**

Sort the following changes into the Venn diagram correctly. Write only the correct number in the diagram.

1. Burning of candle
2. Dissolving of sugar
3. Tearing of papers
4. Burning magnesium ribbon
5. Rusting of iron
6. Freezing milk
7. Melting ice
8. Ripening of fruits
9. Melting wax
10. Fading of cloth



Answer:



Question 11. **[Analyzing]**

The figures below shows two different pictures of an aluminum can.

Before crushing

After crushing

Explain why crushing of an aluminum can is an example of a physical change.

Answer: *This is because even if the aluminum can is crushed it does not change its composition only the shape is changed. Thus, this is a temporary change which is reversible.*

Question 12.

Jamphel carried out an investigation to prove that burning of candle is both physical and chemical change. He followed the following procedure for the investigation:

Step 1: He took the dry weight of the candle and lighted it *(As the candle burned a small amount of liquid wax formed near the flame)*

Step2: After 10 minutes, he extinguished the flame and the candle was allowed to cool.

Step 3: The cooled candle was weighed again.

Based on the above information answer the following questions.

i. Identify ***one*** physical change that takes place in this investigation. **[Understanding]**

ii. State ***one*** observation that indicates a chemical change has occurred in this investigation. **[Applying]**

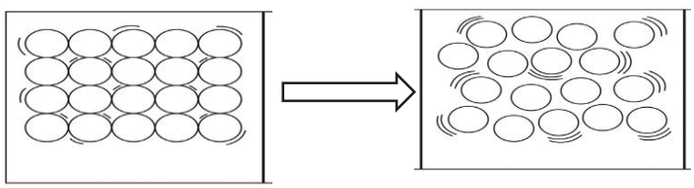
iii. Draw a particle diagram showing the change from solid wax to liquid wax. Use O for particles of wax. **[Applying]**

Answer:

i. Melting of wax: it turns into solid wax on cooling.

ii. Burning of wick and wax: produces new substances like CO_2, water vapour and soot.

iii.



Question 13. **[Evaluating]**

State whether a physical change is useful or harmful. Justify with TWO examples relating to your daily experiences.

Answer:

Physical change is useful because it helps to

- *dry clothes.*
- *brew tea.*
- *evaporate water.*
- *condense and forms clouds that helps in bringing rain.*

Physical change is harmful because it leads to

- *wear and tear.*
- *breakages. (breaking of glass and its remains can be dangerous for animals and to the environment as it is non degradable, water pipes burst in winter causing inconveniences)*

2. CHEMICAL CHANGE

Learning Outcomes

At the end of the lesson, a student should be able to:

6.2.1 Explain chemical change with examples,
6.2.2 Investigate chemical change through experiments,
6.2.4 Discuss the impact of using fossil fuel and
6.2.5 Explain the importance of physical and chemical changes in our day to day life.

Assessment Items

Question 1. **[Remembering]**

Fossils fuels are formed from

A volcanoes.
B the remains of living things.
C the gases in the atmosphere.
D water trapped inside the rocks.

Answer: *B the remains of living things*

Question 2. **[Understanding]**

The burning of fossil fuel has increased the carbon dioxide content in the atmosphere. Which one of the following effects has possibly happened?

A A warmer climate.
B A cooler climate.
C A lower relative humidity.
D More ozone in the atmosphere.

Answer: *A A warmer climate.*

Question 3. **[Applying]**

Gopal is given a mixture of iron filings, sand, and salt. To separate the mixture, he uses a magnet, boiling water, and a filter.

Which statement is **TRUE** about the separation of the above mixture?

A He uses only physical change to separate the mixture's components.
B He uses only chemical change to separate the mixture's components.
C He uses both physical and chemical changes to separate the mixture's components.
D He uses neither physical nor chemical changes to separate the mixture's components.

Answer: *A He uses only physical change to separate the mixture's components.*

Question 4. **[Analyzing]**

Read the following statements.

I. New substances are formed.
II. Energy is produced.
III. Composition of substance changes.
IV. It is a reversible change.
V. The identity of the substance remains same.

Which of the above statements is **WRONG** about a chemical change?

A I and II
B II and III
C III and IV
D IV and V

Answer: *D IV and V*

Question 5. **[Understanding]**

Which is a chemical change?

A Element 2 is heated and evaporated.
B Element 1 is polished to form a smooth surface.
C Element 4 is separated from a mixture by evaporation
D Element 3 develops white powdery surface after standing in air.

Answer: *D Element 3 develops white powdery surface after standing in air.*

Question 6. **[Understanding]**

A black smith grinds the edge of an iron axe against a spinning wheel to sharpen it. Sparks of fire and heat is produced. What kind of change is this?

A Physical change as only the shape of the axe changes.
B Chemical change as it produces sparks.
C Chemical change as heat is produced.
D Physical change as iron melts.

Answer: A *Physical change as only the shape of the axe changes.*

Question 7. **[Remembering]**

Use the words given in the box to define global warming correctly.

The greenhouse the increase temperature in to due earth on effect average

Answer: *The average increase in the temperature is due to greenhouse effect on earth.*

Question 8. **[Remembering]**

Identify the physical factor that brings about the following changes.

i. Drying of wet clothes (*Temperature or heat*)
ii. Respiration (*Air*)
iii. Photosynthesis (*Light*)
iv. Fading of clothes (*Light*)
v. Common salt getting wet (*Moisture*)

Question 9. **[Analyzing]**

Classify the following changes as physical or chemical change and give reason to support your answer. **The first one is done for you.**

Change	**Physical or chemical change**	**Reason**
A haircut	*Physical change*	*Even after a haircut, the composition of the hair remains the same.*
A piece of metal is bent in half		
Rusting of classroom window rods		
An aspirin (medicine) is crushed into powder		
Water evaporates into steam		
Burning of magnesium ribbon		
Rotting of an apple		

Answer:

Change	***Physical or chemical change***	***Reason***
A piece of metal is bent in half	*Physical change*	*Can be bent back to its original shape.*
Rusting of classroom window rods	*Chemical change*	*New substance (iron oxide) formed.*
An aspirin (medicine) is crushed into powder	*Physical change*	*Change from solid to powder but the composition remains the same.*
Water evaporates into steam	*Physical change*	*It can be reversed.*
Burning of magnesium ribbon	*Chemical change*	*New substance (magnesium oxide) is formed.*
Rotting of an apple	*Chemical change*	*Can't reverse the process.*

Question 10. **[Understanding]**

"Chemical change is an essential process in our daily life". Discuss the statement.

Answer: *Chemical changes are very important in our daily life because most of the life processes like photosynthesis, respiration are possible due to chemical reactions. Besides that lot of chemical changes also takes place in the production of soap, detergents, food industries, industries, textile industries, pharmaceutical industries and dairy farms.*

Question 11. [**Creating]**

Imagine you are a Dzongkhag Environment Officer and you are invited to Gakid Lower Secondary as a guest speaker on the World environment Day. The theme of the day is "Global Warming". Prepare a comprehensive speech to deliver on the day.

Answer: *open ended*

3. SOLUTIONS

Learning Outcomes

At the end of the lesson, a student should be able to:

6.3.1 Explain the terms solute and solvent with examples,
6.3.2 State the different types of solution,
6.3.3 Define solubility and investigate the factors affecting solubility and
6.3.4 Describe the consequences if there were no solutions.

Assessment Items

Question 1 **[Understanding]**

If the amount of solute dissolved is less or more in a given volume of solvent the solution can be classified as either

A dilute or concentrated solution.
B aqueous or non-aqueous solution.
C saturated or unsaturated solution.
D homogeneous or heterogeneous solution.

Answer: *A dilute or concentrated solution*

Question 2. **[Understanding]**

Which of these is a solution?

A carbonated water
B silver coating
C gold coating
D salt water

Answer: *D salt water*

Question 3. **[Remembering]**

The concentration of a solution is directly associated to

A pressure.
B solubility.
C temperature.
D diffusion.

Answer: *B solubility*

Question 4. **[Remembering]**

A solution is made by dissolving some sugar in a beaker of water. The sugar is referred to as the

A solute.
B filtrate.
C solvent.
D distillate.

Answer: *A solute*

Question 5. **[Understanding]**

While working in an automobile workshop, Dorji stained his clothes with grease. Which one of the following solvent is **NOT** suitable to remove the stains?

A petrol
B benzene
C carbon disulphide
D carbon tetrachloride

Answer: *C carbon disulphide*

Question 6. **[Applying]**

Coarse sugar and fine sugar are added to 50 mL of water in separate beakers and then stirred as shown in the figure 6.1.

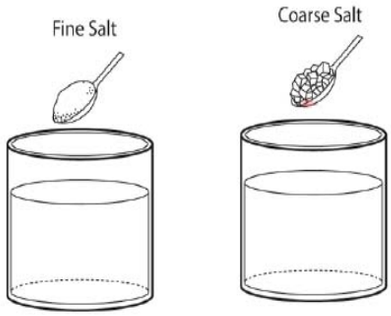


Figure 6.1

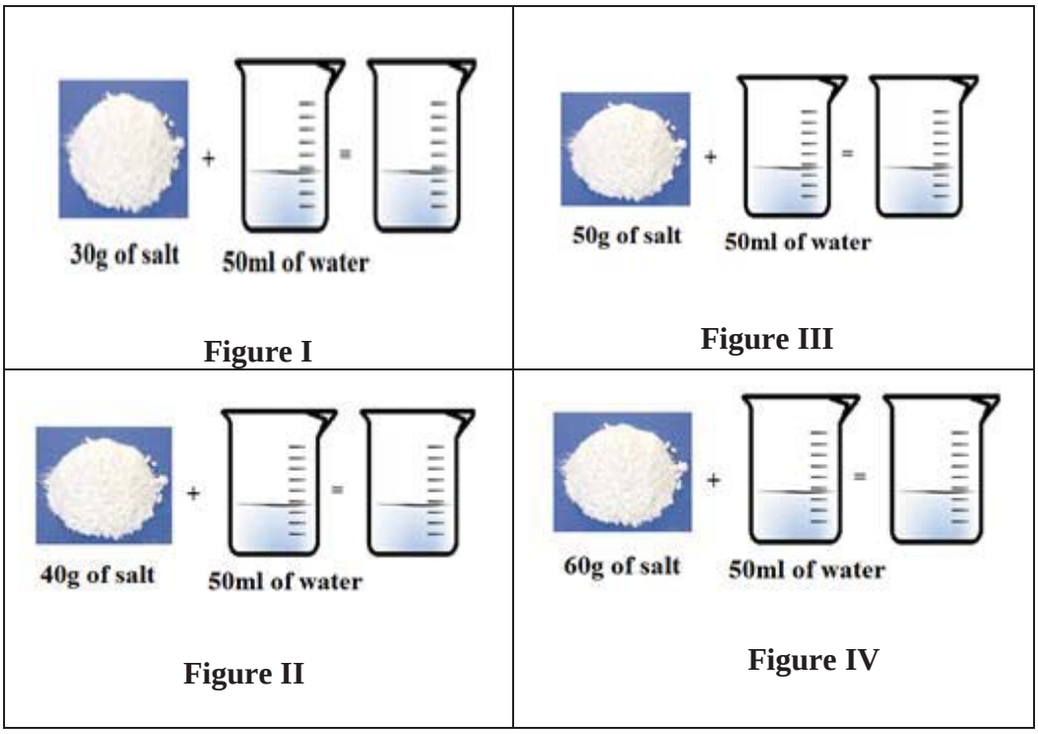
Which statement is **TRUE**?

A Fine sugar will dissolve faster.
B Coarse sugar will dissolve faster.
C They both require heat to dissolve.
D They both will dissolve in the same amount of time.

Answer: *A Fine salt will dissolve faster.*

Question 7. **[Analyzing]**

Which one of the figure given below shows a saturated solution?



A Figure IV
B Figure III
C Figure II
D Figure I

Answer: *A Figure IV*

(Draduk ,Zangpo and Wangmo, conducted two different investigations in a chemistry laboratory. Based on their investigations answer the questions 8, 9 and 10.)

Draduk
1. Took 100mL of water in a clean beaker.
2. Added a pinch of substance X in the beaker.
3. Added some more substance X and kept on stirring.
4. Repeated the above procedure 3 until no more substance dissolved.

Zangpo
1. Took 100mL of water in two clean test-tubes and labeled them A and B.
2. Added 50g of substance X in a test tube A and 50g of substance Y with constant stirring.
3. Repeated the above procedure until no more substance dissolved.
4. Finally weighed the leftover salt.

Wangmo
1. Took 100mL of water in two beakersand labeled them A and B.
2. Added 5 spatula of substance X in both beakers A and B.
3. Kept beaker A at room temperature and heated beaker B for few minutes.
4. Finally observed the changes in beaker A and B.

Question 8. **[Analyzing]**

Wangmo's investigation proves that salt dissolves

A at different rates.
B at higher pressure.
C faster when heated.
D faster at room temperature.

Answer: *C faster when heated*

Question 9. **[Understanding]**

The aim of the investigation is to study

A mixtures.
B elements.
C solubility.
D compounds.

Answer: *C solubility*

Question 10. **[Understanding]**

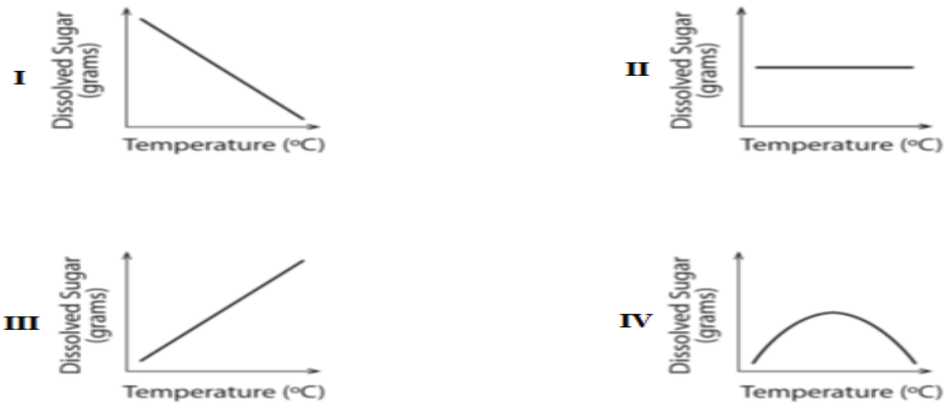
Who among the three friends is making a saturated solution?

A Draduk
B Wangmo
C Zangpo.
D All of them.

Answer: *A Draduk*

Question 11. **[Analyzing]**

Pelzang carried out an experiment to investigate the effect of temperature on solubility of sugar in water by measuring the amount of sugar that would dissolve in 1 liter of water at different temperatures.



Which one of the above graphs shows Pelzang's result?

A I
B II
C III
D IV

Answer: *C III*

Question 12. **[Analyzing]**

Under which condition would sugar cube dissolve quickly when placed in a liter of water kept at room temperature?

A Whole sugar cube is added and water is stirred.
B Whole sugar cube is added and the water is not stirred.
C Crushed sugar cube is added and the water is stirred.
D Crushed sugar cube is added and water in not stirred.

Answer: *C Crushed sugar cube is added and the water is stirred.*

Question 13. **[Remembering]**

Write **TRUE** or **FALSE** against each of the given statements. Correct the false statements by changing only the bold and underlined word.

i. Solutions with low concentration of solute are **dilute**. (*true*)
ii. Sulphur dissolves in **water**. (*false)*
Answer: *Sulphur dissolves in carbon disulphide.*
iii. Solubility of solute in a solution is **inversely proportional** to the temperature. (*false*)
Answer: Solubility of solute in a solution is directly proportional to the temperature.

Question 14. **[Understanding]**

Complete the flow chart using appropriate terms against each letter.

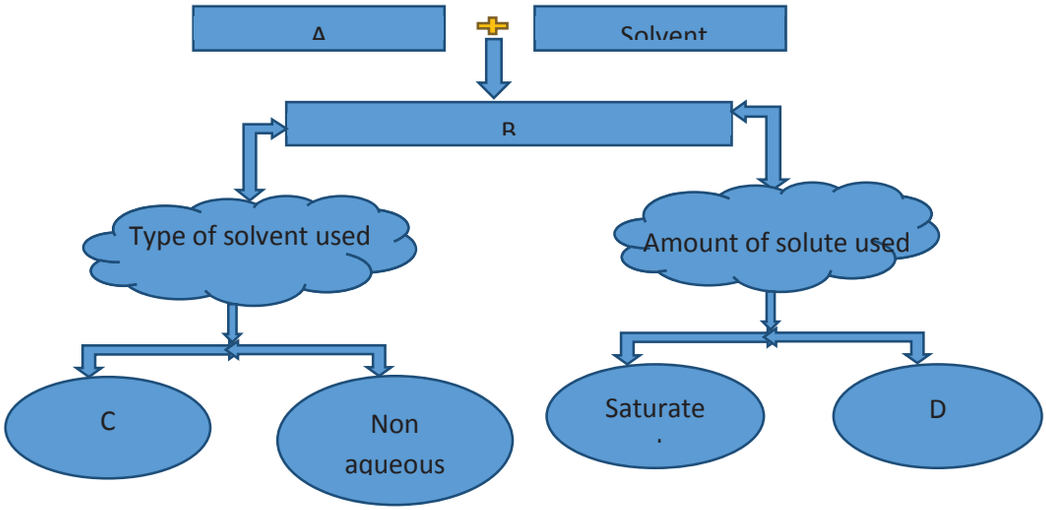


Figure 6.3

Answer:

A *Solute*

B *Solution*

C *Aqueous solution*

D *Unsaturated solution*

Question 15. **[Analyzing]**

Match each item in column A with the correct meaning in column B. Rewrite the correct matching pairs.

