

# INCREASING ACCESS TO SECONDARY SCHOOL LEVEL EDUCATION THROUGH THE PRODUCTION OF QUALITY LEARNING MATERIALS

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## JUNIOR SECONDARY LEVEL TUTOR GUIDE

### BIOLOGY | CHEMISTRY | PHYSICS

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**Partners:**

Ministry of Education and Botswana College of Distance and Open Learning (BOCODOL), Botswana  
Ministry of Education, Science and Technology and the Malawi College of Distance Education (MCDE), Malawi  
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# TUTOR'S GUIDE

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# TUTOR'S GUIDE

## STRUCTURE

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Each of the 3 subjects are identical in structure – this will enable the learners to get used to the structure.

The **PHYSICS** materials comprises 5 modules:

- **Measurement**
- **Matter**
- **Energy**
- **Sound, Waves and Light**
- **Magnetism and Electricity**

The **CHEMISTRY** materials comprises 5 modules:

- **Introduction to Chemistry**
- **Matter and Change of State**
- **Heat, Energy, Air and Combustion**
- **Periodic Classification of the Elements**
- **Metals and Non-metals**

The **BIOLOGY** materials comprises 8 modules:

- **Introduction to Biology and the Classification of Living Things**
- **The Living Cell**
- **Energy and Life**
- **Nutrition and Digestion**
- **Transport**
- **Support, Movement and Control**

- **Continuity of Life**
- **Organisms and the Environment**

Each module is broken down into Units. The Units deal with specific topics. This should make learning easier.

Each Unit starts with an Introduction which gives an overview of the topic to be dealt with in general terms and the objectives for the Unit.

The content of the topic is then provided under headings and subheadings.

Each Unit ends with a summary which reviews the main points covered.

## ACTIVITIES

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We have included 3 types of activities:

- Self-Marked Activities
- Investigations
- End of Module Test



### **SELF-MARKED ACTIVITIES (SMA)**

These are given at intervals throughout each Unit to check that the learning has taken place. While most of the SMAs are doable and straightforward, some may be slightly difficult. This is done deliberately to get learners to think and solve problems. Using information available previously, they should be able to apply knowledge to arrive at the correct answers/solutions by working out the problem.

Tutors may wish to supplement the SMAs with slightly easier and/or more difficult ones where appropriate to further the knowledge of the learners. Answers are provided to all the activities at the end of the module. These may not be the only right answers, but can be considered sample answers.



## INVESTIGATIONS

Experimental investigations are also included to help learners develop the skills of accurate observing, recording and interpreting. The investigations also guide learners in the quest for knowledge. These are essential in Science.

These can be modified depending upon the environment in which the learners find themselves and for these, answers have not been provided. It is expected that tutors will act as facilitators for these investigations.



## END OF MODULE TESTS

Each module ends with a test. The test covers the entire content of the module and is intended to assess the level of attainment of the learner on that module. The tests, questions and suggested answers are given in this Guide, along with a suggested marking scheme.

## TARGET AUDIENCE

- Students/Learners not attending secondary schools
- Students/Learners who have completed primary schooling
- Adult learners that have not completed junior secondary school

## SUPPLIES/EQUIPMENT

Following is a list of the supplies and equipment needed for each investigation in the Modules/Units.

## PHYSICS

Insulated copper wires, dry cells, prisms, bar magnets, wooden meter rule, measuring tape, thermometer ( $-10^{\circ}\text{C} - 110^{\circ}\text{C}$ ) and stop clocks, burettes ( $50\text{ cm}^3$ ), water/oil/paraffin baths, switches, slinky, compass, naphthalene, single pan balance.

## CHEMISTRY

Meter rule, test tubes and racks, bunsen burner, blower, beakers, flasks, pipettes, burettes (different capacities), tripods, evaporating dish, chromatography column and paper, reagents, stands, wire gauze, measuring cylinders, glass rods, litmus paper, condenser, stop watch, bar magnet, watch glass.

## BIOLOGY

Hand lens, prepared slides, meter rule, light microscopes, slides, cover slips, droppers, scalpels, live specimens (as indicated) e.g. potted plants, reagents, forceps, chromatography paper, potometer, rubber and glass tubing.

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## REFERENCE BOOKS

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While every effort has been made to render the material self-explanatory we would recommend additional reference books. Any intermediate level books on integrated science available would be helpful. We would like to make the following suggestions:

Levesley, M. (1991) *Foundation Science Vol I & II for G.C.S.E* (14 – 16), Longman

G. Snape & D. Rowlands (1991), *Science at Work*



# PHYSICS



## END OF MODULE TEST

### MODULE 1

Maximum 50 Marks

		<b><u>Marks</u></b>
1	(a) Explain the term 'volume'.	2
	<hr/> <hr/> <hr/>	
	Describe a simple experiment to determine the volume of a small stone	5
	<hr/> <hr/> <hr/>	
	(b) A cuboid is 30 cm long, 20 cm wide and 10 cm high. Calculate its volume	3
	<hr/> <hr/> <hr/>	

- 2 (a) Explain (i) mass (ii) weight. 5

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How are the two quantities related?

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- (b) A cube of cheese hanged from a spring balance registers a reading of 2.5N. What is the (i) weight (ii) mass of the cheese cube. 3  
Assume gravitational force on 1 Kg to be 10N.

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- 3 (a) Draw a labelled diagram of a clinical thermometer. 3

- (b) State three ways in which a clinical thermometer differs from an ordinary thermometer 3

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- (c) The temperature of a patient is  $37.8^{\circ}\text{C}$ . What is the temperature of the patient on the Kelvin scale? 2

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- 4 100 cm<sup>3</sup> of water is heated in a beaker. Its temperature is recorded at intervals of 1 minute as follows:

Time of heating (minutes)	0	1	2	3	4	5
Temperature in $^{\circ}\text{C}$	25	27	29	31	33	35

- (a) Plot a graph of temperature rise against time. 5

- (b) Use the graph to estimate the temperature rise after heating for 150 seconds. 2

- 5 (a) What is meant by a 'force'? 2

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- (b) Explain what you understand by 'force of friction'. 2

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- (c) State and explain 2 effects of a force. 2

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- (d) A force of 200N acts on a body of mass 40 Kg. Calculate the acceleration produced. 3

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- 6 (i) Explain the term 'pressure' 2

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- (ii) A person is of mass 60 Kg. The person is wearing a pair of shoes having soles of  $200 \text{ cm}^2$  each. Calculate the pressure exerted by the person when standing on the ground:

- (a) on both legs. 3

- (b) on one leg. 3

## ANSWERS – MODULE 1

- 1 (a) Volume of an object means the space it occupies.  
Volume is measured in  $\text{m}^3$  or  $\text{cm}^3$   
**For the experiment to determine volume, refer to investigation 4.**

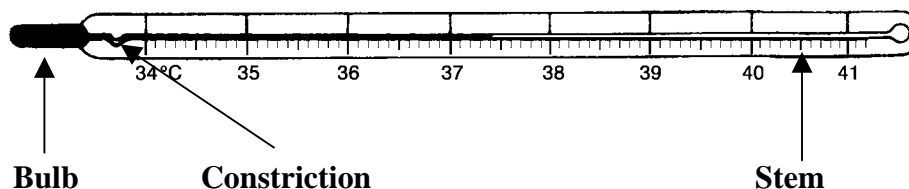
(b)  $\text{Volume} = \text{Length} \times \text{width} \times \text{height}$   
 $= 0.3 \times 0.2 \times 0.1$   
 $= 0.006 \text{ m}^3$

2. (a) (i) Mass of a body means the quantity of matter present in it.  
Mass is a constant quantity measured in g or Kg.
- (ii) Weight of a body means the force it exerts on its supports.  
Weight is measured in N.

$$\text{Weight} = \text{Mass} \times \text{Gravitational force per Kg.}$$

(b)  $\text{Weight of cheese} = 2.5 \text{ N}$   
 $\text{Mass of cheese} = \frac{2.5}{10} = 0.25 \text{ Kg}$

3. (a)



- (b) (i) The scale reading is only from  $34^{\circ}\text{C}$  to  $41^{\circ}\text{C}$ .  
(ii) There is a constriction near the bulb.  
(iii) The stem is oval in shape

(c)  $37.8^{\circ}\text{C} + 273 = 310.8\text{K}$

4. (a)

Time (minutes)	0	1	2	3	4	5
Temperature rise $^{\circ}\text{C}$	0	2	4	6	8	10

Graph is a straight line passing through the origin.

- (b) After 150 seconds ( $=2.5$  minutes), temperature rise  $= 5^{\circ}\text{C}$ .

5. (a) A force is a push or a pull. It is measured in Newtons. Force of gravity and force of friction are examples of forces.
- (b) Force of friction means a force that opposes motion. It is often referred to as a 'contact' force between two surfaces. Normally force of friction is

less when surfaces are smooth but bigger when surfaces are rough.

- (c)
- A force can produce a change in shape of an object. For example when a force is applied to a spring, the spring becomes longer.
  - A force can produce acceleration, that is, an increase in velocity of an object.

(d)    Force =        200N  
       Mass =        40Kg

Acceleration =        ?

