SAMPLE PAPER TEST 01 FOR BOARD EXAM 2025

SUBJECT: SCIENCE **MAX. MARKS: 80**
CLASS : X **DURATION: 3 HRS**

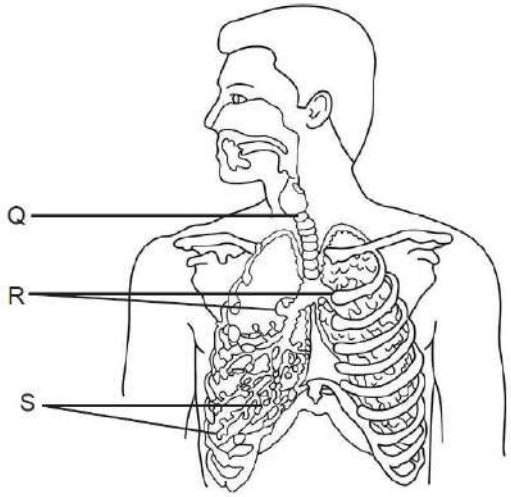
General Instruction:

1. This Question Paper has 5 Sections A-E.
2. **Section A** has 20 MCQs carrying 1 mark each.
3. **Section B** has 5 questions carrying 02 marks each.
4. **Section C** has 6 questions carrying 03 marks each.
5. **Section D** has 4 questions carrying 05 marks each.
6. **Section E** has 3 case based integrated units of assessment (04 marks each) with sub-parts of the values of 1, 1 and 2 marks each respectively.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2marks questions of Section E
8. Draw neat figures wherever required. Take π =22/7 wherever required if not stated.

SECTION – A

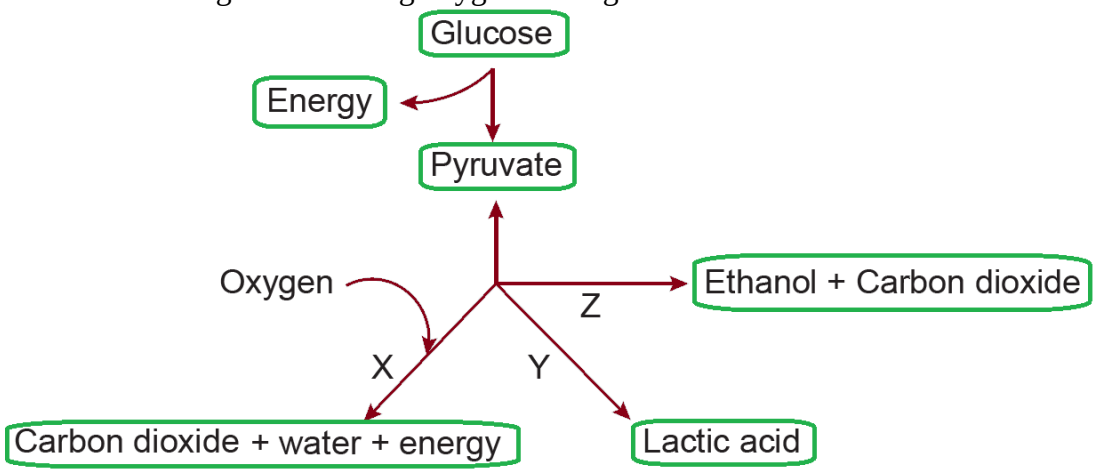
Questions 1 to 20 carry 1 mark each.

1. Identify correctly the labelled parts Q, R and S in figure given below:



(a) Q-Bronchus, R-Bronchiole, S-Trachea
(b) Q-Bronchiole, R-Trachea, S-Bronchus
(c) Q-Trachea, R-Bronchus, S-Alveolus
(d) Q-Trachea, R-Bronchus, S-Bronchiole

2. Which of the following occurs during oxygen shortage in muscle cells?



(a) Only X (b) Only Y (c) Only Z (d) Any of them - X, Y or Z

3. A few drops of turmeric solution are added to a colourless liquid. If the liquid becomes red, the liquid may be :
(a) Hydrochloric acid (b) Distilled water (c) Ammonium hydroxide (d) Lemon juice

4. Which of the following is oxidation reaction?
(a) $Zn \rightarrow Zn^{2+} + 2e^-$ (b) $Zn^{2+} + 2e^- \rightarrow Zn(s)$
(c) $Fe^{3+} + e^- \rightarrow Fe^{2+}$ (d) $Ag^+ + e^- \rightarrow Ag(s)$

5. In the following case(s) the combination reaction occurs in :
I. $CuO + H_2 \xrightarrow{\Delta}$
II. $ZnO + C \longrightarrow$
III. $Na + O_2 \longrightarrow$
IV. $CH_4 + O_2 \longrightarrow$
(a) Only III (b) Only IV (c) II and III (d) I, III and IV

6. A hydrocarbon which contains two C – C single bonds and one C ≡ C triple bond is :
(a) Ethyne (b) Propyne (c) Butyne (d) Benzene

7. While cooking, if the bottom of the vessel is getting blackened on the outside, it means that
(a) the food is not cooked completely
(b) the fuel is not burning completely
(c) the fuel is wet
(d) the fuel is burning completely

8. Anand took four colourless solutions P, Q, R and S, and performed the following tests. What is the definite conclusion that Anand can reach?

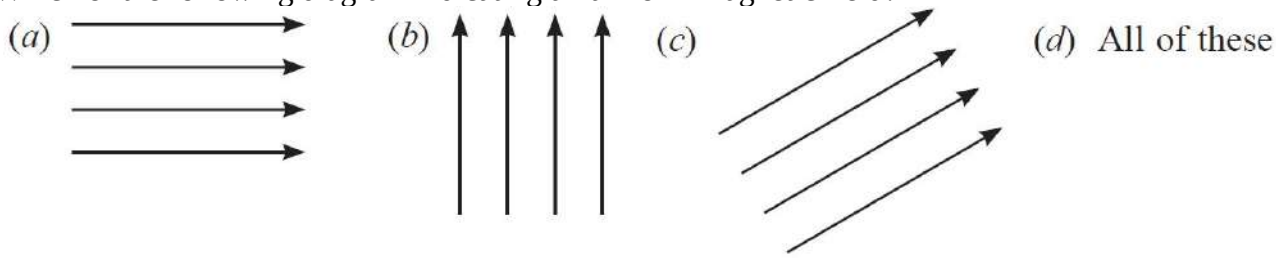
	Solution P	**Solution Q**	**Solution R**	**Solution S**
With methyl orange	No change in colour	Turns red	No change in colour	No change in colour
With phenolphthalein	No change in colour	No change in colour	No change in colour	Turns pink
With red litmus	No change in colour	No change in colour	No change in colour	Turns litmus blue
With blue litmus	No change in colour	Turns litmus red	No change in colour	No change in colour

(a) Both P and S are salt solutions. (b) Both Q and S are basic solutions.
(c) Both Q and R are salt solutions. (d) Both P and R are neutral solutions.

9. Which of the following is/are natural indicator(s)?
(a) Hydrangea (b) Petunia (c) Geranium (d) All of these

10. The image formed by a concave mirror of focal length 50 cm is real and of magnification – 1. In this case the distance between the object from its own image is :
(a) 50 cm (b) 100 cm (c) 200 cm (d) Zero

11. Which of the following diagram indicating an uniform magnetic field?



12. Four cells each of emf 1.5V and the internal resistance 0.5 Ω are connected in series but one cell is wrongly connected as shown in figure.

The net voltage and net internal resistance between A and B is

(a) 6 V, 2 Ω (b) 4.5 V, 1.5 Ω (c) 3V, 1 Ω (d) 3V, 2 Ω

13. Overloading is due to

(a) Insulation of wire is damaged (b) fault in the appliances

(c) accidental hike in supply voltage (d) All of the above

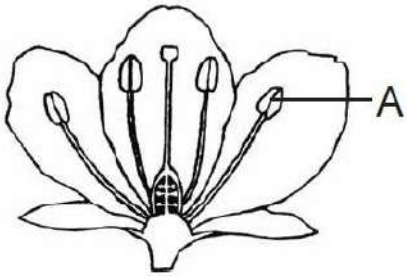
14. Differences shown by the individuals of a species forms basis of

(a) heredity (b) variation (c) mutation (d) crossing over

15. The leaves of Mimosa are sensitive to

(a) light (b) smell (c) touch (d) heat

16. Identify part A from given options in the figure.



(a) Anther of stamen (b) Style (c) Ovule (d) Ovary

DIRECTION: In the question number 17 and 20, a statement of **Assertion (A)** is followed by a statement of **Reason (R)**.

Choose the correct option

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A)

(b) Both assertion (A) and reason (R) are true and reason (R) is not the correct explanation of assertion (A)

(c) Assertion (A) is true but reason (R) is false.