Column A	Column B
a. Saturated solution	1. sulphur and carbon disulphide
b. Soluble	2. liquid which dissolves a substance
c. Solution	3. no more substance will dissolve
d. Solvent	4. a substance which dissolves
e. Non-aqueous solution	5. solute and water
	6. more substance will dissolve

Answer: *a[3], b[4], c[5], d[2], e[1]*

Question 16. [**Evaluating]**

Which method would you prefer to make a solute dissolve faster, stirring or heating? Choose the best method and explain your views.

Answer: ***Stirring because:***

- *it saves time and it is an instant process*
- *energy source in not required*
- *faster and easier*

Heating because:

- *solutes can be dissolved completely*
- *it is more of scientific method*
- *increases the kinetic energy*

CHAPTER 7
SEPARATING MIXTURES

1. MIXTURE AND ITS TYPE

Learning Outcomes

At the end of the lesson, a student should be able to:

7.1.1 Define mixture and its types and
7.1.2 Explain the techniques used for separation of mixtures.

Assessment Items

Question 1. **[Understanding]**

Which one of the following is **NOT** a heterogeneous mixture?

A cake
B juice
C concrete
D emadatsi

Answer: *B juice*

Question 2. **[Understanding]**

A mixture of sand and iodine can be separated by the process of

A condensation.
B evaporation.
C sublimation.
D distillation.

Answer: *C sublimation*

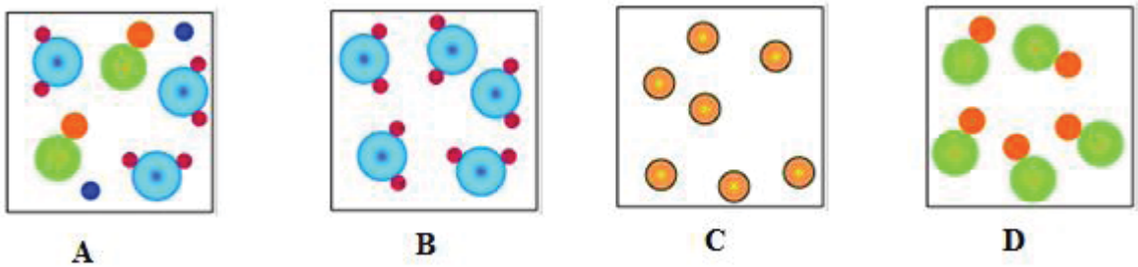
Question 3. **[Remembering]**

Fill in the blanks with correct words.

i. Homogenous mixture of metals are called…… (*alloys*)
ii. Oil in water is an example of ……. mixture. (*heterogeneous*)
iii. Homogenous mixture are commonly known as……. (*solutions*)
iv. Copper, zinc and tin combine uniformly to form…… (*bronze*)

Question 4. **[Understanding]**

Which one of the following represents particles in a mixture?



Answer: *A*

Question 5. **[Applying]**

A teacher uses the following pictures given in figure 7.1 as an example to teach a scientific concept.What concept is he teaching?

Figure 7.1

A heterogeneous mixture
B homogenous mixture
C solid-liquid mixture
D solid-solid mixture

Answer: *B homogenous mixture*

Question 6. **[Applying]**

Figure 7.2 shows the process of separating a mixture of salt, sand and water. However the diagrams are not arranged in sequence.

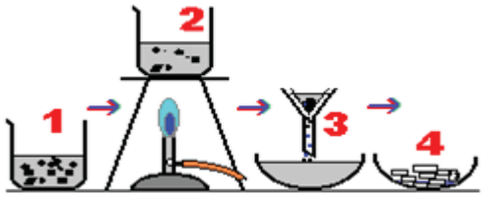


Figure 7.2

Which one of the following sequences is correct?

A $1 \rightarrow 2 \rightarrow 3 \rightarrow 4$
B $1 \rightarrow 3 \rightarrow 2 \rightarrow 4$
C $4 \rightarrow 1 \rightarrow 2 \rightarrow 3$
D $2 \rightarrow 3 \rightarrow 1 \rightarrow 4$

Answer: *B* $1 \rightarrow 3 \rightarrow 2 \rightarrow 4$

Question 7. **[Analyzing]**

Which one of the following pairs shows a homogenous and heterogeneous mixture?

A	Orange juice	bottled pickle
B	Muddy water	Jelly
C	Salt water	Tea
D	Oil in water	sand and gravels

Answer: *A* *Orange juice and bottled pickle*

Question 8. **[Applying]**

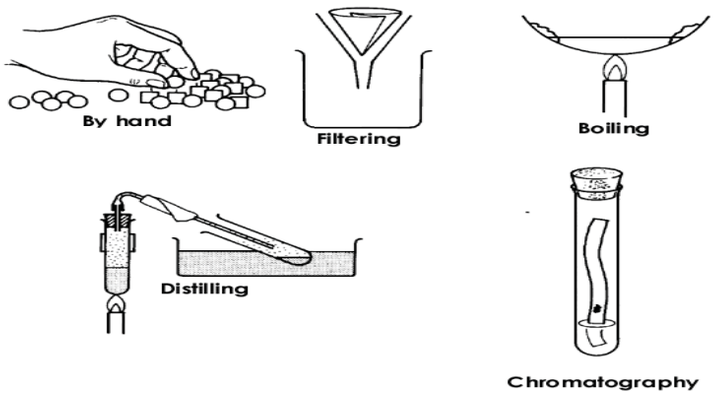
In the crossword puzzle given below, there are hidden names of different separation techniques. Find outas many as you can. One example is given for you.

N	W	D	G	J	S	G	D	C	B	M	L	D	W	C	V	O	T	W
D	V	J	l	N	O	V	D	B	M	H	D	S	V	F	H	G	Z	I
E	Y	S	U	B	L	I	M	A	T	I	O	N	Y	I	K	L	H	N
C	Z	S	U	B	V	I	M	A	T	I	O	N	Z	L	D	J	J	N
A	B	G	A	G	E	S	G	P	G	R	G	B	B	T	H	M	M	O
N	N	H	S	H	N	T	K	L	A	H	H	M	N	R	K	D	G	W
T	O	D	E	K	T	I	L	M	D	K	C	B	O	A	H	F	V	I
A	P	H	I	L	E	L	M	G	G	H	X	V	P	T	G	H	X	N
T	L	Y	V	C	X	A	B	B	B	F	Z	F	L	I	F	N	N	G
I	X	I	I	B	T	T	G	H	N	G	A	C	X	O	D	G	D	R
O	F	O	N	X	R	I	F	M	M	B	J	X	F	N	B	H	S	I
N	T	I	G	Q	A	O	D	F	V	H	O	A	T	G	K	D	M	O
R	U	L	H	X	C	N	F	G	P	M	P	G	U	N	C	G	L	O
G	I	P	K	A	T	P	E	V	A	P	O	R	A	T	I	O	N	K
H	A	J	L	C	I	O	F	F	L	I	Y	G		C	F	O	P	E
G	D	C	H	R	O	M	A	T	O	G	R	A	P	H	Y	X	O	Q
O	P	L	Y	V	N	Y	O	K	I	P	T	M		V	N	P	L	Z

Answer: *sublimation, winnowing, filtration, evaporation, sieving, decantation, chromatography, etc.*

Question 9.

Look at the following ways of separating mixtures and answer the questions that follow:



i. Name the process that you would use to **[Understanding]**

a. turn salty water into pure water. (*distilling*)
b. separate stones from grains. (*by hand*)
c. remove mud from the water. (*filtering*)
d. separate a mixture with the help of heat. (*boiling*)

ii. Which method depends upon evaporation of liquid? **[Undertsanding]**

Answer: *Boiling*

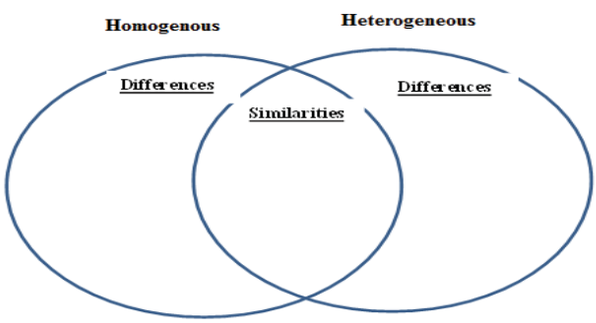
iii. Which method is better for separating the mixture of alcohol and water? Explain with reasons. **[Analysing]**

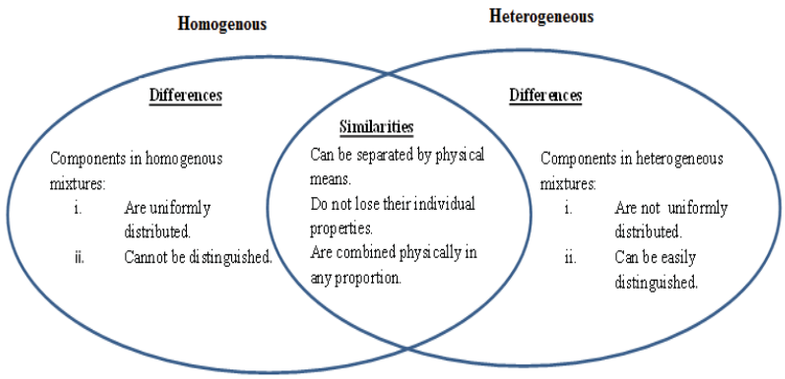
Answer: *Distillation because alcohol has a lower boiling point than water.*

Question 10. **[Analysing]**

Complete the VENN DIAGRAM given below by listing the similarities and differences of homogenous and heterogeneous mixtures.

Answer:





CHAPTER 8

PATTERNS IN CHEMISTRY

1. PERIODIC TABLE

Learning Outcomes

At the end of the lesson, a student should be able to:

8.1.1 Explain the development of the periodic table,
8.1.2 Describe the features of the periodic table and
8.1.3 Draw and complete the periodic table.

Assessment Items

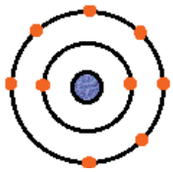
Question 1. **[Remembering]**

If you are an atom with one proton, you are hydrogen. Then which element would you be if your number of proton is 9?

A Ne
B F
C O
D Cl

Answer: *B F*

Question 2. **[Applying]**



How many protons are there in a neutral atom shown in the above diagram?

A 2
B 7
C 9
D 10

Answer: *C 9*

Question 3. **[Understanding]**

Which of the following in the periodic table contains only metals?

A Group 1
B Group 2
C Period 1
D Period 2

Answer: *B Group 2*

Question 4. **[Remembering]**

Water (H_2O) is **NOT** found in the periodic table because it is

A an atom.
B a liquid.
C a mixture.
D a compound.

Answer: *D a compound*

Question 5. **[Understanding]**

Read the descriptions given below:

A
Colourless inert gas Lightest noble gas Contains protons Used to make attention gaining board.

B
Diamond and graphite are made of it. Basis of life Contains six protons Used to make steel when combined with iron

C
Alkali metal Present in baking soda Present in high quantity in bananas

D
Gas at room temperature One of the two elements present in water First element in the periodic table

Name the four elements.

Answer: *A: Helium, B: Calcium, C: Potassium, D: Hydrogen*

Question 6 **[Applying]**

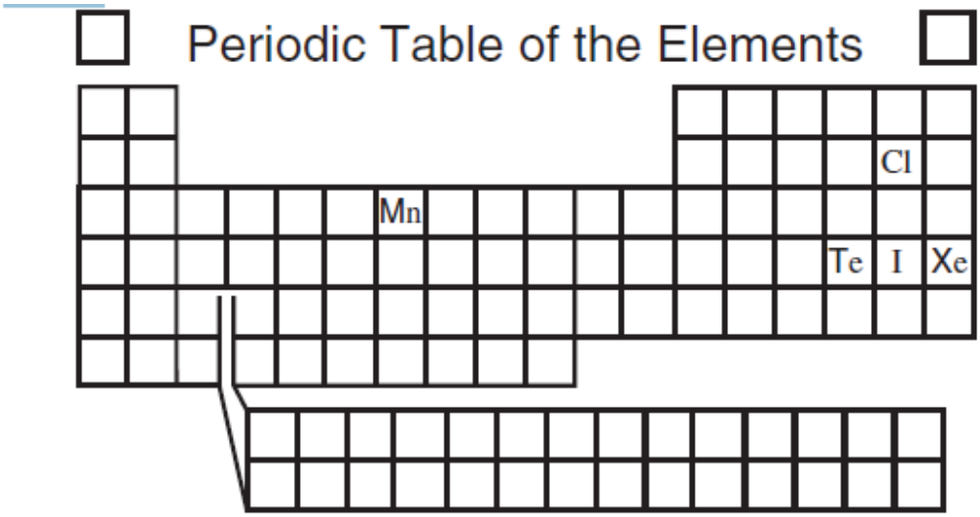
Which of the following is the correct chronological order of the scientists credited with developing the periodic table?

A Moseley, Dobereiner, Newlands, Mendeleev
B Mendeleev, Moseley, Dobereiner, Newlands
C Dobereiner, Newlands, Mendeleev, Moseley
D Newlands, Mendeleev,Moseley, Dobereiner

Answer: *C Dobereiner, Newlands, Mendeleev, Moseley*

[Use this periodic table to answer for Question 7.]

Table 8.1



Question 7. **[Understanding]**

Iodine would have chemical properties similar to

A Mn.

B Te.

C Cl.

D Xe.

Answer: *C Cl*

(The table 8.2 is to be used with Question 8.)

Elements	Element 1	Element 2	Element 3
Atomic Mass	12	14	……..

Question 8.

What is the atomic mass of the Element 3? **[Understanding]**

A 26

B 20

C 18

D 16

Answer: *D 16*

(Use the periodic table 8.3 for Question 9.)

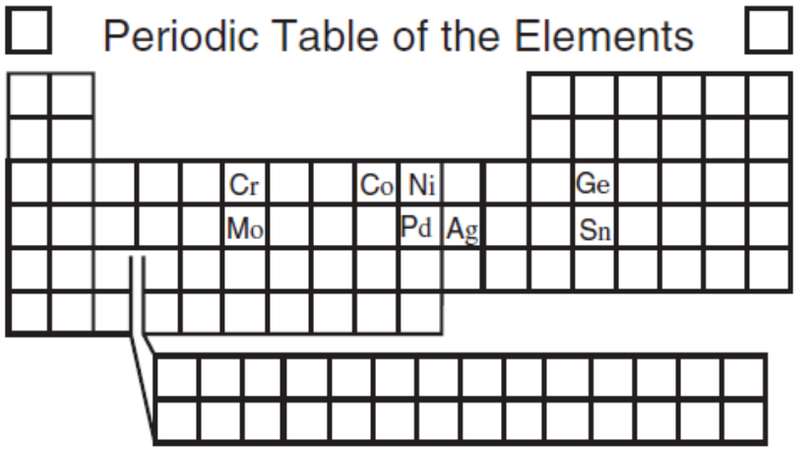


Table 8.3

Question 9. **[Understanding]**

Which of the following ordered pairs of elements show an increase in atomic number but a decrease in average atomic mass?

A Ag to Pd
B Co to Ni
C Ge to Sn
D Cr to Mo

Answer: *B Co to Ni*

Question 10. **[Analyzing]**

Which of the following statements concerning Mendeleev's Periodic Table is **NOT** true?

A Elements are arranged in the order of increasing atomic number.
B Elements with similar properties appear at regular intervals.
C There are gaps left for the elements that are yet to be discovered.
D There were nine vertical columns called groups.

Answer: *A Elements are arranged in the order of increasing atomic number.*

Question 11. **[Analyzing]**

The elements fluorine, chlorine, bromine and iodine are all found in the same group **(17)** on the periodic table. These elements are grouped together because they

A are metals.
B are noble gases.
C react in similar ways.
D have the same atomic mass.

Answer: *B are noble gases*

(Use the periodic table 8.4 for Question 12.)

Portion of the Periodic Table of the Elements

		Groups					18
		13	14	15	16	17	4 He Helium 2
		11 B Boron 5	12 C Carbon 6	14 N Nitrogen 7	16 O Oxygen 8	19 F Fluorine 9	20 Ne Neon 10
		27 Al Aluminum 13	28 Si Silicon 14	31 P Phosphorus 15	32 S Sulfur 16	35 Cl Chlorine 17	40 Ar Argon 18
11	12						
64 Cu Copper 29	65 Zn Zinc 30	70 Ga Gallium 31	73 Ge Germanium 32	75 As Arsenic 33	79 Se Selenium 34	80 Br Bromine 35	84 Kr Krypton 36
108 Ag Silver 47	112 Cd Cadmium 48	115 In Indium 49	119 Sn Tin 50	122 Sb Antimony 51	128 Te Tellurium 52	127 I Iodine 53	131 Xe Xenon 54

Figure 8.4

Question 12. **[Applying]**

How do atomic masses generally vary throughout the periodic table of elements?