Force =        Mass x acceleration

$$\therefore \text{Acceleration} = \frac{200}{40} = 5 \text{ m/s}^2$$

- 6    (i)    Pressure means the force acting perpendicularly on one square metre of surface.

$$\text{Pressure} = \frac{\text{Force}}{\text{Area}}$$

(ii)    Force = weight  
          = 500 N

(a)    on both legs,  
       Area of soles of shoes = 400 cm<sup>2</sup>  
   = 0.04 m<sup>2</sup>

$$\begin{aligned} \text{Pressure} &= \frac{500 \text{ Pa}}{0.04} \\ &= \frac{50000 \text{ Pa}}{4} \\ &= 12500 \text{ Pa} \\ &\text{or } 12.5 \text{ KPa} \end{aligned}$$

(b)    On one leg,

Area = 0.02 m<sup>2</sup>

$$\begin{aligned} \text{Pressure} &= \frac{500 \text{ Pa}}{0.02} \\ &= \frac{50000 \text{ Pa}}{2} \\ &= 25000 \text{ Pa} \\ &\underline{\text{or}} \quad 25 \text{ KPa} \end{aligned}$$

# PHYSICS

## MODULE 2

Maximum 50 Marks

		<u>Marks</u>
1	(a) Name the three states of matter.	2
	<hr/> <hr/> <hr/>	
	(b) Distinguish between the three states of matter in terms of	6
	(i) spacing of particles.	
	(ii) force of attraction between particles.	
	(iii) energy of particles.	
2	(a) What are the main features of the Kinetic theory of gases?	4
	<hr/> <hr/> <hr/>	
	(b) Give evidences in support of the above theory.	4
	<hr/> <hr/> <hr/>	

- 3 (a) A little water falls on a vinyl floor. After some time, the water 'vanishes'. Explain how this occurs. 4
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- (b) Explain the formation of ice by the freezing of water. [Refer to what happens to the molecules of water - in terms of spacing and forces of attraction. 4
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- 4 (a) Name the three fundamental particles that are present in atoms. 1
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- (b) Explain "atomic number". 2
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- (c) Sodium has atomic number 11 and mass number 23. Draw a diagram to illustrate the nuclear model of an atom of sodium. 5



- 5 (a) A gas jar provided with a lid contains a red vapour. Another gas jar is available. How could you use the 2 gas jars to demonstrate diffusion? 4

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- (b) How does diffusion in liquids differ from that in gases? 3

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- (c) Explain why diffusion is normally not observed in solids? 2

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- 6 The periodic table is a classification of elements where elements are classified into 'groups'. Elements that are in the same group are similar.

- (a) What is the basis for this classification? 2

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- (b) State one property common to elements 4
- (i) sodium and potassium.

(ii) neon and argon.

- (c) Explain why elements that are in the same group have similar properties. 3

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## ANSWERS – MODULE 2

1. (a) The three states of matter are

- solid
- liquid
- gas

- (b)

	<b>SOLID</b>	<b>LIQUID</b>	<b>GAS</b>
<b>SPACING</b>	Closely packed	Slightly spaced	More spaced
<b>FORCE</b>	Strong	Weak	Negligible
<b>ENERGY</b>	Vibrational	Kinetic	Kinetic

2. (a) Gases are made up of tiny particles. These are in disorderly motion. Owing to their motion, they have kinetic energy. This increases when the temperature of gases is increased.

- (b) When a bottle of perfume is opened in one corner of a room, the smell can be detected in another corner of the room. In fact the process of diffusion in gases provide evidence for the kinetic theory of gases

3. (a) In fact the water has evaporated away. Its tiny particles have escaped from the liquid state.

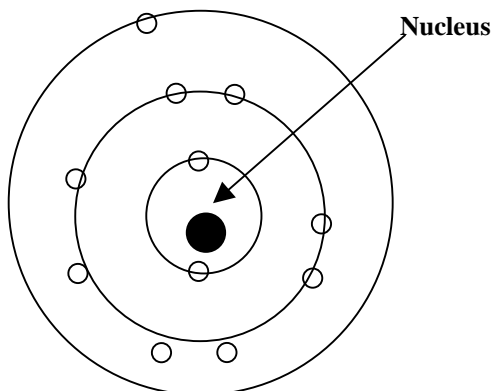
- (b) When water is cooled, its tiny particles become less energetic. They come closer, their disorderly motion decreases. At the freezing point, the strong forces of attraction hold the particles together. Ice is formed.

4. (a) The three fundamental particles that are present in atoms are the:

- Proton
- Neutron
- Electron

- (b) Atomic number of an element means the number of protons (or electrons) in one atom of the element.

(c)



It has a central nucleus (which contains 12 neutrons and 11 protons)

The atom has 3 shells with a total of 11 electrons. These occur as 2,8,1 in the shells.

5. (a) The second gas jar (of air) is inverted over the first. The lid is removed. The red vapour and air in the 2 gas jars get mixed and a uniformly pale red mixture is formed.
- (b) The process of diffusion is **slower** in liquids than in gases.
- This is because the particles in liquids are less energetic than those in gases.
- (c) Diffusion is normally not observed in solids because the particles are held together by strong forces and the particles cannot move from one place to another.
6. (a) The basis for the classification is the atomic number, number of protons, number of electrons or electronic structure.
- (b) (i) Sodium and potassium are highly reactive. When added to water. they react violently liberating hydrogen gas.  
(ii) Neon and Argon are unreactive.
- (c) Elements within the same group are similar because they have the same number of electrons in the outer shell.

# PHYSICS

## MODULE 3

Maximum 50 Marks

		<b><u>Marks</u></b>
1	(a) Distinguish between heat and temperature	3
	<hr/> <hr/> <hr/>	
	(b) Define:	6
	(i) Energy	
	(ii) Power	
	State the unit for each	
	<hr/> <hr/> <hr/>	
2	(a) Sketch a simple pendulum.	2

- (b) Indicate the energy conversions that occur while the pendulum is swinging 3

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- 3 (a) "The specific heat capacity of ice" is  $2100 \text{ J Kg K}^{-1}$ . Explain the statement. 4

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- (b) How much energy is needed to raise the temperature of a 4 Kg block of ice from  $-30^{\circ}\text{C}$  to  $-10^{\circ}\text{C}$ ? 4

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- 4 A vertical ladder has rungs 18 cm apart. An athlete of mass 60 Kg goes from ground level up 20 rungs in 12 seconds.
- (a) What is the weight of the athlete? 2
- (b) What is the height risen by the athlete? 2
- (c) How much energy transfer takes place? 4
- What is the average power developed by the athlete in this particular situation? 4
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- 5 (a) Explain the statement: "The specific latent heat of vaporisation of water is  $2300 \text{ KJ Kg}^{-1}$ ". 4
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- (b) How much energy does 100 grams of steam (at 373 K) release on condensing into water (at 373 K)? 4
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

6 (a) Define a 'machine' 2

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(b) Give 2 common examples of machines 2

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(c) Explain the working of one of them. 4

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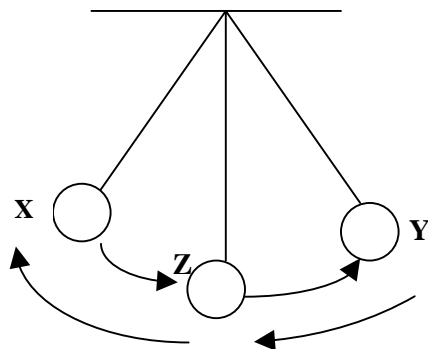
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## ANSWERS – MODULE 3

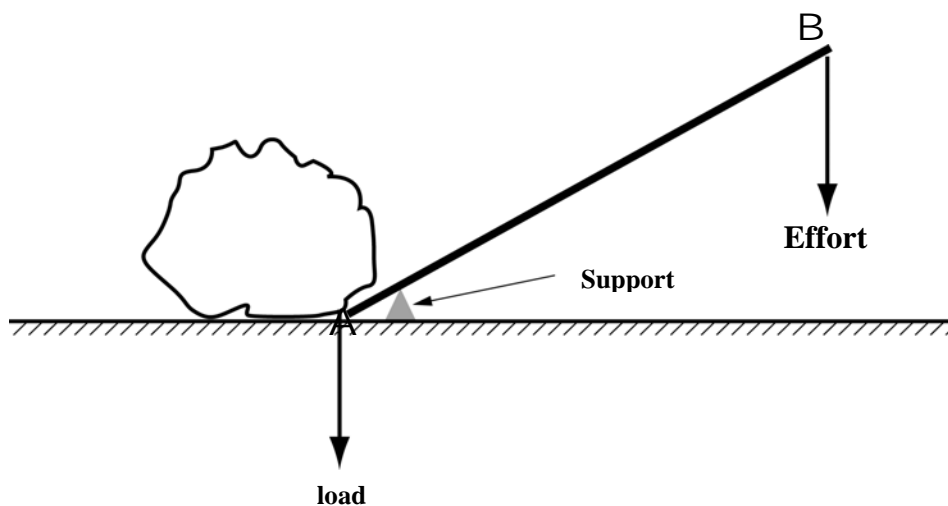
1. (a) **Heat** is a form of **energy**.  
**Temperature** is the degree of hotness of a substance.
- (b) i) Energy is the capacity for doing work.  
 ii) Power is the rate of doing work.  
 The Joule is unit of energy.  
 The Watt is unit of power.

2. (a)



- (b) From X to Z, Potential energy is being converted into Kinetic energy.  
 From Z to Y Kinetic energy is being converted into Potential.  
 From Y to Z, Potential energy  $\longrightarrow$  Kinetic energy  
 From Z to X, Kinetic energy  $\longrightarrow$  Potential energy
3. (a) To raise the temperature of 1 Kg of ice by 1K (without the ice melting) 2100 J of energy is needed  
 e.g. from 270 K to 271 K
- (b) Energy - mass x SHC x temp. rise  
 $= 0.4 \times 2100 \times 20$   
 $= 16800 \text{ J (or 16.8 KJ)}$
4. (a) 600 N
- (b)  $20 \times 18 = 360 \text{ cm (or 3.6m)}$
- (c) Weight x height =  $600 \times 3.6$   
 $= 2160 \text{ J}$
- (d) Power =  $\frac{2160}{12} = 180 \text{ watt}$

5. (a) To convert 1 Kg of water into steam (at 100°C) 2300 KJ of energy is required.
- (b)  $\text{Energy} = m l_v$   
 $= 0.1 \times 2300 \text{ KJ}$   
 $= 230 \text{ KJ}$   
Energy released = 230 KJ
6. (a) A machine is a device which helps us do work in a more convenient manner. It enables us overcome a load using a smaller effort.
- (b) Levers and pulleys are 2 examples of machines.
- (c) A crowbar is one example of a lever. A crowbar can be used to move/turn a heavy object. The load due to the weight of the object is overcome by applying an effort. The crowbar is placed as shown (with a fulcrum or support).



The distance between the support and the effort is bigger than the distance between the load and support. The effort required is much less and thus it is easier to move/turn the object.

# PHYSICS

## MODULE 4

Maximum 50 Marks

		<u>Marks</u>
1	(a) Distinguish between longitudinal and transverse waves. Give one example of each.	3
	<hr/> <hr/> <hr/>	
	(b) A violin string is set vibrating in air at 220 Hz. It emits sound waves.	2
	(i) Explain what is meant by '220 Hz'	3
	<hr/> <hr/>	
	(ii) What is the wave length of the sound emitted? (Assume that sound travels at $330 \text{ ms}^{-1}$ in air)	3
	<hr/> <hr/>	
2	An object in the form of the letter L is placed in front of a plane mirror.	
	(a) Sketch the image which is formed, showing clearly the positions of the object and the mirror.	3

- (b) What are the characteristics of the image formed? 3

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- 3 (a) Which of the following forms of energy can travel in a vacuum? 2  
Light, sound, heat.

