SAMPLE PAPER TEST 03 FOR BOARD EXAM 2025

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

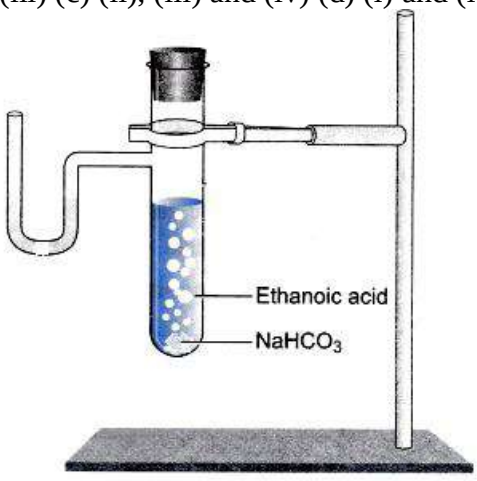
General Instruction:

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.

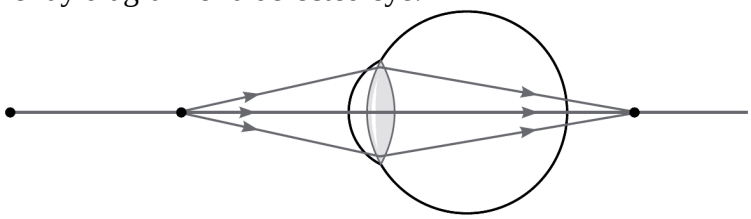
1. Sodium hydrogen carbonate when added to acetic acid evolves a gas.
Which of the following statements are true about the gas evolved?
(i) It turns lime water milky
(ii) It extinguishes a burning splinter
(iii) It dissolves in a solution of sodium hydroxide
(iv) It has a pungent odour
(a) (i) and (ii) (b) (i), (ii) and (iii) (c) (ii), (iii) and (iv) (d) (i) and (iv)



2. The image of an object placed in front of a convex mirror is formed at
(a) the object itself
(b) twice the distance of the object in front of the mirror
(c) half the distance of the object in front of the mirror
(d) behind the mirror

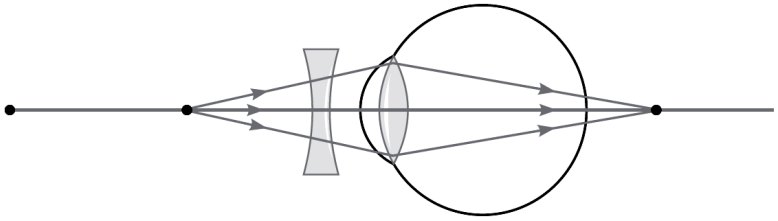
3. In the given reaction : $ZnO + C \rightarrow Zn + CO$.
I. ZnO is being oxidised.
II. CO is being reduced.
III. C is being oxidised.
IV. ZnO is being reduced.
Choose the correct statement.
(a) I and II only (b) III and IV only (c) I, II, and III only (d) All of these

4. The image shows the ray diagram of a defected eye.



Which option shows the correction of the defect of the eye?

(a)



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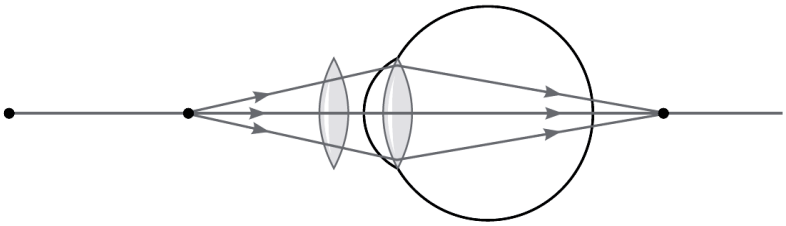
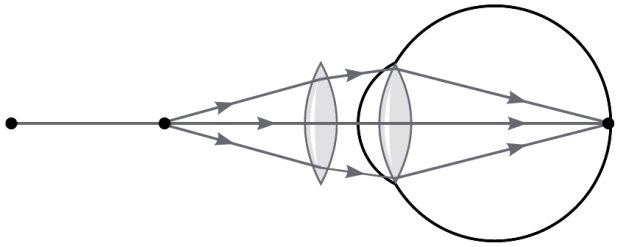


(c)



(d) None of these

5. Common salt besides being used in kitchen can also be used as the raw material for making :
(i) washing soda (ii) bleaching powder (iii) baking soda (iv) slaked lime
(a) (i) and (ii) (b) (i), (ii) and (iv) (c) (i) and (iii) (d) (i), (iii) and (iv)

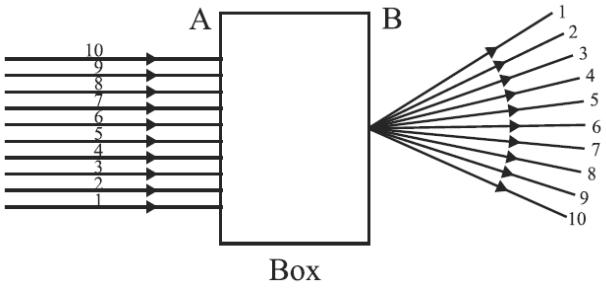
6. Choose the correct path of urine in our body
(a) kidney → ureter → urethra → urinary bladder
(b) kidney → urinary bladder → urethra → ureter
(c) kidney → ureters → urinary bladder → urethra
(d) urinary bladder → kidney → ureter → urethra

7. Which of the following is not the role of decomposers in the ecosystem?
(a) They clean the environment.
(b) They decompose non-biodegradable substances.
(c) They participate in food chain.
(d) They replenish the nutrients in the soil.

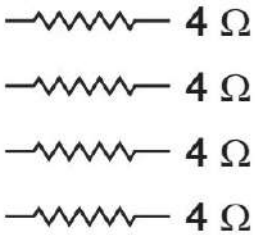
8. The percentage of solar radiation absorbed by all the green plants for the process of photosynthesis is about
(a) 1 % (b) 5 % (c) 8 % (d) 10 %

9. A conducting wire carries 10^{21} electrons in 4 minutes. What is the current flowing through the wire?
(a) 40 A (b) 7 A (c) 4 A (d) 0.7 A

10. A beam of light is incident through the holes on side A and emerges out of the hole on the other face of the box as shown in the figure. Which of the following could be inside the box?
(a) Concave lens (b) Rectangular glass slab
(c) Prism (d) Convex lens

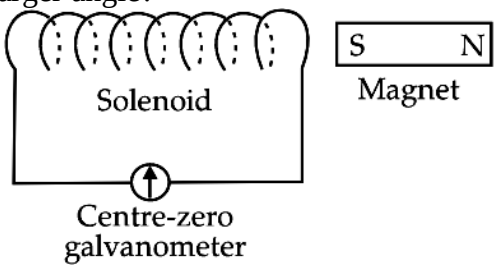


11. What is the minimum resistance which can be made using the following resistors?



(a) 1 Ω (b) 2 Ω (c) 4 Ω (d) 3 Ω

12. In the given diagram, when the magnet is pushed into the solenoid, the pointer of the galvanometer deflects slightly to the left. Which of the following changes would cause the pointer to deflect through a larger angle?