A They increase from left to right and top to bottom.

B They increase from left to right and bottom to top.

C They increase from right to left and top to bottom.

D They increase from right to left and bottom to top.

Answer: *A They increase from left to right and top to bottom.*

Question 13. **[Applying]**

Design power point presentations in your computer laboratory on the following given topics.

A Alkali metals

B Transition metals

C Non metals

D Halogens

E Noble gases

Question 14. **[Analysing]**

Match each description in column A with the relevant names of the scientist in column B. Rewrite the correct matching pair.

Column A	Column B
1. Proposed the laws of Octaves	a. Dobereiner
2 "Father of the Periodic Table"	b. Newlands
3. Arranged the elements into triad	c. Moseley
4. Formulated the modern periodic table	d. Mendeleev
	e. Lavoiser

Answer: *1[b], 2[d], 3[a], 4[c]*

Question 15. **[Applying]**

Study the figure 8.5 carefully and answer the questions that follow:

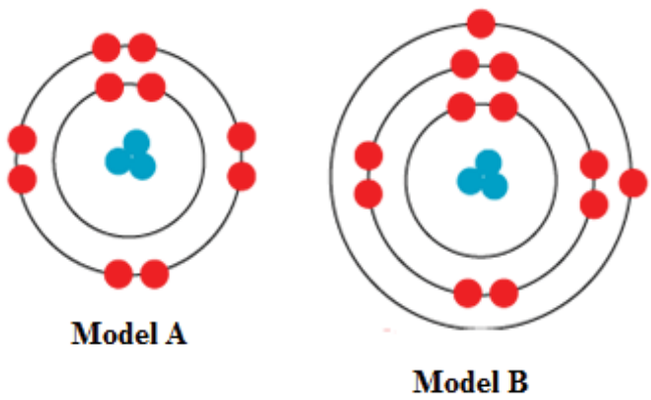


Figure 8.5

i. Which model represents an atom? Give reason a for your choice.
ii. Under which group does this element belong?
iii. Name the element.

Answer:

i. *Model B, because it has complete set of electrons of that atom whereas Model A has lost two electrons to become an ion.*

ii. *Group II(2)*

iii. *Magnesium*

2. ACID, BASE AND INDICATOR

Learning Outcomes

At the end of the lesson, a student should be able to:

8.2.1 Describe the classification of acid with examples,
8.2.2 State the properties and uses of acids,
8.2.3 Define bases with examples,
8.2.4 Explain properties and uses of bases,
8.2.5 Define indicator with examples and
8.2.6 Investigate substances as acids or bases using indicators.

Assessment Items

Question 1. **[Remembering]**

The taste of the acids are

A bitter.
B sour.
C salty.
D sweet.

Answer: *B sour*

Question 2. **[Remembering]**

The characteristic properties of a base is due to the presence of

A hydrogen ions.
B hydride ions.
C hydroxyl ions.
D hydronium ions.

Answer: *C hydroxyl ions.*

Question 3. **[Understanding]**

Which one of the following substances should you rub to neutralize the sting of a wasp?

A washing soda
B tooth paste
C baking soda
D vinegar

Answer: *D vinegar*

Question 4. **[Applying]**

A mechanic wants to test the strength of acid in a car battery. Which one of the following indicators would give him the best result?

A methyl orange
B universal
C litmus solution
D cobalt chloride

Answer: *B universal*

Question 5. **[Remembering]**

The label on the bottle of hydrochloric acid has a symbol as shown in figure 8.6. What does this symbol mean?

Figure 8.6

A irritant
B corrosive
C explosive
D flammable

Answer: B *corrosive*

Question 6. **[Understanding]**

To which colour does universal indicator turn in hydrochloric acid?

A red
B purple
C blue
D green

Answer: *A red*

Question 7. **[Analyzing]**

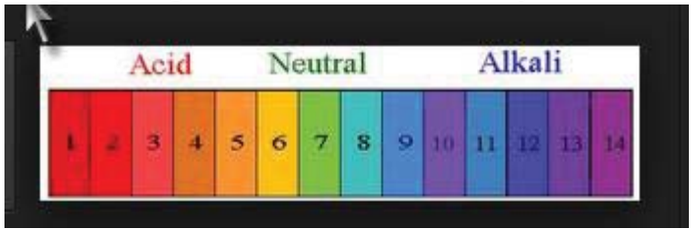
Which one of the following can be used to identify a solution of sodium hydroxide?

A red litmus
B blue litmus
C dilute hydrochloric acid
D sodium carbonate solution

Answer: *A red litmus*

Question 8. **[Applying]**

On the pH scale given below, where would you find strong acids and strong bases.



A In the middle of the pH scale.
B On the left side of the pH scale.
C On either side of the pH scale.
D On the right side of the pH scale.

Answer: *C On either side of the pH scale.*

Question 9. **[Applying]**

Read the following statements.

I. Both acids and bases change colour of all indicators.
II. If an indicator gives a change in colour with an acid, it does not give a change with base.
III. If an indicator gives a change in colour with an base, it does not give a change with acid.
IV. Change of colour in acid or base depends on the nature of indicators.

Which of these statements is/are correct?

A I and II
B III and III
C III and IV
D IV only

Answer: *D IV only*

Question 10. **[Analyzing]**

The pH of four different solutions of some materials are measured. Which of the following lists of solutions are arranged in order from most acidic to most basic?

A battery acid, lemon juice, blood, laundry detergent
B lemon juice, battery acid, blood, laundry detergent
C laundry detergent, blood, lemon juice, battery acid
D battery acid, blood, laundry detergent, lemon juice

Answer: *A battery acid, lemon juice, blood, laundry detergent*

Question 11. **[Understanding]**

Write **TRUE** or **FALSE** against each given statement. Correct the false statements.

i. All substances are either acidic or basic.(*false*)

Answer: *All substances are acidic, basics or neutral.*

ii. Tooth decay is caused by the presence of base. (*false*)

Answer: *Tooth decay is caused by the presence of an acid.*

iii. Higher the pH number , stronger is the acid.(*false*)

Answer: *Higher the pH number, stronger is the base or lower the pH, stronger is the acid.*

iv. Acid reacts with base to form salt and water.(*true*)

v. Methyl orange turns to red colour in an acid medium.(*true*)

Question 12. **[Analyzing]**

Match each substance in column I with the corresponding one in column II.

Column I	Column II
1. Tartaric acid	a. Soap
2. Calcium Hydroxide	b. Curd
3. Vinegar	c. Grapes
4. Sodium Hydroxide	d. Oxalic acid
5. Lactic acid	e. Wasps' sting
	f. Lime water

Answer: *1[c], 2[f], 3[e], 4[a], 5[b]*

Question 13. **[Applying]**

Fill in the blanks with appropriate words.

i. Organic acids are obtained from …… and …… (*plants and animals*)

ii. Inorganic acids are obtained from …….. (*minerals*)

Question 14. **[Analysing]**

A solution of hydrochloric acid (HCl) in water will turn blue litmus paper red. A solution of the sodium hydroxide (NaOH) in water will turn red litmus paper blue. If the acid and base solutions are mixed in the right proportion, the resulting solution will cause neither red nor blue litmus paper to change colour. Explain why?

Answer: *The hydrochloric acid and sodium hydroxide will react to form salt and water which is a neutral solution. OR The hydrogen ions combine with the hydroxide ions to form water, so the litmus paper does not change colour.*

Question 15. **[Applying]**

Fill in the cross word given in figure 8.7 with the help of the clues provided.

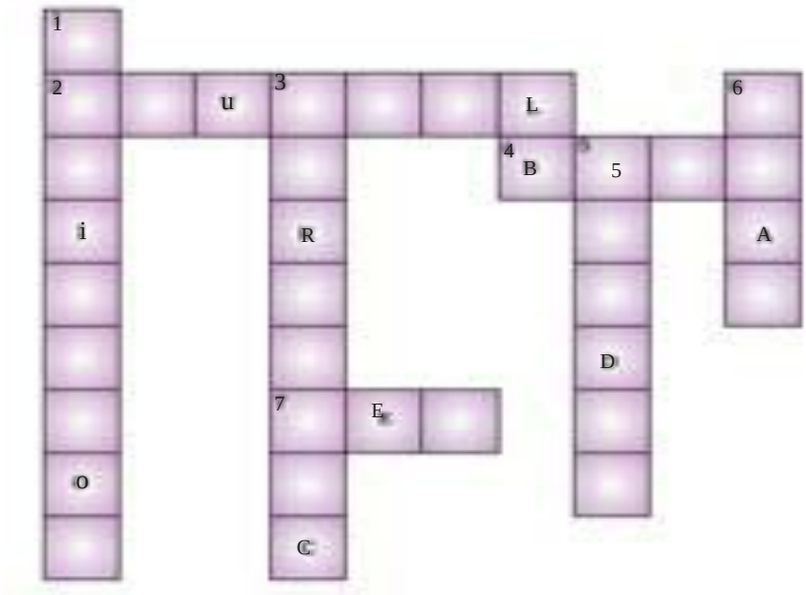


Figure 8.7

Across

- (2) The solution which does not change the colour of either red or blue litmus.
- (4) Phenolphthalein turns pink in this type of solution.
- (7) Colour of blue litmus in lemon juice.

Down

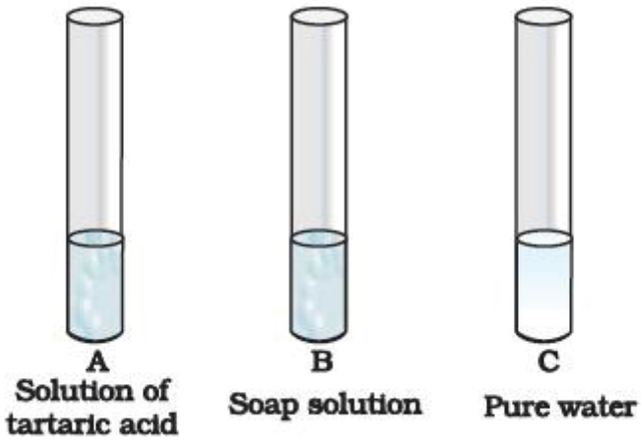
- (1) It is used to test whether a substance is acidic or basic.
- (3) It is a natural indicator that gets pink in basic solution.
- (5) Nature of ant's sting.
- (6) It is responsible for increase in temperature during a neutralization reaction.

Answers:

Across: (2) Neutral, (4) Base, (7) Red

Down: (1) Indicator, (3) Turmeric, (5)Acidic (6)Heat

Question 16. **[Applying]**



You are provided with three test tubes A, B and C containing different liquids as shown in the figure above. What will you observe when you put

I a piece of blue litmus paper in each test tube
II a piece of red litmus paper in each test tube
III few drops of phenolphthalein solution.

Answer: *The content of*

I Test tube A-turns red, Test tube B-remains same, test tube C- no change.
II Test tube A-remains same, Test tube B - turns blue, test tube C- no change.
III Test tube A-colourless, Test tube B-turns pink, test tube C-no change.

Question 17. **[Applying]**

Dorji has a few bottles of soft drinks in his resturant. But unfortunately, these are not labelled. He has to serve the drinks on the demand of customers. One customer wants acidic drink, another wants basic drink and the third one needs neutral drink. How will Dorji decide which drink is to be served to whom?

Answer: *Dorji can use indicators to test which drink is acidic or basic. He can perform litmus paper test, by pouring few drops of drinks on blue litmus and red litmus paper strip. If the blue litmus turns red, the drink is acidic. If the red litmus turns blue the drink is basic. If it has no effect then the drink is neutral.*

Question 18. **[Creating]**

Work in groups and make power point presentations on:

1) Uses of acids
2) Uses of bases
3) Uses of pH

COMPETENCY BASED ASSESSMENT-2015

UNIT III: PHYSICAL PROCESSES

CHAPTER 9

WORK AND ENERGY

1. DISTANCE AND DISPLACEMENT

Learning Outcomes

By the end of the lesson, a student should be able to:

9.1.1 Explain the terms distance and displacement with examples.

Assessment Items

Question 1. **[Understanding]**

Karma travelled 165 km from Thimphu to Phuntsholing yesterday. Which ONE of the following statements is **TRUE** about his journey?

A His distance is less than 165 km.
B His displacement is more than 165 km.
C His distance covered is 165 km.
D His displacement is less than 165 km.

Answer: *C* *His distance covered is 165 km*

Question 2. **[Understanding]**

Which of the following statement is **TRUE** about distance and displacement?

A Distance and displacement may be equal.
B Distance and displacement are always equal.
C Displacement is always more than distance.
D Distance is always more than displacement.

Answer: *A* *Distance and displacement may be equal.*

Question 3. [**Applying**]

An example of zero displacement is

A climbing a ladder.
B running towards a tree.
C walking from school to house.
D making a complete round of a Chorten.

Answer: *D* *making a complete round of a Chorten.*

Question 4. [**Applying**]

Jigme drove his car from P to Q, Q to R and then finally from R to S as shown in Figure 9.1. What is the shortest route from P to S?

A 5 km

B 10 km

C 15 km

D 20 km

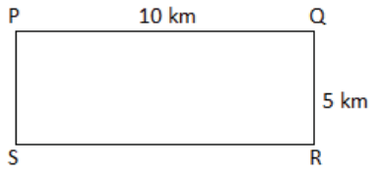


Figure 9.1

Answer: *A 5 km*

Question 5. [**Applying**]

Look at the following crossword puzzle and locate **FIVE** words that describe displacement and define it using those words.

Q	M	O	V	I	N	G	I
S	N	M	O	O	P	U	N
Z	T	O	N	N	H	T	I
S	H	O	R	T	E	S	T
F	I	N	A	L	Y	O	I
L	A	P	T	O	P	O	A
Y	E	I	L	D	E	N	L

Answer: *MOVING, INITIAL, FINAL, SHORTEST, PATH*

Definition: Displacement is the shortest path taken by a moving body between the initial and final positions in a particular direction.

Question 6. **[Analyzing]**

Dema walked from place A to B, B to C and then C to D. Dorji walked from place D to C and then C to B as shown in Figure 9.2. Which ONE of the following statements is TRUE about their journey?

A Dema covered shorter distance than Dorji.

B Dema's displacement is shorter than Dorji.

C Both of them covered equal distance.

D Dorji's and Dema's displacement is zero.

Answer: *C Both of them covered equal distance.*

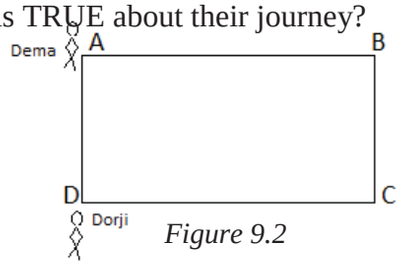


Figure 9.2

2. WORK DONE

Learning Outcomes

At the end of the lesson, a student should be able to:

9.2.1 Define work done and give examples,
9.2.2 Find the relationship between work, force and displacement and
9.2.3 Calculate work done.

Assessment Items

Question 1. **[Understanding]**

In which case is the work done by a body?

A Pushing a wall.

B Lifting a boulder.

C A body travelling a full circular path.

D A car sliding on a layer of ice on the road.

Answer: *B Lifting a boulder.*

Question 2. **[Applying]**

Dawa has to move the wooden box from point A to point B as shown in Figure 9.3 below. He applied 20N of force. What is the amount of work done by him?

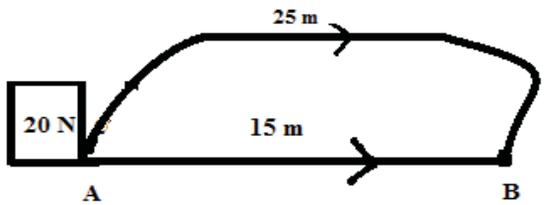


Figure 9.3

A 300 J

B 500 J

C 600 J

D 800 J

Answer: *A 300 J.*

Question 3 **[Analyzing]**

Figure 9.4 is to be used with question number 3.

