

**Instructions to the Students**

- Write only question numbers clearly outside the margin (1, 2, 3.i, 5.b, 4.c.ii, etc.).
- Do not write questions or any titles. (For ex. - Do not write **II. Answer the following**).
- After every answer, give a one-line space.
- For Multiple choice Questions - Both Option and Answer should be written.
- Bullet points & Sub-points should be written inside the margin.
- Do not fold / staple the paper.

Section A

1. **Statement 1:** The first generation of offspring always inherits completely new traits unrelated to their parents. [1]

Statement 2: Reproductive processes in animals do not show any visible variations among individuals.

- a) Both Statements 1 and 2 are true
- b) Both Statements 1 and 2 are false
- c) Statement 1 is true and Statement 2 is false
- d) Statement 1 is false and Statement 2 is true

Answer ⇌

- b) Both Statements 1 and 2 are false (1)

2. Paddy plants → Insects → Frog → Snake → Eagle [1]

If pesticides are sprayed on the paddy plants, which organism in this food chain is likely to have the highest concentration of harmful chemicals in its body?

- a) Paddy plants b) Insects c) Snake d) Eagle

Answer ⇌

- d) Eagle (1)

3. The sensitive plant responds to touch by folding its leaves. This movement does not involve growth. Which of the following best explains how the plant achieves this movement without muscles or nerves? [1]

- a) The plant generates muscular contractions in its stem to move leaves.
- b) The plant uses hormones to break down leaf cells at the point of contact.
- c) The plant changes water content in specific cells, causing them to shrink or swell, resulting in movement.
- d) The plant uses nervous tissue to transmit impulses rapidly, causing motion.

Answer ⇌

- c) The plant changes water content in specific cells, causing them to shrink or swell, resulting in movement. (1)

4. A 10-year-old child shows signs of stunted growth and underdevelopment compared to peers. Laboratory tests reveal underactivity of a specific endocrine gland. Which hormone is most likely deficient, and which gland secretes it? [1]
- a) Thyroxin – Thyroid gland b) Insulin – Pancreas
c) Growth hormone – Pituitary gland d) Testosterone – Testes

Answer ↻

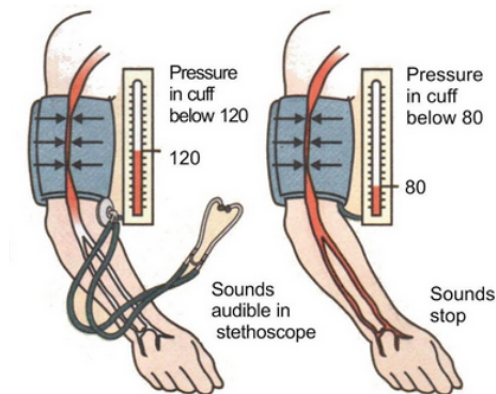
c) Growth hormone – Pituitary gland (1)

5. Which of the following statements about ozone (O_3) is correct? [1]
- a) Ozone is essential for human respiration at ground level
b) Ozone is a deadly poison at ground level but protects life at high altitudes
c) Ozone is a stable form of oxygen and exists in abundance at sea level
d) Ozone is used as a fuel in jet engines

Answer ↻

b) Ozone is a deadly poison at ground level but protects life at high altitudes (1)

6. What does a reading of 120/80 mm Hg represent. [1]



- a) 120 mm Hg is the diastolic pressure and 80 mm Hg is the systolic pressure
b) 120 mm Hg is the systolic pressure and 80 mm Hg is the diastolic pressure
c) 120 mm Hg is the pulse rate and 80 mm Hg is the blood sugar level
d) 120 mm Hg and 80 mm Hg are both average heart rates during rest

Answer ↻

b) 120 mm Hg is the systolic pressure and 80 mm Hg is the diastolic pressure (1)

7. The key difference in the nutritional process between autotrophs and heterotrophs lies in the initial form of their carbon source. Which of the following correctly identifies this difference? [1]
- a) Autotrophs derive carbon from organic acids, while heterotrophs use atmospheric nitrogen.
b) Autotrophs obtain carbon from dissolved carbonates, while heterotrophs use gaseous oxygen.
c) Autotrophs utilize carbon from simple inorganic CO_2 , while heterotrophs utilize carbon from complex organic substances.
d) Autotrophs absorb carbon from decaying matter, while heterotrophs use carbon fixed by bacteria.

Answer ↻

c) Autotrophs utilize carbon from simple inorganic CO_2 , while heterotrophs utilize carbon from complex organic substances. (1)