(a) Move the magnet faster. (b) Move the magnet away from the solenoid.
(c) Unwind some of the turns of the solenoid. (d) Keep the magnet stationary.

13. In peas, a pure tall plant (TT) is crossed with a short plant (tt). The ratio of pure tall plants to short plants in F2 is
(a) 1 : 3 (b) 3 : 1 (c) 1 : 1 (d) 2 : 1

14. $CH_3 — CH_2 — OH \xrightarrow[\text{Heat}]{\text{Alkaline } KMnO_4} CH_3 — COOH$

In the above given reaction, alkaline KMnO4 acts as
(a) reducing agent (b) oxidising agent (c) catalyst (d) dehydrating agent

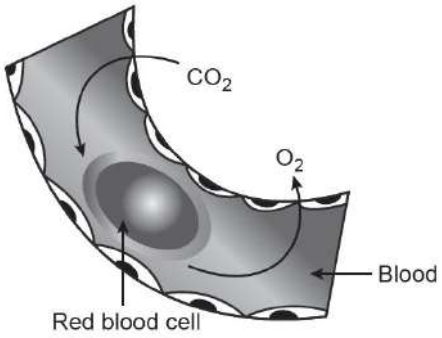
15. In the reaction of iron with copper sulphate solution:

$$CuSO_4 + Fe \rightarrow Cu + FeSO_4$$

Which option in the given table correctly represents the substance oxidised and the reducing agent?

OPTION	Substance Oxidized	Reducing Agent
(a)	Fe	Fe
(b)	Fe	$FeSO_4$
(c)	Cu	Fe
(d)	$CuSO_4$	Fe

16. Given below is a diagrammatic representation of a process taking place in the human body.



In which of these regions/organs could it be occurring?
(i) lungs (ii) heart (iii) brain
(a) only in (i) (b) only in (ii) (c) only in (i) and (ii) (d) in all - (i), (ii) and (iii)

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.

17. Assertion (A): Unisexual flowers have separate male and female flowers.
Reason (R): Cucumber, pumpkin and watermelon are the examples of unisexual flowers.

18. Assertion (A): Myopia is the defect of the eye in which only nearer objects are seen by the eye.
Reason (R): The eye ball is elongated.

19. Assertion (A): In electrolysis of water, the volume of hydrogen liberated is twice the volume of oxygen formed.
Reason (R): Water (H_2O) has hydrogen and oxygen in the ratio of 1 : 2 by volume.

20. Assertion(A): Large concave mirrors are used to concentrate sunlight to produce heat in solar cookers.
Reason(R): Concave mirror converges the light rays falling on it to a point.

SECTION – B

Questions 21 to 25 carry 2 marks each.

21. (a) Which plant hormone is present in greater concentration in the areas of rapid cell division?
(b) Give one example of a plant growth promoter and a plant growth inhibitor.

22. (a) What is the unit of current? Express it in terms of charge and time.
(b) The following table gives the value of resistivity of some materials:

Material	Resistivity (Ohm-m)
A	44×10^{-6}
B	$10^{10} - 10^{12}$
C	1.62×10^{-6}
D	$10^{15} - 10^{17}$

Which material would you suggest to be used in electric heating devices? Give reason for your choice.

OR

(a) On what factors does the resistance of a conductor depend?
(b) Calculate the resistance of an aluminium cable of length 10 km and diameter 2.0 mm if the resistivity of aluminium is 2.7×10^{-8} Ωm.

23. Identify the displacement and the double displacement reaction from the following reactions.
(a) HC1(aq) + NaOH(aq) → NaCI(aq) + H2O(l)
(b) Fe(s) + CuSO4(aq) → FeSO4(aq) + Cu(s)

OR

A teacher provided acetic acid, water, lemon juice, aqueous solution of sodium hydrogen carbonate and sodium hydroxide to students in the school laboratory to determine the pH values of these substances using pH papers. One of the students reported the pH values of the given substances as 3, 12, 4, 8 and 14 respectively. Which one of these values is not correct? Write its correct value stating the reason.

24. Give the pair of contrasting traits of the following characters in pea plant and mention which is dominant and recessive.
(i) yellow seed (ii) round seed

25. What are the differences between the transport of materials in xylem and phloem?

26. Which among the following are physical or chemical changes?
(i) Evaporation of petrol
(ii) Burning of Liquefied Petroleum Gas (LPG)
(iii) Heating of an iron rod to red hot
(iv) Curdling of milk
(v) Sublimation of solid ammonium chloride

SECTION – C

Questions 27 to 33 carry 3 marks each.

27. (i) Why are budding, fragmentation and regeneration all considered as asexual types of reproduction?
(ii) With neat diagrams explain the process of regeneration in Planaria.

OR

Reproduction is one of the most important characteristics of living beings. Give three reasons in support of the statement.

28. What are reflex actions? Give two examples. Explain a reflex arc.

29. (a) What is an ecosystem? List its two main components.
(b) 'The number of trophic levels in a food chain is limited'. Justify the statement.

30. In an industrial process used for the manufacture of sodium hydroxide, a gas 'A' is formed as a by-product. The gas 'A' reacts with lime water to give a compound 'B' which is used as a bleaching agent in the chemical industry. Identify 'A' and 'B'. Also give the chemical equations of the reactions involved.

OR

A metal A, which is used in thermite process, when heated with oxygen gives an oxide B, which is amphoteric in nature. Identify A and B. Write down the reactions of oxide B with HCl and NaOH.

31. A silver article generally turns black when kept in the open for a few days. The article when rubbed with toothpaste again starts shining.
(i) Why do silver articles turn black when kept in the open for a few days? Name the phenomenon involved.
(ii) Name the black substance formed and give its chemical formula.

32. Size of image of an object formed by a mirror having a focal length of 20 cm, is observed to be reduced to 1/3rd of its size. At what distance the object has been placed from the mirror? What is the nature of the image and the mirror?

33. Read the following information:

I. Resistivity of copper is lower than that of aluminium which in turn is lower than that of constantan.

II. Six wires labelled as A, B, C, D, E, F have been designed as per the following parameters:

Wire	Length	Diameter	Material	Resistance
A	*l*	2*d*	Aluminium	R_1
B	*2l*	*d/2*	Constantan	R_2
C	*3l*	*d/2*	Constantan	R_3
D	*l/2*	3*d*	Copper	R_4
E	*2l*	2*d*	Aluminium	R_5
F	*l/2*	4*d*	Copper	R_6

Answer the following questions using the above data:

(i) Which of the wires has maximum resistance and why?

(ii) Which of the wires has minimum resistance and why?

(iii) Arrange R_1, R_3 and R_5 in ascending order of their values. Justify your answer.

SECTION – D

Questions 34 to 36 carry 5 marks each.

34. Draw the pattern of the field lines of the magnetic field around a current carrying straight conductor passing through and held perpendicular to a horizontal cardboard. State right-hand thumb rule and explain how this rule is useful to determine the direction of the magnetic field in the above case, if the direction of current in the conductor is vertically downwards.

OR

With the help of a labelled diagram, explain the distribution of magnetic field due to a current through a circular loop. Why is it that if a current carrying coil has n turns the field produced at any point is n times as large as that produced by a single turn?

35. Why are certain compounds called hydrocarbons? Write the general formula for homologous series of alkanes, alkenes and alkynes and also draw the structure of the first member of each series. Write the name of the reaction that converts alkenes into alkanes and also write a chemical equation to show the necessary conditions for the reaction to occur.