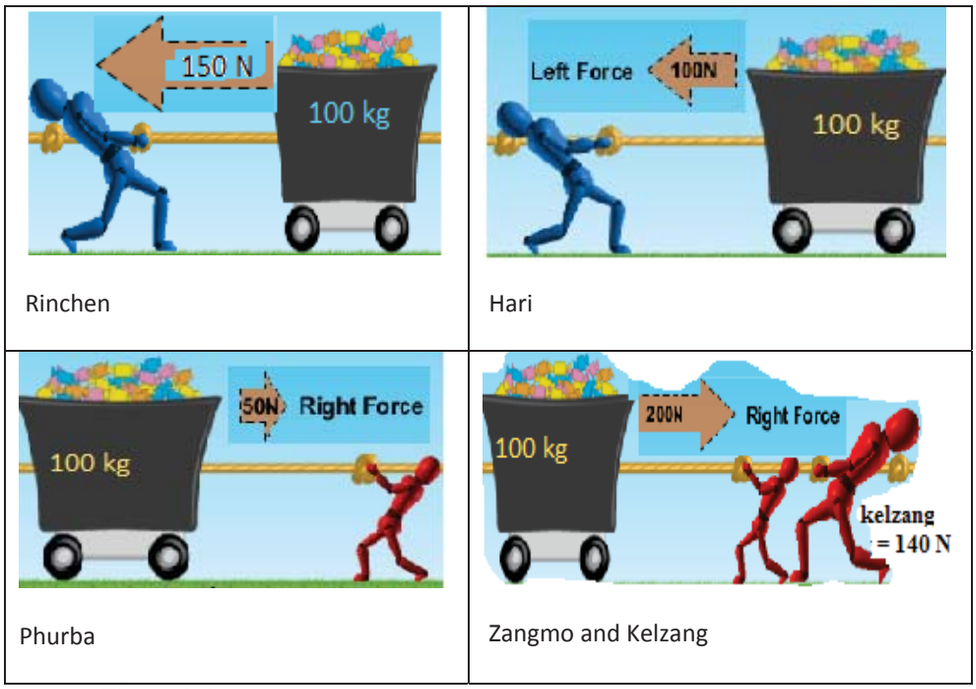


Figure 9.4

I. Rinchen is as strong as Zangmo

II. Hari is weaker than Phuba

III. Phuba is the weakest

IV. Zangmo and Kelzang can pull the heaviest weight.

Which **ONE** of the following statements about the work done best describes the situations shown in Figure 9.4?

A I and IV

B II and III

C III and IV

D II and IV

Answer: C *III and IV*

Question 4. **[Applying]**

Which stone in Figure 9.5 will peg the nail deeper?

A Stone A

B Stone B

C Stone C

D Stone D

Answer: *Stone C*

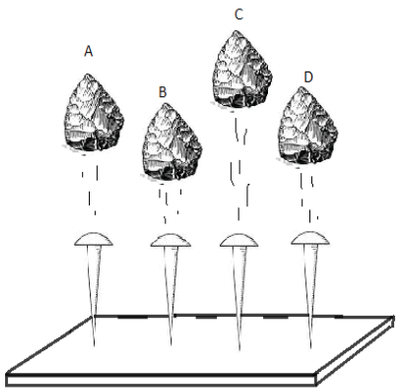


Figure 9.5

Question 5. **[Applying]**

Tashi and Norbu perform equal work by moving the box from one point to another point by applying 15 N and 20 N of forces respectively.

i) Who moves the boxes further?

Answer: *Tashi moves the box further than Norbu as his displacement is greater.*

ii) What is the displacement of the box if they apply equal forces?

Answer: *If they apply equal forces their displacements are equal.*

iii) Find the ratio of the work done by Tashi and Norbu if the displacement is equal.

Answer: $\frac{W1}{w2} = \frac{F1d1}{F2d2} =$ $\frac{3}{4}$

3. SOURCES OF ENERGY

Learning Outcomes

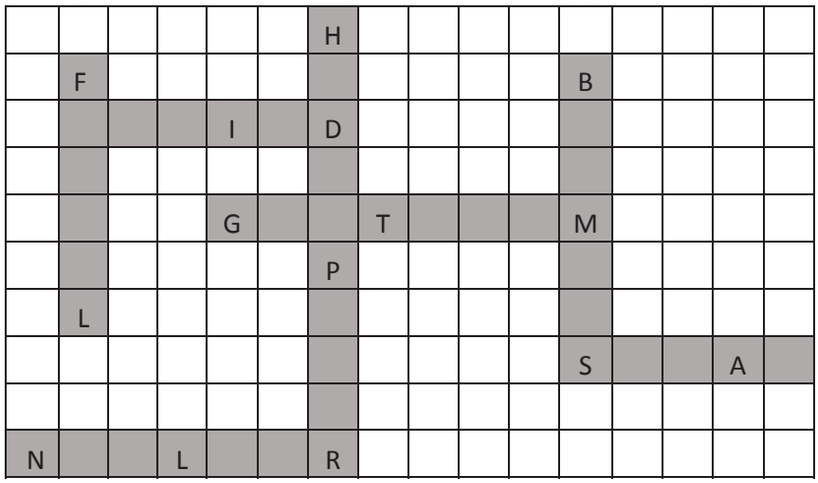
By the end of the lesson, a student should be able to:

9.3.1 Define renewable and non- renewable energy and
9.3.2 Classify the different sources of energy as renewable and non-renewable.

Assessment Items

Question 1. **[Understanding]**

Complete the given crossword using seven different types of energy sources.



Answer: *Wind, Solar, Nuclear, Hydropower, Biomass, Geothermal, Fossil*

Question 2. **[Understanding]**

Which **ONE** of the following statements best describes about non-renewable sources of energy?

I. It cannot be renewed in one human life cycle.
II. It is a clean source of energy.
III. It affects our environment.
IV. It is inexhaustible.

A I and II.
B I and III.
C II and III.
D II and IV.

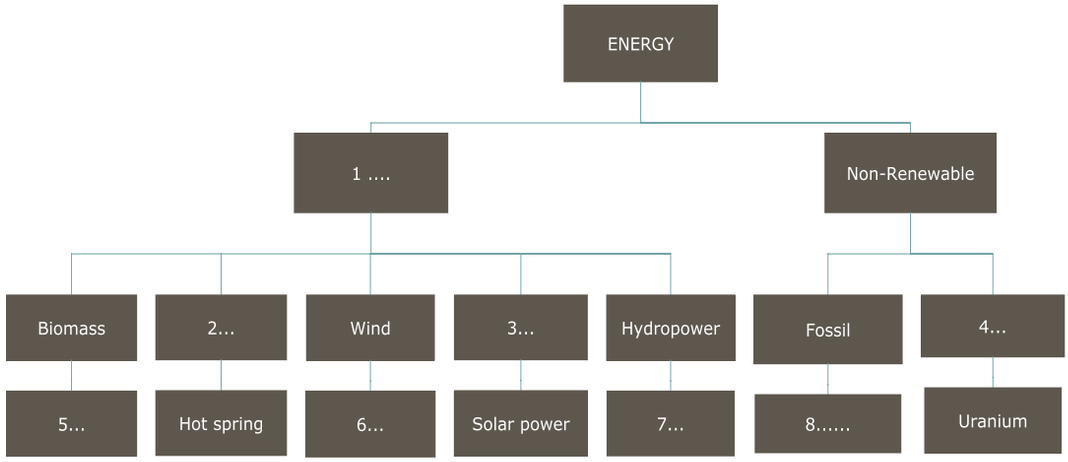
Answer: *B I and III*

Question 3. **[Analyzing]**

Sources of energy can be arranged in a particular order pertaining to their origin, nature or type. Choose the appropriate words from the given list and fill in the spaces provided in the organization chart.

[*Nuclear, Candle, Renewable, wood, geothermal, electricity, sun, windmill*]

Energy Chart



Answer: *1- Renewable; 2- Geothermal; 3- Sun; 4 –Nuclear; 5–Wood; 6- windmill; 7- Electricity ; 8- Candle*

4 FOSSIL FUEL FORMATION

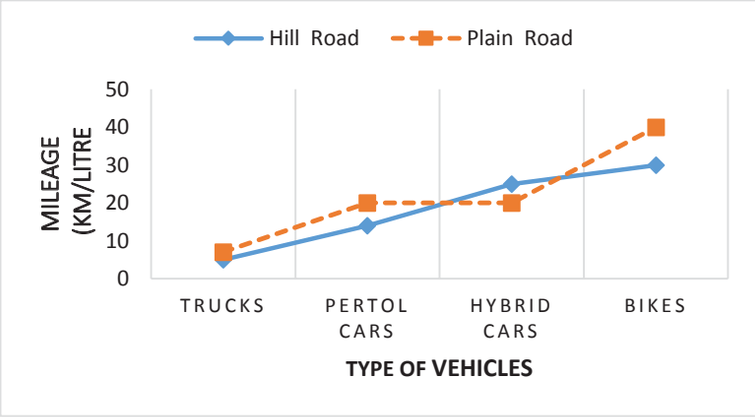
Learning Outcomes

At the end of the lesson, a child should be able to:

9.4.1 Describe the formation of fossil fuel and
9.4.2 Discuss the uses and alternatives to fossil fuels in Bhutan.

Assessment items

The graph below compares the mileage (distance covered per liter of fuel) efficiencies of different types of vehicles in Bhutan. Based on the given graph answer Question 1 and Question 2.



Question 1. **[Analyzing]**

Which types of vehicle consume more fuel?

A Bikes
B Trucks
C Petrol cars
D Hybrid cars

Answer: *B Trucks*

Question2. **[Understanding]**

What types of vehicle should be encouraged to be used by people in Bhutan? Why?

Answer: *Electric car, hybrid cars, two wheelers, etc., as they consume less fuel and less pollutant is emitted into the environment.*

Question 3. **[Evaluating]**

"Hydroelectricity does not affect environment". Justify the statement.

Question 4. **[Creating]**

Illustrate a poster showing the importance of the use of fossil fuel on an environment.

Answer: *open ended*

Question 5. **[Creating]**

Draw a flow chart explaining the formation of petroleum.

CHAPTER 10
FORCES AND MOTION

1. LINEAR AND ROTATIONAL MOTION

Learning Outcomes:
By the end of the lesson, a student should be able to:

10.1.1 Tell the effects of force with examples,
10.1.2 Explain speed and average speed and solve numerical problem on speed,
10.1.3 Distinguish between balanced and unbalanced forces and
10.1.4 Explain rotational motion with examples.

Assessment Items

Question 1. **[Understanding]**

Krishna and Tashi pull a basketball toward each other. For a moment the ball does not move, even though forces are being applied to it. Which ONE of the following best explains the state of the ball?

A Equal forces act on the ball in same direction.
B Equal forces act on the ball in opposite directions.
C The total force acting on the ball is equal to the ball's mass.
D The frictional force acting on the ball is greater than the ball's mass.

Answer: *B Equal forces act on the ball in opposite directions.*

Figure 10.1

Question 2. **[Applying]**

Lhamo starts driving at 7 O'clock. After an hour he reaches Autsho as shown in Figure 10.2. Her destination is Mongar, 35 km from Autsho.

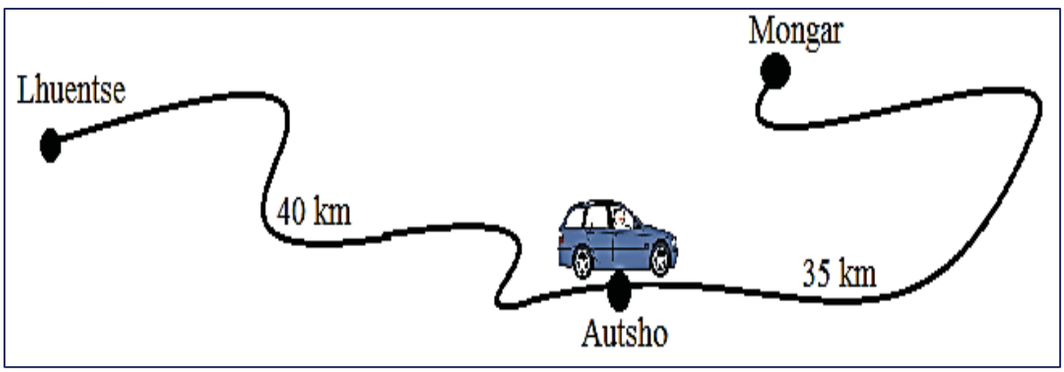


Figure 10. 2

(a) What is her speed between Lhuentse and Autsho?

A 5 km/hr

B 35 km/hr

C 40 km/hr

D 75 km/hr

Answer: C *40 km/hr*

(b) What is her average speed from Lhuentse to Mongar, if she takes another hour to reach Mongar?
Answer: *Average speed= Total distance / Total time = (40+35)/ 2= 75/2=37.5 km/hr.*

Question 3. **[Analyzing]**

Figure 10.3 shows Choden's trip from home to market and back.

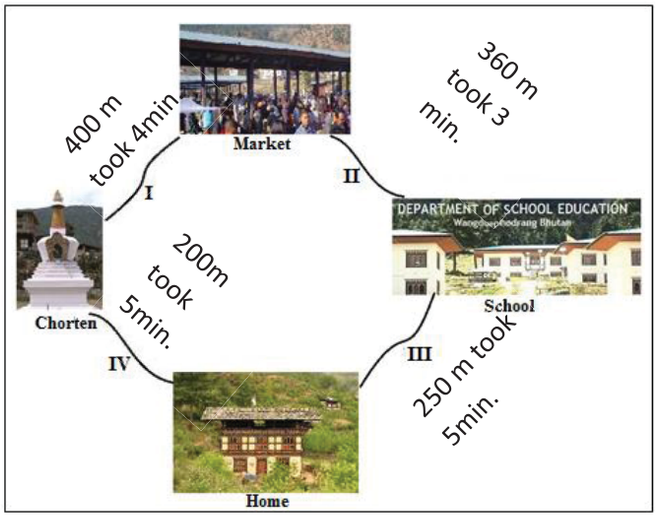


Figure 10.3

(a) Compare the average speed of Choden travelling from home to market and from market to back home.
Answer: *Average speed (home to market) = (200m+400m)/ (5 min+4min) = 600m/9m= 66.67m/min= 4 km /hr.*
Average speed (market to home) = (360m+250m)/ (3 min+5min) = 610m/8m= 76.25m/min= 4.6 km /hr
Therefore, Choden travels fast on the way back home from the market.

(b) Compare the speed of Choden between chorten to market and market to school.
Answer: *Speed from Chorten to market/ speed from Market to school =(400m/4 min)/(360m/3 min)= 1200/1440= 5:6*

(c) Which journey was travelled with the highest speed?
Answer: *Market to school was travelled with the highest speed (360/3= 120m/min)*

Question 4 **[Analyzing]**

Dophu and Norbu are trying to pull the rope in opposite directions as shown in Figure 10.4 below.

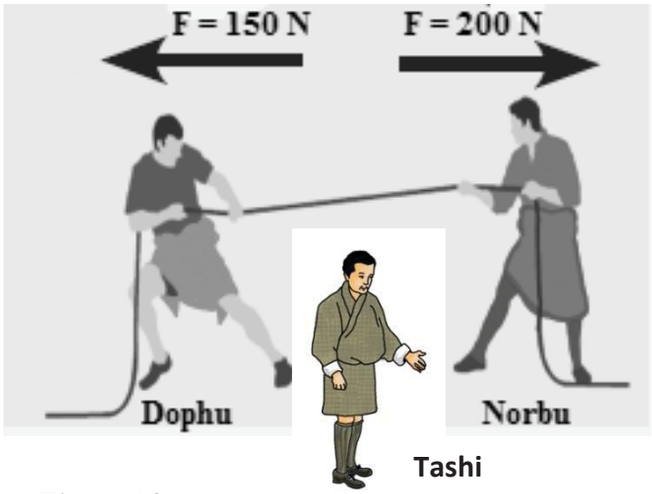


Figure 10. 4

What additional force must be applied by Tashi so that rope does not move in either direction?

A 50 N acting as along the direction of Dophu the 200 N force.

B 50 N acting as along the direction of Norbu the 150 N force.

C 350 N acting along the direction of Dophu the 200 N force.

D 350 N acting along the direction of Norbu the 150 N force.

Answer: *B 50 N acting along the direction of Dophu.*

Question 5. **[Analyzing]**

Penjor and Maya contested in a race covering a distance of 1 km. Penjor took 30 seconds while Maya took 45 seconds to complete the race.

The above scenario describes only the average speed because

A speed at different distances and intervals are not known.

B both of them completed the race on time.

C Penjor took lesser time than Maya.

D the time taken is not realistic.

Answer: *D the time taken is not realistic.*

Question 6 [U**nderstanding**]

Frame questions for the following answers:

I. The symbol is 'S' and the unit is 'metre'.

II. It is a ratio of the total distance covered to the time taken by a moving body.

III. Unbalanced force can change the shape of a non-rigid body.

IV. Wheel of a car produces rotational motion.

Answer:

I. *What is the symbol and unit of distance?*

II. *Define average speed.*

III. *Write an effect of unbalanced force on a non-rigid body.*

IV. *Name a part of a car that produces rotational motion.*

3. SIMPLE MACHINES

Learning Outcomes:

At the end of the lesson, a student should be able to:

10.3.1 Describe different types of simple machines,
10.3.2 Explain mechanical advantage, velocity ratio and efficiency of simple machines,
10.3.3 Calculate the mechanical advantage, velocity ratio and efficiency of a simple machines and
10.3.7 State the importance of simple machines in our day to day life.