8. **Assertion (A):** Decomposers play a crucial role in breaking down dead plants and animals into simple inorganic substances. [1]
Reason (R): Without decomposers, dead organisms and waste would accumulate, and natural replenishment of soil nutrients would not occur.
 a) Both (A) and (R) are true and (R) is the correct explanation of (A)
 b) Both (A) and (R) are true but (R) is not the correct explanation of (A)
 c) (A) is correct but (R) is wrong
 d) (A) is wrong but (R) is correct
Answer ⇨
 a) Both (A) and (R) are true and (R) is the correct explanation of (A) (1)
9. **Assertion (A):** An offspring shows a recessive trait even if both parents do not visibly express it. [1]
Reason (R): A recessive trait (rr) is expressed only when two copies of the recessive allele are present.
 a) Both (A) and (R) are true and (R) is the correct explanation of (A)
 b) Both (A) and (R) are true but (R) is not the correct explanation of (A)
 c) (A) is correct but (R) is wrong
 d) (A) is wrong but (R) is correct
Answer ⇨
 a) Both (A) and (R) are true and (R) is the correct explanation of (A) (1)
10. About 100 acres of forest land was declared as Natural reserve park. The following organisms were predominant in the Natural reserve park: rabbit, frog, grass, fish, fox, water insects, zebra, peacock, snake, trees, bird, owl, insects, tiger, vulture, duck. Create a food web comprising two separate food chains with different producers by using the above data. [2]
Answer ⇨
 Tree food chain- tree, zebra, tiger /Any other food chain (0.5)
 Grassland food chain- grass, zebra, tiger / Any other food chain (0.5)
 Food web- Join the two food chains at a common point (zebra) (1)
11. After a leg injury, Ramesh noticed swelling in the injured area. His doctor said it was due to fluid buildup in the tissues. Using your understanding of the lymphatic system, explain why this swelling occurred and how it can be reduced naturally by the body. [2]
Answer ⇨
 The swelling occurred because excess tissue fluid (lymph) accumulated in the injured area due to damaged blood capillaries leaking plasma. Normally, the lymphatic system drains this fluid back into the bloodstream. (1)
 As Ramesh heals, the lymph vessels slowly absorb and return the fluid, reducing the swelling naturally. (1)

- 12.A. i) Farmers are advised to water plants in the early morning or evening. How is this related to transpiration and water transport? [2]
- ii) Why is transpiration important for tall trees, and what would happen if transpiration did not occur?

Answer ↪

- i) Watering in the early morning or evening reduces water loss due to lower temperatures and slower transpiration. This ensures that plants absorb more water effectively, helping in the upward transport of water and minerals through the xylem. (1)
- ii) Transpiration creates a suction pull that helps move water and minerals from roots to the top of tall trees. If transpiration did not occur, water would not reach the upper parts of the plant efficiently, leading to dehydration, wilting, and poor nutrient transport, ultimately affecting photosynthesis and growth. (1)

(OR)

- 12.B. Why do aquatic organisms need to breathe faster compared to terrestrial organisms? Explain the physiological reason behind this difference. [2]

Answer ↪

- Aquatic organisms breathe faster because the amount of dissolved oxygen in water is much lower than the oxygen available in air. (1)
- To extract enough oxygen for survival, they must increase the rate of water flow over their gills, which increases the rate of breathing. (1)

13. With neat labelled diagram explains the reflex arc in humans.

[3]

Answer ⇌

A reflex arc is the pathway through which nerve impulses travel during a reflex action. It involves a receptor, sensory neuron, spinal cord, motor neuron, and effector.

(1)

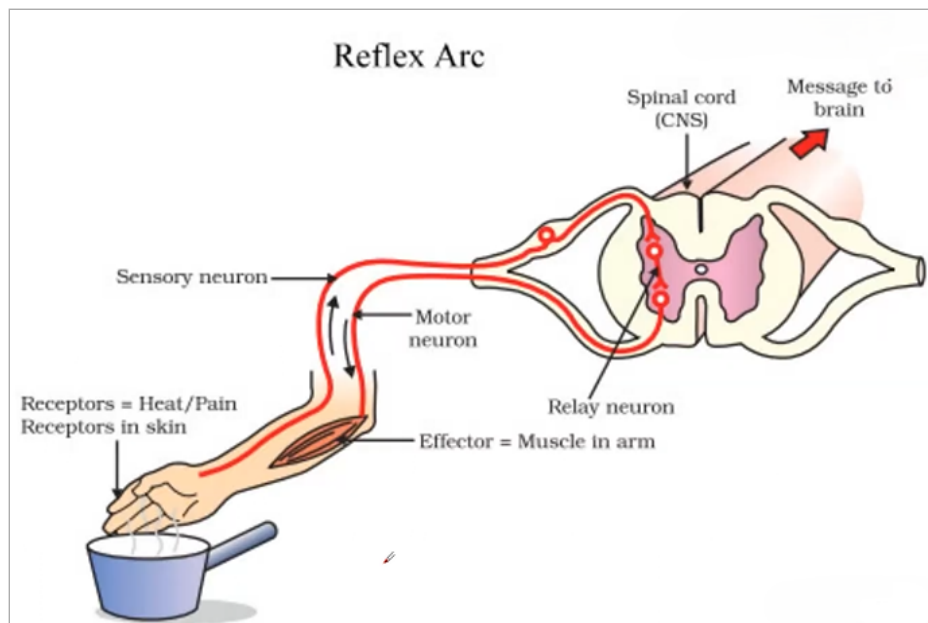


Diagram with labels

(2)

14. A pure pea plant having round (R), yellow (Y) seeds is crossed with another pure pea plant having wrinkled (r), green (y) seeds. Subsequently F1 progeny is self-pollinated to obtain F2 progeny.