36. Define pollination. Explain the different types of pollination. List two agents of pollination. How does suitable pollination lead to fertilization?

OR

(a) Define excretion.

(b) Name the basic filtration unit present in the kidney.

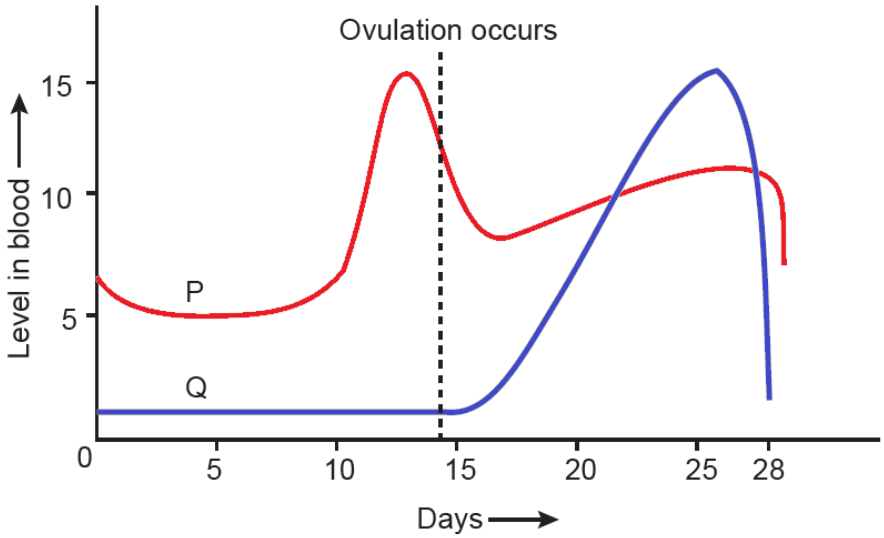
(c) Draw excretory system in human beings and label the following organs of excretory system which perform following functions: (i) form urine. (ii) is a long tube which collects urine from kidney. (iii) store urine until it is passed out.

SECTION – E(Case Study Based Questions)

Questions 37 to 39 carry 4 marks each.

37. Case Study – 1

Humans use sexual mode of reproduction. But the actual transfer of germ cells between two people needs special organs for the sexual act. In mammals such as humans, the baby is carried in the mother's body for a long period and is breastfed later on. The female reproductive organs and breasts will need to mature to accommodate these possibilities. Hence some specialised systems are involved in the process of sexual reproduction. The given graph shows the hormonal changes during a normal menstrual cycle.



(i) What would be a likely consequence if the hormone represented by graph Q is lacking in an adult female?
(ii) What is funeral of unfertilised egg?
(iii) After the beginning of menstrual cycle, at which day progesterone reaches its peak? Give reason.

OR

(iii) (a) Name two simple organisms having the ability of regeneration.
(b) What is the role of the seminal vesicles and the prostate gland?

38. Case Study – 2

A student wants to project the image of a candle flame on the walls of the school laboratory by using a mirror.
(a) Which type of mirror should he use and why?
(b) At what distance, in terms of focal length of the mirror, should he place the candle flame to get the magnified image on the wall?
(c) Draw a ray diagram to show the formation of the image in this case.

OR

(d) (i) To get the diminished image of the candle flame, where the object must be placed?
(ii) If the image formed by this mirror is inverted and real, then what will be its magnification?

39. Case Study – 3

Manoj performed an experiment to understand that heat is produced when a few drops of concentrated sulphuric acid is slowly added into a beaker containing water. For this, he took 10 mL water in a beaker and added a few drops of concentrated H_2SO_4 to it. Then, he swirled the beaker slowly. During the process, a vigourous reaction takes place. It is an exothermic process.

(a) Why is it recommended that the acid should be added to water and not water to the acid?
(b) How will the concentration of hydrogen ions gets affected if an acid is diluted?
(c) What is this process called? Define the process.

OR

If we have hydrochloric acid and acetic acid of equal concentration, which will be a stronger acid and why?

SAMPLE PAPER TEST 03 FOR BOARD EXAM 2025

SUBJECT: SCIENCE **(ANSWERS)** **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.
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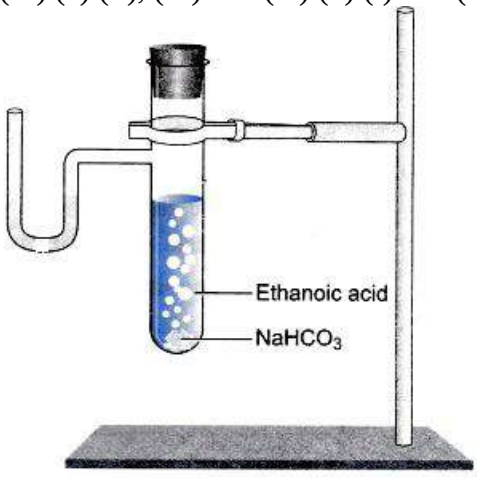
8. Draw neat figures wherever required. Take π =22/7 wherever required if not stated.

SECTION – A

Questions 1 to 20 carry 1 mark each.

1. Sodium hydrogen carbonate when added to acetic acid evolves a gas.
Which of the following statements are true about the gas evolved?
(i) It turns lime water milky
(ii) It extinguishes a burning splinter
(iii) It dissolves in a solution of sodium hydroxide
(iv) It has a pungent odour
(a) (i) and (ii) (b) (i), (ii) and (iii) (c) (ii), (iii) and (iv) (d) (i) and (iv)



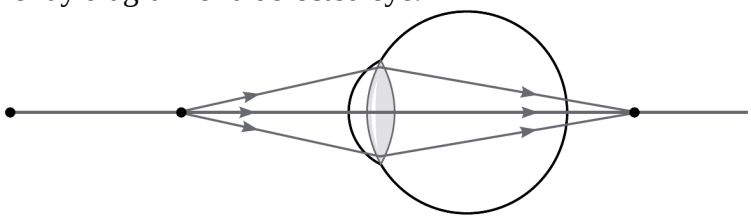
Ans: (a) (i) and (ii)
Reaction between Sodium hydrogen carbonate and acetic acid leads to the evolution of carbon-dioxide gas. CO2 turns the lime water milky and extinguish a burning splinter.

2. The image of an object placed in front of a convex mirror is formed at
(a) the object itself
(b) twice the distance of the object in front of the mirror
(c) half the distance of the object in front of the mirror
(d) behind the mirror
Ans: (d) behind the mirror

3. In the given reaction : $ZnO + C \rightarrow Zn + CO$.
I. ZnO is being oxidised.
II. CO is being reduced.
III. C is being oxidised.