Assessment items

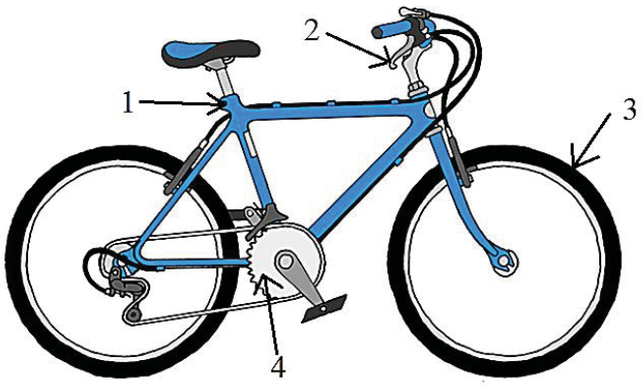


Figure 10.5. Bicycle parts as Machines

Question 1. **[Understanding]**

Label the parts 1, 2, 3 and 4 indicated in Figure 10.5

Answer: *1 – screw, 2 – lever, 3 – wheel, 4 – gear*

Question 2. **[Understanding]**

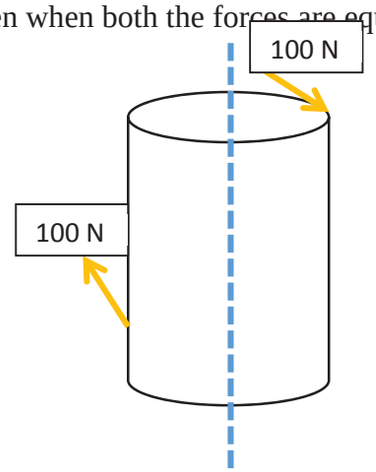
When the balanced forces act on a non-rigid body, they will change the

A state of the body.
B direction of the body.
C dimensions of the body.
D speed of the body.

Answer: *C dimensions of the body.*

Question 3. **[Analysing]**

Equal and opposite forces generally cancel each other's effects and the body does not move. In the figure given below, the body rotates even when both the forces are equal and opposite. Why do you think this happens?



Answer: *Even though the forces are equal and opposite in direction, they do not cancel each other's effects as they do not act on the same line of action. Therefore, resultant force rotates the body.*

Question 4. **[Applying]**

Dechen and Kelzang are playing on a see-saw as shown in Figure 10.6
The statement that best describes the scene is

A The see-saw is balanced.

B Load arm and effort arm are equal.

C Force exerted by Kelzang is greater than Dechen.

D Mass of Kelzang is more than that of Dechen.

Answer: *A The see-saw is balanced.*

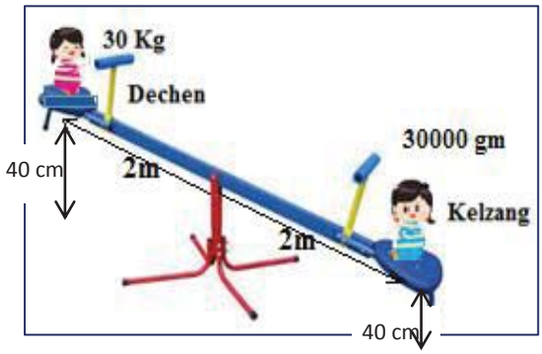
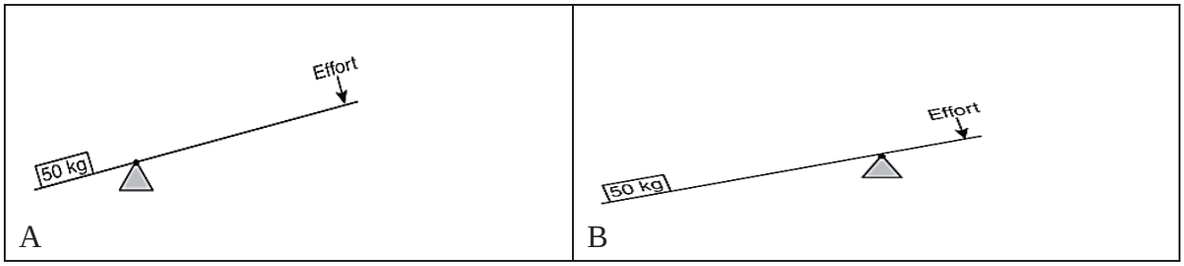
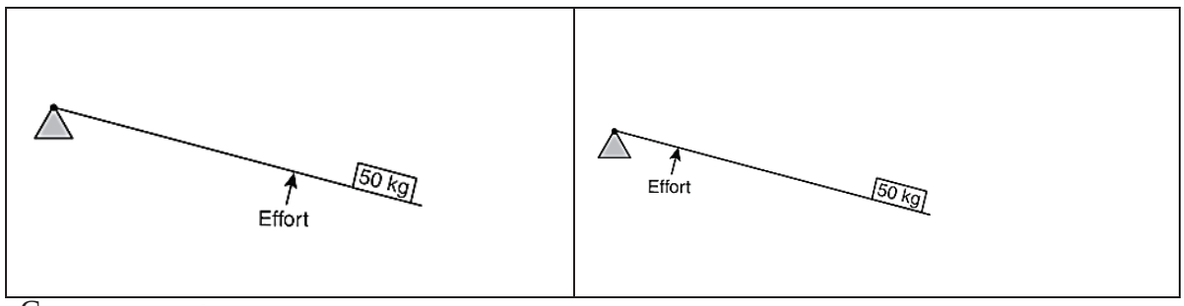


Figure 10.6

Question 5. **[Applying]**

Which lever given below requires the least effort to lift the load?



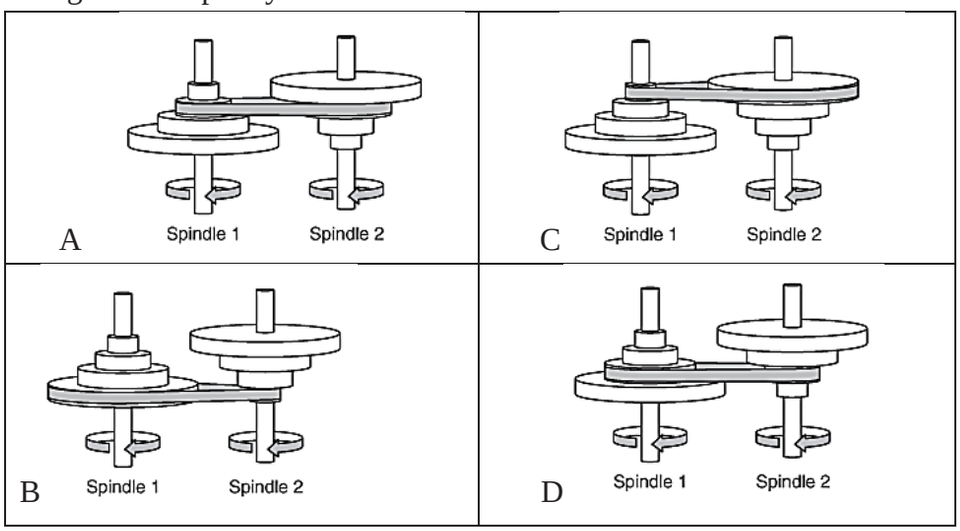


C

Answer: *A* D

Question 6. **[Analyzing]**

Which arrangement of pulleys and belts shown below will result in the fastest rotation of Spindle 2?



Answer: *B*

Question 7.

Figure 10.7 shows a dam and an electric power plant built next to a river. The plant uses the water reserved in the dam to generate electricity.

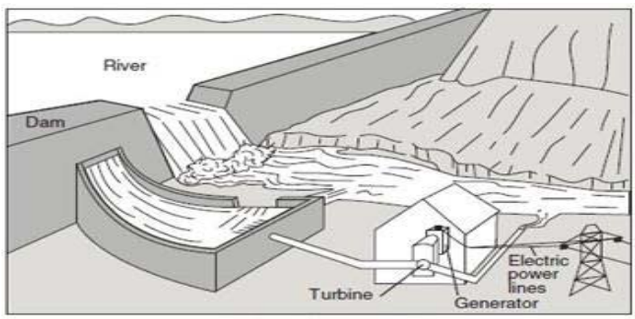


Figure 10.7

a) Identify a simple machine used in the power plant and state how it converts energies from one form to another. **[Applying]**

b) Describe one positive and one negative impact of this type of plant on the environment.

[Analysing]

Answer:

a) *Turbine is made up of wheel and axle which rotates due to kinetic energy of water and the generator produces electrical energy from the rotation of turbine.*

b) One of the positive impacts to the environment is that there is no air pollution. One of the negative impacts is that it disturbs the aquatic ecosystems.

Question 8. **[Remembering]**

Find the following terms related to force, motion and machines in the crossword puzzle.
[simple machine, axle, lever, speed, distance, motion, velocity, force, position, wedge, friction, pulley, wheel, gravity, screw, wheel, inclined, plane, work.]

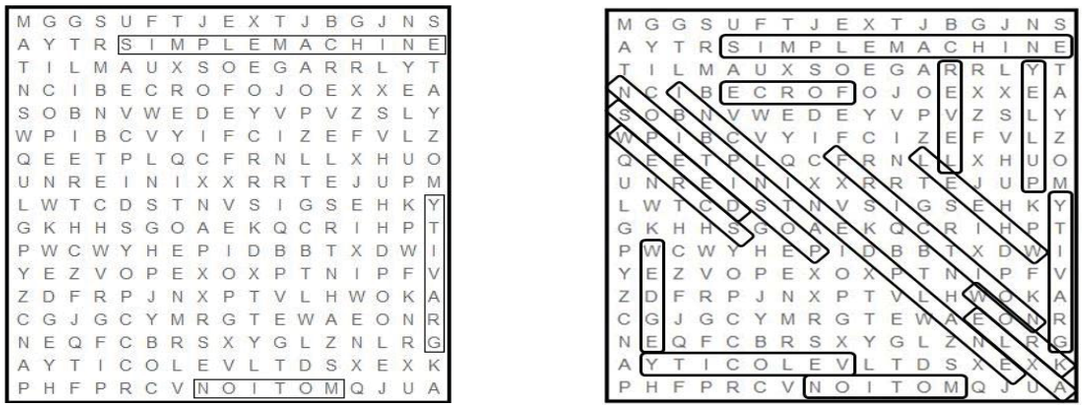


Figure 10.8

Question 9. **[Applying]**

Figure 10.9 below show four different ways of cutting a wire using plier when the wire is placed at different points at the load arm.

Figure 10.9

Which diagram represents the minimum force required to cut a wire?

A I

B II

C III

D IV

Answer: *A I*

Question 10. **[Applying]**

Figure 10.10 below shows a plier which can be used to crack a walnut.
Which ONE of the following statement is correct?

A The load will be greater than effort.

B The efficiency will be greater than one.

C The velocity ratio will be greater than one.

D The mechanical advantage will be greater than one.

Answer: *B The efficiency will be greater than one.*

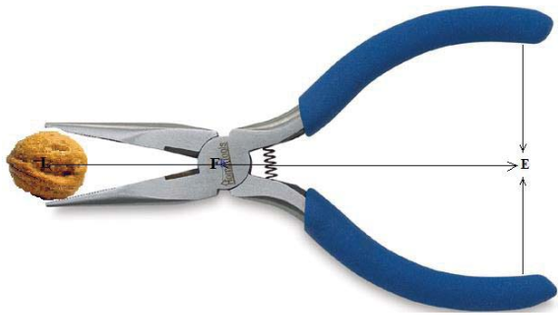


Figure 10.10

Question 11. **[Analysing]**

Fill in the table 10.1 with the simple machines provided in the box.

spindle, water tap, axe, bow, ladder, key, slide, scissors, swing, sharper

Lever	Pulley	Wheel and axle	Inclined plane	Wedge

Table 10.1

Answer:

Lever	Pulley	Wheel and axle	Inclined plane	Wedge
scissors	bow	water tap	ladder	sharper
swing	spindle	key	slide	axe

Question 12. **[Applying]**

How do simple machines make people's life easier? Explain at least THREE.

Answer:

1. *We can do difficult work like taking out water from a deep well using a single fixed pulley.*
2. *It is easier to lift heavy loads like rocks, boxes, logs, etc. by using crowbars.*
3. *We can do many work in less time. Cutting vegetables using knife speeds up the work and saves time.*
4. *We can move faster from one place to another.*

Question 13.

Pair of scissors and a plier are both first class lever that are used for cutting objects. Why is the blade of the plier shorter than that of scissors?

Answer: *The plier is used to cut wires which require greater force. The handles of the plier is longer (longer effort arm) so that effort is multiplied. As a result, less effort is need to cut the wire.*

Question 14. **[Analyzing]**

If the mechanical advantage of a simple machine is 4, then the

A efficiency is 40%.
B output force is 4 times the effort.
C effort is 4 times the output force.
D work output is 4 times the input.

Answer: *B output force is 4 times the effort*

Question 15.

Figure 10.11 shows the combination of different simple machine to lift heavy loads with minimum effort.

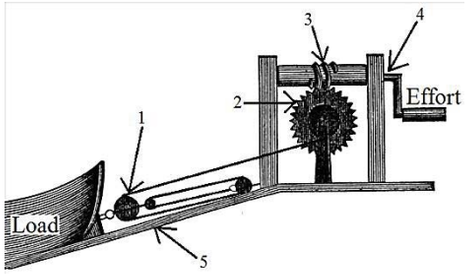


Figure 10.11

a. Name the parts of the machines that are numbered. **[Remembering]**

b. State **TWO** ways of increasing efficiency of simple machines. [**Understanding**]

c. Calculate the mechanical advantage, velocity ratio and efficiency of the pulley system given in the figure assuming the machine is frictionless. **[Applying]**

d. Is it possible to run a vehicle without a gear system? Explain in your own words. [**Analyzing**]

Answer:

a. 1 – pulley, 2 – gear, 3 – screw, 4 – wheel and axle, 5 – inclined plane

b. We can increase the efficiency of simple machines by applying grease or oil between the parts of the machine and by increasing the ratio of load over effort.

c.

$$Mechanical\ advantage = \frac{Load}{Effort} = \frac{3T}{T} = 3$$

$$Velocity\ ratio = \frac{distance\ moved\ by\ effort}{distance\ moved\ by\ load} = \frac{3}{1} = 3$$

$$efficiency = \frac{MA}{VR} \times 100\% = \frac{3}{3} \times 100\% = 100\%$$

d. Most *vehicles use gear system in order to change the speed. It is impossible to find a vehicle that runs without the gear system.*

OR Yes. A vehicle which operates on a constant speed may not have gears.

Question 16. **[Understanding]**

Explain with examples how some of the simple machines used in kitchen ease our work.

Answer:

i) *Milk churner – using wheel and axle is to multiply rotational force to churn the milk faster and easier.*

ii) Use of knife, ladle, grinder, etc.

iii) We use can opener to make our work easy.

Question 17.

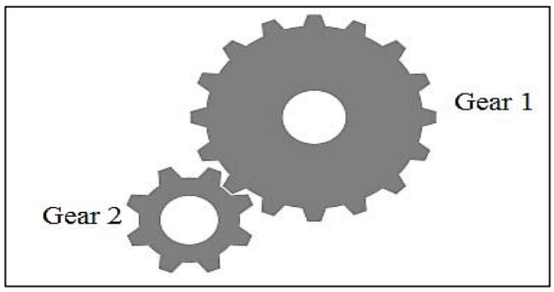


Figure 10.12

Figure 10.12 shows two gears having different number of teeth. Look at the figure carefully and answer the questions that follow.

a. Calculate the gear ratio if the smaller gear is set as driver gear. **[Applying]**

b. Which gear should be used as the driver gear to gain speed? Why? [**Analyzing**]

c. When do we use small gear as a driving gear? **[Understanding]**

Answer:

a.

$$Gear\ ratio = \frac{number\ of\ teeth\ in\ driven\ gear}{number\ of\ teeth\ in\ driver\ gear} = \frac{16}{8} = \mathbf{2}$$

b. To gain speed the larger gear should be used as the driver gear because when Gear 1 makes a complete rotation, Gear 2 will rotate twice.

c. Small gear is used as driver gear when we need to move heavy objects. If the driver gear is smaller than the driven gear, the force applied is multiplied.

Question 18. **[Creating]**

Design and sketch a model of a compound machine which is made by combining different simple machines. Your machines should be able to multiply force, gain speed and as well change the direction of force.

Answer: *Open ended.*

Question 19. **[Analysing]**

Which ONE of the following gear system indicates the correct motion?

A Gear system A

B Gear system B

C Gear system C

D Gear system D

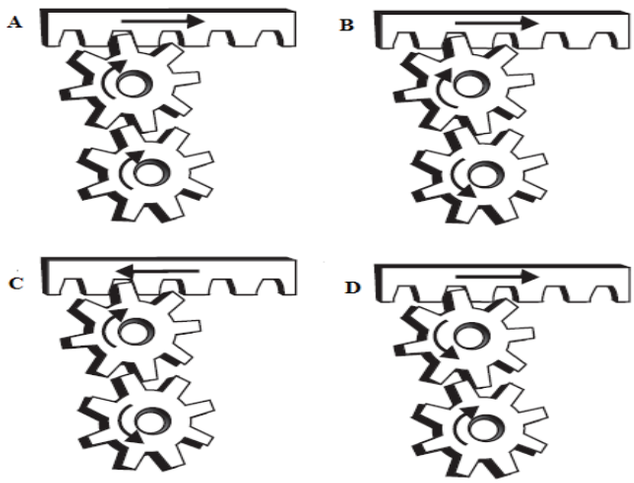


Figure 10.13

Answer: *B Gear system B*

Question 20.