[3]

- What do the seeds of F1 generation look like?
- Give the possible combinations of traits in seeds of F2 generation. Also give their ratio.
- State the reason of obtaining seeds of new combination of traits in F2 generation.

Answer ⇌

- Round, yellow (RRYY, RRYy, RrYY, RrYy) (1)
- round yellow : 9 round green : 3 wrinkled yellow : 3 wrinkled green : 1 (1)
- Traits are inherited independently/Independent assortment of the traits. (1)

15. Rahul has been drinking very little water throughout the day. He also sweats a lot due to outdoor sports. At night, he feels a strong burning sensation while urinating and notices he passes very little urine. His doctor says this may be due to low water intake, affecting his excretory system. The doctor explains that his kidneys filter blood, and when the body lacks water, the urine becomes more concentrated, possibly causing discomfort.

- 15.A. What role does the Bowman's capsule play in the process of urine formation?

[1]

Answer ⇌

The Bowman's capsule collects the filtrate from the blood capillaries in the kidney, starting the process of urine formation

(1)

by filtering out waste and useful substances like water, glucose, and salts.

- 15.B. Why does the urinary bladder not release urine constantly, even though urine is continuously formed? [1]

Answer ⇌

Because the urinary bladder is under nervous control and stores urine until a certain pressure triggers the urge to urinate. (1)

- 15.C. If Rahul continues this habit, what long-term effect might it have on his kidneys? [2]
Suggest one preventive step.

Answer ⇌

Long-term dehydration can lead to kidney stones or urinary tract infections due to poor waste removal. (1)

Drinking adequate water daily is a simple preventive step to support healthy kidney function. (1)

(OR)

- 15.D. Why does Rahul feel a burning sensation while passing urine, and how is it related to kidney function? [2]

Answer ⇌

Rahul's low water intake causes the kidneys to reabsorb more water, making his urine highly concentrated with waste. (1)

This concentrated urine can irritate the urinary tract, causing a burning sensation. It shows how kidneys adjust water reabsorption based on the body's needs (1)

- 16.A.i. A student observed a black powdery growth on a slice of bread kept in a damp place. [2]
Under a microscope, she saw thin thread-like structures and round black blobs on their tips. Identify the organism and explain how these round structures help the organism survive and reproduce under unfavorable conditions.

Answer ⇌

The organism is Rhizopus (bread mould). (1)

The round black structures are sporangia, which contain spores. These spores have thick protective walls that help them survive unfavorable conditions such as dryness or lack of food. (0.5)

When conditions become favorable (moist surface, warmth), the spores germinate and grow into new Rhizopus individuals. (0.5)

- 16.A.ii. What is regeneration? Give one example of an organism that shows this process and one organism that does not. Why does regeneration not occur in the latter? [3]

Answer ⇌

- 1) Regeneration: The ability to give rise to new individual organism from their body parts (1)
- 2) Organism show regeneration: Planaria /Hydra (0.5)
- 3) Organism does not show regeneration: Spirogyra (0.5)
- 4) Because it does not have specialised cells which proliferate to make new cell types and tissues. (1)

(OR)

- 16.B.i. i) Why is the placenta considered a life-support system for the embryo? [3]
ii) Predict what will happen if the embryo is not able to implant in the uterus.
iii) If the oviducts of a woman are surgically blocked, how will it affect reproduction?

Answer ⇌

- i) The placenta provides oxygen and nutrients from the mother's blood to the embryo and also removes waste products. It acts as a connection between mother and embryo, hence a life-support system. (1)
- ii) If the embryo fails to implant in the uterus, it will not get nutrition and protection. The embryo will disintegrate, and pregnancy will not occur. (1)
- iii) If the oviducts are blocked, the egg released by the ovary cannot meet the sperm. Fertilisation will not take place, so pregnancy is prevented. (1)

- 16.B.ii. Why does the lining of the uterus break down and come out as blood and mucous every month in females? [2]

Answer ⇌

- The lining of the uterus becomes thick and spongy each month to prepare for a fertilised egg. If fertilisation does not occur, the egg dies within a day, and the thick uterine lining is no longer needed. (1)
- As a result, the lining breaks down and comes out through the vagina as blood and mucous. This process is called menstruation and occurs roughly once every month. (1)

Section B

17. A student burns three different substances: naphthalene, camphor, and ethanol in a lab activity. She observes the following: [1]

- Naphthalene and camphor burn with yellow, sooty flames.
- Ethanol burns with a clean, blue flame.
- A black residue is found on a metal plate held above the flame of naphthalene.

Which of the following best explains these observations?

- a) Ethanol is a saturated compound and undergoes complete combustion, producing a clean flame.
- b) Naphthalene and camphor are saturated hydrocarbons, so they give sooty flames.
- c) The yellow flame in naphthalene is due to excess oxygen in the combustion reaction.
- d) Ethanol contains sulphur, which helps it burn more cleanly.