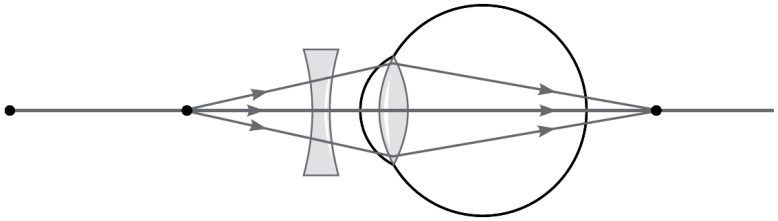
IV. ZnO is being reduced.
Choose the correct statement.
(a) I and II only (b) III and IV only (c) I, II, and III only (d) All of these
Ans: (b) III and IV only
When zinc oxide is heated with coke, carbon monoxide and zinc are formed.
$ZnO + C \rightarrow Zn + CO$
Zinc oxide gives oxygen to carbon. It is oxidation of carbon and reduction of zinc oxide. Carbon is a reducing agent and zinc oxide is an oxidising agent. ZnO loses oxygen during the reaction. So, ZnO is reduced.

4. The image shows the ray diagram of a defected eye.

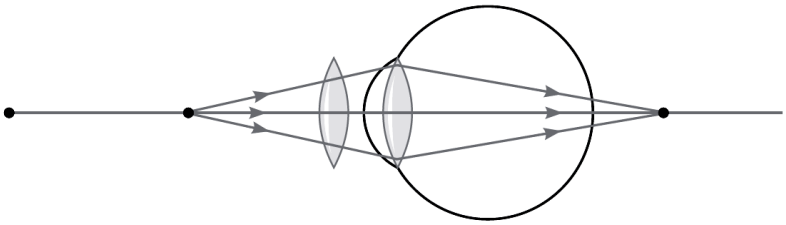


Which option shows the correction of the defect of the eye?

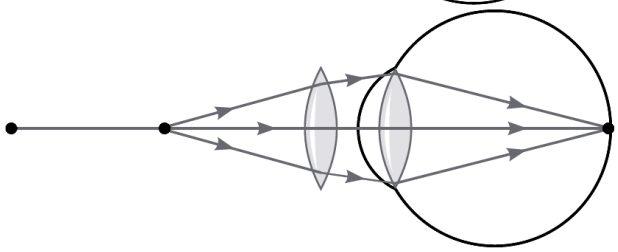
(a)



(b)



(c)



(d) None of these
Ans: (c) This is the type of hypermetropic eye defect and it is connected by convex lens.

5. Common salt besides being used in kitchen can also be used as the raw material for making :
(i) washing soda (ii) bleaching powder (iii) baking soda (iv) slaked lime
(a) (i) and (ii) (b) (i), (ii) and (iv) (c) (i) and (iii) (d) (i), (iii) and (iv)
Ans: (c) (i) and (iii)
The common salt obtained is an important raw material for various other materials of daily use, such as sodium hydroxide, baking soda, washing soda and many more.

6. Choose the correct path of urine in our body
(a) kidney → ureter → urethra → urinary bladder
(b) kidney → urinary bladder → urethra → ureter
(c) kidney → ureters → urinary bladder → urethra
(d) urinary bladder → kidney → ureter → urethra
Ans: (c) kidney → ureters → urinary bladder → urethra
Urine from nephron is brought to the collecting duct of kidneys where the urine enters the ureters. There are 2 ureters, each opening from one kidney into the urinary bladder. The urinary bladder stores urine and its size increases as the amount of urine collected increases. When the

CNS gives a voluntary message the muscles of bladder contract and the bladder sphincter relaxes thus excreting urine out through the urethra.

7. Which of the following is not the role of decomposers in the ecosystem?
(a) They clean the environment.
(b) They decompose non-biodegradable substances.
(c) They participate in food chain.
(d) They replenish the nutrients in the soil.
Ans: (b) They decompose non-biodegradable substances.
Decomposers are the microorganisms which breakdown complex organic substances into simple inorganic substances. They are very important in the ecosystem as:
(1) They decompose biodegradable substances into useful substances like manure. They thus clean the environment.
(2) Decomposed substances go back to the soil and can be used by the plants again. Thus, decomposers participate in the food cycle by replenishing the nutrients of the soil.

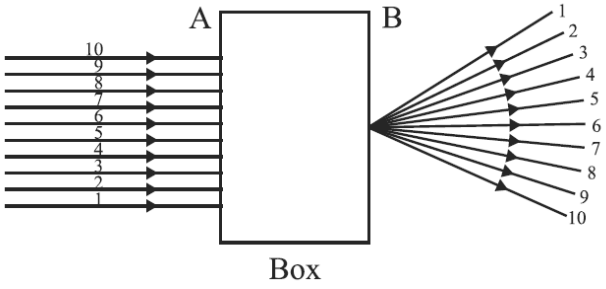
8. The percentage of solar radiation absorbed by all the green plants for the process of photosynthesis is about
(a) 1 % (b) 5 % (c) 8 % (d) 10 %
Ans: (a) 1 %
Green plants utilize 1% of the radiation absorbed by leaf and use it for photosynthesis.

9. A conducting wire carries 10^{21} electrons in 4 minutes. What is the current flowing through the wire?
(a) 40 A (b) 7 A (c) 4 A (d) 0.7 A
Ans: (d) 0.7 A

$$q = ne \Rightarrow q = 10^{21} \times 1.6 \times 10^{-19} = 1.6 \times 10^{2} C$$

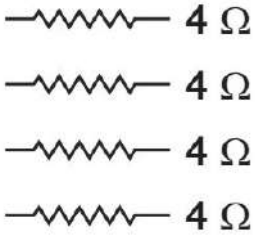
$$Now, I = \frac{q}{t} = \frac{1.6 \times 10^{2}}{240} = 0.7 A$$

10. A beam of light is incident through the holes on side A and emerges out of the hole on the other face of the box as shown in the figure. Which of the following could be inside the box?
(a) Concave lens (b) Rectangular glass slab
(c) Prism (d) Convex lens



Ans: (a) Concave lens

11. What is the minimum resistance which can be made using the following resistors?



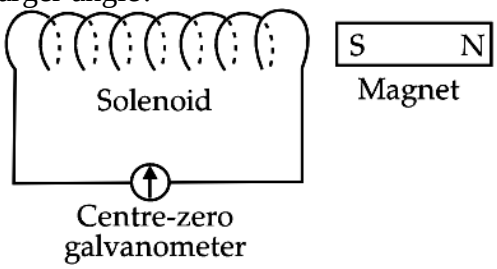
(a) 1 Ω (b) 2 Ω (c) 4 Ω (d) 3 Ω
Ans: (a) 1 Ω

The minimum resistance can be obtained by connecting resistances in parallel. When four resistors each of resistance 4 Ohms are connected in parallel, we get,

$$\frac{1}{R}=\frac{1}{4}+\frac{1}{4}+\frac{1}{4}+\frac{1}{4}=1\Rightarrow R=1\Omega$$

Therefore, minimum resistance = 1 Ohm.

12. In the given diagram, when the magnet is pushed into the solenoid, the pointer of the galvanometer deflects slightly to the left. Which of the following changes would cause the pointer to deflect through a larger angle?



(a) Move the magnet faster. (b) Move the magnet away from the solenoid.
(c) Unwind some of the turns of the solenoid. (d) Keep the magnet stationary.
Ans: (a) Move the magnet faster.
On moving the magnet faster, the change in net magnetic field associated with the solenoid will be more and hence more e.m.f. will be induced.

