

4.7 GENERAL SCIENCE (237)

4.7.1 General Science Paper 1 (237/1)

SECTION A : BIOLOGY

1. (a) Avoid spilling chemicals / acids which corrode bench tops;
Avoid cutting specimens on bench tops because they scratch bench surfaces;
Avoid placing hot objects on bench tops which may burn the tops. (1 mark)
- (b) Distribution of nutrients / transport of nutrients only;
Availability of raw materials for photosynthesis;
Cooling effect to the plant; (3 marks)
2. (a) Dicotyledonae; (1 mark)
- (b) Leaves have net venation;
Have tap root system; (1 mark)
3. (a) There was movement of water molecules from the beaker into the strip of pawpaw by osmosis;
because the strip tissue fluid was hypertonic / water in the beaker was hypotonic; (2 marks)
- (b) The strip became rigid / hard / stiff / turgid / firm;
The strip bent / curved; (1 mark)
4. (a) Peripheral nucleus; Large central vacuole;
Cell wall present; Has regular shape ; /chloroplast present (3 marks)
- (b) Chloroplast; (1 mark)
5. (a) (i) Control reaction rates; (1 mark)
- (ii) They are protein in nature; (1 mark)
- (b) In low temperature the rate of photosynthesis is slow / rate increased with increase in temperature upto to optimum; beyond optimum temperature, rate decreases and eventually photosynthesis stops;

6. (a) To prevent the spread of immunizable diseases;
Enables the individual to develop immunity/to boost/increase immune system;
against immunizable infections; (2 marks)
- (b) Unusual response by the body cells to a foreign substance; (1 mark)
7. (a) Metabolism is slower in older people; because of low oxygen demand;
leading to lower rate of breathing. (vice versa) (2 marks)
- (b) *Micobacterium tuberculosis*; (1 mark)
8. (a) (i) To find out if heat is produced by germinating seeds; as they respire. (1 mark)
- (ii) To kill bacteria that would respire producing heat; (1 mark)
- (b) Glucose; Amino acids; (2 marks)
9. (a) Excretion of excess salts / water / waste products;
Cooling of the body; by evaporating sweat. (2 marks)
- (b) Excess water collects in contractile vacuoles;
which discharge the contents to the exterior; (2 marks)
10. Liver has many metabolic activities which release heat; which is
distributed by blood to maintain body temperature;
When it is cold the liver metabolic activities increase /
when it is hot the liver metabolic activities decrease; (3 marks)

SECTION B : CHEMISTRY (33 marks)

11. (a) (i) - White $\frac{1}{2}$ anhydrous copper (II) Sulphate turns blue $\frac{1}{2}$ (1 mark)
- (ii) - Anhydrous copper (II) Sulphate combines with the water produced to form blue hydrated copper (II) Sulphate. $\checkmark(1)$ / anhydrous Copper (II) Sulphate becomes hydrated. (1 mark)
- (b) It causes global warming / greenhouse effect. $\checkmark(1)$ (1 mark)
12. (a) Q - Manganese (IV) oxide (MnO_2). $\checkmark(1)$ (1 mark)
- (b) $2\text{H}_2\text{O}_{2(aq)} \xrightarrow[\text{catalyst}]{\text{MnO}_{2(s)}} 2\text{H}_2\text{O}_{(l)} + \text{O}_{2(g)}$ $\checkmark(1)$ (1 mark)
 Penalise $\frac{1}{2}$ mark for absence or wrong symbols
- (c) Sodium peroxide and water
- OR
- Na_2O_2 and H_2O (1 mark)
- (d) Oxygen relights / rekindles a glowing splint. $\checkmark(1)$ (1 mark)
13. (a) Solution O; $\checkmark(1)$ (1 mark)
- (b) Salt / sodium salt, carbon (IV) oxide and water $\checkmark(1)$ (1 mark)
 1 mark - 3 correct
 1/2 mark - 2 correct
 0 mark - 1 correct
14. (a) (i) Hygroscopic salt refers to a salt that absorbs water from the atmosphere but does not form a solution. $\checkmark(1)$ (1 mark)
- (ii) KNO_3 , anhydrous copper (II) sulphate (CuSO_4)/anhydrous magnesium chloride and anhydrous calcium chloride. $\checkmark(1)$ (1 mark)
- (b) - Manufacture of chlorine
 - Manufacture of Sodium carbonate $\checkmark(1)$
 - Extraction of sodium metal (1 mark)
15. (a) Absence of source of heat $\checkmark(1)$ / solid PbBr_2 instead of molten lead (II) bromide. (1 mark)
- (b) Bromine gas / fumes $\checkmark(1)$ (1 mark)