Answer ⇌

- a) Ethanol is a saturated compound and undergoes complete combustion, producing a clean flame. (1)

18. Match the following: [1]

Column A	Column B
A. Gallium	i) Conduct electricity despite being non-metal
B. Iodine	ii) Melt at or near room temperature
C. Diamond	iii) Hardest natural substance
D. Graphite	iv) Lustrous non-metal

- a) A–ii, B–iv, C–iii, D–i
- b) A–i, B–ii, C–iv, D–iii
- c) A–iii, B–i, C–ii, D–iv
- d) A–iv, B–iii, C–i, D–ii

Answer ⇌

- a) A–ii, B–iv, C–iii, D–i (1)

19. When calcium reacts with water, bubbles stick to the surface of the metal, and it floats. [1]
The bubbles are of:

- a) Carbon dioxide
- b) Hydrogen gas
- c) Oxygen gas
- d) Water vapour

Answer ⇌

- b) Hydrogen gas (1)

20. What does the "10H₂O" in the chemical formula Na₂CO₃·10H₂O represent? [1]

- a) 10 molecules of water added to sodium carbonate to make it wet
- b) 10 molecules of water of crystallization in washing soda
- c) Water used to dissolve sodium carbonate in a solution
- d) Impurities present in sodium carbonate crystals

Answer ⇌

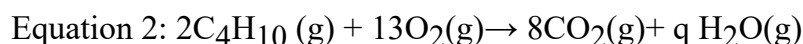
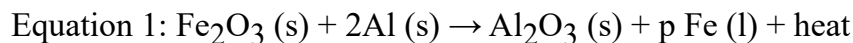
- b) 10 molecules of water of crystallization in washing soda (1)

21. Which of the following statements about sodium chloride is correct? [1]
- a) It is an acidic salt formed from hydrochloric acid and sodium hydroxide.
 - b) It is commonly found only in laboratories.
 - c) It is a neutral salt that can be obtained from seawater and rock deposits.
 - d) It was discovered during the Dandi March.

Answer ⇌

c) It is a neutral salt that can be obtained from seawater and rock deposits. (1)

22. Which of the following equations represent redox reactions and what are the values for 'p' and 'q' in these equations? [1]



- a) Only equation 1 is a redox reaction, $p = 1$ and $q = 3$
- b) Both equations 1 and 2 are redox reactions, $p = 2$ and $q = 4$
- c) Only equation 2 is a redox reaction, $p = 2$ and $q = 10$
- d) Both equations 1 and 2 are redox reactions, $p = 2$ and $q = 10$

Answer ⇌

d) Both equations 1 and 2 are redox reactions, $p = 2$ and $q = 10$ (1)

23. The most common method of extraction of metals from their oxide ores is: [1]
- a) Reduction with carbon
 - b) Reduction with hydrogen
 - c) Reduction with aluminium
 - d) Electrolytic reduction

Answer ⇌

a) Reduction with carbon (1)

24. **Assertion (A):** Detergents form insoluble scum with calcium and magnesium ions in hard water. [1]

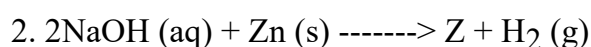
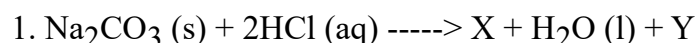
Reason (R): The charged ends of detergent molecules do not form insoluble salts with hard-water ions.

- a) Both (A) and (R) are true and (R) is the correct explanation of (A)
- b) Both (A) and (R) are true but (R) is not the correct explanation of (A)
- c) (A) is correct but (R) is wrong
- d) (A) is wrong but (R) is correct

Answer ⇌

d) (A) is wrong but (R) is correct (1)

25. Observe the following reactions and identify X, Y, and Z: [2]



Answer ⇌

X = 2NaCl (sodium chloride) (0.5)

Y = CO_2 (carbon dioxide) (0.5)

Z = Na_2ZnO_2 (sodium zincate) (1)

26.A. Compare in tabular form the reactivities of the following metals with cold and hot water: [3]

- i) Sodium
- ii) Calcium
- iii) Magnesium

Answer ↻

Metal	Reactivity with Cold Water	Reactivity with Hot Water
Sodium (Na)	Reacts very vigorously with cold water, producing sodium hydroxide (NaOH) and hydrogen gas (H ₂). The reaction is exothermic and can cause the hydrogen to ignite.	Reacts similarly with hot water, with increased intensity.
Reaction:	$2\text{Na} + 2\text{H}_2\text{O} \rightarrow 2\text{NaOH} + \text{H}_2 \uparrow$	$2\text{Na} + 2\text{H}_2\text{O} \rightarrow 2\text{NaOH} + \text{H}_2 \uparrow$
Calcium (Ca)	Reacts moderately with cold water, forming calcium hydroxide (Ca(OH) ₂) and hydrogen gas (H ₂). The reaction is slower compared to sodium.	Reacts more vigorously with hot water, with faster hydrogen gas evolution.
Reaction:	$\text{Ca} + 2\text{H}_2\text{O} \rightarrow \text{Ca(OH)}_2 + \text{H}_2 \uparrow$	$\text{Ca} + 2\text{H}_2\text{O} \rightarrow \text{Ca(OH)}_2 + \text{H}_2 \uparrow$
Magnesium (Mg)	Reacts very slowly with cold water, producing magnesium hydroxide (Mg(OH) ₂) and hydrogen gas (H ₂). The reaction is minimal at room temperature.	Reacts more noticeably with hot water, producing Mg(OH) ₂ and H ₂ , but still slower than sodium or calcium.
Reaction:	$\text{Mg} + 2\text{H}_2\text{O} \rightarrow \text{Mg(OH)}_2 + \text{H}_2 \uparrow$	$\text{Mg} + 2\text{H}_2\text{O} \rightarrow \text{Mg(OH)}_2 + \text{H}_2 \uparrow$

i (1)

ii (1)

iii (1)

(OR)

26.B. Magnesium, aluminium, zinc, and iron all react with dilute hydrochloric acid but at different rates. [3]

- i) Arrange these metals in decreasing order of reactivity based on their reaction with dilute HCl.
- ii) Write balanced chemical equations for the reactions of magnesium and zinc with dilute HCl.
- iii) Explain why copper does not react with dilute hydrochloric acid.