(d) Assertion (A) is false but reason (R) is true.

Ans: (b) Both assertion (A) and reason (R) are true and reason (R) is not the correct explanation of assertion (A)

17. Assertion(A): The sex of a child in human beings will be determined by the type of chromosome he/she inherits from the father.

Reason(R): A child who inherits 'X' chromosome from his father would be a girl (XX), while a child who inherits a 'Y' chromosome from the father would be a boy (XY).

18. Assertion (A): A white coloured powder is used by doctors for supporting fractured bone. It is called as plaster of paris.

Reason (R): It is also called as gypsum.

19. Assertion (A): Human heart does not allow mixing of oxygen rich blood with carbon dioxide rich blood.

Reason (R): Human heart has different chambers

20. Assertion (A): The commercial unit of electric energy is kilowatt hour (kWh).

Reason (R): 1 kWh = 10^6 joule (J)

SECTION – B

Questions 21 to 26 carry 2 marks each.

21. Identify the substances oxidised and the substances reduced in the following reactions.

(i) $ZnO(s) + C(s) \rightarrow Zn + CO(g)$

(ii) $4Na(s) + O_2(g) \rightarrow 2Na_2O(s)$

OR

Which among the following changes are exothermic or endothermic in nature?

(i) Decomposition of ferrous sulphate

(ii) Dilution of sulphuric acid

(iii) Dissolution of sodium hydroxide in water

(iv) Dissolution of ammonium chloride in water

22. (a) Explain any three directional movements in plants.

(b) How brain and spinal cord are protected in human?

23. List two ways due to which variations arise in a population. State the importance of variation.

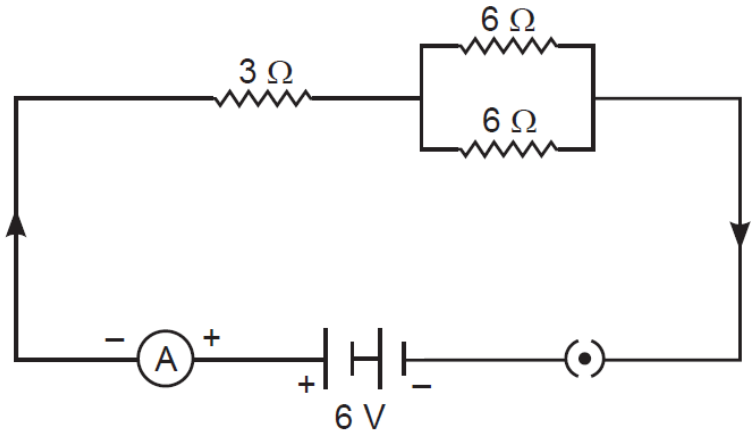
24. A piece of wire of resistance 25 Ω is drawn out so that its length is increased to twice of its original length. Calculate the resistance and ratio of resistivity of the old wire and new stretched wire.

OR

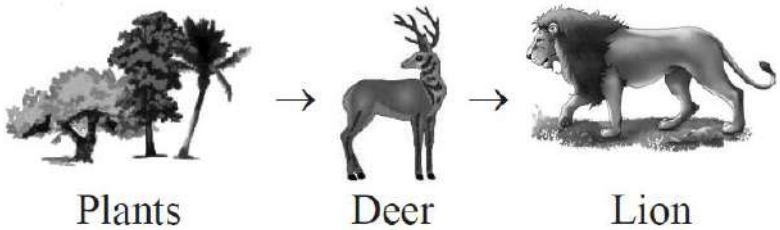
In the given circuit, find:

(a) Total resistance of the network of resistors

(b) Current through ammeter A



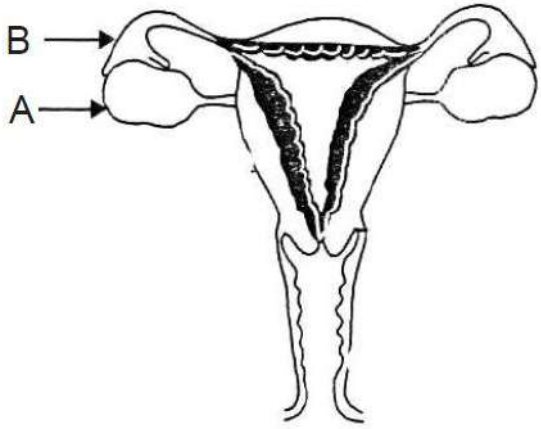
25. (a) In the following food chain, 100 J of energy is available to the lion. How much energy was available to the producer?



(b) In the following food chain, plants provide 500 J of energy to rats. How much energy will be available to hawks from snakes?

Plants → Rats → Snakes → Hawks

26. Write the name and one function of each of the parts A and B shown in the following diagram.



SECTION – C

Questions 27 to 33 carry 3 marks each.

27. What is meant by the term pH of a solution ? The pH of rain water collected from two cities 'A' and 'B' was found to be 6·1 and 5·3 respectively. The water of which city is more acidic ? Justify your answer. State with reason what would happen to the aquatic life of a pond in which the rain water of city 'B' flows.

28. (a) Write a chemical equation for the reaction in which change in colour is observed when a metal is kept immersed in a salt solution of another metal.
(b) When hydrogen gas is passed over heated copper(II) oxide, copper and steam are formed. Write the balanced chemical equation with physical states for this reaction. State what kind of chemical reaction is this.

29. Draw a ray diagram to show the refraction of a ray of light through a triangular glass prism and mark on it (i) angle of incidence (i), (ii) angle of emergence (e), and (iii) angle of deviation (D). What would happen, if instead of a ray, a beam of white light falls on the prism ? Give reason for the phenomenon that occurs in this case.

30. (a) What is cornea?
(b) What part of eye controls the amount of light entering the eye?
(c) Why does the sky appear dark instead of blue to an astronaut?

31. (a) On what factors does the magnetic field produced by a current–carrying circular coil (or wire) depend?
(b) A magnetic needle deflects when it's brought near a current carrying conductor. Why?
(c) A magnet is hung using a string. How will you identify the poles?

32. Draw a diagram of human excretory system and label kidney, ureter, aorta, vena cava, urethra and urinary bladder on it.

33. You have been selected to talk on "ozone layer and its protection" in the school assembly on 'Environment Day'.
(a) Why should ozone layer be protected to save the environment?
(b) List any two ways that you would stress in your talk to bring in awareness amongst your fellow friends that would also help in protection of ozone layer as well as the environment.

OR

What is meant by food chain? "The number of trophic levels in a food chain is limited." Give reason to justify this statement.

SECTION – D

Questions 34 to 36 carry 5 marks each.

34. A metal carbonate X on reacting with an acid gives a gas which when passed through a solution Y gives the carbonate back. On the other hand, a gas G that is obtained at anode during

electrolysis of brine is passed on dry Y, it gives a compound Z, used for disinfecting drinking water. Identify X, Y, G and Z.

OR

An organic compound A on heating with concentrated H_2SO_4 forms a compound B which on addition of one mole of hydrogen in presence of Ni forms a compound C. One mole of compound C on combustion forms two moles of CO_2 and 3 moles of H_2O. Identify the compounds A, B and C and write the chemical equations of the reactions involved.

35. (a) A student suffering from myopia is not able to see distinctly the objects placed beyond 5 m. List two possible reasons due to which this defect of vision may have arisen. With the help of ray diagrams, explain:
(i) why the student is unable to see distinctly the objects placed beyond 5 m from his eyes.
(ii) the type of the corrective lens used to restore proper vision and how this defect is corrected by the use of this lens.
(b) If, in this case, the numerical value of the focal length of the corrective lens is 5 m, find the power of the lens as per the New Cartesian Sign Convention.

OR

(a) Draw a ray diagram to show the formation of image by a convex lens when an object is placed in front of the lens between its optical centre and principal focus.
(b) In the above ray diagram mark the objectdistance (u) and the image-distance (v) with their proper signs (+ve or –ve as per the New Cartesian Sign Convention) and state how these distances are related to the focal length (f) of the convex lens in this case.
(c) Find power of a convex lens which forms a real, and inverted image of magnification –1 of an object placed at a distance of 20 cm from its optical centre.

36. (a) Differentiate between the following:
(i) Pollen tube and style
(ii) Fission in Amoeba and Plasmodium
(iii) Fragmentation and regeneration
(b) Mention two reasons for the appearance of variations among the progeny formed by sexual reproduction.