16. (a) - It provides calcium and magnesium ions $\sqrt{(1/2)}$ used by animals in formation $\sqrt{(1/2)}$ of strong bones, teeth and shells. (1 mark)
- (b) Hard water is passed $\sqrt{(1)}$ through a column packed with a compound of sodium permuttit which exchanges Ca^{2+} $\sqrt{(1)}$ and Mg^{2+} ions for Na^+ ions. (2 marks)
17. (a) Red and blue $\sqrt{(1)}$ (1 mark)
- (b) Brown ink $\sqrt{(1)}$ (1 mark)
18. - Add water to the mixture, sodium chloride dissolves $\sqrt{(1)}$
- Filter to obtain sulphur $\sqrt{(1)}$
- Evaporate filtrate to obtain sodium chloride. $\sqrt{(1)}$ (3 marks)
19. (a) Ionization energy is the minimum energy required to completely remove the outermost electron from an atom in the gaseous state. $\sqrt{(1)}$ (w.t.t.e) (1 mark)
- (b) (i) The atomic size decrease from P to W because of increase in the effective nuclear charge $\sqrt{(1)}$ hence the removal of the outermost electron across the period requires more energy $\sqrt{(1)}$ as the atomic size decreases. (2 marks)
- (ii) (I) R - Amphoteric oxide $\sqrt{(1/2)}$
- (II) U - Acidic oxide $\sqrt{(1/2)}$ (1 mark)
20. (a) A $\sqrt{(1/2)}$ and F $\sqrt{(1/2)}$ (1 mark)
- (b) H_2C_3 $\sqrt{(1)}$ OR Al_2O_3 (1 mark)
- (c) E $\sqrt{(1)}$ (1 mark)
- (d) G $\sqrt{(1)}$ (1 mark)
21. (a) - Covalent bonds $\sqrt{(1/2)}$
- Coordinate / dative bond $\sqrt{(1/2)}$ ($\sqrt{(1/2)}$ mark for the structure only) (1 mark)
- (b) Graphite exist in hexagonal layers which are held together by weak van der waals forces of attraction $\sqrt{(1)}$. These layers slip/slide over each other when compressed hence this makes it a good lubricant. $\sqrt{(1)}$ (2 marks)

SECTION C : PHYSICS

22. Time of fall = 3.68 - 0.05 ; 1
 = 3.63s ; 1

23. Mass per unit volume / density $\frac{\text{mass}}{\text{volume}} / d = \frac{m}{v} / \delta = \frac{m}{v} ; 1$

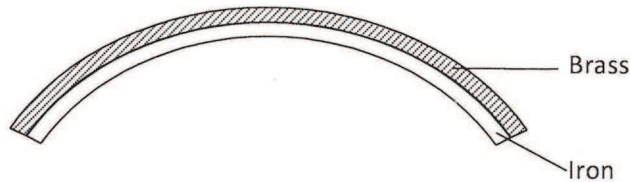
24. W = mg ; 1
 12.5 = m × 10 ; 1
 m = 1.25 kg ; 1

25. On sucking at the open end of the straw, the air inside is removed/sucked out; 1
 This lowers/reduces/decreases the pressure inside the straw; 1
 The atmospheric pressure now being higher than the pressure inside the straw; 1
 forces the liquid up the straw.