Answer ↻

i) Reactivity order (decreasing): Magnesium > Aluminium > Zinc > Iron (1)

ii) $\text{Mg(s)} + 2\text{HCl(aq)} \rightarrow \text{MgCl}_2\text{(aq)} + \text{H}_2\text{(g)}$ (0.5)

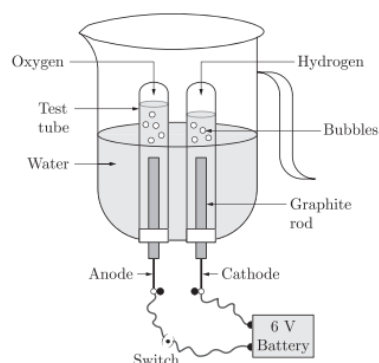
$\text{Zn(s)} + 2\text{HCl(aq)} \rightarrow \text{ZnCl}_2\text{(aq)} + \text{H}_2\text{(g)}$ (0.5)

iii) Because it is less reactive than hydrogen and cannot displace hydrogen from the acid. (1)

27. Study the figure given below and answer the following questions :

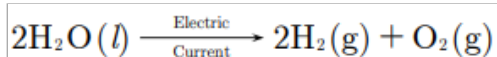
[3]

- Name the process depicted in the diagram.
- Write the composition of the anode and the cathode.
- Write the balanced chemical equation of the reaction taking place in this case.
- The reaction does not take place if a few drops of dilute sulphuric acid are not added to water. Why?



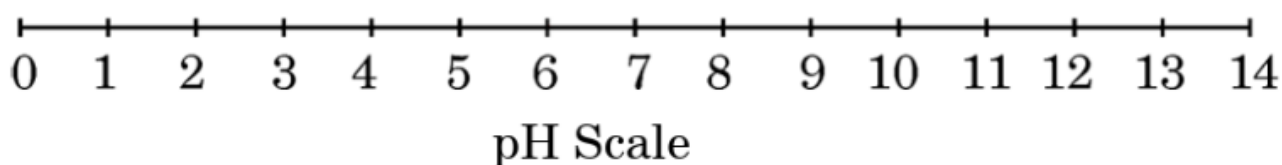
Answer ➡

- Electrolytic decomposition of water/electrolysis of water (0.5)
- cathode- hydrogen ; anode -oxygen (1)
- Because pure water is a poor conductor of electricity (0.5)



Proper equation with Electric current (1)

28. Acid-base indicators can be used to distinguish between an acid and a base. Universal indicator, a mixture of several indicators, shows different colours at different concentrations of acids and bases, thereby indicating their pH on the pH scale of 0 – 14. The pH of a solution is measured by pH paper, which is a paper impregnated with a universal indicator.



- 28.A. Solution P is a strong acid while solution Q is a strong base. On the pH scale, where would you place the solutions P and Q ?

[1]

Answer ➡

- P – pH 0 to 4 (0.5)
- Q – pH 12 to 14 (0.5)

28.B. A solution has a pH of 7. Name a compound you would use to [1]

(i) increase its pH, and

(ii) decrease its pH.

Answer ⇌

(i) By adding sodium hydroxide (0.5)

(ii) By adding hydrochloric acid (0.5)

Any valid response (1)

28.C. When the pH of a solution is decreased from 4 to 2, what effect does it produce on its hydronium ion concentration ? State the colour change shown by the pH paper. [2]

Answer ⇌

Hydronium ion ($\text{H}_3\text{O}^+/\text{H}^+$) ion concentration increases. (1)

Colour will change from yellow/orange to red/pink (1)

(OR)

28.D. A person is feeling pain and irritation in the stomach due to indigestion. What could be the pH of the fluid in the stomach ? Write the common name of the medicines people use for remedy. Give the chemical name of “milk of magnesia” often used for this purpose. [2]

Answer ⇌

low pH/ between 1 to 3 (1)

by the use of antacids/milk of magnesia/sodium hydrogen carbonate (0.5)

Magnesium hydroxide/ $\text{Mg}(\text{OH})_2$ (0.5)

29.A.i. Write chemical equation to show what happens when ethanol : [3]

(a) burns in oxygen/air.

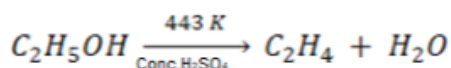
(b) is heated at 443 K in excess conc. H_2SO_4 .

(c) reacts with acidified potassium dichromate.