13. In peas, a pure tall plant (TT) is crossed with a short plant (tt). The ratio of pure tall plants to short plants in F2 is
(a) 1 : 3 (b) 3 : 1 (c) 1 : 1 (d) 2 : 1
Ans: (c) 1 : 1

14. $CH_3 — CH_2 — OH \xrightarrow[\text{Heat}]{\text{Alkaline } KMnO_4} CH_3 — COOH$
In the above given reaction, alkaline KMnO4 acts as
(a) reducing agent (b) oxidising agent (c) catalyst (d) dehydrating agent
Ans: (b) oxidising agent

15. In the reaction of iron with copper sulphate solution:

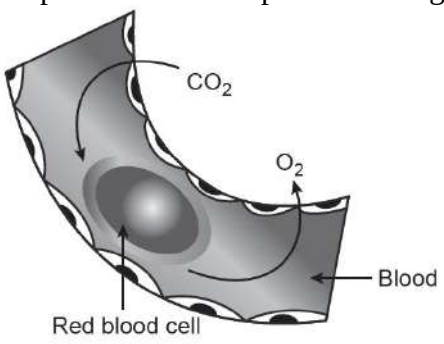
$$CuSO_4 + Fe \rightarrow Cu + FeSO_4$$

Which option in the given table correctly represents the substance oxidised and the reducing agent?

OPTION	Substance Oxidized	Reducing Agent
(a)	Fe	Fe
(b)	Fe	$FeSO_4$
(c)	Cu	Fe
(d)	$CuSO_4$	Fe

Ans: (a) Fe and Fe respectively.
Here, in the above reaction, Fe is oxidised to $FeSO_4$ and Fe is responsible for removing oxygen from $FeSO_4$, therefore, Fe is the reducing agent.

16. Given below is a diagrammatic representation of a process taking place in the human body.



In which of these regions/organs could it be occurring?
(i) lungs (ii) heart (iii) brain
(a) only in (i) (b) only in (ii) (c) only in (i) and (ii) (d) in all - (i), (ii) and (iii)
Ans: (d) in all - (i), (ii) and (iii)

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.

17. Assertion (A): Unisexual flowers have separate male and female flowers.
Reason (R): Cucumber, pumpkin and watermelon are the examples of unisexual flowers.
Ans: (b) Both assertion (A) and reason (R) are true and reason (R) is not the correct explanation of assertion (A)
Unisexual flowers have separate male and female flowers. The example includes cucum-ber, pumpkin and watermelon.

18. Assertion (A): Myopia is the defect of the eye in which only nearer objects are seen by the eye.
Reason (R): The eye ball is elongated.
Ans: (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A)

19. Assertion (A): In electrolysis of water, the volume of hydrogen liberated is twice the volume of oxygen formed.
Reason (R): Water (H_2O) has hydrogen and oxygen in the ratio of 1 : 2 by volume.
Ans: (c) A is true but R is false.

20. Assertion(A): Large concave mirrors are used to concentrate sunlight to produce heat in solar cookers.
Reason(R): Concave mirror converges the light rays falling on it to a point.
Ans: (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A)

SECTION – B

Questions 21 to 25 carry 2 marks each.

21. (a) Which plant hormone is present in greater concentration in the areas of rapid cell division?
(b) Give one example of a plant growth promoter and a plant growth inhibitor.
Ans: (a) Cytokinin. (b) Plant Growth Promoter: Auxin/Gibberellin. Plant Growth Inhibitor: Abscisic acid (ABA).

22. (a) What is the unit of current? Express it in terms of charge and time.
(b) The following table gives the value of resistivity of some materials:

Material	Resistivity (Ohm-m)
A	44×10^{-6}
B	$10^{10} - 10^{12}$
C	1.62×10^{-6}
D	$10^{15} - 10^{17}$

Which material would you suggest to be used in electric heating devices? Give reason for your choice.
Ans: (a) The SI unit of current is Ampere. Current (I) can be expressed in terms of the charge (Q) flowing in time (t) as: I = Q /t

(b) As materials used in electric heating devices are generally made up of alloys having resistivity in the range of 10^{-8} Ohm m to 10^{-6} Ohm–m, material A will be used for electric heating devices as it's resistivity is more than that of C, which is a metal since its resistivity is very low. B and D are insulators as they have very high resistivity.

OR

(a) On what factors does the resistance of a conductor depend?

(b) Calculate the resistance of an aluminium cable of length 10 km and diameter 2.0 mm if the resistivity of aluminium is 2.7×10^{-8} Ωm.

Ans: (a) Resistance of a conductor depends on the following factors:

(1) Length of the conductor

(2) Area of cross section of the conductor

(3) Nature of material of the conductor

(4) Temperature of the conductor

(b) Given: l = 10 km = 10000 m; d = 2 mm; r = 1 mm = 10^{-3} m; r = 2.7×10^{-8} Ω m

$$R = \rho\frac{l}{A} = 2.7\times10^{-8}\times\frac{10000}{3.4\times(10^{-3})^2} \Rightarrow R = 0.859\times10^{2}\,\Omega = 86\Omega(approx.)$$

23. Identify the displacement and the double displacement reaction from the following reactions.

(a) HC1(aq) + NaOH(aq) → NaCI(aq) + H2O(l)

(b) Fe(s) + CuSO4(aq) → FeSO4(aq) + Cu(s)

Ans: (a) Double displacement reaction (b) Displacement reaction

OR

A teacher provided acetic acid, water, lemon juice, aqueous solution of sodium hydrogen carbonate and sodium hydroxide to students in the school laboratory to determine the pH values of these substances using pH papers. One of the students reported the pH values of the given substances as 3, 12, 4, 8 and 14 respectively. Which one of these values is not correct? Write its correct value stating the reason.

Ans: The pH value of water given is incorrect. Its correct value is 7 since it is neutral in nature.

24. Give the pair of contrasting traits of the following characters in pea plant and mention which is dominant and recessive.

(i) yellow seed (ii) round seed

Ans: (i) yellow — dominant

green — recessive

(ii) round — dominant

wrinkled — recessive

25. What are the differences between the transport of materials in xylem and phloem?

Ans:

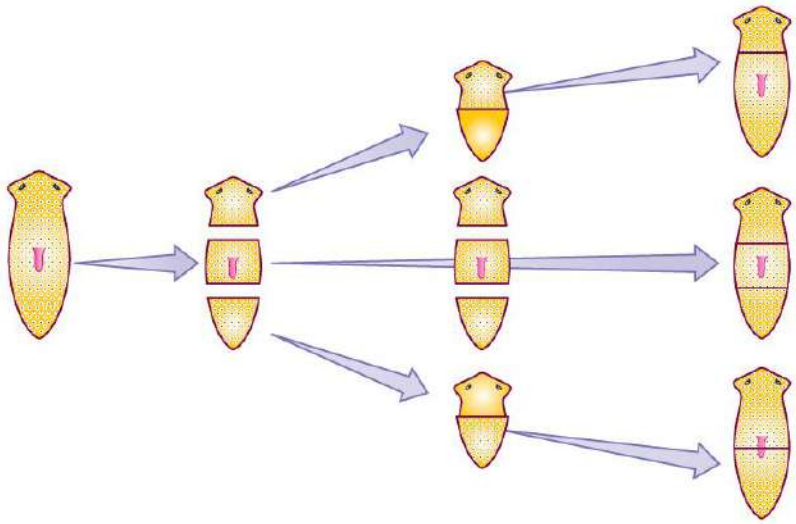
S. No.	Xylem	Phloem
1	Xylem conducts water and dissolved minerals from roots to leaves and other parts.	Phloem conducts prepared food material from leaves to other parts of plant in dissolved form.
2	In xylem, transport of material takes place through vessels and tracheids.	In phloem, transport of material takes place with the help of companion cells.
3	In xylem, upward movement of water and dissolved materials is mainly achieved by transpiration pull. It is caused due to sanction created by evaporation of water molecules from the stomata of a leaf.	In translocation, material is transferred into phloem tissue using energy from ATP. This increases the osmotic pressure that moves the material in the phloem to the tissues which have less pressure.
4	Movement of water is achieved by simple physical forces. There is no expenditure of energy. So, ATP molecules are not required.	The translocation in phloem is an active process and requires energy. This energy is taken from ATP molecules.