26. The intermolecular distances in gases are larger/greater/higher/larger/more than/bigger than in liquids; 1

27. (a) This is to allow for contraction ; during cold weather, 1
 If this is not done the wires would break ; causing alot of damage. 1

(b)



28. Heat is energy transferred from place to place; 1
 as a result of temperature difference; 1

Form of energy; when absorbed/taken in, temperature rises; or when lost/given out, temperature f---

29. Sum of anticlockwise moments = Sum of clockwise moments/ $F_1d_1 = F_2d_2$

Let weight of rule be x ; 1

$$x \times 30 = 20 \times 4.5 ; 1$$

$$x = \frac{20 \times 4.5}{30}$$

$$= 3 \text{ N} ; 1$$

30. (a) Stable ; 1
- (b) If the cone is slightly displaced, the position of the centre of gravity rises and falls /broad base/larger base/bigger base; 1
back to the same position when the displacing force is removed/vertical line passing through the c.o.g. falls within the base.
31. (a) The body undergoes uniform/steady/constant acceleration /velocity increasing at uniform rate; 1
- (b) The body moves with constant/steady/uniform velocity; zero acceleration. 1
- (c) The body moves with a uniform/steady/constant deceleration / velocity decreasing at uniform rate; 1
uniform negative acceleration.
32. Extension = 20.8 - 20 = 0.8 cm ; 1
- $F = Ke$
- $\frac{400}{1000} \times 10 = K \times \frac{0.8}{100}$; 1
- $K = \frac{4 \times 100}{0.8} = 500 \text{ Nm}^{-1}$; 1
33. This is caused by the tendency of the body to remain stationary (inertia); 1
since the body was initially at rest, it tends ; 1
to remain at rest as the truck moves forward.
34. - Weight/mg/gravitational ; 1
- Upthrust ; 1
- Tension ; 1
35. Chemical to electrical ; 1
Electrical to light / heat ; 1

4.7.2 General Science Paper 2 (237/2)

SECTION A : BIOLOGY

1. Ecology is the study of interaction of organisms with one another and with their physical environment while Ecosystem is the sum total of the interactions linking organisms in a community with one another and with their environment. (2 marks)
2. (a) Carbon (II) Oxide;
Carbon (IV) Oxide;
Carbon particles / soot; (3 marks)
- (b) *Entamoeba histolytica*; (1 mark)
3. (a) (i) K - Prostate gland; L - Epididymis; (2 marks)
- (ii) Controls development of secondary sexual characteristics;
leads to formation of spermatozoa/sperms; (1 mark)
- (b) It is a type of cell division giving rise to two identical diploid daughter cells; (1 mark)
4. (a) The time between implantation and birth. (1 mark)
- (b) Genital sores /painless sores;
Ulcers in affected areas; (2 marks)
- (c) It is the genetic constitution / make up of an organisms; (1 mark)
5. (a) Ability of a seed to germinate; (1 mark)
- (b) It softens the seed coat;
It hydrolyses stored food;
It is a medium for enzyme activity / activates enzymes / transports dissolved nutrients; (2 marks)

6. (a) In continuous growth, the animal grows all the way from fertilization till maturity;
e.g. height in humans; (2 marks)
- (b) Homozygosity is a condition in which the gene pairs are similar / same / identical while Heterozygosity is a condition in which the gene pairs are different. (2 marks)
7. (a) It is a theory on the origin of life; that suggests that life began from simple elements through complex compounds; (2 marks)
- (b) Meiosis leads to the formation of the gametes which are haploid; Meiosis ensures that the chromosomal constitution of offspring is the same as that of parents; (2 marks)
8. (a) Irritability - ability to detect and respond to changes in the environment; (1 mark)
- (b) Stimulus - A detectable change in the environment capable of producing a response; (1 mark)
- (c) Response - the change in activity by the organism due to a stimulus. (1 mark)
9. Semicircular canals;
Utriculus;
Sacculus; (3 marks)
10. Give the body its shape;
Protects delicate internal organs;
Provides surface for attachment of muscles;
Produces / manufacture blood cells;
Stores calcium and phosphate ions;
Enables/allows movement;
Gives body balance and posture;
Supports the body wight. (3 marks)

