

4.8 GENERAL SCIENCE (237)

4.8.1 General Science Paper 1 (237/1)

SECTION A : BIOLOGY

1. (a) Bacteria; (1 mark)
- (b) (i) Coarse adjustment knob - raising and or lowering the body tube to bring image into sharp focus; (1 mark)
- (ii) Diaphragm - regulate the amount of light entering the condenser; (1 mark)
2. (a) K - brings blood into the heart; (1 mark)
L - takes blood away from the heart; (1 mark)
- (b) (i) On the lower surface; (1 mark)
- (ii) The lower surface has more stoma than the upper surface; (1 mark)
3. (a) Crenated/shrunked/shrunken; (1 mark)
- (b) Water moves from cell to (the hypertonic) solution by osmosis; cell membrane shrinks losing its original shape (becomes crenated); (2 marks)
4. (a) Age;
Basal metabolic rate;
Occupation/ everyday activity;
Sex;
Body size;
State of health; (2 marks)
- (b) Autotrophism - simple materials are built up/synthesised to form complex food substances;
- Heterotrophism - complex food substances are broken down to simple food substances (2 marks)

Mark as a whole

5. (a)	Aerobic respiration	Anaerobic respiration
•	Oxygen is used;	Oxygen is not used;
•	Water and energy are produced;	Alcohol, lactic acid and energy are produced;
•	More energy is released;	Less energy is produced;
•	Takes place in cytoplasm and mitochondria;	Takes place in cytoplasm;

(2 marks)

- (b) Ecology; (1 mark)
6. (a) - Lined with a thin membrane/ one-cell thick layer;
- Moist;
- Highly vascularised;
- Numerous alveoli; (2 marks)
- (b) Overproduction of mucus;
Production of hissing sound - while breathing;
Low blood pressure; (1 mark)
7. (a) P - sweat duct;
Q - temperature/ pressure receptor; (2 marks)
- (b) High osmotic pressure of blood leads to production of more anti-diuretic hormone (ADH); making more water to be reabsorbed from the kidney tubules into the blood-stream; low osmotic pressure of blood leads to production of less ADH; making less water to be reabsorbed from the kidney tubules into the blood stream. (2 marks)
8. (a) Avoid excessive intake of alcohol;
Timely treatment of liver infections; (2 marks)
- (b) Removal of metabolic waste from the body; (1 mark)
9. (a) (i) Tissue - group of cells specialised to perform a given function;
(ii) Cell - structural and functional unit of living organisms;
Basic functional (2 marks)
- (b) Universal identity to avoid confusion; They rarely change; (1 mark)
10. (a) (i) active transport;
(ii) osmosis; (2 marks)
- (b) To the solution of the food substance add an equal amount of sodium hydroxide solution and a drop of Copper (II) Sulphate solution/Biuret reagent; a purple colour indicates presence of protein while a blue colour shows absence;
(Correct procedure and reagents) (2 marks)

SECTION B : CHEMISTRY

11. (a) (i) Blue litmus paper remains blue. $\sqrt{\frac{1}{2}}$
(ii) Red litmus paper turns to blue. $\sqrt{\frac{1}{2}}$ (1 mark)
- (b) Neutralisation (1 mark)
12. (a) - Add dilute nitric (V) acid to excess lead (II) oxide, $\sqrt{\frac{1}{2}}$ to get a solution of lead (II) nitrate $\sqrt{\frac{1}{2}}$
- filter to collect filtrate of lead (II) nitrate $\sqrt{\frac{1}{2}}$
- Add sodium sulphate solution to the filtrate; $\sqrt{\frac{1}{2}}$
- Filter to obtain the residue; $\sqrt{\frac{1}{2}}$
- Rinse and dry residue between litmus papers $\sqrt{\frac{1}{2}}$ (3 marks)
- (b) - manufacture of cement
- plastering walls
- manufacture of plaster of paris
(Any one correct) (1 mark)
13. (a) TO (1 mark)
(b) It absorbs/reacts with carbon (IV) oxide gas (1 mark)
(c) Nitrogen gas (1 mark)
14. (a) (i) mass number - neutrons = $(19 - 10) = 9$ electrons
Electron arrangement - 2.7 (1 mark)
- (ii) period 2 (1 mark)
- (b) Group 3 (1 mark)
15. (a) (i) Its larger because more energy levels are added down the group hence increasing the atomic radius of element N away from the nucleus. (1 mark)
- (ii) L, M, N. (1 mark)
- (b) As more energy levels are increased down the group, $\sqrt{1}$ the electrons on the outer most energy level become less attracted to the positive nucleus, hence less energy is required to remove the first electron. $\sqrt{1}$ (2 marks)
16. (a) Density of the liquids $\sqrt{1}$.
The molecules of the two liquids don't mix to form homogeneous solution/ liquids are immiscible. $\sqrt{1}$ (2 marks)
- (b) Discard the liquid where solution L_1 and L_2 meet.