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- (b) Explain the formation of an 'echo'. 3

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- (c) (i) In a thunder the flash is seen first and then the sound is heard. 5  
Explain.

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- (ii) During an eclipse of the sun, light and heat are cut off at the same time. Explain.

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- 4 (a) Give one instance of each of each of the following as it applies to 6  
light

- (i) Reflection

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(ii) Refraction

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(iii) Dispersion

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(b) Illustrate each of the above using a sketch. 6

5 (a) Distinguish between a real image and a virtual image. 5

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(b) Using a suitable transparent lens in each case give one instance of 6

(i) a real image.

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(ii) a virtual image.

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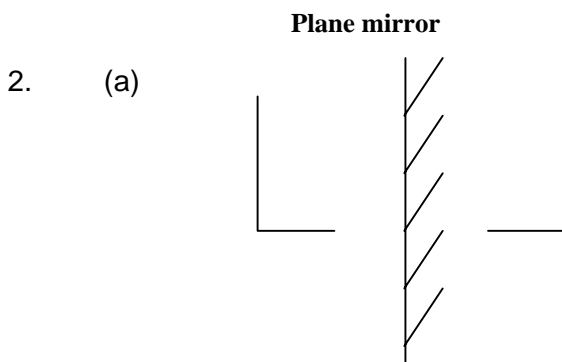
## ANSWERS – MODULE 4

1. (a) A longitudinal wave is one which moves in a direction parallel to the direction of vibration. One example is sound wave.

A transverse wave is one which moves in a direction perpendicular to the direction of vibration.

One example is water waves.

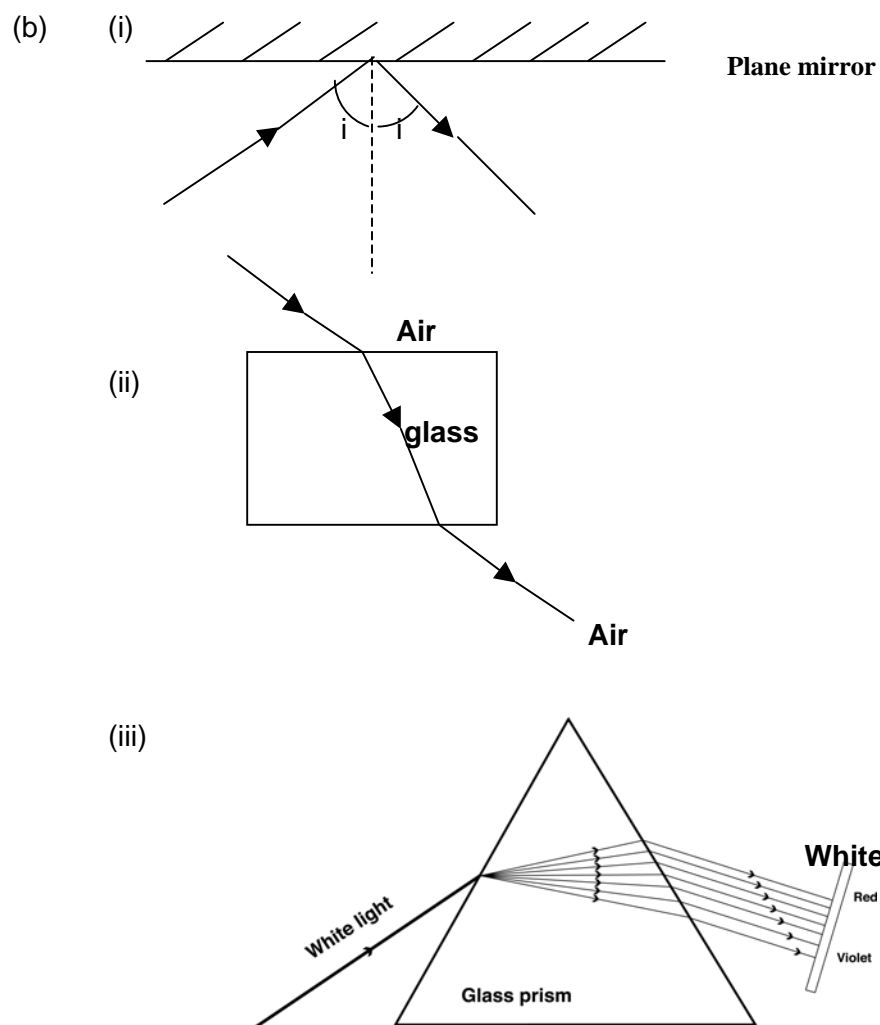
- (b) (i) The Hertz (abbreviated as Hz) is the unit of frequency. This itself represents the number of vibrations per sec.  
Thus, '220 Hz' means that the string is vibrating 220 times each sec.
- (ii) We use the relation  
speed = frequency  $\times$  wavelength  
By replacing, we have:  
 $330 = 200 \times \lambda$   
 $\lambda = \frac{330}{220}$   
 $= \frac{3}{2} = 1.5 \text{ metre}$



- (b) The image is:
- (i) virtual
  - (ii) of the same size as the object
  - (iii) behind the mirror
  - (iv) laterally inverted
  - (v) at the same distance (from the mirror) as the object (from the mirror)

3. (a) Light, heat  
 (b) An 'echo' is formed by the reflection of sound from a hard surface such as a wall or cliff  
 (c) (i) This is because light travels much faster (in air) than sound.  
 (ii) This is because both light and heat (from the sun) travel at the same speed.

4. (a) (i) In a plane mirror  
 (ii) In a block of glass  
 (iii) In a glass prism



5. (a) A real image is one which can be cast on a screen.  
 A virtual image is one which cannot be cast on a screen.
- (b) (i) When a converging lens is made to focus the sun's image on a screen behind the lens.
- (ii) When we are examining a biological specimen using a hand lens/magnifying glass.

# PHYSICS

## MODULE 5

(Maximum 50 marks)

		<u>Marks</u>
1	(a) Draw a bar magnet. Mark its poles.	3
	(b) Sketch the magnetic field of the horse-shoe magnet.	5
2	(a) Distinguish between <u>temporary</u> magnets and <u>permanent</u> ones.	5
	_____	
	_____	
	_____	
	(b) How are magnets kept so as to ensure that they retain their magnetism for long times.	3
	_____	
	_____	
	_____	



3 (a) Describe the working of an electromagnet 3

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(b) State five uses of electromagnets 2

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4 (a) State Ohm's law 2

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(b) A current of 1.5A passes through a resistance of 6 Ohms.  
Calculate the potential difference across the resistor 4

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5 (a) State three common safety devices used in domestic electricity. 3

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- (b) A fuse is marked '13A'. What deductions can you make for its suitability 3

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- 6 (a) An electric fan, when in use at 240 volts draws a current of 0.5 A. At what power is it operating? Calculate also its resistance. 6

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- (b) The fan was to be used as in (a) for 8 hours daily. If 1 KWh costs 50p, calculate the weekly cost of electrical energy for using the fan. 4

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- 7 (a) Describe the utilisation of electrical energy at home. 4

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- (b) What are the main dangers associated with domestic electricity? 3

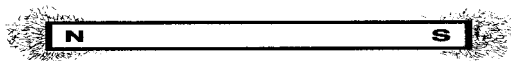
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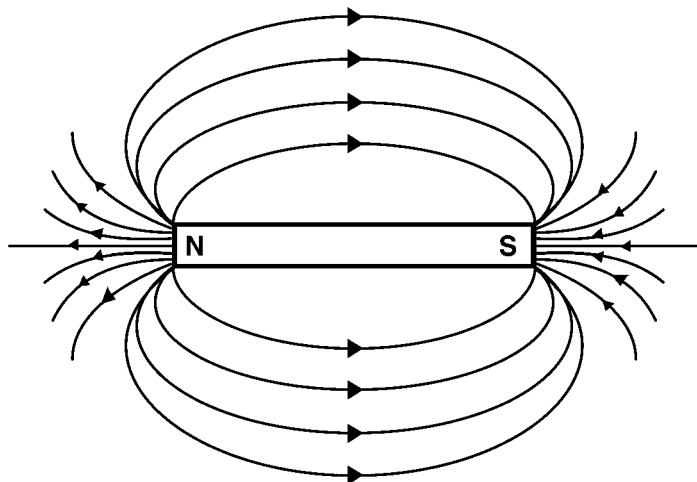
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## ANSWERS – MODULE 5

1.(a)



(b)

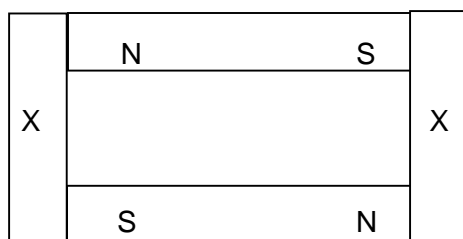


2. (a) Temporary magnets are made of iron. They do not retain magnetism.

Permanent magnets are made of steel. They retain their magnetism.

- (a) It is essential to use 'keepers' as shown.

(b)



X, X = 'Keepers' of iron

3. (a) An electromagnet consists of a coil of copper wire wound on an iron rod. The iron rod acts as a magnet only when a current flows. If the current is switched off, the iron is no longer a magnet.

- (b) Electromagnets are used for lifting large quantities of magnetic materials.

They are also used in electric bell and telephone earpiece.