Answer ⇌



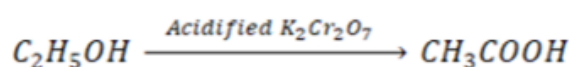
(II)



(a) (1)

(b) (1)

(III)



(c) (1)

29.A.ii. Write in tabular form the structural formula and functional group present in following compounds?

[2]

(a) Ethanol

(b) Ethanoic acid

Answer ↪

Compound	Structural Formula	Functional Group
Ethanol	$ \begin{array}{c} \text{H} \quad \text{H} \\ \quad \\ \text{H}-\text{C}-\text{C}-\text{O}-\text{H} \\ \quad \\ \text{H} \quad \text{H} \end{array} $	Alcohol (-OH)
Ethanoic acid	$ \begin{array}{c} \text{H} \quad \text{O} \\ \quad \\ \text{H}-\text{C}-\text{C}-\text{O}-\text{H} \\ \\ \text{H} \end{array} $	Carboxylic acid (-COOH)

ethanol (1)

Ethanoic acid (1)

(OR)

29.B.i. What are hydrocarbons? Distinguish alkanes from alkenes and each of them from alkynes, giving one example of each.

[2]

Answer ↪

What are hydrocarbons

Hydrocarbons are organic compounds composed only of carbon (C) and hydrogen (H) atoms. They are the simplest type of organic compounds and form the basis for all other organic molecules. (0.5)

Alkanes

General formula = $\text{C}_n\text{H}_{2n+2}$, Only single bonds (C-C), Eg: Methane (CH_4), Ethane (C_2H_6) (0.5)

Any 2 valid response (1)

Alkenes

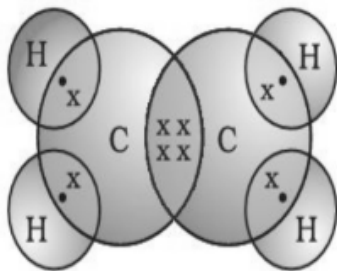
General formula = C_nH_{2n} , At least one double bond (C=C), eg: Ethene (C_2H_4) (0.5)

Any 1 valid response (0.5)

Alkynes

General formula = $\text{C}_n\text{H}_{2n-2}$, At least one triple bond (C≡C), eg: Ethyne (C_2H_2) (0.5)

Any 1 valid response (0.5)



- i) Identify the Hydrocarbon and write its name and molecular formula
- ii) Draw its bond structure.
- iii) Is it saturated or unsaturated compound? Justify.

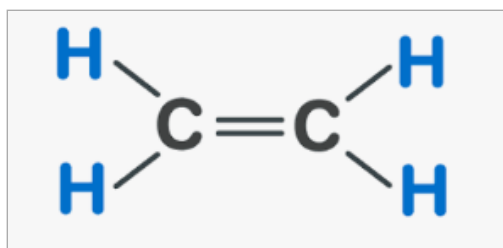
Answer ↪

i) This compound is Ethene

(0.5)

Molecular formula: C_2H_4 .

(0.5)



ii) Diagram

(1)

Answer ↪

iii) Ethene is an unsaturated hydrocarbon.

(0.5)

Justification: It contains a double bond between the carbon atoms, which means it does not have the maximum number of hydrogen atoms possible (saturation means all carbon-carbon bonds are single).

(0.5)

Section C

30. Consider the following statements regarding eye donation:

[1]

- I. Individuals suffering from diabetes or hypertension are generally not eligible to donate their eyes.
- II. The eye removal procedure is lengthy, often leading to disfigurement of the donor's face.
- III. A single pair of donated eyes has the potential to restore vision to up to four corneal blind individuals.
- IV. For successful donation, eyes must be removed within 4-6 hours after death.

Which of the above statement are correct.

- a) I and II only b) II and III only c) III and IV only d) I, III and IV

Answer ↪

c) III and IV only

(1)

31. In the equation $\frac{\sin i}{\sin r} = \text{constant}$, what is this constant called? [1]
- Critical angle
 - Index of refraction of the first medium
 - The refractive index of the second medium
 - The speed of light ratio

Answer ➞

- c) The refractive index of the second medium (1)

32. **Assertion (A):** The formula for the focal length of a spherical mirror depends on the object distance, image distance, and focal length. [1]

Reason (R): The formula is used to determine the magnification of lenses.

- Both (A) and (R) are true and (R) is the correct explanation of (A)
- Both (A) and (R) are true but (R) is not the correct explanation of (A)
- (A) is correct but (R) is wrong
- (A) is wrong but (R) is correct

Answer ➞

- c) (A) is correct but (R) is wrong (1)

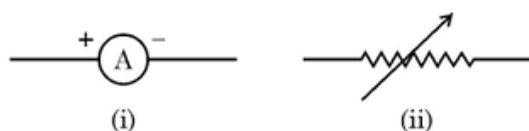
33. A lens has a power of -2.5 D. [2]
- What type of lens is it?
 - Calculate its focal length in metres.

Answer ➞

- i) The lens is a concave lens (1)

ii) $f = \frac{1}{P} = \frac{1}{-2.5} = -0.4m$ (1)

- 34.A. What do the symbols given below represent in an electric circuit ? [2]
- Write one function of each.