OR

- Run L_2 into a beaker and discard a small amount at interface. (1 mark)
17. (a) - All the four electrons in diamond are used in forming covalent bonds $\sqrt{1}$
 - The structure of diamond is tetrahedral and cross linked $\sqrt{1}$ (2 marks)
- (b) - Drilling rocks
 - Jewellery
 (Any one correct) (1 mark)
18. (a) - The bulb did not light initially because the ions were immobile; $\sqrt{1}$
 - When water is added, the crystals dissociate to form ions which are free to move and conducts the electricity. $\sqrt{1}$ (2 marks)
- (b) $H^+ \sqrt{\frac{1}{2}}$, $Zn^{2+} \sqrt{\frac{1}{2}}$ (1 mark)
19. (a) - Carbon (IV) oxide in the air dissolves in rain water from the atmosphere to form carbonic acid (H_2CO_3); $\sqrt{\frac{1}{2}}$
 - The weak carbonic acid reacts with rocks containing calcium carbonate and magnesium carbonate to form calcium hydrogen carbonate and magnesium hydrogen carbonate $\sqrt{1}$ which causes temporary hardness of water. $\sqrt{\frac{1}{2}}$ (2 marks)
- (b) Calcium salts in hard water are used in the formation of bones and teeth. (1 mark)
20. (a) $Zn_{(s)} + H_2SO_{4(aq)} \longrightarrow ZnSO_{4(aq)} + H_{2(g)}$ (1 mark)
- (b) The gas is lighter/less dense than air (1 mark)
- (c) - filling balloons for weather studies
 - manufacture of ammonia
 - manufacture of margarine
 - rocket fuel
 - Manufacture of hydrochloric acid
 (Any one correct) (1 mark)
21. - boiling point
 - melting point
 - density
 - refractive index
 - viscosity
 (Any two correct) (2 marks)

SECTION C : PHYSICS

22. $3.22 + 0.20 = 3.245$
23. Adhesive forces are forces of attraction between molecules of different types substances/
kind.
Cohesive forces are forces of attraction between molecules of similar type
24. As the balloon rises the atmospheric pressure decreases and thus the air/gas in the balloon
expands/pressure in.
25. The movement is caused by collision of the dust particles by the water particles; which are
in continuous/constant random motion.
26. clinical thermometer
ordinary thermometer
maximum - minimum thermometer/six's thermometer
liquid in glass thermometers
bimetallic thermometer
gas thermometer
eletronic thermometer
27. Metal are better conductors of heat than wood. Thus when touched metals conduct heat away
(from body) faster than wood which is a poor conductor/ metals are good conductors while
wood is a poor conductor/insulator; metals conduct heat away faster.
28. Warm air rises and escapes through the ventilations while cool air comes in through the doors
and windows or warm air is less dense than cold air and rise cold air take its' place.
29. (a) This is the distance between two points in a specified direction. A vector quantity has
both magnitude and direction /distance in a specified direction.
(b) The body is moving with uniform velocity in a positive direction.
30. Clockwise moments = Anti clockwise moments
 $300 \times 5 = 2 \times W$ $W = 750 \text{ N}$
31. The level of the water in the tube first drops then rises up. as the flask first expands then the
water starts to expand. Water expands more than the flask.
32. Kinetic \longrightarrow Potential \longrightarrow Kinetic
33. $F = ke$
 $4.5 = 3K$ $K = 1.5 \text{ N/cm}$
34. The point through which the resultant of the weights of all the particles of a body acts or
appears to act. Point of application of the resultantforce due to the earth's pull on a body.
35. This is because of inertia. The bag tends to remain stationary as the pick-up moves forward.
36. Change the shape of steel to increase the upthrust (volume displaced). This lowers the
average density of the steel. Weight of steel equals upthrust.