SECTION B : CHEMISTRY (33 marks)

- 11.** (a) Chlorine gas is slightly soluble in water $\sqrt{(1/2)}$ hence water rises to occupy $\sqrt{(1/2)}$ the space which was occupied by the dissolved gas. (1 mark)
- (b) (i) Turns red $\sqrt{(1/2)}$ then bleached $\sqrt{(1/2)}$
OR
decolourised / turned white $\sqrt{(1)}$ (1 mark)
- (ii) Chlorine gas dissolves in water to form acidic solution which turns blue to red. $\sqrt{(1)}$
The red litmus paper is further decolourised / bleached due to presence of hypochlorous acid or chloric (I) acid. $\sqrt{(1)}$
- (2 marks)
4 marks
- 12.** Formula mass of KNO_3 $\sqrt{(1/2)}$ = 39 + 14 + 3 (16)
= 53 + 48
= 101 g $\sqrt{(1/2)}$
- Number of moles in 30 g = 30/101 $\sqrt{(1/2)}$
= 0.2970 moles $\sqrt{(1/2)}$
- (2 marks)
2 marks
- 13.** (a) The balloon increased / expanded in size/volume. $\sqrt{(1)}$ (1 mark)
- (b) Rise in temperature increases kinetic energy of air molecules in the balloon hence increased collisions / bombardments against the walls of the balloon, $\sqrt{(1)}$ causing the balloon to expand. (2 marks)
- (2 marks)
3 marks
- 14.** (a) A process where a solvent is increased/water is added/increased $\sqrt{(1)}$ while the amount of solute remains constant in a given solution. (1 mark)
- (b) Formula mass of NaOH = 23 + 16 + 1 = 40 g
- Moles in 25cm³ = $\frac{0.2 \times 25}{1000}$ $\sqrt{(1/2)}$
- Mass in 25cm³ of NaOH = $\frac{0.2 \times 25}{1000} \times 40$ $\sqrt{(1/2)}$
= 0.2 g $\sqrt{(1/2)}$
- (2 marks)
3 marks

15. (a) Natural polymers
Cellulose / proteins / natural rubber/silk/wool. $\sqrt{(1/2)}$
- Uses
Used for paper manufacturing, textiles
- Rubber used in tyres, tubes $\sqrt{(1/2)}$
- Proteins / cellulose in textiles. (1 mark)
- (b) Advantages of synthetic polymer
- Cheap / long lasting / moulded into many shapes. $\sqrt{(1/2)}$
- Prevent / safe destruction of plants and animals.
- Some are heat resistant / good insulators / non corrosive to acids / alkalis.
(any one correct for $(1/2)$ mark)
- (ii) Disadvantage of synthetic polymer $\sqrt{(1/2)}$
- Pollutants to the environment $\sqrt{(1/2)}$
- Non-biodegradable
- Costly to recycle
- Burn producing poisonous gases. (1 mark)
(any one correct at $(1/2)$ mark)
2 marks
16. (a) Magnetite / Pyrite. $\sqrt{(1)}$
- OR
- FeCO_3 / FeS (1 mark)
- (b) (i) Coke /Carbon $\sqrt{(1)}$ (1 mark)
- (ii) Temperatures at the blast furnace are higher than the melting point of iron metal. $\sqrt{(1)}$ (1 mark)
- (c) Use of stainless steel
- Construction of bridges
- In ships
- Pipes, padlocks
- Nails
- Cutlery. (1 mark)
(any one correct for 1 mark)
- Reason: Stainless steel does not rust /is resistant to corrosion. (1 mark)
5 marks