4. (a) Ohm's law states that the potential difference (V) across a conductor is directly proportional to the current (I) flowing provided temperature is constant.
- OR
- $V = IR$
- (b) Potential difference =  $V = IR$   
 $= 1.5 \times 6$   
 $= 9.0 \text{ Volts}$
5. (a) Fuses  
Switches  
Insulation  
Earthing  
Circuit breakers
- (b) It is suitable for currents up to 13 Amperes. Larger currents would cause the fuse to 'blow up' or melt.
6. (a) Power = Volts x Amps  
 $= 240 \times 0.5$   
 $= 120W$
- (b) Power in KW = 0.12  
No. of KWh daily =  $0.12 \times 8$   
 $= 0.96$   
No. of KWh for 1 week =  $0.96 \times 7 = 6.72$   
1 KWh costs 50p  
6.72 KWh costs  $50 \times 6.72 = 336p$ .
7. (a) At home, electrical energy is used  
in: electric bulbs and tubes, electric iron, fan, heater, grill, oven,  
brush, vacuum cleaner, microwave, radio, TV, refrigerator, etc.
- (b) 1. damaged wires left bare (NOT insulated)  
2. overheating  
3. loose connections  
4. faulty connections e.g. fuse in the neutral wire (instead of live wire)

## CHEMISTRY

## MODULE 1



## END OF MODULE TEST

**Each question carries 10 marks**

1. Name 5 pieces of apparatus (used in the Chemistry laboratory) NOT made of glass.

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2. Match each item to be measured in column A with the method of measurement given in column B.

A	B
Volume of water	Metre value
Mass of salt	Thermometer
Temperature of tap water	Measuring cylinder
Length of magnesium ribbon	Balance

3. For each statement below, write *True* or *False*.

(a) Mercury does not conduct electricity because it is not a solid.

(b) Graphite is a non-metal and, as such, it fails to conduct an electric current.

(c) Chlorine is mixed with tap water in order to make it safe for drinking.

(d) Argon is present in air to the extent of about 0.9% by volume.

4. Complete the table below for the 5 elements indicated in the first column.

Element	Is it a metal or a non-metal?	Give one use
Silver		
Oxygen		
Hydrogen		
Copper		

5. Draw sketches for 4 pieces of apparatus made of glass, commonly found in the Chemistry laboratory.

## ANSWERS – MODULE 1

1.
  - (i) Tripod
  - (ii) Test tube holder
  - (iii) Rubber tubing
  - (iv) Bunsen burner
  - (v) Stand and Clamp
  
2.

Volume of water ..... Measuring cylinder

Mass of salt ..... Balance

Temperature of tap water ..... Thermometer

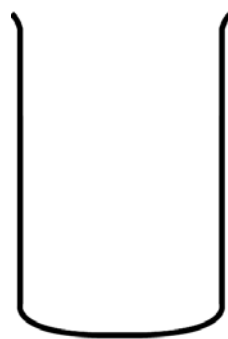
Length of magnesium ribbon..... Metre rule
  
3.
  - (a) False
  - (b) False
  - (c) True
  - (d) True

- 4.
- |          |           |                                |
|----------|-----------|--------------------------------|
| Silver   | Metal     | Silverware                     |
| Oxygen   | Non metal | Respiration                    |
| Hydrogen | Non metal | Making margarine               |
| Copper   | Metal     | Wire (as electrical conductor) |

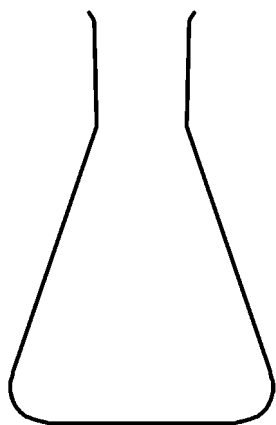
5.



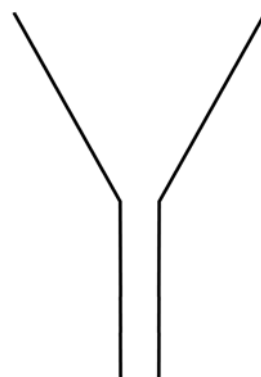
**(i) Test tube**



**(ii) Beaker**



**(iii) Conical Flask**



**(iv) Funnel**



# CHEMISTRY

## MODULE 2

**Each question carries 10 marks**

1. Match each mixture in column A with the method of separation given in column B.

A

Broad beans + green peas

Sugar solution + sand

Alcohol + water

Salt solution + water

B

Fractional Distillation

Hand picking

Distillation

Filtration

2. Fill in the blanks.

(a) Water can be frozen into \_\_\_\_\_. Water can also be boiled to form \_\_\_\_\_.

(b) Silver is a metal because \_\_\_\_\_

(c) Air is a mixture because \_\_\_\_\_

3. (a) Make a list of 5 substances which dissolve in water.

---

---

(b) Name 5 substances which do NOT dissolve in water.

---

---

4. A few tiny crystals of potassium permanganate are dropped in a glass of water. Observations are made on a daily basis for a fortnight. Describe the changes that would be seen. Account for them.

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5. (a) Make a list of the uses of water.

---

---

- (b) Give 3 ways in which the wastage of water can be avoided.

---

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## ANSWERS – MODULE 2

1. Broad beans + green peas ..... Hand picking  
Sugar solution + sand ..... Filtration  
Alcohol + water ..... Fractional distillation  
Salt solution + water ..... Distillation
  
2. (a) Water can be frozen into ice. Water can also be boiled to form steam (or water vapour).  
  
(b) Silver is a metal because it is a good conductor of heat and electricity (or it is malleable, ductile).  
  
(c) Air is a mixture because its composition is variable (or it has the properties of its constituents).
  
3. (a) table salt  
glucose  
alcohol  
cane sugar  
fructose  
  
(b) Rock  
Plastic  
Wood  
Sand  
Glass
  
4. At first an intense purple colour is noticed at the bottom. Slowly the colour spreads. Eventually the contents of the glass turn pale purple.

The tiny particles of potassium permanganate dissolve in the water around the crystals. The molecules diffuse (spread) thus causing the colour to spread. Owing to diffusion of tiny particles of water as well, the coloured substance and water eventually form a uniform pale purple mixture.

5. (a) At home: for cleaning, washing, cooking, preparing fruit juice, drinks such as milk, tea, coffee. We also drink water and use it for irrigating our gardens.

In industry: for cooling machines, in manufacturing acids such as sulphuric acid, nitric acid.

- (b) (i) By NOT opening the tap fully.  
(ii) By closing the tap when NOT being used.  
(iii) By having leakages in pipes, taps repaired without delay.

# CHEMISTRY

## MODULE 3

**Each question carries 10 marks**

1. (a) What do you know about air?

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- (b) Give the importance of air.

---

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2. (a) Make a list of the uses/applications of oxygen.

---

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- (b) Write about oxygen in relation to:

(i) rusting \_\_\_\_\_

(ii) burning \_\_\_\_\_

3. (a) Write down five forms of energy.

---

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- (b) Outline the utilisation of energy in the home.

---

---

4. (i) Indicate a few sources of energy. \_\_\_\_\_

- (ii) How are the sources of energy put to use? \_\_\_\_\_

---

5. (i) A candle is lighted. Describe what is seen.

---

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- (ii) After some time, a tall beaker is inverted over the lighted candle. Describe and explain what is seen.

---

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## ANSWERS – MODULE 3

1. (a) Air is a mixture of several gases. Pure air contains:
- |                            |             |                |            |
|----------------------------|-------------|----------------|------------|
| Nitrogen                   | (79 – 80 %) | Carbon dioxide | 0.035 %    |
| Oxygen                     | (19 – 20 %) | Water vapour   | (variable) |
| Noble gases (mainly argon) |             | 0.9 %          |            |
- (b) Air is essential to life. All living animals as well as plants need air. No living organism can survive in the absence of air. It is especially oxygen of the air which is of great importance in maintaining life.
2. (a) 1. For breathing/respiration by living organisms.  
2. It is used in cylinders by divers, mountaineers.  
3. Cylinders of oxygen are used in hospitals, clinics.  
4. In the oxy-acetylene blowpipe (during welding).  
5. For burning fuels.
- (b) (i) Rusting (of iron) takes place in the presence of water and oxygen (of the air). If iron were kept in an oxygen free environment (air) no rusting occurs.
- (c) Burning requires 3 items:  
substance (e.g. fuel)  
source of heat (e.g. burner)  
oxygen (e.g. from air)  
If any one of the above items is missing, burning does **NOT** take place.
3. (a) 1. Heat    2. Light    3. Sound    4. Chemical    5. Electrical
- (b) In the modern home, electrical energy is widely used. It is used in electrical devices such as: bulbs, tubes, electric irons, fans, cookers, boilers, grills, refrigerators.

In the kitchen, energy is used from coal, combustible gases, alcohol, kerosene.

4.
  - (i) coal, coke, alcohol, kerosene, biogas, dry wood, batteries.
  - (ii) Materials such as coal, coke etc. can be burnt. The heat energy which is given out is applied for cooking. Electrical energy is put to use through electrical devices.
  
5.
  - (a) The yellow flame causes the candle wax just below it to melt. The candle gradually (and very slowly) becomes smaller.
  - (b) Inside the beaker droplets of a liquid collect. The flame becomes smaller and smaller till the candle gets extinguished. The droplets are water droplets. The candle burns as long as there is oxygen in the air around it (inside the beaker). As the oxygen gets used up, the flame goes out.



# CHEMISTRY

## MODULE 4

**Each question carries 10 marks.**

1. (a) Tabulate the names and symbols of THREE noble gases.

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- (b) What are the main features of noble gases?

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2. (a) Give the arrangement of electrons in atoms of:

(i) Magnesium

(ii) oxygen

- (b) State the type of bond in magnesium oxide. How is it formed?

---

---

3. (a) What do you know about the atom of hydrogen?

---

---

- (b) Show the distribution of electrons in a unit of hydrogen peroxide ( $\text{H}_2\text{O}_2$ ).

4. (a) Magnesium is a metallic element. Which 3 features of metals does magnesium show? \_\_\_\_\_

- (b) Outline metallic bonding in magnesium. \_\_\_\_\_

---

5. (a) What is meant by the nuclear model of the atom?

---

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- (b) Write briefly about the nuclei of atoms.

---

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## ANSWERS – MODULE 4

1.