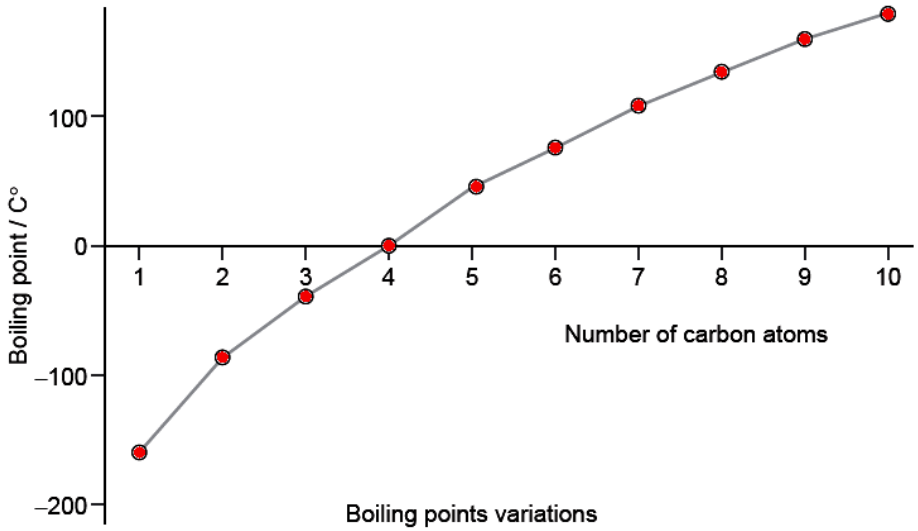
OR

(a) Write the functions of each of the following parts in a human female reproductive system:
(i) Ovary (ii) Uterus
(iii) Fallopian tube
(b) Write the structure and functions of placenta in a human female.

SECTION – E(Case Study Based Questions)

Questions 37 to 39 carry 4 marks each.

37. The ability of carbon atoms to form chains leads to the existence of a series of compounds that have same functional group (and hence similar chemical properties) and only differ from each other by the presence of an additional carbon atom and its two associated hydrogen atoms in the molecule (which causes the physical properties to change in a regular manner). A series of compounds related in this way is said to form an homologous series.
The point about chemical properties is best illustrated by the sections that follow, on different homologous series. The changes in physical properties are a result of the changes that occur in the strength of van der Waals' forces with increasing molar mass and in some cases a change in molecular polarity. The simplest illustration of the effect of chain length on physical properties is the, variation of the boiling point of the alkanes with the number of carbon atoms in the chain, as illustrated in figure.



(i) All the members of a homologous series have similar chemical properties. Why?
(ii) In the graph shown, which has the higher boiling point and why?
Hydrocarbon with 3 carbon atoms or hydrocarbon with 6 carbon atoms
(iii) (a) What is the boiling point of heptane as shown in the graph?
(b) Why the curve is initially steep and flattens at the end?

OR

(iii) (a) Write the molecular formula of the 2nd and the 3rd member of the homologous series whose first member is methane.
(b) Write the next homologue of each of the following: I. C_2H_4 II. C_4H_6

38. Plantation drives are often carried out especially during monsoon season for the protection of our environment. Such programmes need a lot of saplings for tree plantation. Plants are propagated by sexual or asexual means in fields and nurseries. Over the years horticulturists have developed asexual methods that use vegetative parts of the plants to multiply. Many plants can reproduce by this method naturally as well as by artificial means.

(a) Which specific part of the plant is used for sexual and asexual means of propagation to produce a new plant ? (1)
(b) Give one example of (i) a flower, and (ii) a fruit grown by vegetative propagation. (1)
(c) (i) List two advantages of growing plants by vegetative propagation. (2)

OR

(c) (ii) Describe an activity to show how potatoes reproduce asexually.

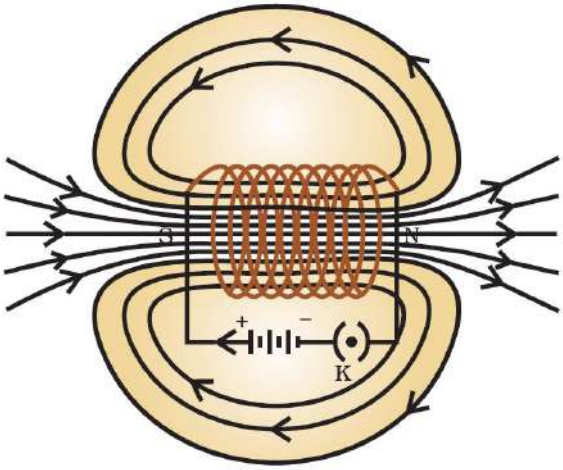
39. An insulated copper wire wound on a cylindrical cardboard tube such that its length is greater than its diameter is called a solenoid. When an electric current is passed through the solenoid, it produces a magnetic field around it. The magnetic field produced by a current-carrying solenoid is similar to the magnetic field produced by a bar magnet. The field lines inside the solenoid are in the form of parallel straight lines. The strong magnetic field produced inside a current carrying solenoid can be used to magnetise a piece of magnetic material like soft iron, when

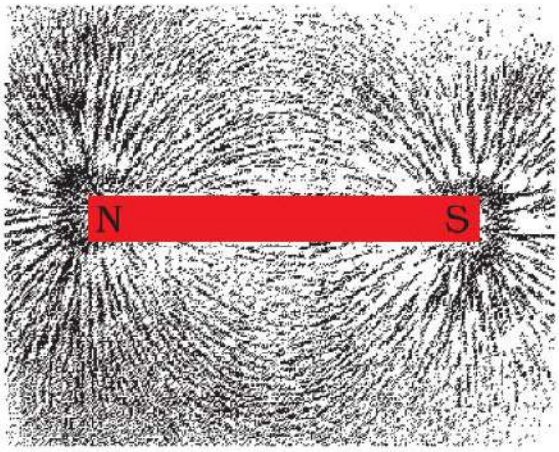
placed inside the solenoid. The strength of magnetic field produced by a current carrying solenoid is directly proportional to the number of turns and strength of current in the solenoid.

(a) What do the field lines inside the solenoid indicate?

(b) Which rule is used to determine the north-south polarities of an electromagnet?

(c) The pattern of magnetic field lines around a current-carrying solenoid and a bar magnet is shown below. Observe them carefully, compare and find out if there is any similarity and dissimilarities between them.





OR

(c) Distinguish between an electromagnet and a permanent magnet.

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CLASS : X **DURATION: 3 HRS**

General Instruction:

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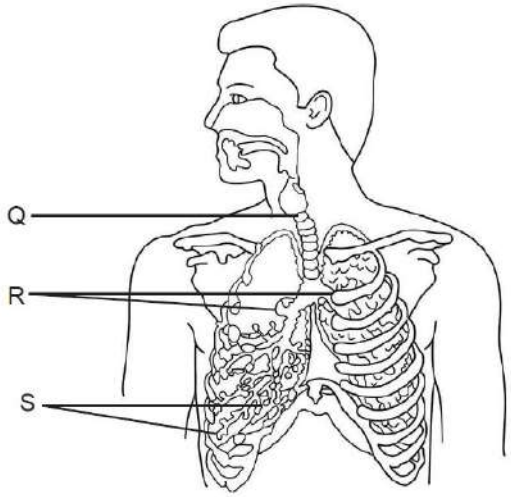
6. **Section E** has 3 case based integrated units of assessment (04 marks each) with sub-parts of the values of 1, 1 and 2 marks each respectively.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2marks questions of Section E
8. Draw neat figures wherever required. Take π =22/7 wherever required if not stated.

SECTION – A

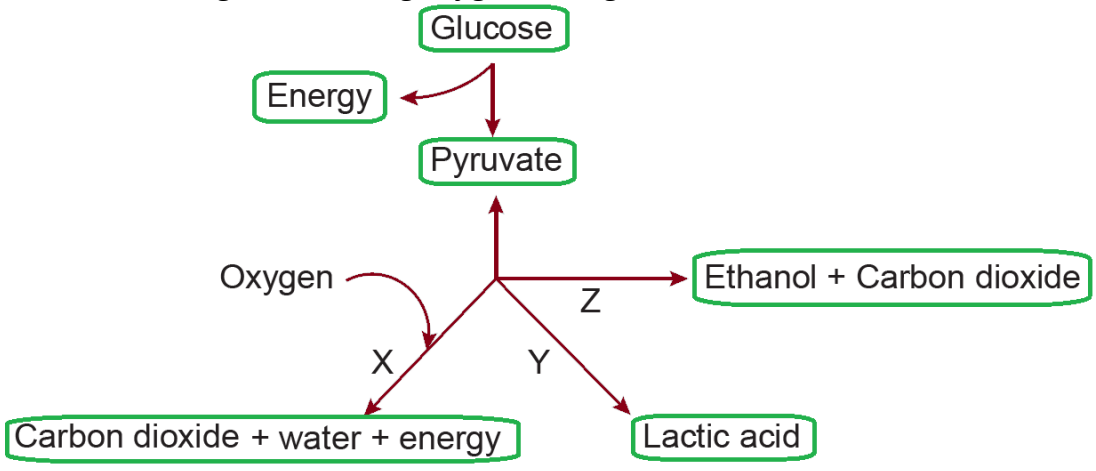
Questions 1 to 20 carry 1 mark each.