Answer ➞

- (i) Ammeter. (0.5)

Ammeter is used to measure electric current (0.5)

- (ii) Rheostat or variable resistance (0.5)

Rheostat is used in a circuit to vary the resistance of the circuit (0.5)

(OR)

- 34.B. A wire of resistance $R = 10 \Omega$ is connected to a battery of voltage $V = 12 \text{ V}$. If the same wire is stretched to double its original length without changing its volume, calculate the new current flowing through the wire when connected to the same battery. [2]

Answer ↪

$$\text{New resistance} = R' = P \frac{l'}{A'} = P \frac{2l}{\frac{A}{2}} = 4R \quad (1)$$

$$R' = 4 \times 10 = 40 \text{ ohm} \quad (1)$$

$$I = V/R' = 12/40 = 0.3 \text{ A} \quad (1)$$

35. Explain the purpose of a plug key (switch) in an electric circuit and distinguish between open and closed states with their symbols. [3]

Answer ↪

A plug key or switch is used to control the flow of current by opening or closing the circuit. (1)

When the switch is open, the circuit is incomplete, and current does not flow. (0.5)

When the switch is closed, the circuit is complete, and current flows. (0.5)

Plug key or switch (open)	$\text{---}(\text{---})\text{---}$
Plug key or switch (closed)	$\text{---}(\bullet)\text{---}$

Open state (0.5)

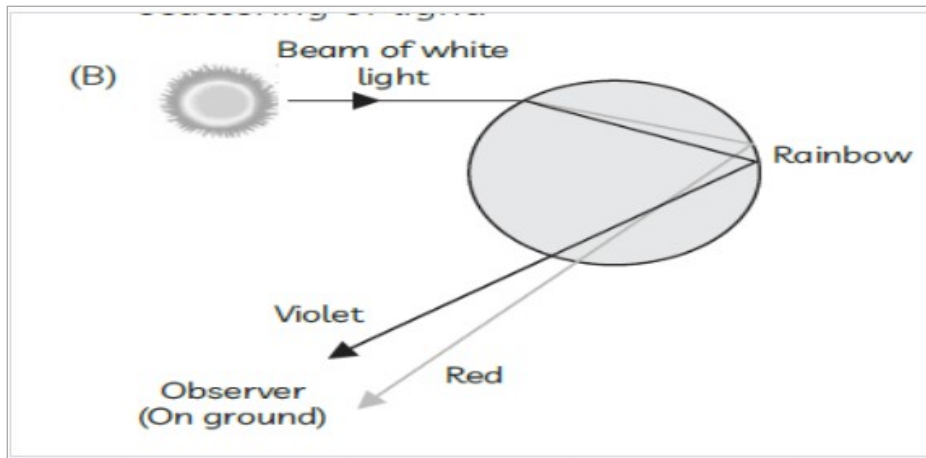
Closed state (0.5)

36. Mars's atmosphere is composed mainly of carbon dioxide, nitrogen, argon, negligible amounts of oxygen, water vapour and methane. [3]
- i) Using the information given in the sentence above and based on the knowledge about how rainbows are formed on Earth, explain why rainbow formation is impossible on Mars.
- ii) Nitin saw a rainbow on a sunny day when he looked at the sky through a waterfall. Draw a diagram of rainbow which he would have seen

Answer ↪

Mars's atmosphere is composed mainly of carbon dioxide, nitrogen, argon, negligible amounts of oxygen, water vapour and methane. (1.5)

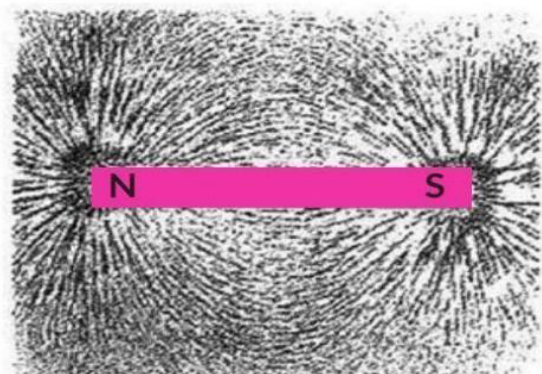
There is no enough water vapour in the atmosphere to cause scattering of light.



Rainbow formation (1.5)

Valid Diagram response (1.5)

37. Study the diagram given below and answer the questions that follow: [3]
- i) Why do the iron filings arrange in such a pattern?
 - ii) What does this pattern demonstrate?
 - iii) Why do the iron filings near the bar magnet seem to align in the shape of closed curves?



Answer ↪

They are influenced by the magnetic field of the bar magnet. (1)

This pattern demonstrates the magnetic field lines around the bar magnet. (1)

The iron filings align in closed curves because magnetic field lines are continuous loops. They start at the magnet's north pole, travel through the surrounding space, and return to the south pole, forming closed loops. (1)

38. Paheli was curious about how magnifying glasses and spectacles work. She observed that the glass used in them was thicker in the middle and curved. Her teacher explained that such glasses are called lenses, which are made of transparent materials and are bound by at least one spherical surface. Lenses have important parts like the optical centre, principal axis, centres of curvature (C_1 and C_2), and aperture. When light passes through a lens, its direction changes due to refraction, depending on the shape and material of the lens.