4.8.2 General Science Paper 2 (237/2)

SECTION A : BIOLOGY

1. (a) (i) habitat - specific locality with particular set of conditions where an organism lives;
(ii) population - all members of a given species in a particular habitat at a particular time;
(2 marks)
- (b) (i) SO_2 - dissolves in rain water and falls as acid rain which lowers soil pH affecting agricultural productivity/irritation of respiratory system resulting in ailments;
(any one explained)
(2 marks)
- (ii) Smoke
- affect visibility;
- block stoma, hindering photosynthesis;
- cause eye irritation, headache and breathing difficulties
- green-house effect;
- poisoning.
(any one explained)
(2 marks)
2. (a) To ensure a cooler; environment for quality sperm production. (2 marks)
- (b) Procreation/sustains or perpetuates the species;
For quality improvements; (2 marks)
3. (a) A - plumule;
B - Radicle;
(2 marks)
- (b) (i) Epicotyl is part of the embryo between the cotyledon and the plumule, while hypocotyl is the part of the embryo between the cotyledon and the radicle;
(1 mark)
- (ii) Auxins / IAA;
(1 mark)
4. (a) (i) Genetics - study of heredity and variation and how they are inherited / passing of traits from parents to offsprings;
(1 mark)
- (ii) Gene - unit of instruction / inheritance located on chromosomes, that produce or influence a specific trait in the offspring;
(1 mark)

- (b) (i) Complete dominance - Attribute of a trait which is expressed when the responsible gene is present in both homozygous and heterozygous states. (1 mark)
- (ii) Phenotype - observable traits of an organism that arises because of the interaction between genes and the environment. (1 mark)
5. (a) Acquired traits / characteristics cannot be inherited; as they do not affect the genotype of an individual; (2 marks)
- (b) Is growth and development process in which insects go through four stages (developmental) that are different from each other in term of structure i.e egg - larva - pupa - adult /imago. (1 mark)
6. - Both elicit a response;
- Both achieve co-ordination;
- Both provide means of communication within the body; (2 marks)
7. (a) (i) Scattered;
(ii) Ring arrangement; (2 marks)
- (b) When the biceps muscle contract the triceps muscle relaxes, this pulls the arm upwards in the direction shown; (1 mark)
8. (a) *Treponema pallidum*; (1 mark)
- (b) Luteinising hormone; (1 mark)
9. (a) • Resolving disputed parentage;
• Giving professional advice on genetic disorders and diseases; (2 marks)
- (b) (i) Wearing concave / divergent lenses;
(ii) Wearing cylindrical lenses; (2 marks)
10. - Simple reflex is inborn (innate) while conditional reflex is learned;
- Simple reflex is specific conditioned reflex is related to varied stimulus;
- Simple reflex is constant while conditioned can be weakened / strengthened;
- Simple reflex brain is not involved while conditioned reflex brain is involved; (2 marks)