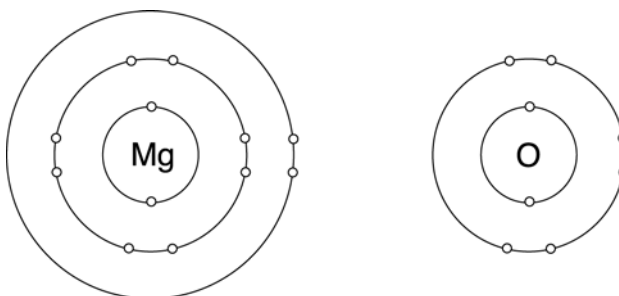
(a)

Name of noble gas	Symbol
Helium	He
Neon	Ne
Argon	Ar

(b) The noble gases

- are colourless, odourless and tasteless
- have atoms with stable electron arrangements
- do not tend to lose, gain or share electrons
- are chemically inert i.e. NOT reactive
- have molecules made up of one atom each

2. (a)



Mg : 2, 8, 2

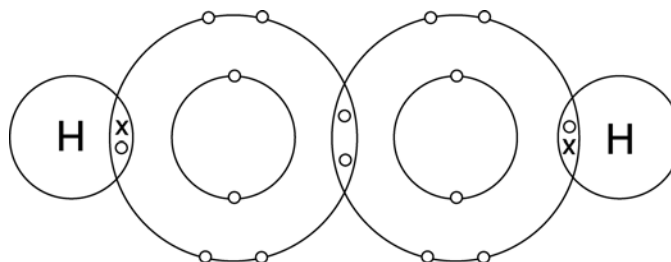
O : 2, 6

(b) **Ionic bond**

Each magnesium atom transfers two outermost electrons to an oxygen atom. Thus, a magnesium cation and an oxygen anion are formed. As they are oppositely charged, they attract mutually and form a bond.

3. (a) The atom of hydrogen is the simplest of all atoms. It has a nucleus with 1 proton. Outside the nucleus there is a single shell in which 1 electron occurs.

(b)



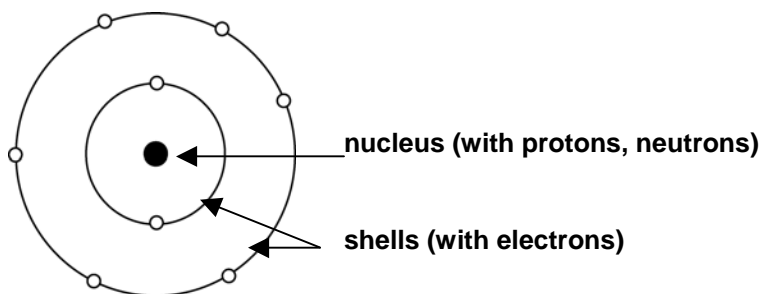
4. (a) 1. It has a shining surface.  
2. It conducts electrically.  
3. It is malleable (can form sheets).

(b) Each magnesium atom has 2 electrons in the last shell. The 2 electrons are so loosely 'held' in the atom that they move away leaving behind magnesium cation. In the metal there are many atoms, which, by electron loss form cations. The electrons form a 'sea' in which the positive ions are 'drowned'. This type of bond is typical of metals.

5. (a) The atom consists of a nucleus. This is surrounded by shells which contain electrons.

(b) The nuclei of atoms:

- are centrally located in the atoms
- are massive
- carry positive charge
- usually contain protons and neutrons
- contain as many protons as the number of electrons in the shells outside the nuclei.



# CHEMISTRY

## MODULE 5

**Each question carries 10 marks**

1. (a) How would you prepare a sample of hydrogen in the laboratory?

---

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- (b) Give 3 uses of hydrogen.

---

---

---

2. (a) How is oxygen prepared in the laboratory?

---

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- (b) Give 2 large scale applications of oxygen.

---

---

3. Describe **ONE** test for each of the following:

- (i) water vapour

---

(ii) hydrogen

---

(iii) carbon dioxide

---

(iv) oxygen

---

(v) ammonia

---

4. Give one major use for each of the following:

(i) sulphuric acid

---

(ii) slaked lime

---

(iii) zinc

---

(iv) chlorine

---

(v) diamond

---

(vi) carbon dioxide

---

(vii) aluminum

---

(viii) oxygen

---

(ix) hydrogen

---

(x) rock salt

---

5. (a) Give **2 disadvantages** of hard water.

---

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(b) Distinguish between temporary hardness and permanent hardness. State the cause of each in natural water.

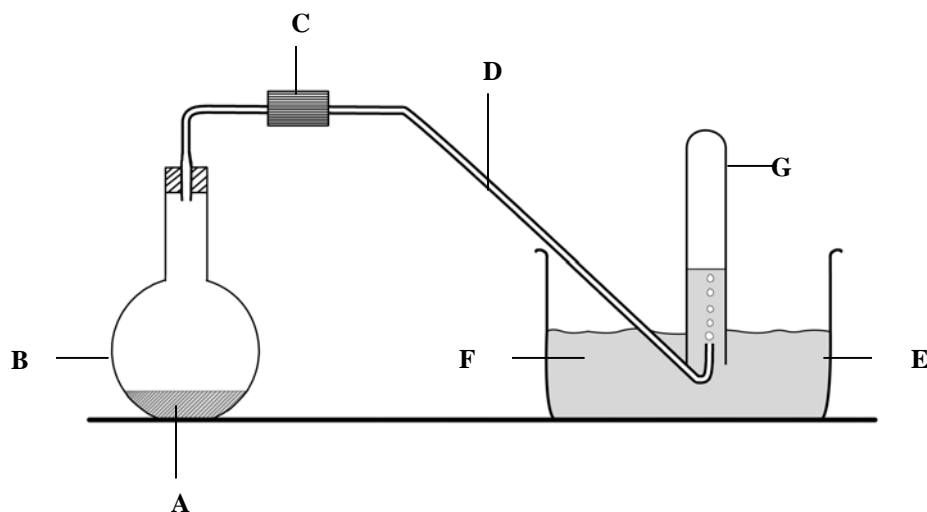
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## ANSWERS – MODULE 5

1. (a) A mixture of aluminium foil and sodium hydroxide solution can be used as a source of hydrogen in the laboratory.

The apparatus shown below can be used.

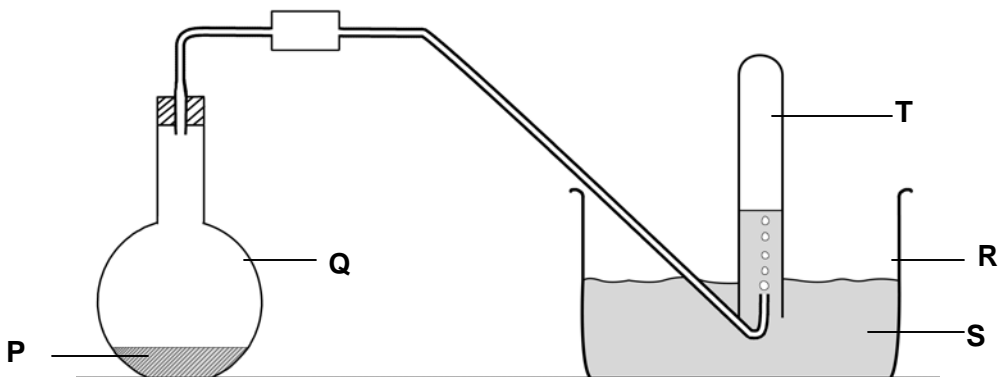


- A - mixture of aluminium and sodium hydroxide
- B - flat bottomed flask
- C - rubber tubing
- D - delivery tube
- E - trough
- F - cold water
- G - inverted boiling tube

- (b) (i) To manufacture ammonia.  
(ii) To convert edible oils into margarine  
(iii) As a fuel to release energy by combination with oxygen in space crafts.
2. (a) Oxygen is prepared on a small scale by mixing together hydrogen peroxide and manganese dioxide.



The apparatus used is shown in the figure below:



- |   |   |  |
|---|---|--|
| P | - | mixture of hydrogen peroxide and manganese dioxide |
| Q | - | flat bottomed flask                                |
| R | - | trough   |
| S | - | tap water  |
| T | - | inverted boiling tube                              |

- (b) (i) In the conversion of ammonia into nitric acid.  
(ii) In the manufacture of sulphuric acid.
3. (i) It turns cobalt chloride paper from blue to pink.  
(ii) When a lighted splinter is applied it burns with a 'pop' sound.  
(iii) When it is shaken with lime water, the latter turns milky.  
(iv) When a glowing splinter is applied to it, the splinter is relighted.  
(v) It changes moist red litmus paper to blue.
4. (i) In batteries of motor vehicles.  
(ii) To neutralise soil acidity.  
(iii) To galvanise iron.  
(iv) To kill germs in tap water.  
(v) As a jewel.  
(vi) To make soda water.  
(vii) To make frames for doors, windows.  
(viii) For breathing.

- (ix) In the manufacture of margarine.
  - (x) As table salt in the kitchen.
5. (a) (i) Wastage of soap  
(ii) slow deposition of a white layer in kettles.
- (b) **Temporary hardness** in water can be removed by boiling the water. It is caused by the presence, in water of calcium, hydrogen carbonate and magnesium hydrogen carbonate.
- Permanent hardness** in water cannot be removed by boiling the water. This type of hardness is caused by the presence, in water, of calcium sulphate and magnesium sulphate.

# BIOLOGY

## MODULE 1



### END OF MODULE TEST

**Marks**

1. Fill in the blanks. 8
- a) Plants manufacture their own food by the process of \_\_\_\_\_
  - b) The organ which removes urea from our body is the \_\_\_\_\_
  - c) During respiration, food is burnt to produce \_\_\_\_\_
  - d) The \_\_\_\_\_ excrete carbon dioxide.
  - e) A \_\_\_\_\_ is a factor which can change during an experiment.
  - f) A microscope is used to \_\_\_\_\_ an object.
  - g) An animal without backbone is an \_\_\_\_\_
  - h) Plants with leaves that have parallel veins belong to the group of \_\_\_\_\_

2. Give 2 reasons why animals carry out movements 4

---

---

3. Which of the following characteristics are common to both animals and plants? 3

Feeding  
Growth  
Movement  
Respiration

4. Name all your sense organs. \_\_\_\_\_ 5
5. How can you tell the difference between
- (a) An insect and an arachnid? 8
- \_\_\_\_\_
- \_\_\_\_\_
- (b) a flowering and a non-flowering plant?
- \_\_\_\_\_
- \_\_\_\_\_
- (c) an amphibian and a reptile
- \_\_\_\_\_
- \_\_\_\_\_
- (d) a fish and a reptile?
- \_\_\_\_\_
- \_\_\_\_\_
6. Give 2 ways in which a fish is adapted to swim. 2
- \_\_\_\_\_
- \_\_\_\_\_
7. (i) To which group of vertebrates does a cat belong? 3
- \_\_\_\_\_
- \_\_\_\_\_
- ii) Give 2 reasons for your answer. 2
- \_\_\_\_\_
- \_\_\_\_\_

8. What is a controlled experiment? 2

---

---

9. What is the advantage of showing a result in the form of a graph rather than a table? 3

---

---

10. What is the use of a dichotomous key? 2

---

---

## ANSWERS – MODULE 1

1.
  - a) Photosynthesis
  - b) Kidney
  - c) Energy
  - d) Lungs
  - e) Variable
  - f) Magnify
  - g) Monocotyledon
2. To search for food, a mate, shelter
3. Growth, movement and respiration.
4. Ears, eyes, tongue, nose and skin.
5.
  - a) An insect has 3 pairs of legs while an arachnid has eight pairs
  - b) A flowering plant produces flowers
  - c) An amphibian lives both in water and on land
  - d) A fish has scales and fins
6. It has an elongated body  
It has fins  
It has scales which offer less resistance to water.
7.
  - i) Mammals
  - ii) - gives birth to young ones  
- has hairs on its body  
- feeds its own milk to young ones.
8. An experiment where all the variables are kept constant.
9. The trend shown by the results can be easily seen.
10. It allows us to identify and name organisms.