1. Identify correctly the labelled parts Q, R and S in figure given below:



(a) Q-Bronchus, R-Bronchiole, S-Trachea (b) Q-Bronchiole, R-Trachea, S-Bronchus
(c) Q-Trachea, R-Bronchus, S-Alveolus (d) Q-Trachea, R-Bronchus, S-Bronchiole
Ans. (d) Q-Trachea, R-Bronchus, S-Bronchiole

2. Which of the following occurs during oxygen shortage in muscle cells?



(a) Only X (b) Only Y (c) Only Z (d) Any of them - X, Y or Z

Ans: (b) Only Y
Lactic acid is produced during oxygen shortage in muscle cells.

3. A few drops of turmeric solution are added to a colourless liquid. If the liquid becomes red, the liquid may be :
(a) Hydrochloric acid (b) Distilled water (c) Ammonium hydroxide (d) Lemon juice
Ans. (c) Ammonium hydroxide

4. Which of the following is oxidation reaction?
(a) $Zn \rightarrow Zn^{2+} + 2e^-$ (b) $Zn^{2+} + 2e^- \rightarrow Zn(s)$
(c) $Fe^{3+} + e^- \rightarrow Fe^{2+}$ (d) $Ag^+ + e^- \rightarrow Ag(s)$
Ans. (a) $Zn \rightarrow Zn^{2+} + 2e^-$
Loss of electrons takes place in oxidation.

5. In the following case(s) the combination reaction occurs in :
I. $CuO + H_2 \xrightarrow{\Delta}$
II. $ZnO + C \longrightarrow$
III. $Na + O_2 \longrightarrow$
IV. $CH_4 + O_2 \longrightarrow$
(a) Only III (b) Only IV (c) II and III (d) I, III and IV
Ans. (a) Only III

6. A hydrocarbon which contains two C – C single bonds and one C ≡ C triple bond is :
(a) Ethyne (b) Propyne (c) Butyne (d) Benzene
Ans. (c) Butyne

7. While cooking, if the bottom of the vessel is getting blackened on the outside, it means that
(a) the food is not cooked completely
(b) the fuel is not burning completely
(c) the fuel is wet
(d) the fuel is burning completely
Ans. (b) the fuel is not burning completely
This means that the fuel is not burning completely and unburnt carbon particles get deposited on the bottom of the vessel, making it black.

8. Anand took four colourless solutions P, Q, R and S, and performed the following tests. What is the definite conclusion that Anand can reach?

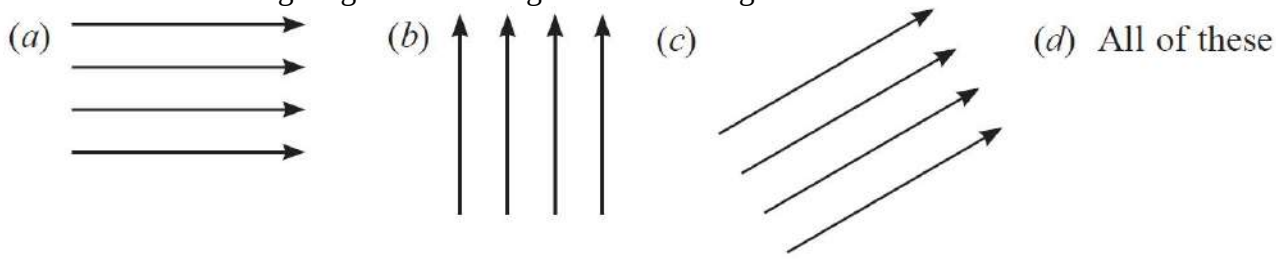
	Solution P	**Solution Q**	**Solution R**	**Solution S**
With methyl orange	No change in colour	Turns red	No change in colour	No change in colour
With phenolphthalein	No change in colour	No change in colour	No change in colour	Turns pink
With red litmus	No change in colour	No change in colour	No change in colour	Turns litmus blue
With blue litmus	No change in colour	Turns litmus red	No change in colour	No change in colour

(a) Both P and S are salt solutions. (b) Both Q and S are basic solutions.
(c) Both Q and R are salt solutions. (d) Both P and R are neutral solutions.
Ans: (d) Both P and R are neutral solutions.
Since there is no change in the colour of solution P and R with any of the indicators so they are neutral solutions.

9. Which of the following is/are natural indicator(s)?
(a) Hydrangea (b) Petunia (c) Geranium (d) All of these
Ans. (d) All of these

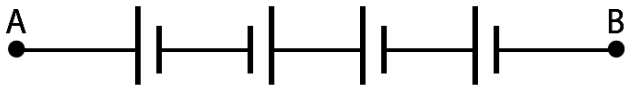
10. The image formed by a concave mirror of focal length 50 cm is real and of magnification – 1. In this case the distance between the object from its own image is :
(a) 50 cm (b) 100 cm (c) 200 cm (d) Zero
Ans. (d) Zero

11. Which of the following diagram indicating an uniform magnetic field?



Ans. (d) All of these

12. Four cells each of emf 1.5V and the internal resistance 0.5 Ω are connected in series but one cell is wrongly connected as shown in figure.



The net voltage and net internal resistance between A and B is
(a) 6 V, 2 Ω (b) 4.5 V, 1.5 Ω (c) 3V, 1 Ω (d) 3V, 2 Ω

Ans: (d) 3V, 2 Ω

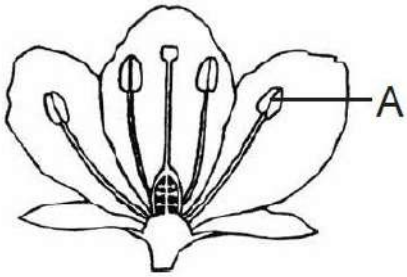
Cells are connected in series.
So, E_{net} = 1.5 – 1.5 + 1.5 + 1.5 = 3V
r_{net} = 0.5 + 0.5 + 0.5 + 0.5 = 2 Ω

13. Overloading is due to
(a) Insulation of wire is damaged (b) fault in the appliances
(c) accidental hike in supply voltage (d) All of the above
Ans. (d) All of the above
All are the causes to occur overloading

14. Differences shown by the individuals of a species forms basis of
(a) heredity (b) variation (c) mutation (d) crossing over
Ans. (b) variation

15. The leaves of Mimosa are sensitive to
(a) light (b) smell (c) touch (d) heat
Ans. (c) touch

16. Identify part A from given options in the figure.



(a) Anther of stamen (b) Style (c) Ovule (d) Ovary
Ans. (a) Anther of stamen

DIRECTION: In the question number 17 and 20, a statement of **Assertion (A)** is followed by a statement of **Reason (R)**.

Choose the correct option
(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A)
(b) Both assertion (A) and reason (R) are true and reason (R) is not the correct explanation of assertion (A)
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.
Ans: (b) Both assertion (A) and reason (R) are true and reason (R) is not the correct explanation of assertion (A)

17. Assertion(A): The sex of a child in human beings will be determined by the type of chromosome he/she inherits from the father.
Reason(R): A child who inherits 'X' chromosome from his father would be a girl (XX), while a child who inherits a 'Y' chromosome from the father would be a boy (XY).
Ans: (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A)

18. Assertion (A): A white coloured powder is used by doctors for supporting fractured bone. It is called as plaster of paris.
Reason (R): It is also called as gypsum.
Ans. (c) A is true but R is false

19. Assertion (A): Human heart does not allow mixing of oxygen rich blood with carbon dioxide rich blood.
Reason (R): Human heart has different chambers
Ans. (a) Both A and R are true and R is the correct explanation of A.

20. Assertion (A): The commercial unit of electric energy is kilowatt hour (kWh).
Reason (R): 1 kWh = 10^6 joule (J)
Ans. (c) Assertion (A) is true but reason (R) is false.

SECTION – B

Questions 21 to 26 carry 2 marks each.

21. Identify the substances oxidised and the substances reduced in the following reactions.
(i) $ZnO(s) + C(s) \rightarrow Zn + CO(g)$
(ii) $4Na(s) + O_2(g) \rightarrow 2Na_2O(s)$
Ans: (i) C is oxidised and ZnO is reduced.
(ii) Na is oxidised and O_2 is reduced.

OR

Which among the following changes are exothermic or endothermic in nature?
(i) Decomposition of ferrous sulphate
(ii) Dilution of sulphuric acid
(iii) Dissolution of sodium hydroxide in water
(iv) Dissolution of ammonium chloride in water
Ans: (i) is endothermic as heat is absorbed in these changes.
(ii) is exothermic as heat is released in these changes.
(iii) is exothermic as heat is released in these changes.
(iv) is endothermic as heat is absorbed in these changes.