SECTION B : CHEMISTRY

11. (a) Constant pressure $\sqrt{\frac{1}{2}}$
 Constant temperature $\sqrt{\frac{1}{2}}$ (1 mark)
- (b) (i) The level of coloured water at A lowers/goes down while at B rises/goes up. (1 mark)
- (ii) - Carbon (IV) oxide is heavier than air hence its rate of diffusion is lower than that of air $\sqrt{\frac{1}{2}}$
 - Air diffuses faster into the porous pot exerting more pressure hence pushing the coloured water level at A downward $\sqrt{\frac{1}{2}}$. (1 mark)
12. (a) Molarity refers to the number of moles of a substance contained in 1000 cm³ or 1 litre of solution / concentration of a solution in grams in a litre solution/1000 cm³.
- (b) (i) No. of moles in 100 cm³ of 0.1 M NaOH, $\frac{100}{1000} \times 0.1 = 0.01$ ✓ (1)
 No. of moles 100 cm³ of 1 M NaOH, $\frac{100}{1000} \times 1 = 0.10$ $\sqrt{\frac{1}{2}}$ moles
 Total No. of moles = 0.01 + 0.1 = 0.11 moles $\sqrt{\frac{1}{2}}$
 Total volume = 200 cm³ (2 marks)
- (ii) Hence $\frac{200}{1000} \times c = 0.11$ $\sqrt{\frac{1}{2}}$
 $C = 0.11 \times \frac{1000}{200}$ ✓ (1)
 $= 0.55 \text{ M}$ $\sqrt{\frac{1}{2}}$ (2 marks)
13. (a) paper/clothing (1 mark)
 polyvinyl chloride / pvc (1 mark)
- (b) - Non-biodegradable ✓
 - Most detergents contain phosphates which cause environmental ✓ pollution ("Algae growth")
 - Detergents discharged to water cause pollution i.e. foaming of water.
 - Kill aquatic animal
 (Any two correct) (2 marks)
14. (a) Sulphur (IV) oxide combines with moisture/water to form sulphurous acid ✓¹

$$\text{SO}_{2(g)} + \text{H}_2\text{O}_{(l)} \longrightarrow \text{H}_2\text{SO}_{3(aq)}; \text{ (dye-oxygen) + H}_2\text{SO}_3 \xrightarrow{\text{(aq)}} \text{(dye) + H}_2\text{SO}_{4(aq)}$$

(coloured)
(white)
(aq)

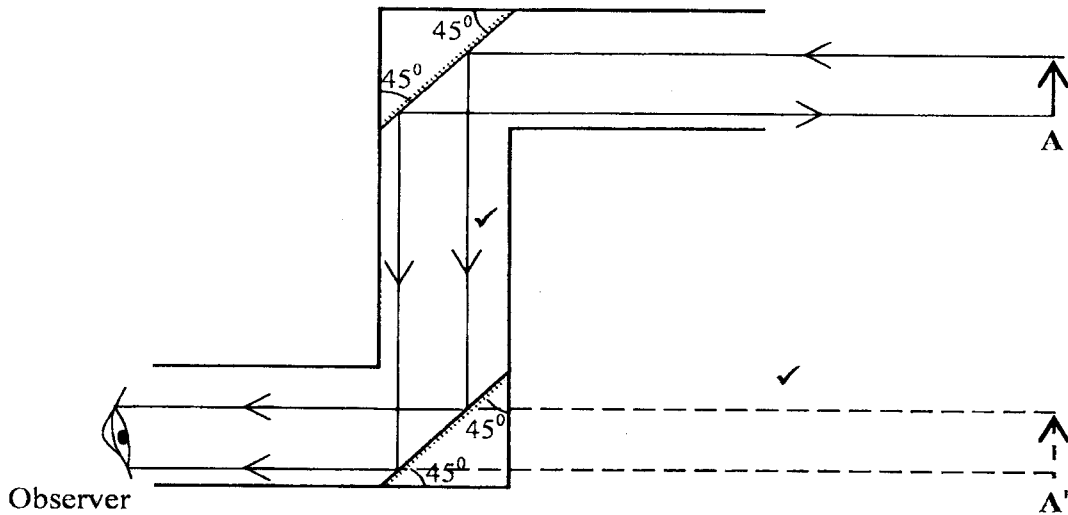
 The oxygen in the dye combines with the sulphurous acid to form sulphuric (VI) acid and hence the dye becomes decolourised/bleached. ✓¹
 (2 marks)