17. (a) (i) The thistle funnel is above the reagents and allows the gas to escape \checkmark ($\frac{1}{2}$) /
OR
The thistle funnel doesn't have a tap. ($\frac{1}{2}$ mark)
- (ii) Use a dropping funnel / Dip the thistle funnel into the reagents. \checkmark ($\frac{1}{2}$)
($\frac{1}{2}$ mark)
- (b) (i) Used to dry the sulphur (IV) oxide/as a drying agent. \checkmark (1)
- (ii) The sulphur (IV) oxide gas would dissolve in the water, hence no gas would be collected in the gas jar.
- (c) Uses of sulphur (IV) oxide
- Manufacture of sulphuric (VI) acid \checkmark (1) / sulphuric acid/ $H_2SO_{4(l)}$
 - Bleaching agent
 - As a refrigerant
 - Fruit preservative
 - Infumigation/to kill germs (1 mark)
- (any one correct for 1 mark)
-
- 4 marks
18. (a) (i) Heat / enthalpy of solution \checkmark (1) (1 mark)
- (ii) The temperature would drop / boiling tube becomes cold. \checkmark (1) (1 mark)
- (iii) Endothermic reaction. \checkmark (1) (1 mark)
- (b)
- Heat value \checkmark (1)
 - Cost of fuel \checkmark (1)
 - Availability
 - Environmentally friendly/less pollution
 - Cost of transporting the fuel/toxicity of fuel (2 marks)
- (Any two correct for 2 marks)
-
- 5 marks
19. (a) But - 2 - ene \checkmark (1) (1 mark)
- (b) Addition reaction \checkmark (1) (1 mark)
-
- 2 marks
20. (a) As the temperature rises, the time taken for the cross to disappear decreases. \checkmark (1)
OR
as the temperature decreases, the time taken for the cross to disappear increases.
(1 mark)

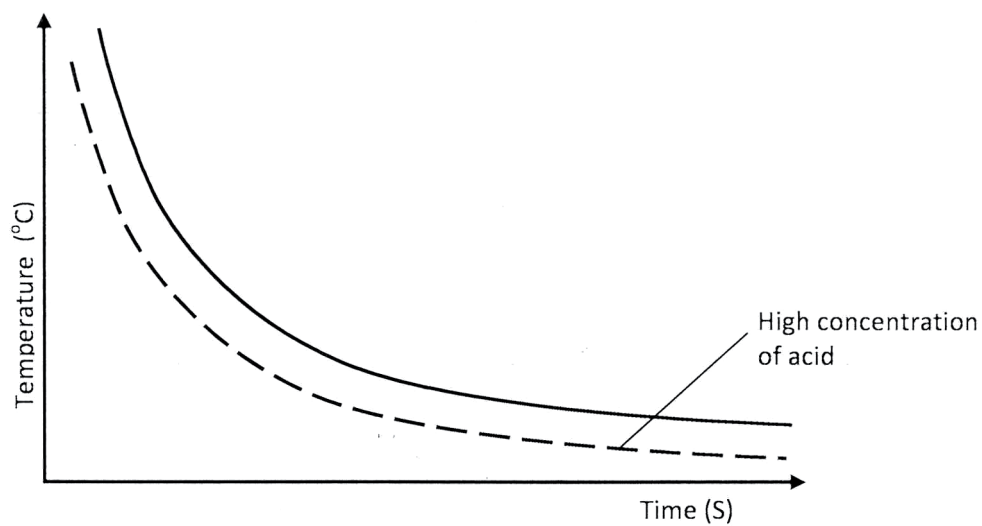
(b) The rate of reaction increases with rise in temperature. \surd (1)

OR

The rate of reaction decreases with decrease in temperature.

(1 mark)

(c) Diagram.

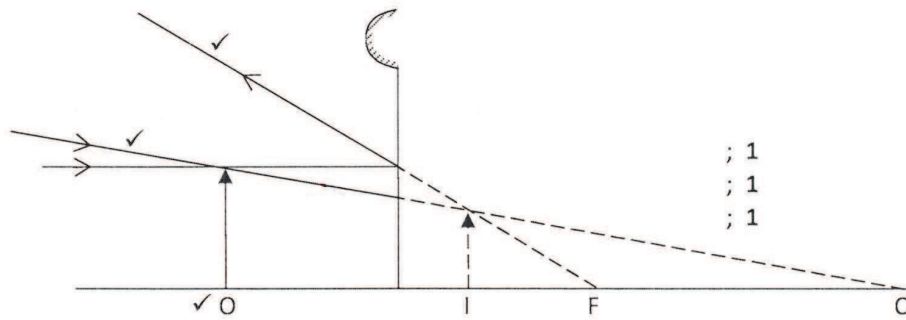


(1 mark)

3 marks

SECTION C : PHYSICS

21.