22. (a) Explain any three directional movements in plants.
(b) How brain and spinal cord are protected in human?
Ans. (a) The three directional movements in plants are:
Phototropism: movement of plant towards or away from the light.
Geotropism: movement of plant parts towards the earth or away from it.

Hydrotropism: movement of plant parts towards or away from any source of water.
(b) Brain is protected by a bony box in the skull called cranium. Spinal cord is protected by a bony cage called vertebral column.

23. List two ways due to which variations arise in a population. State the importance of variation.
Ans. Two ways
1. Errors in DNA copying mechanism
2. Sexual reproduction
• Importance: (any one of following)
1. Helps a species to survive
2. Helps an organism to adapt to the changing environment
3. Forms the basis of evolution (or any other)

24. A piece of wire of resistance 25 Ω is drawn out so that its length is increased to twice of its original length. Calculate the resistance and ratio of resistivity of the old wire and new stretched wire.
Ans. R = 25 Ω,

$$R = \frac{\rho l}{A} \Rightarrow 25 = \frac{\rho l}{A} ...(i)$$

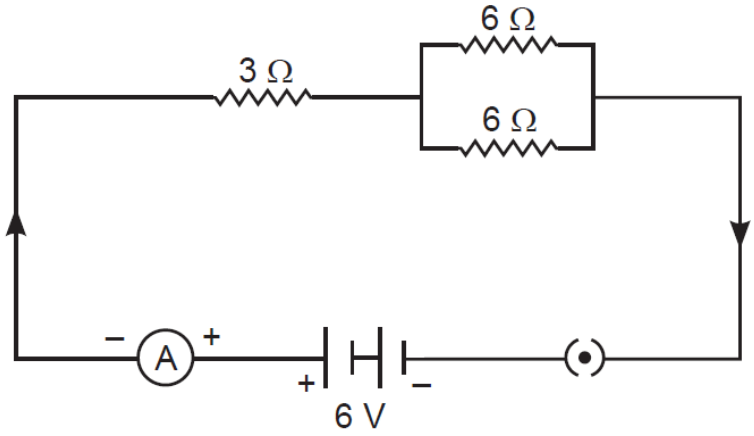
When the length is increased two times, the cross-sectional area becomes A/2

$$R' = \frac{\rho 2l}{A/2} = 4\left(\frac{\rho l}{A}\right) ...(ii)$$

From (i) and (ii), R′ = 4 × 25 = 100 Ω
The new resistance becomes 100 Ω.
Resistivity of the wire is independent from its dimensions but depends only on the nature of the material.
∴ Required ratio = 1 : 1

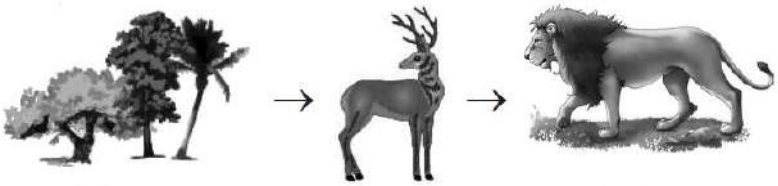
OR

In the given circuit, find:
(a) Total resistance of the network of resistors
(b) Current through ammeter A



Ans. (a) Both 6 Ω resistors are in parallel
Their equivalent resistance is $\frac{1}{R_P} = \frac{1}{R_2} + \frac{1}{R_3} = \frac{1}{6} + \frac{1}{6} = \frac{2}{6} = \frac{1}{3}$
∴ R_P = 3 Ω
Now, R_1 = 3 Ω and R_P = 3 Ω are in series combination. Their equivalent resistance is
$R_S = R_1 + R_P = 3 + 3 = 6$ Ω
Hence, total resistance of the given network of the resistor = 6 Ω
(b) Current through ammeter, $I = V/R_S = 6/6 = 1.0$ A

25. (a) In the following food chain, 100 J of energy is available to the lion. How much energy was available to the producer?

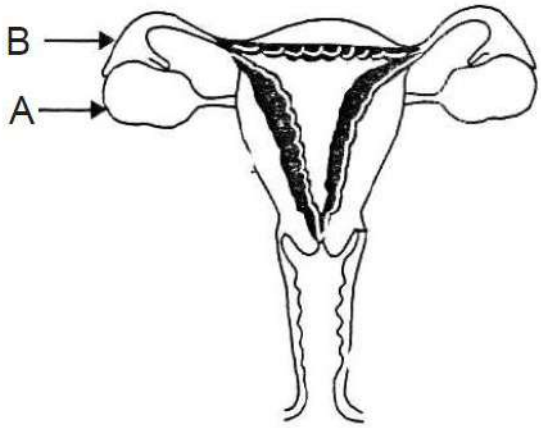


(b) In the following food chain, plants provide 500 J of energy to rats. How much energy will be available to hawks from snakes?

Plants ⟶ Rats ⟶ Snakes ⟶ Hawks

Ans. (a) 10,000 J of energy was available to the producers.
(b) 0.5 J of energy, will be available to the hawk.

26. Write the name and one function of each of the parts A and B shown in the following diagram.



Ans. A–Ovary
B–Oviduct or fallopian tube
Functions :
A – • Ovary produces an egg or gamete for fertilisation.
• It also produces reproductive hormones namely oestrogen and progesterone.
B – • Oviduct is the site of fertilization.
• Initial stage of development of fertilized egg takes place in the oviduct. (any one)

SECTION – C

Questions 27 to 33 carry 3 marks each.

27. What is meant by the term pH of a solution ? The pH of rain water collected from two cities 'A' and 'B' was found to be 6·1 and 5·3 respectively. The water of which city is more acidic ? Justify your answer. State with reason what would happen to the aquatic life of a pond in which the rain water of city 'B' flows.
Ans. (a) • pH of a solution is a measure of H+ ion concentration in it / a number which indicates the acidic or basic nature of a solution.
• City B
• Lower the pH, more is the acidic nature.
• Acidic rain water lowers the pH of pond making the survival of aquatic life difficult.

28. (a) Write a chemical equation for the reaction in which change in colour is observed when a metal is kept immersed in a salt solution of another metal.
(b) When hydrogen gas is passed over heated copper(II) oxide, copper and steam are formed. Write the balanced chemical equation with physical states for this reaction. State what kind of chemical reaction is this.
Ans. (a) $Fe(s) + CuSO_4(aq) \rightarrow FeSO_4(aq) + Cu(s)$
(Copper sulphate) (Iron sulphate)
Blue Light Green

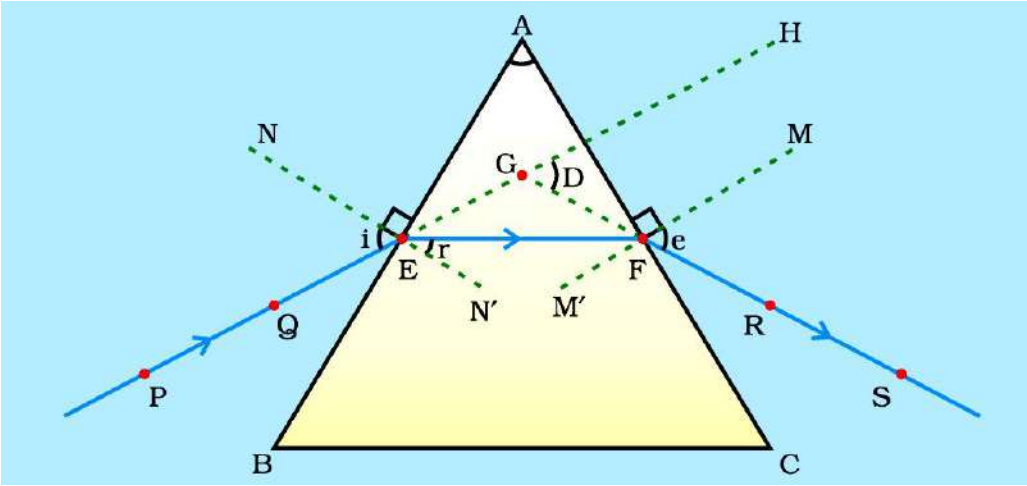
(any other suitable example)

(b) $CuO(s) + H_2(g) \xrightarrow{heat} Cu(s) + H_2O(g)$

• Redox reaction

29. Draw a ray diagram to show the refraction of a ray of light through a triangular glass prism and mark on it (i) angle of incidence (i), (ii) angle of emergence (e), and (iii) angle of deviation (D). What would happen, if instead of a ray, a beam of white light falls on the prism ? Give reason for the phenomenon that occurs in this case.