- 38.A. Why is a concave lens called a diverging lens? [1]

Answer ↪

Because it spreads out (diverges) parallel rays of light away from the principal axis after refraction. (1)

- 38.B. Which property of a convex lens allows it to be used in devices like magnifying glasses and microscopes? [1]

Answer ↪

A convex lens converges parallel light rays to a focal point, which helps in magnifying images, making it suitable for magnifying glasses and microscopes. (1)

38.C. How does a convex lens differ from a concave lens in terms of shape and behavior with light? [2]

Answer ⇨

A convex lens is thicker at the center and thinner at the edges/bulges outwards. It converges parallel rays of light to a point, making it a converging lens. (1)

A concave lens is thinner at the center and thicker at the edges/curves inwards. It diverges parallel rays of light, so it is known as a diverging lens. (1)

(OR)

38.D. Why does a concave lens make objects appear smaller, while a convex lens can make them appear larger? [2]

Answer ⇨

A concave lens diverges light, causing the image to form between the optical centre and the focus, making it diminished. (1)

A convex lens converges light, which can create a magnified image if the object is within the focal length. (1)

39.A.i. A house hold uses the following electric appliance; [3]

(i) Refrigerator of rating 400w for ten hour each day.

(ii) Two electric fans of rating 80w each for twelve hours each day.

(iii) Six electric tubes of rating 18w each for 6hours each day.

Calculate the electricity bill of the household for the month of June if the cost per unit of electric energy is Rs. 3.00.

Answer ⇨

i) Electricity consumed by refrigerator in one day = power x time = $400 \text{ W} \times 10 \text{ h} = 4000 \text{ Wh} = 4 \text{ kwh}$ (0.5)

ii) Electricity consumed by 2 electric fans in 1 day = $2 \times 80 \text{ W} \times 12 \text{ h} = 1920 \text{ Wh} = 1.92 \text{ kwh}$ (0.5)

iii) Electricity consumed by 6 electric tubes in 1 day = $6 \times 18 \text{ W} \times 6 \text{ h} = 648 \text{ wh} = 0.648 \text{ kwh}$ (0.5)

Total energy consumed in one day = $4 + 1.92 + 0.648 = 6.568 \text{ kwh}$ (0.5)

Total energy consumed in one month = $6.568 \times 30 = 197.04 \text{ kwh}$ (0.5)

Cost of 1 unit (kwh) = Rs 3.00 Cost of 197.04 kwh = 197.04 x 3 Electricity bill = Rs 591.12 (0.5)

- 39.A.ii. An electric kettle is rated 750 W; 220 V. Can this kettle be used in a circuit which has a fuse of current rating 3 A ? Give reason for your answer. [2]

Answer ➡

$$I = P/V \quad (0.5)$$

$$750/220 = 3.4 \text{ A} \quad (0.5)$$

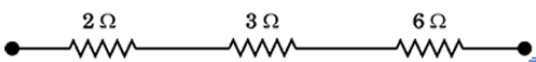
No, this kettle cannot be used. (0.5)

The current drawn by the kettle is more than the fuse rating (3A). So, the fuse will melt and break the circuit. (0.5)

(OR)

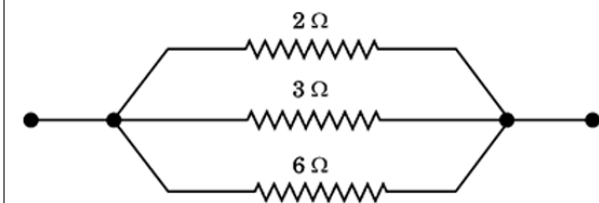
- 39.B.i. Three resistors of 2Ω , 3Ω , and 6Ω are connected in (i) series, and (ii) parallel. Draw the arrangements of the resistors and find the equivalent resistance of each arrangement [3]

Answer ➡

(i)	
	1/2
In series, $R_s = R_1 + R_2 + R_3$	1/2
$= (2 + 3 + 6) \Omega = 11 \Omega$	1/2

Give mark as mentioned

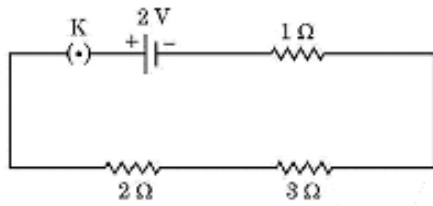
(1.5)

(ii)	
	1/2
In parallel, $\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$	1/2
$= \frac{1}{2} + \frac{1}{3} + \frac{1}{6}$	
$= \frac{3+2+1}{6}$	
$R_p = 1.0 \Omega$	1/2

Give mark as mentioned

(1.5)

- 39.B.ii. Use Ohm's law to determine the potential difference across the 3Ω resistor in the circuit [2]
shown in the following diagram when key is closed.



Answer 

$$1) R_s = R_1 + R_2 + R_3 \quad (0.5)$$

$$2) 1 + 2 + 3 = 6\Omega \quad (0.5)$$

$$3) I = V/R \quad (0.5)$$

$$4) I = \frac{2}{6} = \frac{1}{3}A \quad (0.5)$$

$$5) V = IR = \frac{1}{3} \times 3 = 1V \quad (0.5)$$