# BIOLOGY

## MODULE 2

	<b>Marks</b>
1. (a) Define the term cell.	1
<hr/>	
2. (a) Make a labelled drawing of a named (i) plant cell	2
(ii) animal cell.	2
(b) State the differences between the two cells you have drawn in 2(a).	2
<hr/>	
<hr/>	

3. (a) What are specialized cells? 1

---

---

- (b) List three specialized cells in 1

(i) your body \_\_\_\_\_

(ii) a named plant \_\_\_\_\_

(c)

Make a labelled drawing of one specialized cell in

(i) your body

(ii) a balsam plant.



4. Define and give one example of
- |     |          |   |
|-----|----------|---|
| (a) | a tissue | 1 |
|     | _____    |   |
|     | _____    |   |
| (b) | an organ | 1 |
|     | _____    |   |
|     | _____    |   |
| (c) | a system | 1 |
|     | _____    |   |
|     | _____    |   |
| (d) | a herb   | 1 |
|     | _____    |   |
|     | _____    |   |
| (e) | a shrub  | 1 |
|     | _____    |   |
|     | _____    |   |
| (f) | a tree   | 1 |
|     | _____    |   |
|     | _____    |   |

5. (a) Make a labelled drawing of: 2
- (i) external structure of a leaf

- (ii) external structure of a flower. 2

6. (a) Name two plants with (i) fibrous root, (ii) tap root 2

---

---

- (b) What is the difference between a tap root and a fibrous root? 2

---

---

7. State two examples of (i) a tissue, (ii) an organ, (iii) a system, from (a) a plant, (b) an animal 6

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8. (a) Name three organic and two inorganic substances found in your body. 3

---

---

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---

- (b) State the importance of each substance you mention in 8 (a). 3

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9. (a) Explain what is meant by (i) diffusion, (ii) osmosis. 4
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- (b) State the importance of diffusion to living organisms. 3
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
10. (a) Describe an experiment to show osmosis using a visking tube. 5
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- (b) Explain why 2
- (i) human red blood cells burst when placed in distilled water?
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- (ii) plant cells do not burst when placed in distilled water? 2
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
11. Describe an experiment to investigate osmosis in a named living tissue. 4

## ANSWERS – MODULE 2

1. (a) A cell is the basic structural and functional unit of a living organism.
2. (a) (i) Refer to drawing of root hair cell in Fig. 9 – 1.5.1.  
(ii) Refer to drawing of red blood cell in Fig. 8 – 1.5.1.  
(b) 

<u>Root Hair Cell</u>	<u>Red Blood Cell</u>
cell wall present	cell wall absent
nucleus present	nucleus absent
central vacuole present	central vacuole absent
3. (a) It is a cell with a distinct shape. It carries out a specific function and special kinds of chemical changes occur in its cytoplasm.  
(b) (i) red blood cell; muscle cell; nerve cell.  
(ii) balsam plant – guard cell; root hair cell; xylem vessel.  
(c) (i) and (ii) refer to drawings of red blood cell and guard cell, figs 8 and 12 respectively – 1.5.1
4. (a) It is a group of cells having a similar structure and function to carry out a particular task. *e.g. muscle, blood, vascular tissue.*  
(b) It consists of different tissues which group together to work as a functional unit. *e.g. heart, lung, leaf.*  
(c) It consists of several organs which work together to carry out a particular set of functions. *e.g. digestive system, shoot system.*  
(d) A herb is a plant whose stem has little or no wood. *e.g. grass.*  
(e) A shrub is a plant whose stem has some wood. *e.g. hibiscus.*  
(f) A tree is much larger than a shrub and it has a woody main stem. *e.g. mango tree.*
5. (a) Refer to Fig. 21 – 2.1.2.  
(b) Refer to Fig. 22 – 2.1.3.
6. (a) (i) Maize plant, sugar cane plant.

- (ii) Balsam plant, bean plant.
- (b) A tap root has a main root with lateral roots whereas in a fibrous root system all the roots are of about the same size and length.
- 7.
  - (a)
    - (i) Vascular tissue      (ii) leaf      (iii) shoot system
  - (b)
    - (i) Muscle      (ii) heart      (iii) digestive system
- 8.
  - (a)
 

Organic substances	-	carbohydrates, fats, proteins
Inorganic substances	-	water, mineral salts
  - (b) Refer to sections 3.1 & 3.2
- 9.
  - (a)
    - (i) It is the movement of molecules from a region of their concentration to a region of their lower concentration.
    - (ii) It is the movement of water molecules from a region of high water potential to a region of lower water potential across a selectively permeable membrane.
  - (b) It allows easy exchange of materials and gases between cells and the surrounding.
- 10.
  - (a) Refer to Investigation 3 illustrated in Fig. 40 - 5.4.
  - (b)
    - (i) the human red blood cells burst because their membrane is thin, weak and it cannot resist the pressure of the swelling cell.
    - (ii) the plant cells do not burst because they have rigid cell walls which can resist the turgor pressure.
- 11. Refer to Investigation 4 - 5.5.

# BIOLOGY

## MODULE 3

	<b><u>Marks</u></b>
1. What do you understand by: Respiration	2
_____	
Breathing	2
_____	
Gaseous exchange	2
_____	
Photosynthesis	2
_____	
2. Where does respiration occur in the body?	2
_____	
3. Where does gaseous exchange occur?	2
_____	
4. Explain what happens to your intercostal and diaphragm muscles as you breathe in?	2
_____	
_____	
_____	
5. How does exhaled air differ from air around you?	3
_____	
_____	
6. Name the substance present in tobacco smoke which makes you become addicted to smoking.	2
_____	

7. Give two differences between aerobic respiration and anaerobic respiration 4
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
8. Which molecule stores energy temporarily in man? 1
- \_\_\_\_\_
9. Give 2 ways in which the internal features of a leaf adapt it to photosynthesis 6
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
10. Explain how you would optimize plant growth in a glasshouse. 10
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_



## ANSWERS - MODULE 3

1. Respiration is the oxidation of glucose to release energy.  
Breathing is the taking in and taking out of air in and out of the lungs.  
Gaseous exchange is the exchange of gases between the alveoli and surrounding blood vessels.  
Photosynthesis is the process during which green plants use carbon dioxide and water in the presence of sunlight and chlorophyll to produce sugars. Oxygen is produced as a by-product.
2. In the cells.
3. In the alveoli.
4. They contract. (support with diagram)
5. It contains more carbon dioxide and less oxygen than the surrounding. It is also saturated with water vapour.
6. Nicotine
7. 

<b>Aerobic respiration</b> <ul style="list-style-type: none"><li>• Occurs in presence of oxygen</li><li>• Carbon dioxide and water are produced</li></ul>	<b>Anaerobic respiration</b> <ul style="list-style-type: none"><li>• Occurs in absence of oxygen</li><li>• Lactic acid is produced in muscles</li><li>• Alcohol and carbon dioxide produced in yeast.</li></ul>
---	---
8. ATP
9. Mesophyll cells contain chloroplasts to trap light energy.  
Epidermal cells are transparent to allow passage of light.  
Stomata are present for gaseous exchange.
10. The following factors are to be considered:
  - Higher concentration of carbon dioxide
  - Optimum light provided artificially
  - Controlled optimum temperature
  - Constant supply of water

# BIOLOGY

## MODULE 4

	Marks
1. (a) Define Nutrition.	1
_____	
_____	
(b) State three different types of nutrition	1
_____	
_____	
_____	
2. Why do you take food?	1
_____	
_____	
3. Define a balanced diet?	1
_____	
_____	
4. Name the classes of food which make up a balanced diet?	1
_____	
_____	
5. Explain why you should consume a balanced diet?	1
_____	
_____	

6. Complete the following table.

Nutrients	Functions	Sources
Sources		
Proteins		
Vitamin C		
	forms haemoglobin in red blood cells	
Calcium		
	makes food bulky and prevent constipation	
		rice, potato, cassava
	acts as energy reserve in the body	

2

7. What is malnutrition?

1

---



---

8. Explain the following terms:

(a) Ingestion

1

---

(b) Digestion

1

---

(c) Absorption

1

---

(d) Assimilation

1

---

9. Name one enzyme which digests

(a) Starch

1

---

(b) Fats

1

---

(c) Proteins 1

---

10. Why do you need to digest your food? 1

---



---

11. (a) Where are villi found? 1

---

(b) What are they used for? 1

---

12. Complete the following table of the digestive system?

Organ	Name of digestive juice	Enzyme present	Food acted upon	Final product
Mouth				
Stomach				
Duodenum				
Ileum				

2

13. Name the organ of the digestive system which:

(a) serves as a temporary food store. 1

---

(b) produces a secretion that has no enzymes 1

---

(c) absorbs most of the digested food. 1

---

(d) absorbs water and salts. 1

---

14. (a) Explain how the tooth can decay. 2

---

---

---

- (b) State three measures you can take to prevent dental decay. 3

---

---

---

## ANSWERS - MODULE 4

1. (a) It is a characteristic feature of life. It is the way organisms obtain their food.  
(b) Autotrophic Nutrition, Heterotrophic Nutrition, Saprophytic Nutrition.
2. Food - provides energy, gives substances for repair and replacement of worn out tissues, supplies materials for growth, keeps the organisms healthy
3. It is one which provides you with all essential nutrients according to your body's needs.
4. Carbohydrates, fats, proteins, vitamins, mineral salts, water, fibre.
5. A balanced diet prevents us from malnutrition.