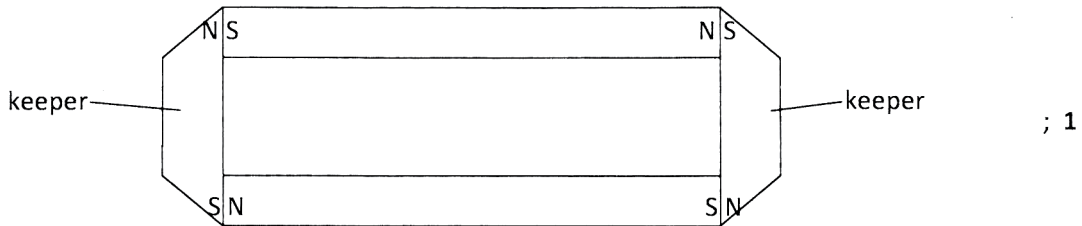


22. When the polythene rod is rubbed it acquires a negative charge; On bringing it near a negatively charged pith ball the two repel one another; 1
1

23. (a) Polarization / local action/polarization/accumulation of hydrogen bubbles around the cathode 1

(b) Polarization is minimised by adding depolarizer /pottasium dichromate/ local action/ dissolving of zinc/zinc being eaten / local action is minimised by coating zinc with mercury/amalgamation/using pure zinc. 1

24.



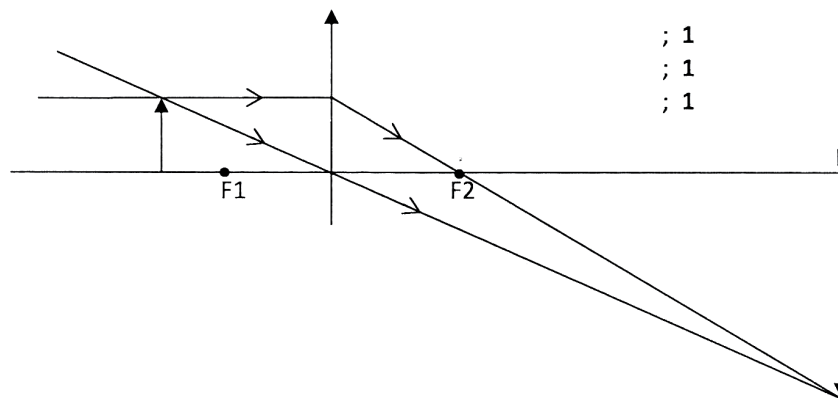
25. (a) ; 1 Perpendicular oscilation.

(b) ; 1 Parallel along direction of the wave.

26. - Temperature; 1
- Humidity; 1
- Density of air

27. Work done in moving a unit charge from one point to another; 1
28. (a) Circuit Y; 1
- (b) More current is flowing due to less; 1
resistance in the circuit hence a greater heating effect; 1
29. - Light rays from the bottom of the pool are refracted at the interface; 1
- The ray of light from the bottom is bend away from the normal; 1
- The image of the bottom appears raised; 1

30.



31. $a = 4 \text{ m}$; 1
32. $1500 \div 1000 = 1.5 \text{ kW}$; 1
Cost of electricity $= 1.5 \times 30 \times 8$; 1
 $= \text{Ksh.}360$; 1
33. (a) By using a magnetic or electric field; 1
- (b) - By increasing the grid potential so that/making the grid more negative; 1
fewer electrons reach the screen/more electrons are repelled; 1
34. - By raising the temperature of the semiconductor; 1
- By doping the semiconductor; 1
35. - Radiations have high energy; 1
which damages the body cells; 1