- (b) Oxygen from the air re-oxidises the colourless material in presence of sunlight to restore the dye. (1 mark)
15. (a) Molten sodium chloride and calcium chloride. (1 mark)
- (b) At the Anode:

$$2\text{Cl}^{-}(l) \longrightarrow \text{Cl}_{2(g)} + 2e$$
 (1 mark)
- (c) Steel (1 mark)
- (d) Uses of sodium metal
 - coolant in nuclear, anti-knock
 - extraction of titanium metal
 - sodium lamp - street light
 - making alloys Na₂Pb
 - makes sodium peroxide
 - makes sodium cyanide for gold extraction (1 mark)
 (any two correct)
16. (a) Enthalpy of combustion is the energy released when one mole of substance is completely burned in oxygen/ air. (1 mark)
- (b) (i) kerosene (1 mark)
- (ii) - It is liquid, room temperature which is easy to carry and store $\sqrt{\frac{1}{2}}$.
 - It has high heat value $\sqrt{\frac{1}{2}}$ 48kJg⁻¹ (1 mark)
- (iii) Charcoal ✓ (1) solid at room temperature and undergoes incomplete combustion to produce pollutants namely carbon (II) oxide, soot, Nitrogen (IV) oxide and sulphur (IV) oxide. ✓ (1) (2 marks)
17. (a) The greater the surface area of the reactant, the higher the rate of reaction ✓ (1) since more particles come into contact hence higher rate of reaction ✓ (1). (2 marks)
- (b) The decrease in concentration of reactants slows down the rate of reaction ✓ (1) because there are fewer particles that collide/react/combine. ✓ (1) (2 marks)
18. (a) Oxidizing agent - chlorine ✓ (1)
- (b) CFCs - when burned, they produce gases such as carbon (IV) oxide which accumulate in the atmosphere causing greenhouse effect/global warming ✓ (1)
 - when they are released to the atmosphere, they cause depletion of the ozone layer ✓ (1) leading to increased UV rays / radiations reaching the earth hence affecting people and living things in general. (2 marks)
19. (a) copper (II) carbonate / (CuCO₃) (1 mark)
- (b)
$$\text{CO}_{2(g)} + \text{Ca}(\text{OH})_{2(aq)} \longrightarrow \text{CaCO}_{3(s)} + \text{H}_2\text{O}(l)$$
 (1 mark)

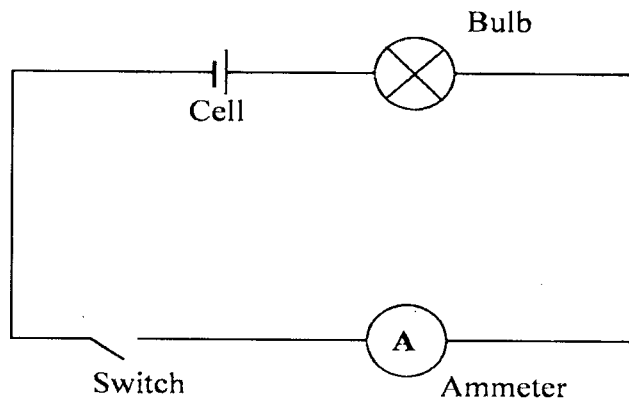
SECTION C : PHYSICS

20.



21. The rod gains some electrons thus becoming negatively \checkmark charged while the fur loses electrons thus becoming positively charged. Electrons moved from the fur to the rod.

22.