Nutrients	Functions	Sources
Proteins	build body tissue during growth and repair of damaged cells.	Lean meat, fish, eggs
Vitamin C	keeps gums healthy protects body against infections	Citrus fruits, guavas, lemons
Iron	forms haemoglobin in red blood cells	Liver, green vegetables, eggs and watercress
Calcium	Important for formation of bones and teeth	Milk, cheese, fish, eggs, pulses
Fibre	makes food bulky and prevent constipation	Fruits, salads, vegetables
Carbohydrates	Provide energy for body activities	rice, potato, cassava
Fats	act as energy reserve in the body	Butter, ghee, margarine, vegetable oils.

7. (a) It is caused by feeding on an unbalanced diet. It involves undernutrition and overnutrition.
8. (a) It is the taking in of food in the buccal cavity.  
(b) It is the gradual breakdown of large, complex food molecules into

- simpler and soluble ones that can be easily absorbed.
- (c) This is the diffusion of digested food into the blood to be used by the body.
- (d) It is the utilization of absorbed food by the body cells for different metabolic activities.

9. (a) Amylase (b) Lipase (c) Protease (Trypsin)
10. Food must be digested so that it can be easily absorbed by the body cells.
11. (a) In the inner wall of the ileum.  
(b) They present a large surface area for absorption of digested food.

12.

Organ	Name of digestive juice	Enzyme present	Food acted upon	Final product
Mouth	Saliva	Amylase	Starch	Maltose
Stomach	Gastric Juice	Pepsin	Protein	Peptides
Duodenum	Pancreatic Juice	Lipase	Fats (emulsified)	Fatty acids and glycerol
Ileum	Intestinal Juice	Maltase	Maltose	Glucose

13. (a) Stomach (b), (c), (d)  
(b) Bile  
(c) Ileum  
(d) Large intestine
14. (a) Bacteria feed on food particles in between the teeth and change sugars into acids. The acid dissolves the enamel of the tooth. If you do not take care this reaches the dentine and the decay spreads.  
(b) Avoid sweets; brush teeth after every meal; use toothpaste for brushing teeth.

# BIOLOGY

## MODULE 5

	<u>Marks</u>
1. How does water enter root hairs.	2
<hr/> <hr/>	
2. How are xylem vessels adapted to their functions?	2
<hr/> <hr/>	
3. What is root pressure?	2
<hr/> <hr/>	
4. Explain the importance of transpiration?	2
<hr/> <hr/>	
5. (a) What is transpiration?	1
<hr/> <hr/>	
(b) What causes wilting in a plant?	1
<hr/> <hr/>	
6. (a) You have a closed circulatory system. Explain what this means.	2
<hr/> <hr/>	



- (b) Name one advantage of having a double circulatory system? 1
- \_\_\_\_\_
- \_\_\_\_\_
- (c) Explain what causes a heart attack? 1
- \_\_\_\_\_
- \_\_\_\_\_
- (d) State three measures you can take to avoid heart diseases. 3
- \_\_\_\_\_
- \_\_\_\_\_
7. State three differences between an artery and a vein. 3
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
8. Make a drawing to show the circulation of blood in the heart. 2
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
9. Mention three important functions of blood. 3
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

## ANSWERS MODULE 5

1. Water from the soil enters root hair cells by osmosis. Water potential is higher in the surrounding soil water than the cell sap of the root hair cell.
2. Xylem vessels consist of dead cells which are hollow and they are joined end to end. This allows them to conduct water and minerals easily. They have thick cell walls which provide support.
3. It is the force which pushes water up the xylem of the stem from the root.
4. It helps to cool the plant and helps the movement of water and salts up the stem.
5.
  - (a) It is the loss of water in the form of water vapour from the shoot of a plant.
  - (b) It occurs when the rate of transpiration exceeds the rate of water absorption by the roots.
6.
  - (a) In a closed circulatory system blood circulates in a continuous system of tubes called blood vessels.
  - (b) Blood is pumped out of the heart at high pressure and its supply to the organs can be controlled.
  - (c) If the coronary artery is blocked, the heart muscles get little or no food and oxygen. This causes thrombosis which leads to a heart attack.
  - (d) Consume a balanced diet; avoid smoking; take exercise regularly; avoid alcohol and drug abuse.

7.

Artery	Vein
Blood flows away from the heart.	Blood flows towards the heart.
Blood flows at high pressure.	Blood flows at low pressure.
No valves (except pulmonary artery and aorta).	Valves are present to prevent back flow of blood.

8. Refer to Figure 15 - 2.2.1.
9.
  - To transport oxygen from the lungs to body tissues;
  - To defend the body against harmful bacteria and germs;
  - To transport food and distribute it to all the cells.

# BIOLOGY

## MODULE 6

		<b><u>Marks</u></b>
1.	Name three types of skeleton found in animals and give one example of each	3
	<hr/> <hr/> <hr/>	
2.	State three functions of your skeleton	3
	<hr/> <hr/> <hr/>	
3.	Make a labelled drawing to show a hinge joint in your body.	2
4.	How are joints helpful to you?	1
	<hr/> <hr/>	
5.	State three different types of muscles found in your body and give one example of each	3
	<hr/> <hr/> <hr/>	

6. What are antagonistic muscles? 1
- \_\_\_\_\_
- \_\_\_\_\_
7. Name three types of joints found in your body 3
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
8. Explain how insulin controls your blood glucose level. 2
- \_\_\_\_\_
- \_\_\_\_\_
9. Make a drawing to show some endocrine glands in your body? 2
- \_\_\_\_\_
- \_\_\_\_\_
10. Explain how adrenaline helps your body in emergency situations. 3
- \_\_\_\_\_
- \_\_\_\_\_
11. Make a labelled drawing of 3
- (a) a sensory nerve cell (b) a motor nerve cell

12. How are your nerve cells different from your cheek cells? 2
- \_\_\_\_\_
- \_\_\_\_\_
13. What is a reflex action? Give an example. 2
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
14. Give two differences between a reflex action and a voluntary action. 2
- \_\_\_\_\_
- \_\_\_\_\_
15. What is a drug? 1
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
16. What is meant by drug abuse? 1
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
17. State two effects of
- (a) Heavy alcohol drinking 1
- \_\_\_\_\_
- \_\_\_\_\_
- (b) Dagga abuse 1
- \_\_\_\_\_
- \_\_\_\_\_

## ANSWERS MODULE 6

1. Hydrostatic skeleton; endoskeleton; exoskeleton.
2.
  - (i) gives shape and strength to your body.
  - (ii) provides support to your body.
  - (iii) protects your internal organs. For example, the skull protects the brain, the rib cage protects your heart and lungs.
3. Refer to Figure 6 - 1.5
4. The joints allow desirable movements and help us to make movements to carry out our activities.
5. Voluntary muscles e.g. skeletal muscles.  
Involuntary muscles e.g. muscles in the wall of blood vessels;  
Cardiac muscles e.g. muscles found in the wall of heart.
6. These occur in pairs. When one muscle contracts the other one relaxes and vice versa. For example, when biceps contracts, triceps relaxes.
7. Fixed joints; slightly movable joints; freely movable joints.
8. When insulin arrives at the liver it makes the liver cells change glucose to glycogen. This helps to lower the blood glucose level.
9. Refer to Figure 7 - 2.0.
10. Adrenaline helps to convert glycogen to glucose and it increases the rate of metabolism. This provides surplus energy necessary in emergency situations.
11.
  - (a) Refer to Figure 9 - 2.2.3
  - (a) Refer to Figure 10 - 2.2.3
12. Nerve cells are specialised cells. They have axons and dendrons which can carry nerve impulses. These are absent in cheek cells.
13. A reflex action is an involuntary action which is done without thinking in order to protect oneself. For example, the pupils in the eye become smaller when they are exposed to bright light or the hands are pulled away immediately when they touch a hot object.

14.

Reflex Action	Voluntary Action
It is initiated by reflex centers and the brain is not involved.	It is initiated by the cerebrum. Brain is involved.
It is an involuntary, unconscious and fast action.	It is voluntary, conscious and may be fast or slow according to our thinking and reasoning.

15. A drug is any externally administered chemical substance which affects the functions and the chemical reactions of the body. It can change the way a person thinks, feels or acts.
16. Drug abuse is the deliberate use of drugs which causes physical, mental, emotional and social harm to a person or to people close to him or her. This abuse damages a person's health and it can become a social problem.
17. (a) Stomach ulcers; cancers of the digestive system; heart diseases.  
(b) Increases risks of heart diseases; reduces resistance against infection.

# BIOLOGY

## MODULE 7

**Marks**

1. Give two differences between meiosis and mitosis. 2 each

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---

2. Explain each of the following:

- (a) Wind pollinated flowers have feathery stigmas while insect pollinated flowers have sticky stigmas. 2

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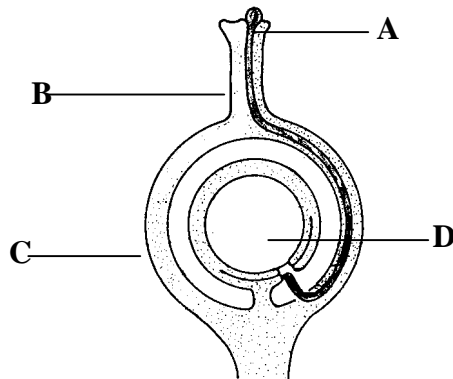
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- (b) Pollen grains of wind pollinated flowers are produced in large numbers. 2

---

---

3. (a) Label the structures A – D in the female part of a flower. 1 each



- (b) Draw on it a pollen tube carrying a male gamete 3  
(c) Which part shown above gives the seed? 1  
(d) What happens to parts A and B after fertilisation? \_\_\_\_\_ 2



4. Which part of the human reproductive system: 2
- (a) makes sperms? 2
- \_\_\_\_\_
- (b) protects the developing embryo? 2
- \_\_\_\_\_
- (c) receives sperms? 2
- \_\_\_\_\_
- (d) nourishes the embryo? 2
- \_\_\_\_\_
- (e) carries the ova towards the uterus? 2
- \_\_\_\_\_
5. Give **two** functions of the placenta. 2
- \_\_\_\_\_
- \_\_\_\_\_
6. Give **two** ways in which the HIV virus is transmitted. 2
- \_\_\_\_\_
- \_\_\_\_\_
7. List **two** symptoms of an AIDS sufferer. 2
- \_\_\_\_\_
- \_\_\_\_\_
8. How can birth be controlled? 5
- \_\_\_\_\_
- \_\_\_\_\_

9. What is the importance of breastfeeding? 5

---

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10. What are STDs and how can they be prevented? 6

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---

# ANSWERS - MODULE 7

1.