26. Which among the following are physical or chemical changes?
(i) Evaporation of petrol
(ii) Burning of Liquefied Petroleum Gas (LPG)
(iii) Heating of an iron rod to red hot
(iv) Curdling of milk
(v) Sublimation of solid ammonium chloride
Ans: (i) Physical change (ii) Chemical change (iii) Physical change
(iv) Chemical change (v) Physical change

SECTION – C

Questions 27 to 33 carry 3 marks each.

27. (i) Why are budding, fragmentation and regeneration all considered as asexual types of reproduction?
(ii) With neat diagrams explain the process of regeneration in Planaria.
Ans: (i) Because these methods involve only one parent / organisms are formed as a result of mitotic division / progeny (organisms) are similar in their genetic makeup and no variations.
(ii) Planaria can be cut into any number of pieces and each piece grows through specialized cells into a complete organism.



OR

Reproduction is one of the most important characteristics of living beings. Give three reasons in support of the statement.
Ans: Reproduction is an energy-consuming process which is not essential for the survival of an individual. But it is highly essential for all living beings because of the following reasons :
(i) Reproduction helps in increasing the number of members of a population.
(ii) By replacing the dead members with the new ones, it minimizes the risk of extinction of a species.
(iii) It brings about variations in species, thus, leading to their evolution.

28. What are reflex actions? Give two examples. Explain a reflex arc.
Ans: The sudden involuntary movement in a voluntary organ; in response to a stimulus; is called reflex action.
Examples of reflex action:
(a) Moving your hand away from a hot iron plate
(b) Blinking of eyes
Reflex Arc: Reflex arc is a path of electrical impulse during a reflex action. It is composed of sensory neuron, spinal cord, motor neuron and muscle.
Steps of reflex arc

- The sensory neuron picks signals from the stimulus and carries the signals to the spinal cord.
- Spinal cord process the signals and sends a message through the motor neuron.

- Motor neuron transmits the signals to the effector muscle so that the muscle can take immediate action.

29. (a) What is an ecosystem? List its two main components.
(b) 'The number of trophic levels in a food chain is limited'. Justify the statement.
Ans: (a) Ecosystem: It is the structural and functional unit of biosphere. It is a self-sustaining system where energy and matter are exchanged between living and non-living components. The main components of ecosystem are biotic and abiotic components. Biotic components comprise of living organisms: plants, animals, human beings and microorganisms. Abiotic components comprise of non-living part of the environment: air, water, soil, minerals, sunlight etc.
(b) When green plants are eaten by primary consumers, a great deal of energy is lost as heat to the environment. Some amount goes into digestion and in doing work and the rest goes towards growth and reproduction. Only 10 percent of the energy received by them is converted into their body mass which is available for the organisms of the next trophic levels. The longer the food chain, the less is the energy available to the final members of the food chain and that energy will be insufficient for their survival.

30. In an industrial process used for the manufacture of sodium hydroxide, a gas 'A' is formed as a by-product. The gas 'A' reacts with lime water to give a compound 'B' which is used as a bleaching agent in the chemical industry. Identify 'A' and 'B'. Also give the chemical equations of the reactions involved.
Ans: A — Cl_2 (Chlorine gas)
B — $CaOCl_2$ (Calcium oxychloride)

$$2NaCl + 2H_2O \rightarrow 2NaOH + Cl_2 + H_2$$
$$Cl_2 + Ca(OH)_2 \rightarrow CaOCl_2 + H_2O$$

OR

A metal A, which is used in thermite process, when heated with oxygen gives an oxide B, which is amphoteric in nature. Identify A and B. Write down the reactions of oxide B with HCl and NaOH.
Ans: A is aluminium (Al). It reacts with oxygen to form aluminium oxide, Al2O3.
$4Al(s) + 3O_2(g) \rightarrow 2Al_2O_3(s)$
So, B is Al_2O_3.
$Al_2O_3 + 6HCl \rightarrow 2AlCl_3 + 3H_2O$
$Al_2O_3 + 2NaOH \rightarrow 2NaAlO_2 + H_2O$

31. A silver article generally turns black when kept in the open for a few days. The article when rubbed with toothpaste again starts shining.
(i) Why do silver articles turn black when kept in the open for a few days? Name the phenomenon involved.
(ii) Name the black substance formed and give its chemical formula.
Ans: (i) Metals such as silver when attacked by substances around it such as moisture, acids, gases, etc, are said to corrode and this phenomenon is called corrosion.
(ii) The black substance is formed because silver (Ag) reacts with H_2S present in air. It forms thin black coating of silver sulphide (Ag_2S).

$$2Ag(s) + H_2S(g) \rightarrow Ag_2S(s) + H_2(g)$$
Black

32. Size of image of an object formed by a mirror having a focal length of 20 cm, is observed to be reduced to 1/3rd of its size. At what distance the object has been placed from the mirror? What is the nature of the image and the mirror?
Ans: An image smaller in size can be formed both by a concave mirror as well as a convex mirror.
Case I: When mirror is concave, the image is real.
Here, $m = -\frac{1}{3}, f = -20cm$

$Now, m = -\frac{v}{u} = -\frac{1}{3} \Rightarrow v = \frac{u}{3}$

Using, $\frac{1}{f} = \frac{1}{v} + \frac{1}{u} \Rightarrow \frac{1}{-20} = \frac{3}{u} + \frac{1}{u} \Rightarrow \frac{4}{u} = \frac{1}{-20} \Rightarrow u = -80cm$

$\Rightarrow v = \frac{u}{3} = -\frac{80}{3}cm$

∴ Image is real and inverted.

Case II: When mirror is convex, the image is virtual

Here, $m = \frac{1}{3}, f = 20cm$

$Now, m = -\frac{v}{u} = \frac{1}{3} \Rightarrow v = \frac{-u}{3}$

Using, $\frac{1}{f} = \frac{1}{v} + \frac{1}{u} \Rightarrow \frac{1}{20} = \frac{-3}{u} + \frac{1}{u} \Rightarrow \frac{-2}{u} = \frac{1}{20} \Rightarrow u = -40cm$

$\Rightarrow v = \frac{-u}{3} = \frac{40}{3}cm$

∴ Image is virtual and erect.