- correct diagram \checkmark
- labelling \checkmark

23. - Temperature of air \checkmark
- Humidity \checkmark
- Wind

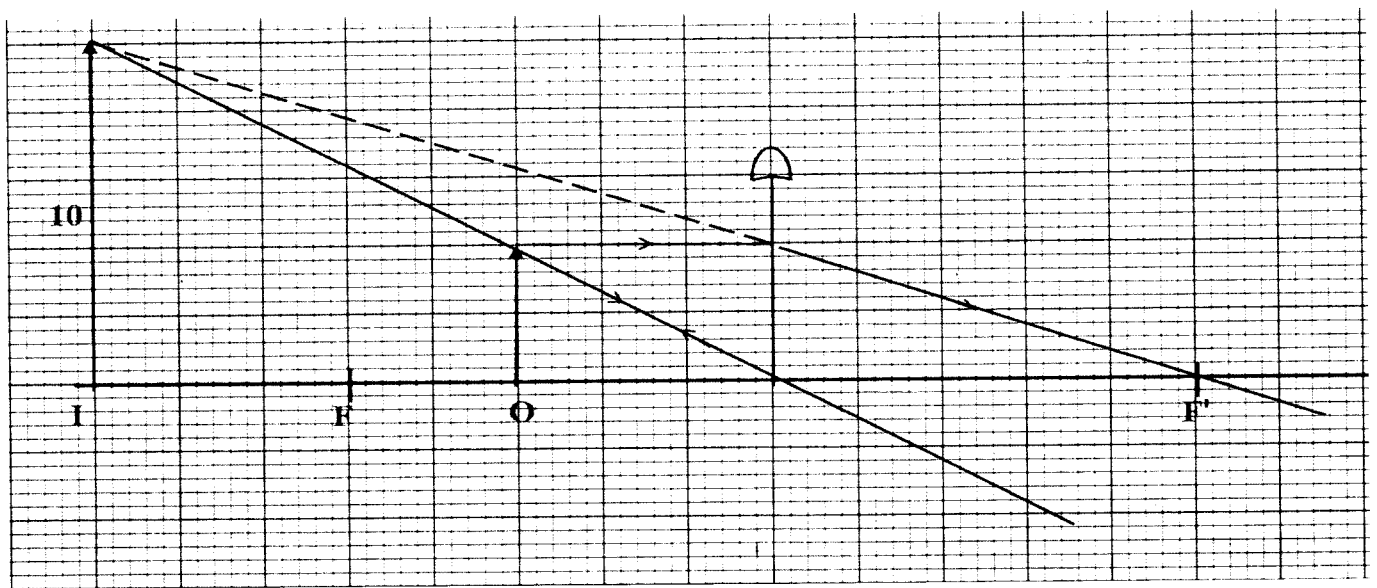
24. (i) Vibration of the medium particles is perpendicular to the direction of the travel of the wave. \checkmark

(ii) The vibration of medium particles is in the same direction of travel as the wave.

25. On placing the nails in contact with the magnet they become magnetised. \checkmark The free ends have identical poles \checkmark and therefore they repel each other. \checkmark

26. This is the measure of the opposition offered to the flow of an electric current in a conductor. The SI unit is the Ohm (Ω). ✓
27. (i) Distinct colours will be observed/spectrum of colour. ✓
(ii) Dispersion of white light/splitting of white light/separation of white light. ✓
28. - The coils had different resistance/x-sectional area length. ✓
- The coils had different current passing through them. ✓
- Different electrical conductivity

29.



30. Total cost = Total power x cost per kilowatt hour ✓

$$180.90 = x \times 4 \times 30 \times 6.7 \times 3 \quad \checkmark$$

$$x = \frac{180.9}{2412}$$

$$= 0.075 \text{ kW/75 W}$$

31. Control the brightness of the beam on the screen/control number of electrons reaching the screen. ✓
32. - may damage cells/living tissue/kills cells ✓
- may cause cancer ✓
- may cause genetic mutations/damage/unpredictable chemical changes in living cells
- Produce deep rooted burns
33. - When exposed to radiations it becomes dark. ✓
- The amount of darkness can be used to detect the presence of radiations.
34. PN junction diode is forward biased when the P-type is connected to the positive ✓ terminal and the n-type to the negative terminal.