Ans.



PE – Incident ray, ∠i – Angle of incidence, EF – Refracted ray, ∠r – Angle of refraction

FS – Emergent ray, ∠e – Angle of emergence, ∠A – Angle of the prism, ∠D – Angle of deviation

• White light will split into a band of seven colours of spectrum.

• Different colours of white light bend / refract through different angles with respect to incident ray as they pass through a prism.

30. (a) What is cornea?

(b) What part of eye controls the amount of light entering the eye?

(c) Why does the sky appear dark instead of blue to an astronaut?

Ans. (a) Cornea: It is the transparent spherical membrane covering the front of the eye and allows light to enter into the eye.

(b) The pupil controls the amount of light entering the eye.

(c) This is because at this height there is no atmosphere which can scatter the white light. Therefore, the sky appears dark.

31. (a) On what factors does the magnetic field produced by a current–carrying circular coil (or wire) depend?

(b) A magnetic needle deflects when it's brought near a current carrying conductor. Why?

(c) A magnet is hung using a string. How will you identify the poles?

Ans. (a) Factors on which magnetic field produced by current - carrying circular coil depends are:

(i) Current flowing through the coil I

$B \propto I$

(ii) Radius of circular coil r

$B \propto 1/r$

(iii) Number of turns of wire in the circular coil n

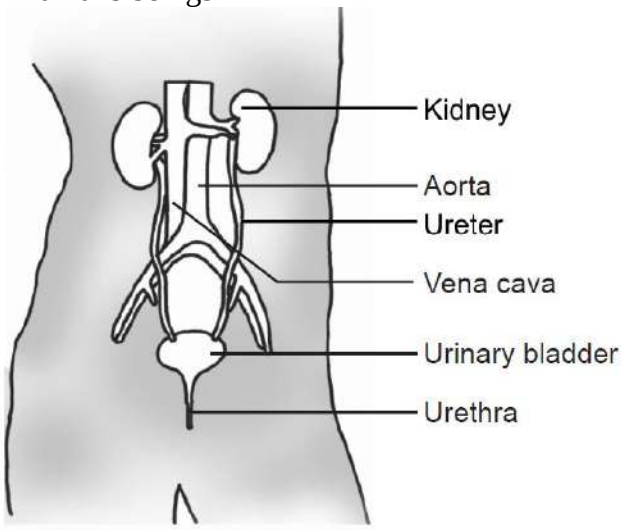
$B \propto n$

(b) Magnetic force exerted by the magnetic field produced by the straight current carrying conductor causes the deflection in the needle.

(c) The north seeking pole is north pole and the south seeking pole is south pole.

32. Draw a diagram of human excretory system and label kidney, ureter, aorta, vena cava, urethra and urinary bladder on it.

Ans. Excretory system in humans beings



33. You have been selected to talk on "ozone layer and its protection" in the school assembly on 'Environment Day'.

(a) Why should ozone layer be protected to save the environment?

(b) List any two ways that you would stress in your talk to bring in awareness amongst your fellow friends that would also help in protection of ozone layer as well as the environment.

Ans: (a) Ozone layer is a rich zone of ozone found in upper atmosphere. It helps in shielding the Earth from the harmful UV radiations coming from the Sun. If ozone layer gets depleted, UV radiations can directly reach the Earth's surface and drastically affect the life on Earth. For instance, UV radiations coming from the Sun causes skin cancer. So, it is very important to protect the ozone layer so as to save our environment and the planet Earth.

(b) Some of the ways to help protect and stop the depletion of the ozone layer include: Not buying products in aerosol cans, maintaining air-conditioning filters and units.

In order to halt the depletion of the ozone layer, countries around the world have banned the use of chlorofluorocarbons and other ozone-depleting substances. These compounds produce chlorine and bromine atoms high in the atmosphere, and these atoms react with ozone, destroying it.

By reducing the use of fluorescent lights.

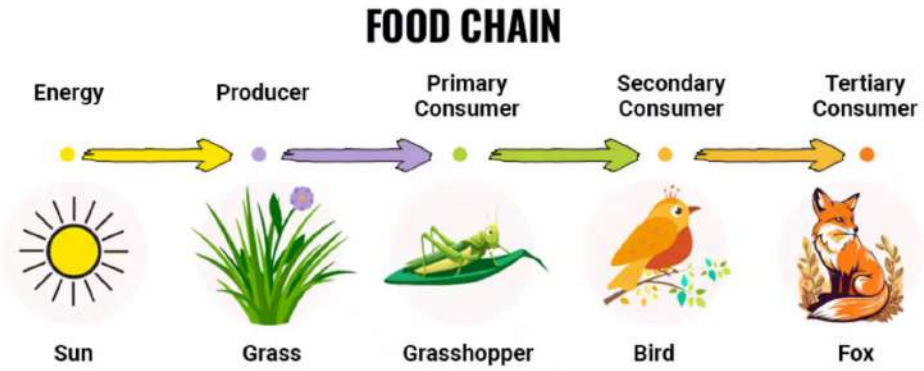
By minimising the use of vehicles to limit the emission of harmful gases that cause damage to the ozone layer, we can contribute to its protection

OR

What is meant by food chain? "The number of trophic levels in a food chain is limited." Give reason to justify this statement.

Ans. The series of organisms that take part at various biotic levels form a food chain. At each trophic level in a food chain, a large portion of the energy is utilised for the maintenance of organisms which occur at that trophic level and energy is lost as heat.

As a result of this, organisms in each trophic level pass on less energy to the next trophic levels, than they receive. The longer the food chain, the less is the energy available to the final member of the food chain, which will be insufficient for their survival.



SECTION – D

Questions 34 to 36 carry 5 marks each.

34. A metal carbonate X on reacting with an acid gives a gas which when passed through a solution Y gives the carbonate back. On the other hand, a gas G that is obtained at anode during electrolysis of brine is passed on dry Y, it gives a compound Z, used for disinfecting drinking water. Identify X, Y, G and Z.

Ans: The gas evolved at anode during electrolysis of brine is chlorine (G).

When chlorine gas is passed through dry $Ca(OH)_2$ (Y) produces bleaching powder (Z) used for disinfecting drinking water.

$$\underset{\text{Slaked lime (Y)}}{Ca(OH)_2} + Cl_2 \longrightarrow \underset{\text{Bleaching powder (Z)}}{CaOCl_2} + H_2O$$

Since Y and Z are calcium salts, therefore X is also a calcium salt and is calcium carbonate.

$$\underset{\substack{\text{Calcium carbonate}\\ \text{(X)}}}{CaCO_3} + 2HCl \longrightarrow CaCl_2 + CO_2 + H_2O$$

$$Ca(OH)_2 + CO_2 \longrightarrow CaCO_3 + H_2O$$

OR

An organic compound A on heating with concentrated H_2SO_4 forms a compound B which on addition of one mole of hydrogen in presence of Ni forms a compound C. One mole of compound C on combustion forms two moles of CO_2 and 3 moles of H_2O. Identify the compounds A, B and C and write the chemical equations of the reactions involved.

Ans: Since compound C gives 2 moles of CO_2 and 3 moles of H_2O, it shows that it has the molecular formula C_2H_6 (Ethane). C is obtained by the addition of one mole of hydrogen to compound B so the molecular formula of B should be C_2H_4 (Ethene). Compound B is obtained by heating compound A with concentrated H_2SO_4 which shows it to be an alcohol. So compound A could be C_2H_5OH (Ethanol).

$$\underset{\text{A}}{C_2H_5OH} \xrightarrow{\text{Hot conc. } H_2SO_4} \underset{\text{B}}{C_2H_4} + H_2O$$

$$\underset{\text{B}}{C_2H_4} + H_2 \xrightarrow{Ni} \underset{\text{C}}{C_2H_6}$$

$$\underset{\text{C}}{C_2H_6} + \frac{7}{2}O_2 \longrightarrow 2CO_2 + 3H_2O + \text{Heat and light}$$

35. (a) A student suffering from myopia is not able to see distinctly the objects placed beyond 5 m. List two possible reasons due to which this defect of vision may have arisen. With the help of ray diagrams, explain:

(i) why the student is unable to see distinctly the objects placed beyond 5 m from his eyes.

(ii) the type of the corrective lens used to restore proper vision and how this defect is corrected by the use of this lens.

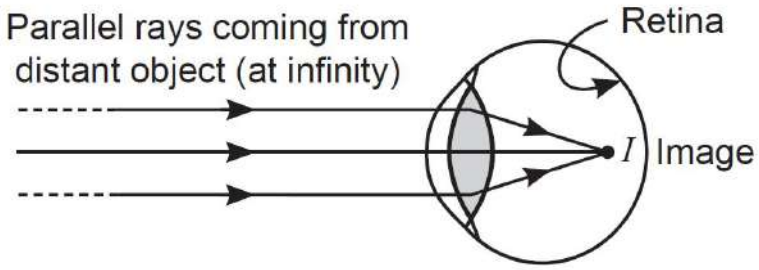
(b) If, in this case, the numerical value of the focal length of the corrective lens is 5 m, find the power of the lens as per the New Cartesian Sign Convention.