Figure 10.14 shows a student using spring scale to pull a wooden block up a ramp that is resting on a stack of books.

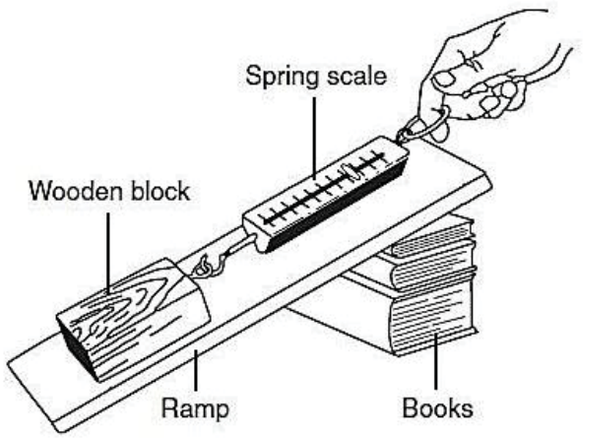


Figure 10.14

(a) What would you change to decrease the effort applied **[Analyzing]**

(b) What precaution would you suggest to obtain the correct amount of force required to pull the wooden block?

Answer:

(a) Lower the angle of the ramp, or make the surfaces smooth to reduce friction.

(b) *Do not touch the base of spring balance on the ramp while pulling the wooden block.*

Figure 10.15 shows two different sized claw hammers used by Raju and Jigme to remove a nail from a piece of wood. Use the diagram to answer questions 21 and 22 that follow.

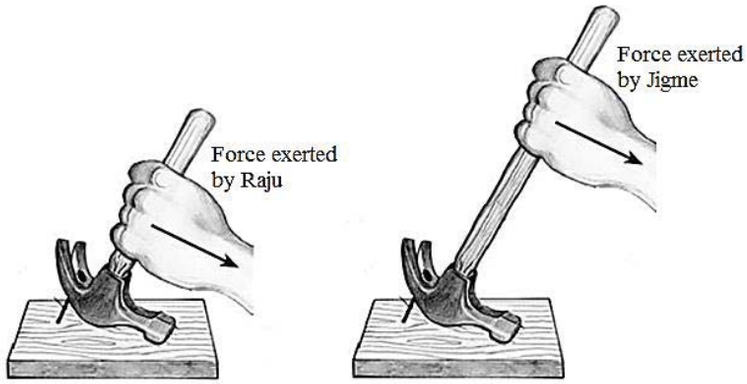


Figure 10.15

Question 21.

(a)Name the type of machine represented by a hammer? **[Understanding]**

A inclined plane
B third class lever
C first class lever
D second class lever

Answer: *C first class lever*

Question 22. **[Analyzing]**

Which ONE of the following inferences is correct about the diagram?

A Both exerted same forces.
B Jigme exerted more force than Raju.
C Raju exerted more force than Jigme.
D For Raju, it was more convenient to use the hammer.

Answer: *C Raju exerted more force than Jigme.*

Question 23.

A single fixed pulley is neither a force multiplier nor a distance multiplier, yet it is still used. Based on the above statement which ONE of the following best describes purpose of single fixed pulley?

A It can be used to pull a load quickly.
B It can be used in all types of machines.
C It can be used to pull a load without touching the load.
D It can be used to change the direction of applied force.

Answer: *D It can be used to change the direction of applied force.*

Question 24. **[Understanding]**

Simple machines are very important in our lives because

A all works need machines.
B simple machines are automatic.
C simple machines makes our work easier.
D works can be done in a complex manner.

Answer: C simple machines makes our work easier

4. DENSITY

Learning Outcomes

At the end of the lesson, a student should be able to:

10.4.1 Define density and relative density and
10.4.2 Solve simple numerical problems to find out density and relative density.

Assessment Items

Question 1. **[Analyzing]**

The two boxes given below are of the same volume but each has a different number of balls of equal mass. Which box of balls will have more density? Explain in your own words.

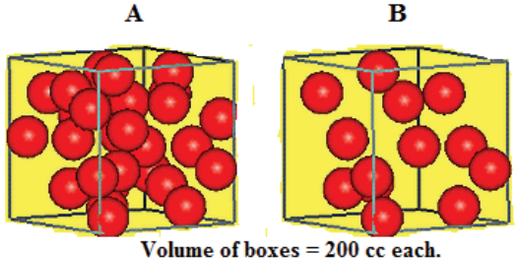


Figure 10.16

Answer: *Since density=* $\frac{Mass}{Volume}$*, the density is directly proportional to mass of the substance. Since, box A has more marbles, it has more mass. Hence the density of box A is greater than box B.*

Question 2.

The Table below shows metals having the same volume of 2 cm^3 .

Sl. No.	Substance	Mass (g)	Density (g/cm^3)
1.	Gold	38.6	……
2.	Brass	……	8.4
3.	Silver	21	……
4.	Copper	……	8.9
5.	Aluminium	5.4	……

Table 10.2

a. Calculate the missing values in the above table. **[Applying]**

b. Plot the line graph for Mass versus Density against Substances using MS Excel in IT lab. **[Applying]**

c. What kind of relationship can you conclude from the graph about mass and density?

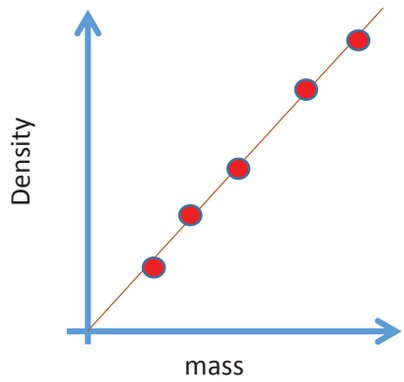
[**Analyzing**]

Answer:

a.

Sl. No.	***Substance***	***Mass (g)***	***Density (g/cm^3)***
1.	*Gold*	*38.6*	***19.3***
2.	*Brass*	***16.8***	*8.4*
3.	*Silver*	*21*	***10.5***
4.	*Copper*	***17.8***	*8.9*
5.	*Aluminium*	*5.4*	***2.7***

b.



d. Mass of a substance is directly proportional to the density.

Question 3. **[Analyzing]**

An object has a density of 1.2 gm/cm^3 is immersed in a liquid of density 1.5gm/cm^3.

(a) Will the object float on the liquid? Why?

(b) Will the water float on the liquid? Why?

(c) Will the object float in water? Why?

Answer:

(a) The object will float on the liquid as density of object is less than the density of the liquid.

(b) The density of water is 1 gm/cm^3 which is less than the density of the liquid. Therefore, the water will float on the liquid.

(c) The object will sink in water as density of object is more than the density of the water.

Question 4. **[Analyzing]**

Three different types of insoluble liquids were poured into a beaker which formed individual layers. Which ONE of the following conclusions best describes the illustration?

A The density of all liquids are equal.

B The density of liquid 2 is less than liquid 1.

C The density of liquid 3 is greater than that of Liquid 2.

D The density of liquid 1 is greater than that of Liquid 2.

Answer: *The density of Liquid 3 is greater than that of Liquid 2.*

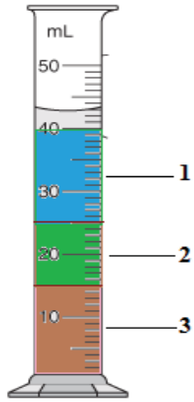


Figure 10.17

Question 5. **[Understanding]**

(a) Explain specific gravity of the substance.

Answer: *Relative density is termed as specific gravity if water is used as the reference materials to compare the density of any substance*.

(b) Relative density of silver is 10.50. Explain the statement.

Answer: *It means that the ratio of the density of silver to the density of water is 10.50. In other words, silver of same volume is 10.50 times heavier than equal volume of water.*

Question 6. **[Creating]**

Design an electric puzzle board on density, mass and volume of various substances and objects you used in our daily life.

Answer: *open ended*

CHAPTER 11
ELECTRICITY AND MAGNETISM

1. CIRCUITS

Learning Outcomes
At the end of the lesson, a student should be able to:

11.1.1 Design and draw an electric circuit using symbols,
11.1.2 Measure current and voltage by using ammeter and voltmeter,
11.1.3 Explain resistance in relation to current and voltage in circuits,
11.1.4 State energy transformation in some electrical appliances and
11.1.6 Mention the safety measures while using electricity.

Assessment Items

Question 1. **[Applying]**
The diagram below shows an electric circuit made by Namgay.

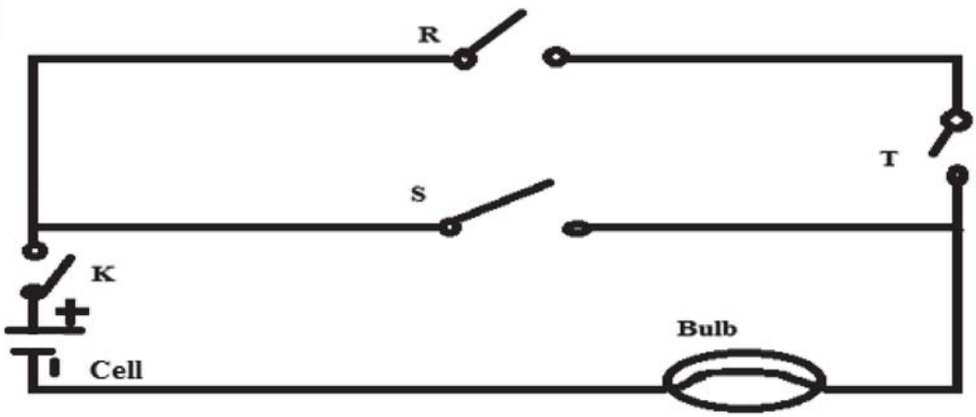


Figure 11.1

Which switch, if when opened, will cause the light bulb to stop glowing?

A Switch K

B Switch R

C Switch S

D Switch T

Answer: *A* *Switch K*

Question 2. **[Analyzing]**

Which **ONE** of the following circuits will continue to operate if the fifth light bulb fails?

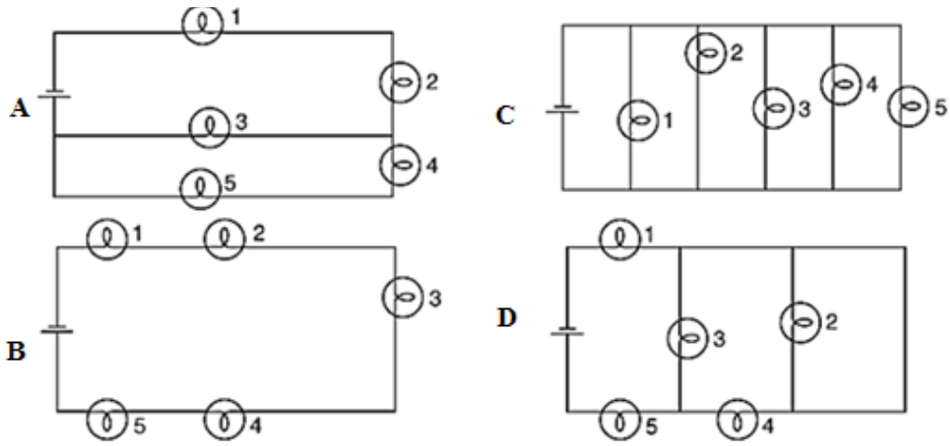


Figure 11. 1

Answer: C

Question 3. **[Understanding]**

Figure 11.3 shows the setup of a simple electrical circuit.

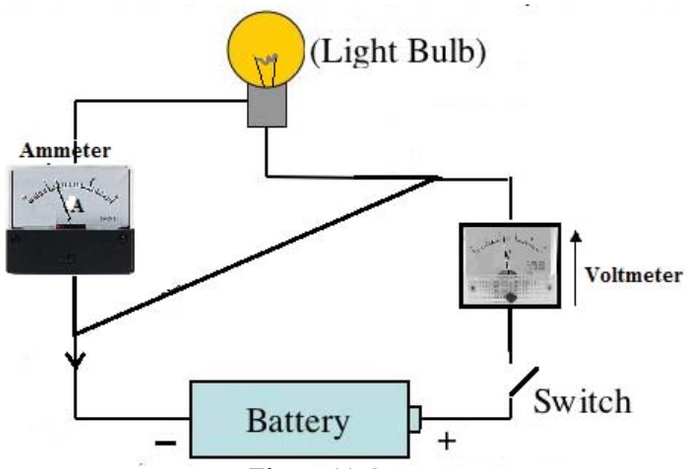


Figure 11. 2

Which device is considered as a load in the electrical circuit?

A cell

B bulb

C ammeter

D Voltmeter

Answer: *B* *bulb*

Figure 11.4 shows three identical bulbs connected to a cell. Use this Figure to answer Question 4 and Question 5.

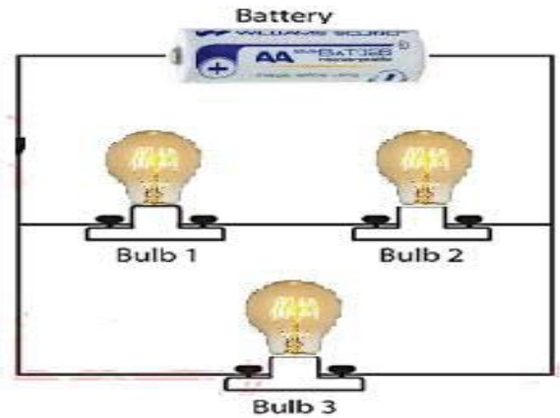


Figure 11.4

Question 4. **[Understanding]**

Which **ONE** of the following statements is true?

A The current in bulb 1 is greater than the current in bulb 2.
B The current in bulb 1 is greater than the current in bulb 3.
C The current in bulb 2 is the same as the current in bulb 3.
D The current in bulb 2 is the same as the current in bulb 1.

Answer: *D The current in bulb 2 is the same as the current in bulb 1.*

Question 5. **[Analyzing]**

All the following statements are correct **EXCEPT**

A The bulb 1 glows brighter than bulb 2.
B The bulb 2 glows brighter than bulb 3.
C The bulb 2 glows dimmer than bulb 3.
D The bulb 2 glows dimmer than bulb 1.

Answer: *B The bulb 2 glows brighter than bulb 3.*

Use figure 11.5 given below to answer Question 6 and Question 7.

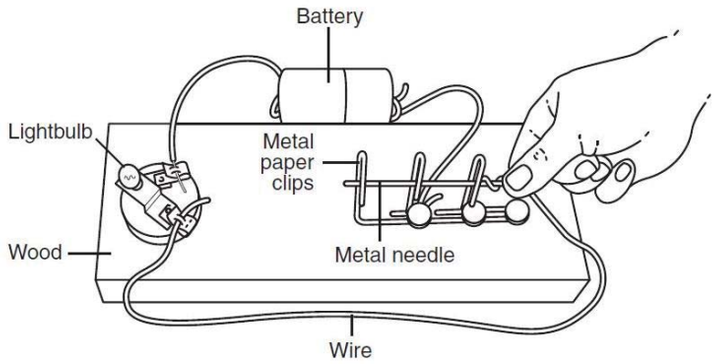


Figure 11.5

Question 6. [**Analyzing**]

The diagram give above shows a game where players need to move a metal needle through three metal paper clips without touching the clips to win. A bulb lights when the needle touches a paper clip.
Why does the bulb light when the needle touches a paper clip?

A A circuit is completed.
B The needle becomes an electro magnet.
C Convection current is produced by needle.
D The paper clip becomes an electro magnet.

Answer: *A A circuit is completed.*

Question 7. **[Creating]**

Design a game similar to Figure 11.5 using the electric circuits.
Answer: *open ended*

Question 8. **[Analyzing]**

In a science class, Yangchen designed a simple electrical circuit to perform an experiment. She found the following readings as shown in Figure 11.6. Use the figure to answer the question that follows.

Figure 11.6

What is the least count of voltmeter and the voltage in the electrical circuit?

A 1 V and 2.1 V
B 1 V and 2.2 V
C 0.5 V and 2.1 V
D 0.2 V and 2.2 V

Answer: *D 0.2 V and 2.2 V*

Question 9. **[Applying]**

Which ONE of the following energy conversions takes place in a speaker operated by a battery?

A mechanical - electrical – sound
B chemical – electrical – sound
C chemical – mechanical – sound
D electrical – mechanical – sound

Answer: *B chemical – electrical – sound*

Question 10. **[Applying]**

Figure 11.7 shows an example of conversions of energy.

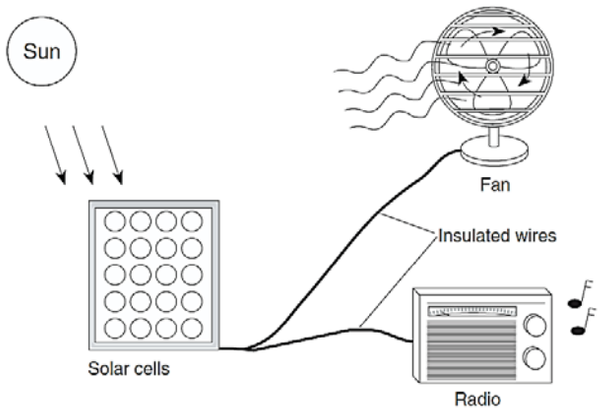


Figure 11.7

Track the conversion of energy in the above diagram.