<b>Meiosis</b>	<b>Mitosis</b>
- four daughter cells are formed	Two daughter cells are formed
- daughter cells genetically different from parental cells	Daughter cells genetically similar to parental cells
<b>Or</b> – daughter cells contain half number of chromosomes	Contain normal number of chromosomes

- 2 (a) the feathery stigmas must catch pollen grains which are being carried about by the wind.  
The sticky stigmas serve to collect pollen grains which have stuck on insects' bodies.
- (b) Many pollen grains will be wasted as the chance of meeting a stigma of the same kind of flower is quite small.

- 3 (a) A: Stigma      B: Style      C: Ovary      D: Ovule  
(c) D  
(d) They wither and die

- 4 (a) testes (b) uterus (c) vagina  
(d) placenta (e) fallopian tube

5. Food and oxygen pass from the mother's blood to foetal blood.  
Carbon dioxide and waste products pass in opposite direction.  
or  
Harmful substances from mother are prevented to pass to foetus

6. Through shared syringes and unprotected sex.

7. Any two of:
- loss of body weight
  - fever
  - skin and mouth infections
  - pneumonia
  - tuberculosis

8. There are different methods i.e. natural, chemical, mechanical and surgical (see 1.16)

9. It's complete  
Always available  
Close contact child/mother  
Free and inexpensive

10. Gonorrhoea, Syphilis, AIDS  
For prevention see 1.18.1

# BIOLOGY

## MODULE 8

	<b><u>Marks</u></b>
1. What is meant by the following?	
(a) a habitat?	1
_____	
_____	
(b) a population?	1
_____	
_____	
(c) a community?	1
_____	
_____	
(d) an ecosystem?	1
_____	
_____	
2. (a) Define the term	
(i) producer	1
_____	
_____	
(ii) consumer	1
_____	
_____	

- |    |   |   |
|----|---|---|
|    | (iii) decomposer  | 1 |
|    | <hr/>   |   |
|    | <hr/>   |   |
|    | (b) How is a food web different from a food chain?  | 2 |
|    | <hr/>   |   |
|    | <hr/>   |   |
|    | (c) Construct a food chain from the following: eagles, caterpillars, green plants, small birds. | 2 |
|    |   |   |
|    | (d) What is meant by a producer in a food chain?  | 1 |
|    | <hr/>   |   |
|    | <hr/>   |   |
|    | (e) Explain why there are rarely more than four or five links in a food chain.                  | 1 |
|    | <hr/>   |   |
|    | <hr/>   |   |
| 3. | (a) Construct a food web in a named habitat   | 2 |

(b) State the (i) primary consumer 1

---

---

ii) secondary consumer in that food web. 1

---

---

4. (a) Make a drawing to illustrate the flow of energy in an ecosystem. 2

(b) How does energy enter an ecosystem? 2

---

---

5. (a) Draw a water cycle. 2

(b) Why is the water cycle important? 2

---

---

6. (a) Draw a carbon cycle 2

(b) Explain why the amount of carbon dioxide in the air stays fairly constant. 2

---

---

7. (a) Why do living things need nitrogen? 2

---

---

(b) How are nitrates changed into nitrogen? 2

---

---

(c) Draw a sketch of nitrogen cycle. 2

8. (a) How can burning organic fuels lead to pollution? 2

---

---

(b) Name five harmful substances which act as pollutants. 4

---

---

---

9. Explain two effects of deforestation 2

---

---

10. Explain the term 'pollution' 2

---

---

Give examples of a few pollutants which affect us? 2

---

---

---

11. What are the advantages of using substances which produce biodegradable pollutants? 2

---

---

---



12. What is (i) immigration? 1

---

---

(ii) emigration? 1

---

---

13. State five environmental factors which may limit the growth of a population 4

---

---

14. (a) Draw a population growth curve. 2

(b) Explain briefly what happens in each phase of this curve 3

---

---

15. World population of humans rose rapidly after the year 2000. Suggest some reasons for this. 4

---

---

16. Why are bacteria and yeast used to carry out experiments on population size? 3

---

---

17. State some effects of the human population increase on the environment 5

---

---

18. (a) Define pollution. 2

---

---

- (b) State four pollutants produced by human activities. 4

---

---

19. (a) What is soil erosion? 2

---

---

- (b) What may lead to soil erosion? 2

---

---

20. Explain why deforestation is harmful to us. 5

---

---

---

21. Why should farmers not over-use
- (i) pesticides 1
- 
- 
- (ii) fertilizers? 1
- 
- 
22. What is acid rain? 1
- 
- 
23. (a) Differentiate between renewable and non-renewable resources. 2
- 
- 
- 
- (b) Explain the rational utilization of a named renewable resource 2
- 
- 
- 
24. (a) What is conservation? 2
- 
- 
- (b) Why is conservation important? 2
- 
- 
- 
- (c) How does recycling of materials help in conservation? 2

## ANSWERS - MODULE 8

1.
  - (a) It is the natural home of an organism. It is that part of the environment in which the organism lives and reproduces.
  - (b) It is a group of plant or animals of the same kind which live in a given habitat or place.
  - (c) This consists of many populations which live together in a particular place.
  - (d) When different communities interact with one another and their physical environment, they form an ecosystem. This is a self-supporting unit of the environment which consists of producers, consumers, decomposers which interact with the physical environment.
2.
  - (a)
    - (i) A producer is an organism which makes food during the process of photosynthesis.
    - (ii) A consumer is an organism which cannot make food. It obtains ready-made food from another organism.
    - (iii) A decomposer feeds by breaking down the waste products and dead bodies of plants and animals. Decomposers are mostly bacteria and fungi.
  - (b) A food web consists of several food chains interconnected whereas a food chain shows direct feeding relationship between different organisms.
  - (c) Green plants → Caterpillars → Small birds → Eagles
  - (d) A producer makes food by photosynthesis for consumers.
  - (e) This is because there is a great loss of energy at each trophic level along the food chain.
3.
  - (a) Refer to Figure 3 – 1.1.4.
4.
  - (a) Refer to Figure 7 – 1.4.
  - (b) Green plants which are producers absorb light energy during the process of photosynthesis.
5.
  - (a) Refer to Figure 8 – 1.7.1.
  - (b) It is important to provide a continuous supply of water on earth.
6.
  - (a) Refer to Figure 9 – 1.7.2.
  - (b) This is because carbon dioxide which is released by various processes into the atmosphere is taken up by the process of photosynthesis.
7.
  - (a) In order to make proteins.
  - (b) This is done by the action of denitrifying bacteria in the soil.
  - (c) Refer to Figure 10 – 1.7.3.
8.
  - (a) This leads to production of harmful gases like carbon dioxide and sulphur dioxide as well as smoke.
  - (b) Smoke, carbon dioxide, sulphur dioxide, nitrogen dioxide, lead.

9. This increases the concentration of carbon dioxide in the atmosphere leading to the 'greenhouse' effect. It also leads to soil erosion.
10. It is the harmful effect of human activities on the natural environment. It changes the quality of air, water and land by contaminating it. Examples of pollutants are: exhaust fumes from vehicles; noise and industrial wastes.
11. These substances are easily broken down into simpler substances by decomposers and they do not persist in the ecosystem.
12. (i) It is the movement of individuals into a population.  
(ii) It is the movement of individuals out of a population.
13. Food supply, predation, overgrazing, diseases and competition.
14. (a) Refer to Figure 12 – 2.2.  
(b) At first rate of growth is slow – lag phase.  
As number of individuals increase, more of them reproduce and the population grows faster – log phase. Finally the rate of population slows down due to limitation factors.
15. This is because there has been improved agriculture to provide more food, better health facilities, vaccination against several diseases, good control over disease organisms, and poor population control in certain underdeveloped countries.
16. This is because they reproduce quickly and they are easy to grow.
17. There has been overexploitation of many resources leading to pollution.
18. (a) It is the contamination of the environment by the harmful effects of human activities.  
(b) Smoke, exhaust fumes, domestic, agricultural and industrial wastes and noise.
19. (a) Soil erosion occurs when the soil is washed away by rain water or blown away by wind whenever it is exposed.  
(b) Poor farming methods, deforestation, overgrazing.
20. It produces excess carbon dioxide to the atmosphere causing the greenhouse effect. It also leads to soil erosion and brings about disbalance of nature.
21. (i) Overuse of pesticides leads to destruction of ecosystems. The concentration of pesticides increases as it passes along food chains. Thus organisms found at higher trophic levels are killed.  
(ii) When fertilizers reach water bodies they cause overgrowth of microscopic algae. These also support the growth of bacteria. This makes the water murky and poor in oxygen content. Thus other forms of aquatic life are killed.

22. (a) Oxides of nitrogen as well as sulphur dioxide from industries and vehicles exhausts are released into the atmosphere. These gases dissolve in rainwater and fall as acid rain.
- (b) By burning less coal, oil and gas. Furthermore, the coal and oil can be treated to remove some of their sulphur before they are burnt.
23. (a) A renewable resource is one which is replaced by nature once it is removed or utilized whereas a non-renewable resource cannot be replaced after its removal or utilization.
- (b) Rational utilization of fish in a lake implies removal of an equal number of fish per year as the number which can be added by reproduction during the same period of time.
24. (a) It is the careful management of our environment and it involves the proper use of resources and the control of pollution.
- (b) It prevents extinction of plants and animals, it keeps the balance of nature, it helps to maintain the diversity of species and beauty of the environment, it avoids the depletion of our resources.
- (c) Recycling helps to reduce land pollution and it slows down the depletion of natural resources. It also helps to save energy.