33. Read the following information:

I. Resistivity of copper is lower than that of aluminium which in turn is lower than that of constantan.

II. Six wires labelled as A, B, C, D, E, F have been designed as per the following parameters:

Wire	**Length**	**Diameter**	**Material**	**Resistance**
A	*l*	2*d*	Aluminium	R_1
B	*2l*	*d/2*	Constantan	R_2
C	*3l*	*d/2*	Constantan	R_3
D	*l/2*	3*d*	Copper	R_4
E	*2l*	2*d*	Aluminium	R_5
F	*l/2*	4*d*	Copper	R_6

Answer the following questions using the above data:

(i) Which of the wires has maximum resistance and why?

(ii) Which of the wires has minimum resistance and why?

(iii) Arrange R_1, R_3 and R_5 in ascending order of their values. Justify your answer.

Ans: (i) Wire C has maximum resistance because it has maximum length, least thickness and highest resistivity.

(ii) Wire F has the minimum resistance since it has least length, maximum thickness and least resistivity. (Using $R = \rho l/A$)

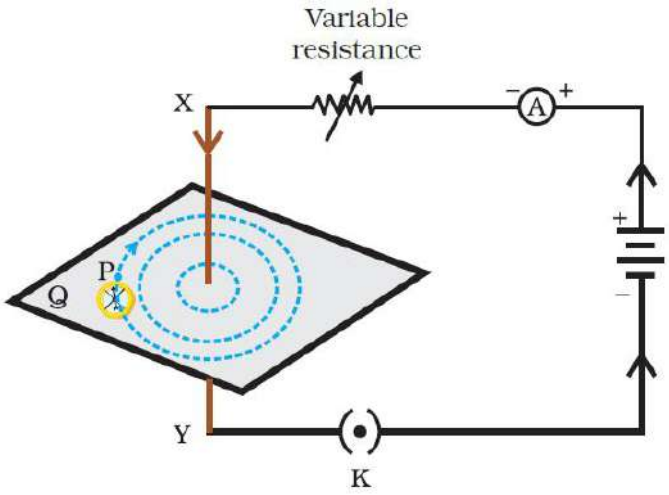
(iii) $R_3 > R_5 > R_1$ (Using relation $R = \rho l/A$ and comparing)

SECTION – D

Questions 34 to 36 carry 5 marks each.

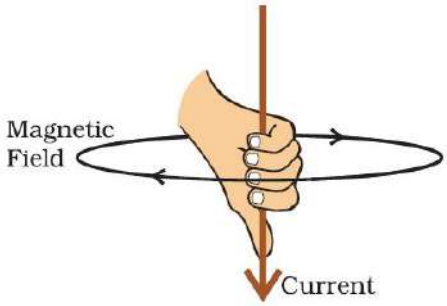
34. Draw the pattern of the field lines of the magnetic field around a current carrying straight conductor passing through and held perpendicular to a horizontal cardboard. State right-hand thumb rule and explain how this rule is useful to determine the direction of the magnetic field in the above case, if the direction of current in the conductor is vertically downwards.

Ans:



Maxwell Right Hand Thumb Rule: It states that suppose you are holding a current carrying conductor in your right hand in such a way that your thumb points in the direction of the current. Then the way or direction in which your fingers will encircle will give the direction of magnetic field lines.

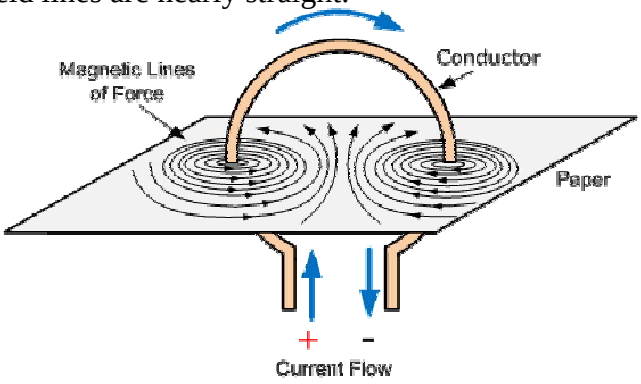
As in this case, the current flows downwards, so the magnetic field lines go clockwise.



OR

With the help of a labelled diagram, explain the distribution of magnetic field due to a current through a circular loop. Why is it that if a current carrying coil has n turns the field produced at any point is n times as large as that produced by a single turn?

Ans: The pattern of the magnetic field lines near the wires of the coil are concentric circles. The curvature of these curves goes on increasing as we move away from the wire. At the centre of the circular loop, the field lines are nearly straight.



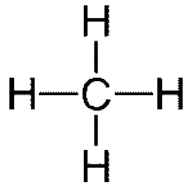
The magnetic field produced by a current carrying wire at a given point depends directly on the current passing through it. Therefore, if there is a circular coil having n turns, the field produced is n-times as large as that produced by a single turn. This is because the current in each circular turn has the same direction, and the field due to each turn then just adds up.

35. Why are certain compounds called hydrocarbons? Write the general formula for homologous series of alkanes, alkenes and alkynes and also draw the structure of the first member of each series. Write the name of the reaction that converts alkenes into alkanes and also write a chemical equation to show the necessary conditions for the reaction to occur.

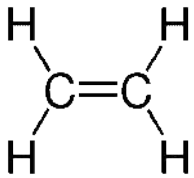
Ans: Certain compounds are called hydrocarbons because they are a group of compounds which are made up of hydrogen and carbon.

The homologous group of compounds are like alkanes, alkenes, alkynes, etc.

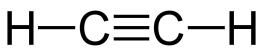
The alkanes only have carbon atoms that are attached to the other carbon atoms through single bonds.
In alkenes, the carbon atoms are connected through at least one double bond and the rest might or might not be single bonds.
In alkynes, the carbon atoms are connected through at least one triple bond and the rest might or might not be single bonds.
The homologous group of compounds have the same general formula.
The general formula of homologous series alkanes is C_nH_{2n+2}.
The general formula of homologous series alkenes is C_nH_{2n}.
The general formula of homologous series alkynes is C_nH_{2n-2}.
The first member of alkanes homologous series is methane.



The first member of alkenes homologous series is ethene.



The first member of alkynes homologous series is ethyne.



Ethene can be converted to ethane through the reaction known as catalytic hydrogenation reaction. This is known as this because it uses Raney Ni, Pt, or Pd as a catalyst. The reaction is given below.

$$\underset{Ethene}{CH_2=CH_2} + \underset{Hydrogen}{H_2} \xrightarrow[Nickel]{423\ K} \underset{Ethane}{CH_3-CH_3}$$

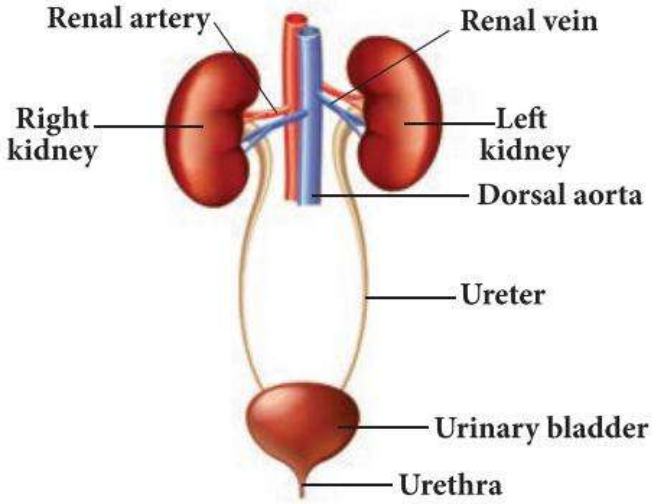
The conditions which are necessary for this reaction are the presence of a catalyst Ni and the temperature should be 423K.