A electrical → sound → light and mechanical
B mechanical → light → sound and electrical
C sound → mechanical → light and electrical
D solar → electrical → mechanical and sound

Answer: *D solar → electrical → mechanical and sound*

Question 11. **[Evaluating]**

Figure 11.6

Which cell would you prefer, Cell A or B? Justify your choice.

Answer:

Option 1: *I would prefer the rechargeable cell B as it can be reused and will help prevent pollution of environment. Cell A will have to be discarded once it gets exhausted.*

Option 2: *I would prefer to use cell A since it is cheaper than cell B. Cell B is not useful where there is no electricity supply.*

Question 12. **[Understanding]**

Which one of the following appliances uses the concept of resistance to the flow of current?

A bulb
B television
C electric fan
D electric heater

Answer: *D electric heater*

Question 13. **[Understanding]**

In an electrical circuit, the resistance offered to the flow of current

A increases with the increase in resistance of electrical appliances and wires.
B decreases with the decrease in current flow in the circuit.
C increases with the temperature of the circuit.
D decreases with the decrease in the circuit.

Answer: *A increases with the increase in resistance of electrical appliances and wires*

2 STATIC ELECTRICITY

Learning Outcomes

At the end of the lesson, a student should be able to:

11.2.1 Explain static electricity and give examples of its occurrences,
11.2.2 Explain activities which exhibit static electricity and
11.2.3 Describe safety measures to protect ourselves from phenomenon of static electricity in nature such as lightning

Assessment Items

Question 1. **[Analyzing]**

The dust usually stick on Television screen because dust

A falls on the TV screen.
B particles are metallic conductors.
C is attracted by magnets in the TV screen.
D is attracted by static charges on the TV screen.

Answer: *D is attracted by static charges on the TV screen*

Question 2. **[Understanding]**

Lightning with thunder does **NOT** involve the movement of

A protons from the clouds to the ground.
B electrons between clouds and the ground.
C charges within the cloud to separate them.
D electrons away from the cloud to the ground.

Answer: *A protons from the clouds to the ground*

Question 3. **[Analyzing]**

Why does lightning usually strike buildings and electric poles?

A Buildings and electric poles are good conductors.
B Lightning clouds tend to form over buildings and trees.
C Buildings and electric poles are always charged with electricity.
D Buildings and electric poles may be the closest point to charged clouds.

Answer: *D Buildings and electric poles may be the closest point to charged clouds.*

Question 4. **[Understanding]**

During lightning and thunder

I. Avoid touch metallic objects.
II. Use an umbrella as a shield
III. Stay away from tall trees.
IV. Lie flat on ground on the open field

Which of the following are the best ways to protect yourselves from lightning?

A I,II and III
B I,II and IV
C I,III and IV
D II,III and IV

Answer: C *I, III and IV*

Question 5. **[Analyzing]**

Dorji walks across a nylon carpet and then touches a metal door knob. He feels an electric shock. This is because

A Dorji's body gets charged while walking on nylon carpet.
B the door knob is connected to electric current.
C nylon carpet is close to the door.
D it is lighting outside.

Answer*:* *A Dorji's body gets charged while walking on nylon carpet.*

Question 6. **[Understanding]**

Explain how the force of attraction caused by static electricity is used in automobile painting.

Answer: *The body of the automobile is electrically charged. When the paint is sprayed, the molecules of the paint are attracted and there by attaches to the body.*

3. MAGNETISM

Learning Outcomes

At the end of the lesson, a student should be able to:

11.3.1 Explain magnetism based on molecular theory,
11.3.2 Explain magnetic induction and
11.3.3 Design an electromagnet

Assessment Items

Question 1. **[Remembering]**

When the north poles of two bar magnets are brought closer, they will

A attract each other.
B repel each other.
C niether attract , nor repel each other.
D one magnet will attract and the other magnet will repel.

Answer: B *repel each other*

Question 2. **[Understanding]**

Letters A, B, C, and D represent locations on a bar magnet.

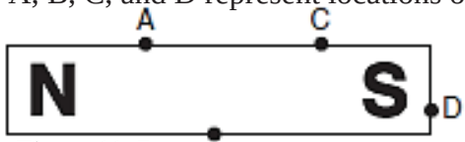


Figure 11. 7

Which part on the magnet provides the maximum magnetic force?

A Part D
B Part C
C Part B
D Part A

Answer: *A Part D*

Question 3. **[Applying]**

An iron nail can turn into a magnet, if it is placed in a strong magnetic field for some time. The magnetisation is due to

A conduction.
B induction.
C charging.
D friction.

Answer: *B induction*

Question 4. **[Applying]**

The diagram below shows three bar magnets. The south and north poles have been labeled S and N on magnet A. The lines between each magnet show how iron filings line up when sprinkled around the magnets.

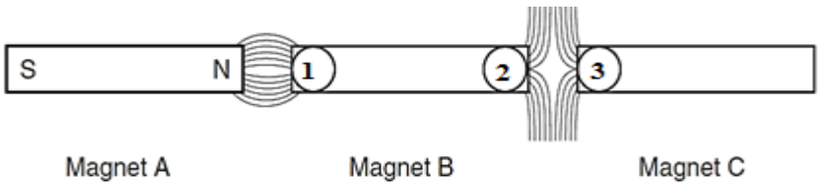


Figure 11.8

a. Identify the unmarked poles of Magnet B and Magnet C.

b. How did you determine the polarity of Magnet B and Magnet C?

Answer:

a. 1 – South, 2 – North, 3 – North.

b. Like poles repel and unlike poles attract each other. Pole 1 is South Pole of Magnet B as the magnetic lines depicts attraction between the poles. Consequently, pole 2 is North Pole as it is opposite corresponding pole of Magnet B. Pole 3 of Magnet C is a north pole as magnetic lines depicts repulsion between the poles.

Question 5. **[Creating]**

Draw a design of a toy car made up of duster and magnets that uses the principle of attraction and repulsion of magnetic poles of magnets.

Answer: *open ended*

Question 6. **[Applying]**

Karma has a bar magnet and an unknown metal bar.

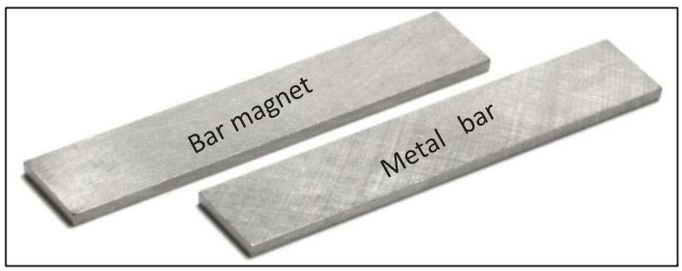


Figure 11.9

a. How can he use the magnet to find out whether the metal bar is a magnet?

b. How can he determine the pole of the metal bar if it is a magnet?

Answers:

a. Put one end of magnet to both ends of metal bar; if the magnet repels any one end of the metal bar, then the metal bar is a magnet.

b. *If North Pole of magnet attracts the end of the metal bar, then the end is the South Pole. If North Pole of the magnet repels then the end is the North pole of metal bar.*

Question 7. **[Applying]**

Lhamo sets up an investigation to test the strength of magnets. She has several magnets of different sizes, shapes and masses. She uses the magnets to lift metal paper clips.

She can find the strength of the magnets by the

A size of the magnet.

B mass of the magnet .

C number of metal paper clips attracted by the magnet.

D duration of the metal paper clips attached on the magnet.

Answer: *C number of metal paper clips attracted by the magnet*

Question 8. **[Understanding]**

Karma is building an electro magnet. The strength of the electromagnet can be increased by

A connecting a switch.

B increasing the size of the core.

C increasing the electric current.

D making the turns of the coil bigger.

Answer: *C increasing the electric current*

Question 9. **[Analyzing]**

Metal industries use magnets for lifting and transporting heavy load. Observe the figure 11.12 carefully and answer the following question.

Figure 11.10

What kind of magnet is being used to lift the load in the picture shown above? Why?

Answer: *The magnetic loader is a temporary electromagnet. When the power supply is switched off it gets demagnetised and drops the load to a desired location.*

Question 10. **[Evaluating]**

We use magnets for various purposes and it would be very difficult to develop machines without magnets. Do you agree or disagree the statement? Justify with at least THREE points.

Answer: *Open ended*

Question 11. **[Creating]**

Teachers very often have to use cello tapes to stick chart papers to display diagrams and flowcharts on the metallic chalkboard. Design a magnetic sticker to replace cello tapes. State the advantages of using the sticker.

Answer: *Open ended*

CHAPTER 12
LIGHT AND SOUND

1. PROPAGATION OF LIGHT

Learning Outcomes

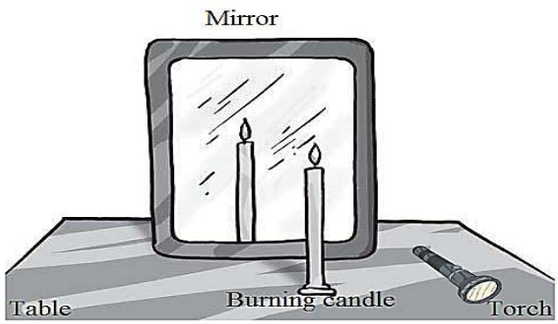
At the end of the lesson, a student should be able to:

12.1.1 Distinguish between luminous and non-luminous objects.

Assessment Items

Question 1. **[Understanding]**

Identify the luminous object in the figure give below:



A table
B torch
C mirror
D burning candle

Answer: *D burning candle*

Question 2. **[Applying]**

What are non-luminous objects which do not reflect any colour of light?

Answer:

i) *Any black object. Black objects absorb all the colours of light that fall on them and hence they cannot reflect any colour.*

ii) Transparent object like glass, water, etc. do not absorb any colours of light and hence they cannot reflect light.

2. REFLECTION OF LIGHT

Learning Outcomes

At the end of the lesson, a student should be able to:

12.2.1 State and explain the properties of light and
12.2.2 Explain reflection of light and its laws.

Assessment Items

Question 1. **[Applying]**

Figure 12.1 below shows an incident light ray striking an aluminium foil.

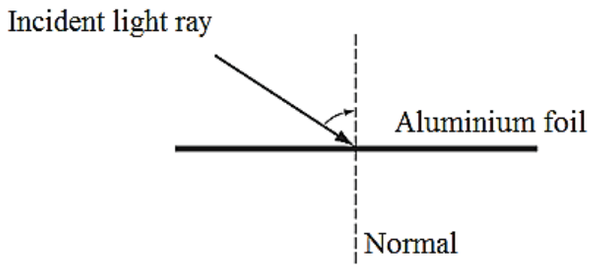


Figure 12.1

What will happen to the light ray after it strikes the aluminium foil?

A The light ray will be absorbed.
B The light ray will be refracted.
C The light ray will be reflected at the same angle as the incident light ray.
D The light ray will be reflected at a different angle to the normal than the incident light ray.

Answer: *C* *The light ray will be reflected at the same angle as the incident light ray.*

Question 2. **[Understanding]**

If the mirror is placed vertically to the left, what will be the image formed?

A
B
C
D

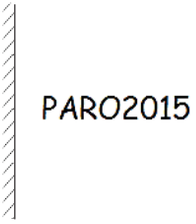
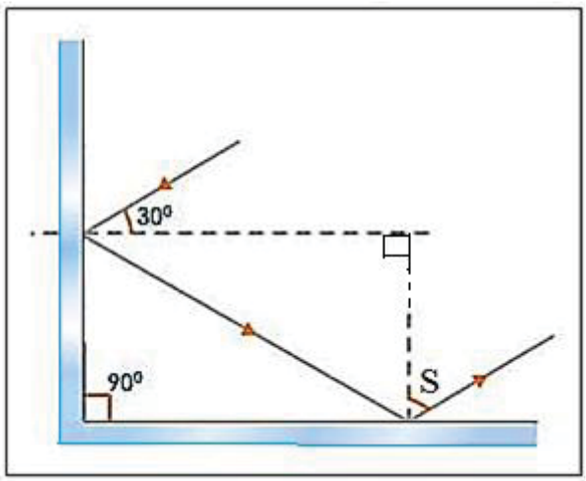


Figure 12.2

Answer: *B*

Question 3. **[Analyzing]**

The figure given below shows a ray of light reflected by plane mirrors. The angle S is 60^0 because



A angle of incidence is always equal to angle of reflection.

B the path of light can be changed.

C light is reflected by mirror.

D light travels in straight line.

Answer: *A angle of incidence is always equal to angle of reflection*

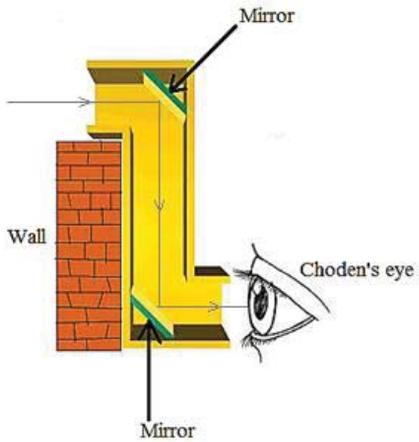
Question 4.

Choden wants to see what is happening on the other side of a wall. She designed a device consisting of mirror parallel to each other to look over the wall.

a. Name the device. (*periscope*) **[Remembering]**

b. Draw the ray diagram indicating the path travelled by the light rays. **[Applying]**

Answer:



3. SPHERICAL MIRRORS

Learning Outcomes

At the end of the lesson, a student should be able to:

12.3.1 Draw a ray diagram to show the image formed by a mirror and
12.3.2 Explain the application of mirrors in our daily lives.

Assessment Items

(The Figure 12.2 below is to be used for answering questions 1 and 2.)

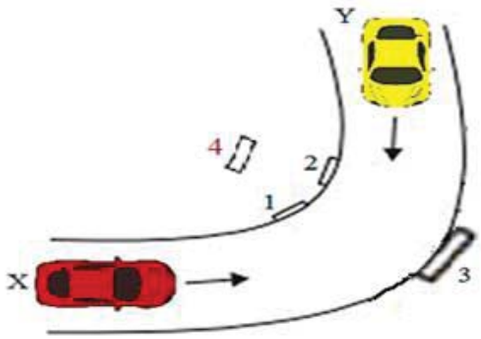


Figure 12.2

A mirror needs to be placed at the sharp and blind curve on the road as shown in Figure12.2. There are four possible locations identified and labelled as 1, 2, 3 and 4 such that drivers can avoid accidents.

Question 1. **[Applying]**

Which is the best location at which mirror could be fixed?

A 1

B 2

C 3

D 4

Answer: *C 3*

Question 2. **[Remembering]**

What type of mirror is used for the purpose?

A plane mirror

B convex mirror

C curved mirror

D concave mirror

Answer: *B convex mirror*

Question 3. **[Analyzing]**

Figure 12.3 shows two incident rays X and Y from a distant object forming the image of an object at I.

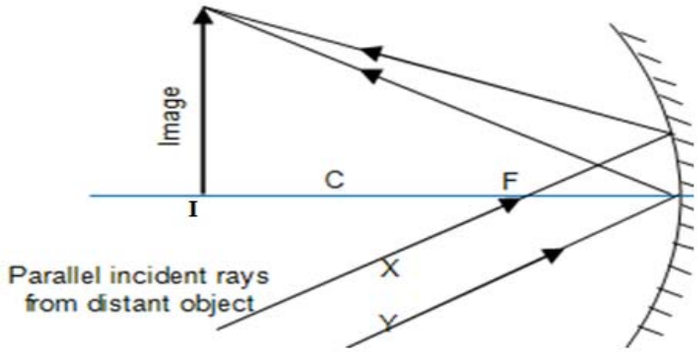


Figure 12.3

The above ray diagram is wrong because

A the image formed is upright.

B ray X is above ray Y after reflection.

C rays are not parallel after reflection.

D image formed is beyond the principle focus.

Answer: *D image formed is beyond the principle focus*

Question 4. **[Understanding]**

Figure 12.5 shows a bird landing on a bird feeder outside a window. The bird sees its own image on the window panes made of glass. This is the result of light being

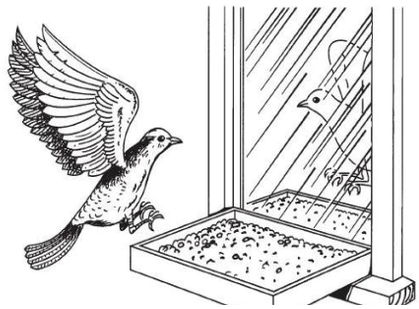


Figure 12.5

A absorbed.

B reflected.

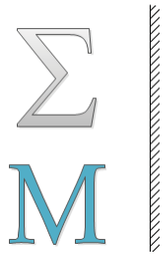
C refracted.

D transmitted.

Answer: *B reflected*

Question 5. **[Applying]**

Draw the image of the letters placed in front of a mirror.



Answer :

Question 6. **[Applying]**

The opposite walls of a barber shop are covered by plane mirrors, so that multiple images arise from multiple reflections, and you see many reflected images of yourself. Draw the arrangements of mirrors and ray diagrams to show how the mirrors can be used to see your back.