Ans. (a) Two possible reasons are:

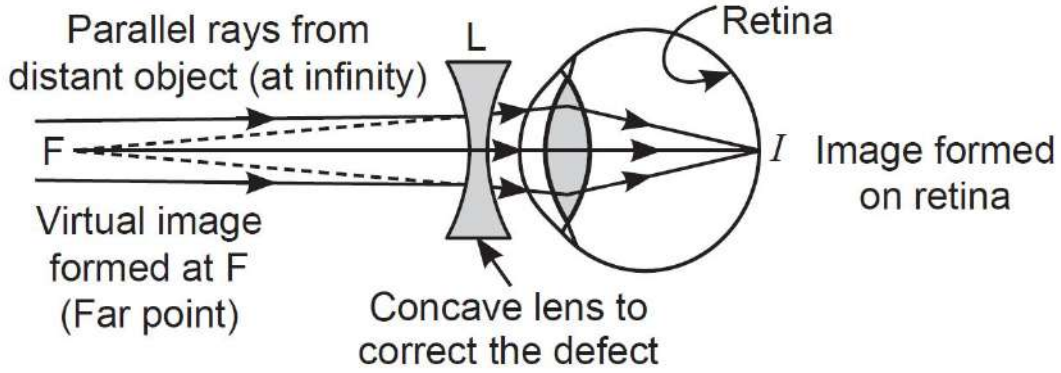
– excessive curvature of the eye lens.

– elongation of the eyeball.

(i) The image in this case, forms in front of the retina, so the distant object looks blurred.



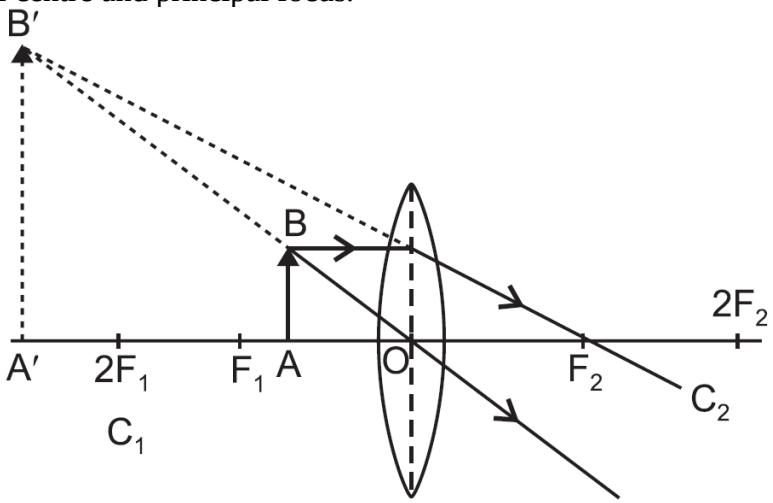
(ii) The defect is corrected by using a concave lens of suitable power placed in front of eye as shown below. It diverge the rays and forms a virtual image of distant object at far point of the myopic eye. These diverged rays enter into the eye and form the image on the retina. Thus, the concave lens shifts the image back onto the retina instead of in front of it and the defect is corrected.



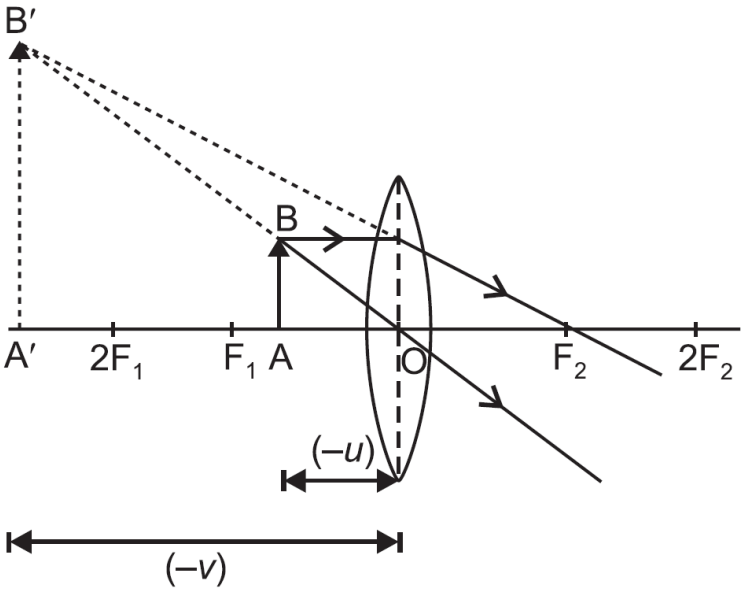
(b) f = – 5 m (since lens is concave)
P = 1/ f(metre) = 1/(–5) = – 0.2 D

OR

(a) Draw a ray diagram to show the formation of image by a convex lens when an object is placed in front of the lens between its optical centre and principal focus.
(b) In the above ray diagram mark the objectdistance (u) and the image-distance (v) with their proper signs (+ve or –ve as per the New Cartesian Sign Convention) and state how these distances are related to the focal length (f) of the convex lens in this case.
(c) Find power of a convex lens which forms a real, and inverted image of magnification –1 of an object placed at a distance of 20 cm from its optical centre.
Ans. (a) The formation of image by a convex lens when an object is placed in front of the lens between its optical centre and principal focus.



(b) According to the new cartesian sign convention, the object distance ‘u’ and image distance ‘v’ both are negative as they are measured opposite to the direction of incident ray. The object distance (u), image- distance (v) and the focal length (f) of a convex lens is in the above case are related as given below.



(c) Given: u = –20 cm, v = ?, m = –1

For a spherical lens, linear magnification is given by

$$m = \frac{v}{u} \Rightarrow -1 = \frac{v}{-20} \Rightarrow v = +20 \text{ cm}$$

Using lens formula, $\frac{1}{f} = \frac{1}{v} - \frac{1}{u} = \frac{1}{20} - \frac{1}{-20} = \frac{1}{10} \Rightarrow f = 10$ cm

Therefore, the power of the given convex lens is calculated as

P = 1/f(m) = 100cm/10cm = + 10 ⇒ P = + 10 D

36. (a) Differentiate between the following:

(i) Pollen tube and style

(ii) Fission in Amoeba and Plasmodium

(iii) Fragmentation and regeneration

(b) Mention two reasons for the appearance of variations among the progeny formed by sexual reproduction.

Ans. (a) (i)

Pollen tube	Style
– It is the structure formed when pollen lands on a suitable stigma.	– It is middle elongated part of carpel.
– Pollen tube is formed from the pollen grain and it travels down through style to reach the ovary.	– Through it the pollen tube travels to reach the ovary.
– It carries the gametes.	– It has no role in pollination or in fertilisation.

(ii)

Fission in Amoeba	Fission in Plasmodium
– Parent cell is divided into two small, nearly identical equal sized daughter cells.	– Parent cell is divided into several small, nearly equal sized daughter individuals.
– It shows binary fission.	– It shows multiple fission.

(iii)

Fragmentation	Regeneration
It is the mode of asexual reproduction in which the parent body splits into two or more fragments and each fragment develops into an organism under favourable conditions, e.g., Spirogyra.	It is the regeneration of lost body part and it is used as mode of reproduction in some organisms, e.g. Hydra and Planaria.

(b) (i) Two individuals as parents are involved to make the gametes which is the main reason for variation

development in the progeny.

(ii) During meiosis, the chromosomes on cross-over may combine differently leading to variation.

OR

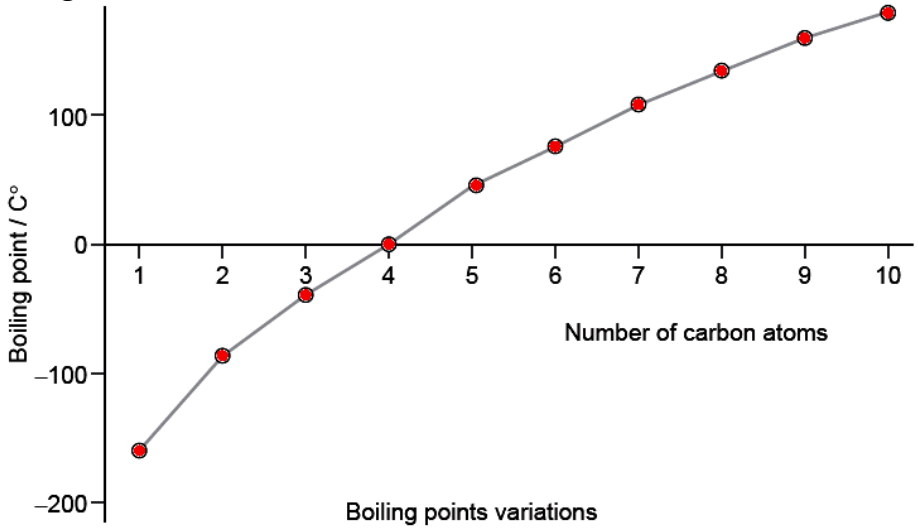
(a) Write the functions of each of the following parts in a human female reproductive system:
(i) Ovary (ii) Uterus
(iii) Fallopian tube
(b) Write the structure and functions of placenta in a human female.