36. Define pollination. Explain the different types of pollination. List two agents of pollination. How does suitable pollination lead to fertilization?
Ans: Pollination is defined as the transfer of pollen from anther or stamen to stigma of the flower.
Types of pollination:
(i) **Self pollination:** Transfer of pollen from anther or stamen to stigma occurs in the same flower or to the flower of same plant.
(ii) **Cross pollination:** Pollen is transferred from anther or stamen of one flower to stigma of another flower of another plant of same species.
Agents of pollination: Wind, water, insects and animals. (Any two)
After pollination, a tube grows out of the pollen grain and travels through the style to reach the female germ cell in the ovary, which results in fertilization.

OR

(a) Define excretion.
(b) Name the basic filtration unit present in the kidney.
(c) Draw excretory system in human beings and label the following organs of excretory system which perform following functions: (i) form urine. (ii) is a long tube which collects urine from kidney. (iii) store urine until it is passed out.

Ans: (a) Excretion is defined as the biological process of removal of harmful nitrogenous wastes like urea and uric acid from our body which are produced as byproducts of the various metabolic processes taking place in our body.
(b) The basic filtration unit present in the kidney is the nephron.
(c) The human excretory system is drawn here:



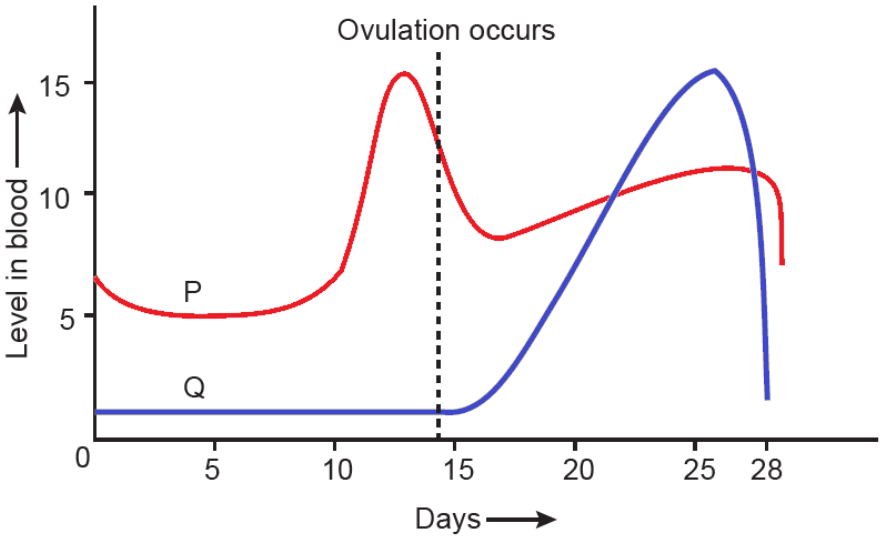
The organs performing the following functions have been labelled in the diagram.
(i) form urine: Kidneys
(ii) is a long tube which collects urine from kidney: Ureter
(iii) stores urine until it is passed out: Urinary bladder

SECTION – E(Case Study Based Questions)

Questions 37 to 39 carry 4 marks each.

37. Case Study – 1

Humans use sexual mode of reproduction. But the actual transfer of germ cells between two people needs special organs for the sexual act. In mammals such as humans, the baby is carried in the mother's body for a long period and is breastfed later on. The female reproductive organs and breasts will need to mature to accommodate these possibilities. Hence some specialised systems are involved in the process of sexual reproduction. The given graph shows the hormonal changes during a normal menstrual cycle.



(i) What would be a likely consequence if the hormone represented by graph Q is lacking in an adult female?
(ii) What is funeral of unfertilised egg?
(iii) After the beginning of menstrual cycle, at which day progesterone reaches its peak? Give reason.

OR

(iii) (a) Name two simple organisms having the ability of regeneration.
(b) What is the role of the seminal vesicles and the prostate gland?
Ans: (i) The uterine lining might not be sufficiently stable for implantation of fertilised ovum.
(ii) Menstruation is also called funeral of egg since it is not fertilised.
(iii) According to the given chart of hormone regulation in the menstrual cycle, the progesterone level peaks at the 22nd day.

OR

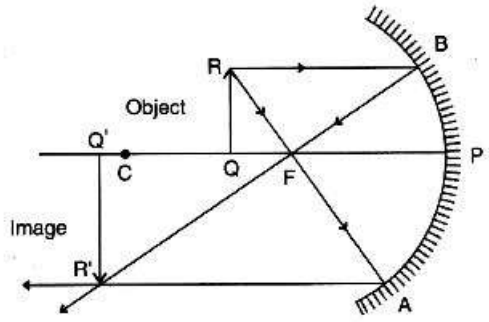
(iii) (a) Planaria/Hydra/Earthworm.
(b) Seminal vesicles are a pair of thin-walled muscular elongated sacs which secrete fluid for nourishment of sperms.
Prostate glands also produce fluid which is released in the urethra along with secretion of seminal vesicle and helps in sperm mobility. The secretion of these accessory glands together with sperm is called semen. It affects the vaginal pH so that sperms move smoothly inside the vagina.

38. Case Study – 2

A student wants to project the image of a candle flame on the walls of the school laboratory by using a mirror.
(a) Which type of mirror should he use and why?
(b) At what distance, in terms of focal length of the mirror, should he place the candle flame to get the magnified image on the wall?
(c) Draw a ray diagram to show the formation of the image in this case.

OR

(d) (i) To get the diminished image of the candle flame, where the object must be placed?
(ii) If the image formed by this mirror is inverted and real, then what will be its magnification?
Ans: (a) He should use a concave mirror as it forms real images.
(b) He should place the candle flame between the focus and centre of curvature of the mirror to get the magnified image on the wall.
(c)



OR

(d) (i) To get the diminished image of the candle flame, the object must be placed at infinity.
(ii) If the image formed by this mirror is inverted and real, then the magnification will be negative.

39. Case Study – 3

Manoj performed an experiment to understand that heat is produced when a few drops of concentrated sulphuric acid is slowly added into a beaker containing water. For this, he took 10 mL water in a beaker and added a few drops of concentrated H_2SO_4 to it. Then, he swirled the beaker slowly. During the process, a vigourous reaction takes place. It is an exothermic process.

(a) Why is it recommended that the acid should be added to water and not water to the acid?
(b) How will the concentration of hydrogen ions gets affected if an acid is diluted?
(c) What is this process called? Define the process.

OR

If we have hydrochloric acid and acetic acid of equal concentration, which will be a stronger acid and why?

Ans: (a) Dilution of concentrated acid is an exothermic process. If water is added to a concentrated acid, the heat generated may cause the mixture to splash out and cause burns. When the acid is added to water slowly with constant stirring, the mixture will not splash out.
(b) Concentration of H^+ decreases with increase in dilution.
(c) Dilution of the acid. Dilution of an acid or base means mixing an acid or base with water. This is done to decrease the concentration of ions (H_3O^+/OH^-) per unit volume.

OR

Hydrochloric acid will be a stronger acid, because it produces more H^+ ions.