Figure 12.6

Answer: *The mirrors on the opposite walls of a barber's shop can be placed in such a way that they are inclined slightly towards each other so that the person having a hair cut can see the back of the head due to multiple reflections. Rays from the back of the head strikes the back wall mirror and get reflected horizontally which then get again reflected from the front wall mirror. Thus the final rays of the light will fall to the eyes thereby allowing the person to see his back. This phenomenon follows the laws of reflection.*

Question 7. **[Understanding]**

Two plane mirrors are kept vertically at 90^0 to each other.

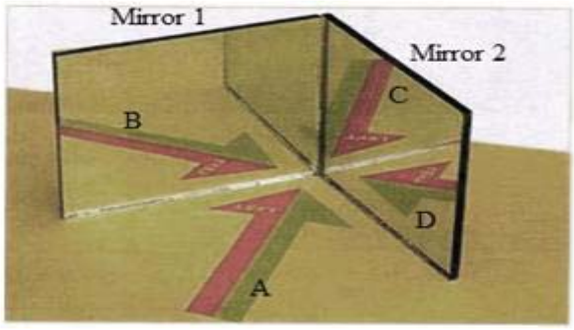


Figure 12.7

Which arrow is the object for image B in figure 12.7?

A Arrow A
B Arrow B
C Arrow C
D Arrow D

Answer: *A Arrow A*

Question 8. **[Applying]**

Irregular reflection is the phenomenon in which light rays are

A scattered in different directions after reflection.
B reflected by a smooth and plain surface.
C reflected along same direction.
D completely absorbed.

Answer: *A scattered in different directions after reflection*

4. PRODUCTION AND PROPAGATION OF SOUND

Learning Outcomes

At the end of the lesson, a student should be able to:

12.4.1 Describe how sound is produced,
12.4.2 Explain sound wave and wave pattern and
12.4.3 Define frequency and range of audibility.

Assessment Items

Question 1. **[Remembering]**

The range of audibility for human is 20 Hz to 20,000 Hz.
The above statement best describes that

A only the sound between 20 Hz to 20,000 Hz are produced in our surroundings.
B humans can hear only the sounds between *20 Hz to 20,000 Hz.*
C humans produce sound between *20 Hz to 20,000 Hz.*
D range of audibility for all animals are the same.

Answer: *B humans can hear only the sounds between 20 Hz to 20,000 Hz*

Question 2. **[Understanding]**

A common characteristic of all sound waves is that they

A are produced by vibrations.
B have definite direction.
C have same frequency.
D travel long distances.

Answer: *A are produced by vibrations*

(The figure 12.8 is to be used with the question 3.)

Kinley and Kumar are doing a science experiment as shown in Figure 12.8.

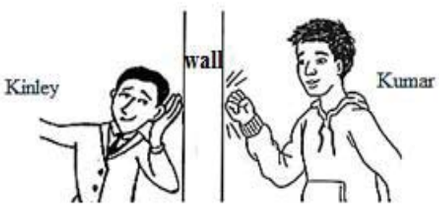


Figure 12.8

Question 3. **[Understanding]**

The experiment is to show that

A force is applied to produce a sound.

B sound travels through a medium.

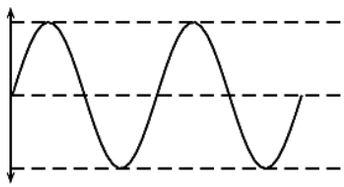
C sound is fainter behind the wall.

D sound and light are different.

Answer: *B sound travels through a medium*

Question 4. **[Understanding]**

Study the diagram below representing a musical note. Redraw the diagram for a note

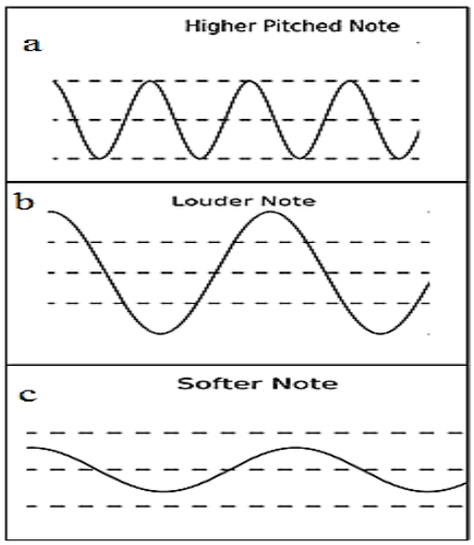


a. with a higher pitch

b. that is louder

c. that is softer

Answer:



Question 5. **[Applying]**

Figure 12.9 shows a musical sound wave.

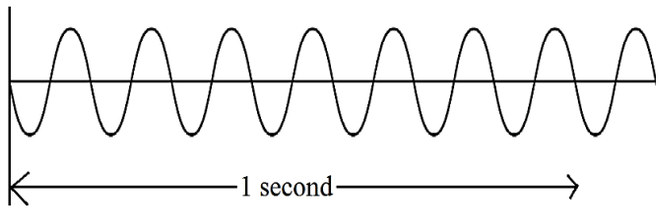


Figure 12.9

The frequency of the given sound is

A 7 Hz.
B 8 Hz.
C 14 Hz.
D 16 Hz.

Answer: *A 7 Hz*

5. SOUND AND ENVIRONMENT

Learning Outcomes

At the end of the lesson, a student should be able to:

12.5.1 Explain the affects of sound on humans and the environment.

Assessment Items

Question 1. **[Applying]**

If your range of audibility is between 20 Hz to 46,000 Hz, do you think life would be different? Explain.

Answer: *Yes, life will be different. I can hear what dogs can. I will be able to hear sounds of higher frequencies.*

Question 2. **[Applying]**

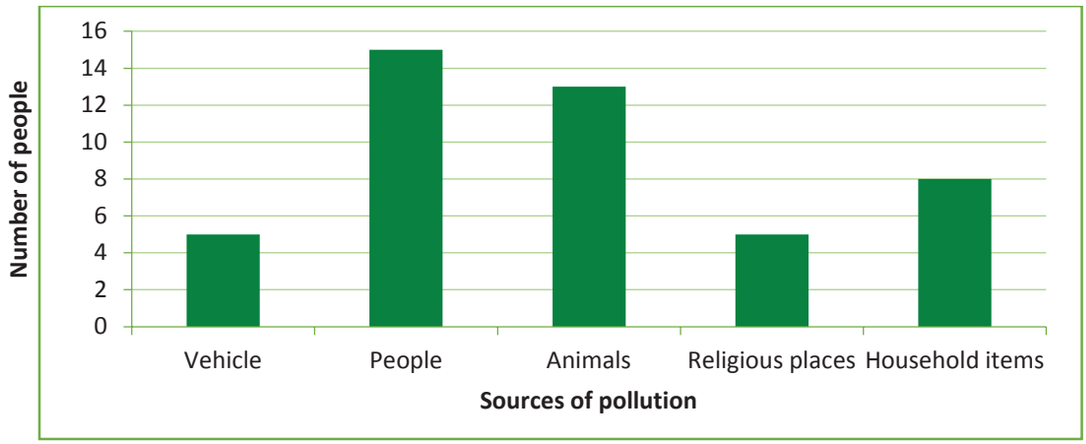
(a) Design a questionnaire to find out the major sources of noise pollution in your area.

Answer: *Sample Data Collection form: Major sources of noise pollution in your area.*

1. Vehicle		
a. Yes	b. No	c. Don't know
2. People		
a. Yes	b. No	c. Don't know
3. *Animal*		
a. Yes	b. No	c. Don't know
4. Religion		
a. Yes	b. No	c. Don't know
5. Household items such as washing machines, TV, music		
a. Yes	b. No	c. Don't know

(b) If the following table represents the sample data you have collected, draw a graph to represent the data.

Sources of noise pollution	**Number of people**
Vehicle	10
People	15
Animals	13
Religious places	5
Household items	8



Question 3.

Design a poster to create awareness to prevent noise pollution. **[Creating]**

Answer: *sample poster*

Question 4. **[Evaluating]**

The use of mobile earphones (headsets) has become very popular among the youth. Should they be further encouraged or discouraged to use the earphones? Justify.

Answer: *Yes, they should be encouraged to use them because it will help in reducing noise pollution since there will be very less noise.*

No, they should be discouraged to use them because it causes hearing problems or hearing loss due to loud sound.

Question 5. **[Creating]**

Design an experiment to create different pitched sounds

Answer: *Open ended*

CHAPTER 13
THE EARTH AND BEYOND

1. FORMATION OF SOLAR SYSTEM

Learning Outcomes

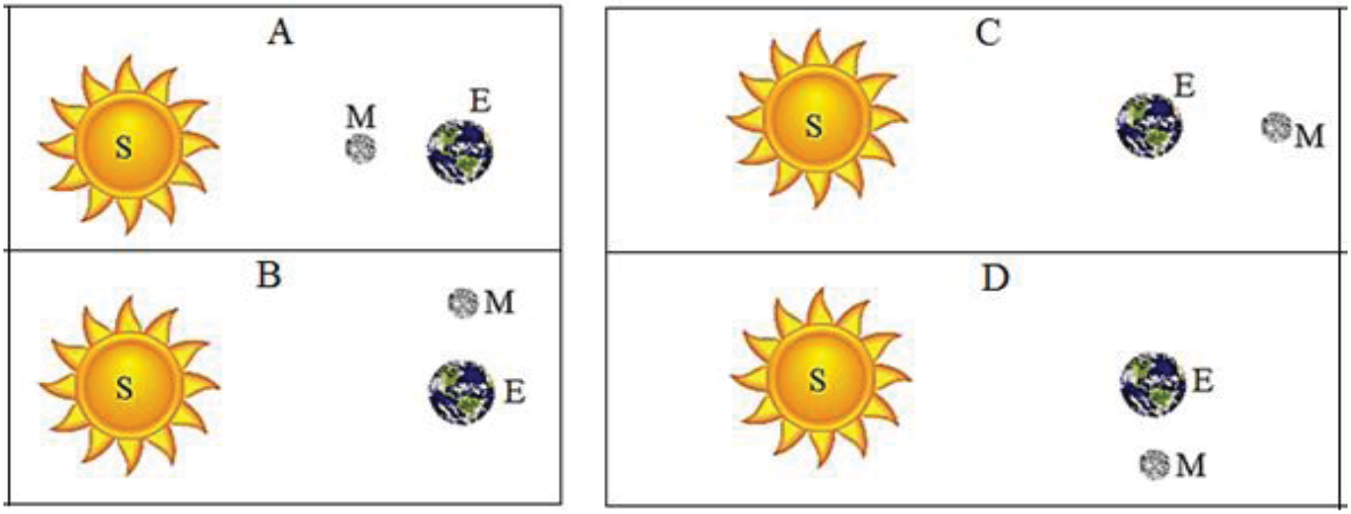
At the end of the lesson, a student should be able to:

13.1.1 Describe the formation of the solar system,
13.1.2 Describe the different heavenly bodies which make up the solar system and
13.1.3 Explain the occurrences of eclipse.

Assessment Items

Question 1. **[Understanding]**

Which diagram best shows the position of Sun (S), Moon (M), and Earth (E) during solar eclipse?



Answer: *A*

Question 2. **[Understanding]**

Which of the following is the principal cause of sea tides?

A Change in wind direction.
B Gravitational pull of the Moon.
C Earthquake on the ocean floor.
D Heating of the oceans by the Sun.

Answer: *B* *Gravitational pull of the Moon.*

Question 3. **[Understanding]**

Which one of these revolves around a planet?

A a star

B a moon

C a comet

D a meteoroid

Answer: *B a moon*

Question 4. **[Applying]**

Name the phenomenon shown in figure 13.1.

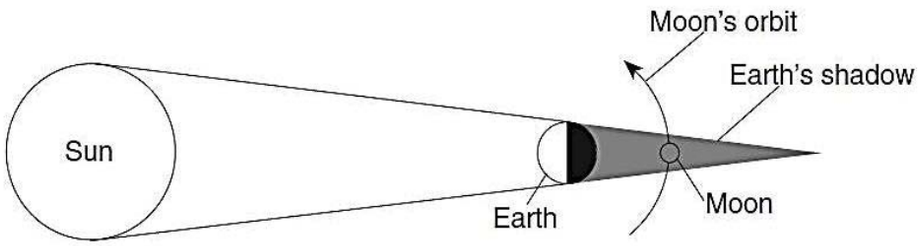


Figure 13.1

A solar eclipse

B lunar eclipse

C revolution of earth

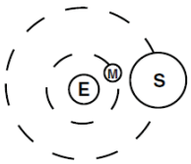
D revolution of moon

Answer: *B lunar eclipse*

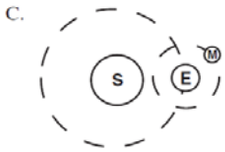
Question 5. **[Understanding]**

Which diagram shows the correct orbital relationship between Earth 'E', Moon 'M', and Sun 'S'?

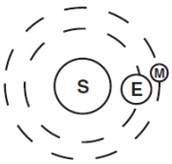
A.



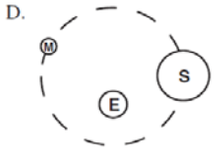
C.



B.



D.



Answer*:* *C*

Question 6. **[Understanding]**

Which of the following sets of heavenly bodies are seen as a result of reflected light?

A planets, stars and moons
B moons, comets and stars
C planets, stars and comets
D moons, planets and comets

Answer: *D moons, planets and comets*

Question 7. **[Analyzing]**

During solar eclipse, we should not look directly at the eclipse. Why?

Answer: *It is never safe to look at an eclipse without the proper equipment and techniques because our retina will be damaged due to high intensity of light.*

Question 8. **[Applying]**

a. List down **FOUR** things that should not be used to view a solar eclipse.
b. Suggest **THREE** ways to view a solar eclipse safely.

Answers:

a) *The following materials should never be used to view a solar eclipse:*

1. *Color film,*
2. *Medical X-ray film with images on them,*
3. *Smoked glass,*
4. *Any kind of sunglasses and*
5. *CDs or floppy disks.*

b) The following things can be used while viewing solar eclipse:

1. *Pinhole projector,*
2. *Eclipse glasses,*
3. *Welder's goggles and*
4. *Reflection of eclipse on water*

Question 9. **[Applying]**

From the crossword puzzle given below, identify the **FIVE** heavenly bodies of the solar system.

T	I	M	E	A	S	T	O	A	M	A	S	S
N	A	M	E	L	N	U	S	R	O	I	E	T
S	O	I	L	T	A	T	C	I	T	Y	T	A
E	Q	L	W	H	E	E	L	Z	E	C	I	R
T	V	D	O	R	Z	O	E	O	Y	N	L	T
R	A	T	O	F	F	E	R	N	A	I	L	E
O	D	I	D	E	O	R	O	O	M	N	E	N
H	D	D	E	N	I	P	L	A	I	E	T	G
S	T	E	N	A	L	P	U	C	L	D	A	A
S	E	P	A	L	I	M	E	N	I	U	S	M

Answer:

T	I	M	E	A	S	T	O	A	M	A	S	S
N	A	M	E	L	N	U	S	R	O	I	E	T
S	O	I	L	T	A	T	C	I	T	Y	T	A
E	Q	L	W	H	E	E	L	Z	E	C	I	R
T	V	D	O	R	Z	O	E	O	Y	N	L	T
R	A	T	O	F	F	E	R	N	A	I	L	E
O	D	I	D	E	O	R	O	O	M	N	E	N
H	D	D	E	N	I	P	L	A	I	E	T	G
S	T	E	N	A	L	P	U	C	L	D	A	A
S	E	P	A	L	I	M	E	N	I	U	S	M

Question 10. **[Analyzing]**

Earth is the only known planet that sustains life. Describe what would happen if the Earth's planetary position is changed with:

i) the first planet (near to Sun.)

ii) the last planet (far away from the Sun).

Answer:

i) *If the Earth takes the position of Mercury then the earth will become very hot and unbearable. No living organisms will survive. A lot of volcanoes, earthquakes, tsunamis, etc. may occur.*

ii) If the Earth replaces the position of Neptune, it will become so cold and the life may not be possible at all.

Question 11. **[Understanding]**

Describe the life on Earth if it has two moons.

Answer: *If our earth has two moons, we will most probably have two new moon nights and two full moon nights in a month with same brightness if the two moons appear alternately. But if the moons appear simultaneously then we will have the normal lunar cycle but with doubled brightness on full moon night.*

Question 12. **[Analyzing]**

Why is Pluto considered as a dwarf planet?

Answer: *Since the orbit of Pluto overlaps with that of Neptune, it is classified as a dwarf planet.*

Question 13. **[Evaluating]**

Some people still believe that eclipses an omen that changes luck. Do you believe in this superstition? Justify.

Answer: *Yes, I believe in this superstition because during eclipses, demons eat the Sun and the moon. We come together on such a day and bang pots and pans and make loud noises to scare away the demons. No, because now I understand the causes of solar and lunar eclipses. It is a natural phenomenon that takes place in the solar system.*

Question 14. **[Creating]**

Draw diagrams that explain that lunar eclipse occur only on full moon night, however not during every full moon nights.

Answer: *Open ended*