Ans. (a) (i) **Ovary**
– It produces the female gametes or ova for reproduction.
– It also produces the female sex hormones.
(ii) **Uterus**
– Implantation of the embryo occurs in the lining of uterus and the complete development of foetus occurs here.
– The contractions of the muscles of uterus help in child birth.
(iii) **Fallopian tube**
– It transports the ova from the ovary to uterus/womb.
– Fertilisation occurs in the fallopian tube.
(b) **Structure of placenta**:
– Placenta is a disc-like structure embedded in the uterine wall.
– It contains villi on the embryo's side and on the mother's side there are blood spaces, which surround the villi; this arrangement provides a large surface area for exchange of materials.
Functions of placenta:
– It transfers glucose and oxygen from the mother's blood to the foetus.
– It also removes the wastes (CO_2 and nitrogenous wastes) generated by the foetus to the mother's blood.

SECTION – E(Case Study Based Questions)

Questions 37 to 39 carry 4 marks each.

37. The ability of carbon atoms to form chains leads to the existence of a series of compounds that have same functional group (and hence similar chemical properties) and only differ from each other by the presence of an additional carbon atom and its two associated hydrogen atoms in the molecule (which causes the physical properties to change in a regular manner). A series of compounds related in this way is said to form an homologous series.
The point about chemical properties is best illustrated by the sections that follow, on different homologous series. The changes in physical properties are a result of the changes that occur in the strength of van der Waals' forces with increasing molar mass and in some cases a change in molecular polarity. The simplest illustration of the effect of chain length on physical properties is the, variation of the boiling point of the alkanes with the number of carbon atoms in the chain, as illustrated in figure.



(i) All the members of a homologous series have similar chemical properties. Why?
(ii) In the graph shown, which has the higher boiling point and why?

Hydrocarbon with 3 carbon atoms or hydrocarbon with 6 carbon atoms
(iii) (a) What is the boiling point of heptane as shown in the graph?
(b) Why the curve is initially steep and flattens at the end?

OR

(iii) (a) Write the molecular formula of the 2nd and the 3rd member of the homologous series whose first member is methane.
(b) Write the next homologue of each of the following: I. C_2H_4 II. C_4H_6

Ans: (i) In a homologous series, functional group which is responsible for the chemical properties is same.
(ii) Hydrocarbon with 6 carbon atoms has higher boiling point because with the increase in molar mass, the intermolecular forces become stronger and the boiling point increases.
(iii) (a) Heptane means 7 carbon atoms. Its boiling point as shown in the graph is 100°C.
(b) This is because for small molecules, the addition of an extra carbon has a proportionally larger effect on the molar mass. As the length of the chain increases, the percentage change in the molar mass is progressively smaller and so the curve flattens.

OR

(iii) (a) Alkane series
2nd member - Ethane - C_2H_6
3rd member - Propane - C_3H_8
(b) I. C_3H_6 II. C_5H_8

38. Plantation drives are often carried out especially during monsoon season for the protection of our environment. Such programmes need a lot of saplings for tree plantation. Plants are propagated by sexual or asexual means in fields and nurseries. Over the years horticulturists have developed asexual methods that use vegetative parts of the plants to multiply. Many plants can reproduce by this method naturally as well as by artificial means.

(a) Which specific part of the plant is used for sexual and asexual means of propagation to produce a new plant ? (1)
(b) Give one example of (i) a flower, and (ii) a fruit grown by vegetative propagation. (1)
(c) (i) List two advantages of growing plants by vegetative propagation. (2)

OR

(c) (ii) Describe an activity to show how potatoes reproduce asexually.

Ans. (a) Sexual – Seed
Asexual - Roots/stem/leaves.
(b) (i) Rose/Jasmine (or any other)
(ii) Grapes/orange/banana (or any other)
(c) (i) (Any two of the following)
• Production of genetically similar plants
• Propagated plants bear fruits and vegetables earlier than those produced from seeds.
• Propagation of plants that have lost capacity to produce seeds. (Any other)

OR

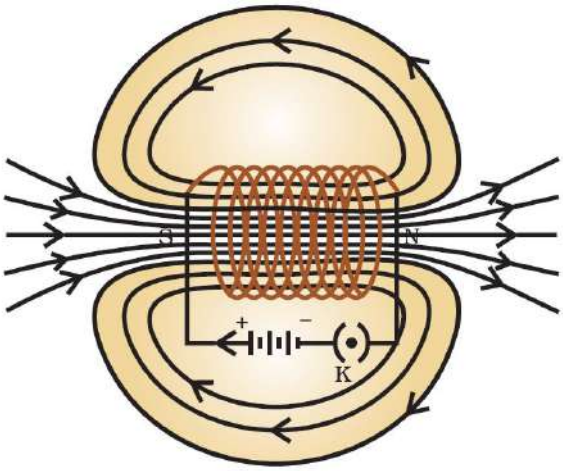
(c) (ii) Put the small pieces of potato containing notches or buds in moist cotton for few days and observe. Notches or buds will give rise to fresh green shoots and roots.

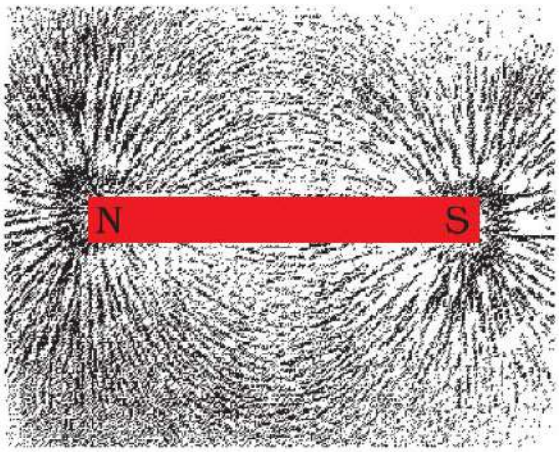
39. An insulated copper wire wound on a cylindrical cardboard tube such that its length is greater than its diameter is called a solenoid. When an electric current is passed through the solenoid, it produces a magnetic field around it. The magnetic field produced by a current-carrying solenoid is similar to the magnetic field produced by a bar magnet. The field lines inside the solenoid are in the form of parallel straight lines. The strong magnetic field produced inside a current carrying solenoid can be used to magnetise a piece of magnetic material like soft iron, when placed inside the solenoid. The strength of magnetic field produced by a current carrying solenoid is directly proportional to the number of turns and strength of current in the solenoid.

(a) What do the field lines inside the solenoid indicate?

(b) Which rule is used to determine the north-south polarities of an electromagnet?

(c) The pattern of magnetic field lines around a current-carrying solenoid and a bar magnet is shown below. Observe them carefully, compare and find out if there is any similarity and dissimilarities between them.





OR

(c) Distinguish between an electromagnet and a permanent magnet.

Ans. (a) The field lines inside the solenoid are in the form of parallel straight lines. This indicates that the magnetic field is same at all points inside the solenoid, that is the field is uniform inside the solenoid.

(b) Clock face rule is used to determine the north-south polarities of an electromagnet.

(c) Similarities

(i) Both have North pole and South pole.

(ii) The magnetic field produced by them are identical.

(iii) At the axial position, the magnetic field is same in both cases.

Dissimilarities

(i) The swapping of poles of a solenoid can be done by changing the direction of current but cannot be done in case of a bar magnet.

(ii) A solenoid produces a magnetic field only in the presence of a flowing current while bar magnet has a permanent magnetic field.

(iii) The magnetic field outside the solenoid is very weak almost zero but not outside a bar magnet.
(any two)

OR

(iii)

Electromagnet	**Permanent magnet**
– It is a strong magnet.	– It produces weak magnetic field.
– Strength of the magnetic field can be changed.	– Strength of the magnetic field cannot be changed.
– Polarity of the magnet can be changed. e.g. soft iron core when placed inside the coil of a solenoid becomes a magnet.	– Polarity of the magnet cannot be changed. e.g. bar magnet.

(any two)