Sample Paper 02

Class X 2023-24

Science (086)

Time: 3 Hours **Max. Marks: 80**

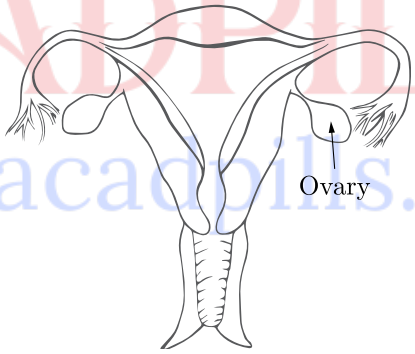
General Instructions:

1. This question paper consists of 39 questions in 5 sections.
2. All questions are compulsory. However, an internal choice is provided in some questions. A student is expected to attempt only one of these questions.
3. Section A consists of 20 Objective Type questions carrying 1 mark each.
4. Section B consists of 6 Very Short questions carrying 02 marks each. Answers to these questions should in the range of 30 to 50 words.
5. Section C consists of 7 Short Answer type questions carrying 03 marks each. Answers to these questions should in the range of 50 to 80 words.
6. Section D consists of 3 Long Answer type questions carrying 05 marks each. Answer to these questions should be in the range of 80 to 120 words.
7. Section E consists of 3 source-based/case-based units of assessment of 04 marks each with sub-parts.

SECTION-A

Select and write one most appropriate option out of the four options given for each of the questions 1 – 20.

1. The image shows the reproductive organ in females.



Which event will likely occur in the ovaries of females after attaining puberty?

(a) Synthesis of eggs

(b) Fertilisation

(c) Growth and development of embryo

(d) Production of eggs

2. How will you protect yourself from the heat generated while diluting a concentrated acid?

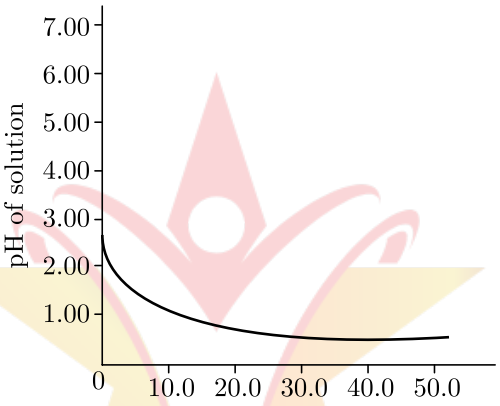
(a) By adding water to acid with constant stirring

(b) By adding acid to water with constant stirring

(c) By adding base to acid with constant stirring

(d) By adding water to acid followed by base

3. 50.0 mL of tap water was taken in a beaker. Hydrochloric acid was added drop by drop to water. The temperature and pH of the solution was noted. The following graph was obtained. Choose the correct statements related to this activity.



Volume of HCl added (ml).

(i) The process of dissolving an acid in water is highly endothermic.

(ii) The pH of the solution increases rapidly on addition of acid.

(iii) The pH of the solution decreases rapidly on addition of acid.

(iv) The pH of tap water was around 7.0

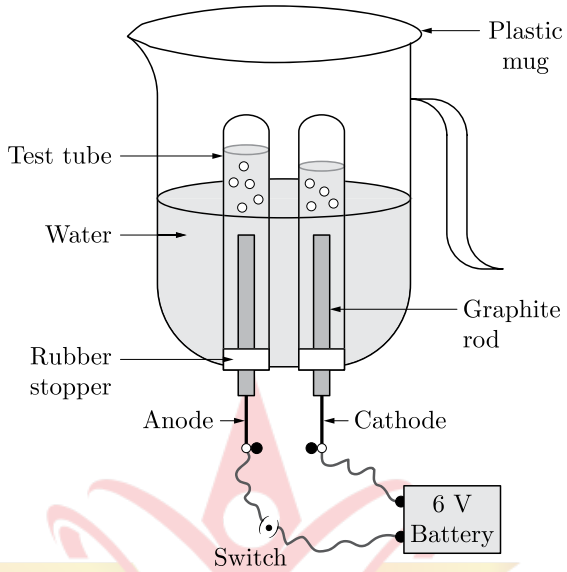
(a) (i) and (iii)

(b) (i) and (ii)

(c) (ii) and (iv)

(d) (iii) and (iv)

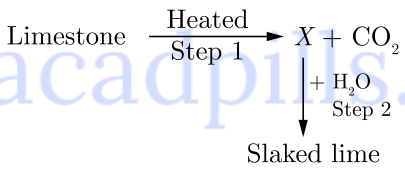
4. Observe the given diagram and identify the correct statements.



(i) At anode, oxygen gas is evolved.
(ii) In the test tube covering the anode, the amount of gas collected is double than that of the gas collected in the test tube covering the cathode.
(iii) At cathode, hydrogen gas is evolved.
(iv) It is a decomposition reaction.

(a) (i), (iii) and (iv)
(b) (i), (ii) and (iii)
(c) All the statements are correct.
(d) (iii) and (iv)

5.



Identify the correct option from the given table which represents the type of reactions occurring in step 1 and step 2.

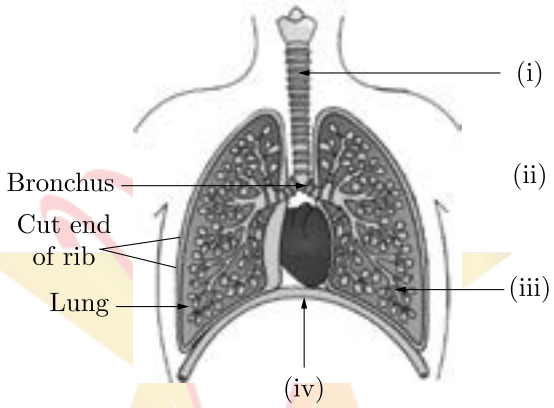
Option	**Endothermic**	**Exothermic**
a.	×	✓
b.	✓	×
c.	✓	✓
d.	×	×

6. Which one of the following structures correctly depicts the compound $CaCl_2$?

(a) $Ca^{2+}\left[\cdot\!\underset{\times}{\overset{\bullet\bullet}{\overset{\bullet\bullet}{Cl}}}\!\cdot\right]^{2-}$ (b) $\left[\overset{\times\times}{\underset{\times\times}{\times Cl\times}}\right]^{2+}\left[\cdot\!\underset{\times}{\overset{\bullet\bullet}{\overset{\bullet\bullet}{Cl}}}\!\cdot\right]_2$

(c) $Ca^{2+}\left[\cdot\!\underset{\times}{\overset{\bullet\bullet}{\overset{\bullet\bullet}{Cl}}}\!\cdot\right]_2$ (d) $\left[\overset{\times\times}{\underset{\times\times}{\times Cl\times}}\right]^{2+}\left[\cdot\!\underset{\times}{\overset{\bullet\bullet}{\overset{\bullet\bullet}{Cl}}}\!\cdot\right]^{-}_2$

7. Carefully study the diagram of the human respiratory system with labels (i), (ii), (iii) and (iv). Select the option which gives correct identification and main function and/or characteristic.

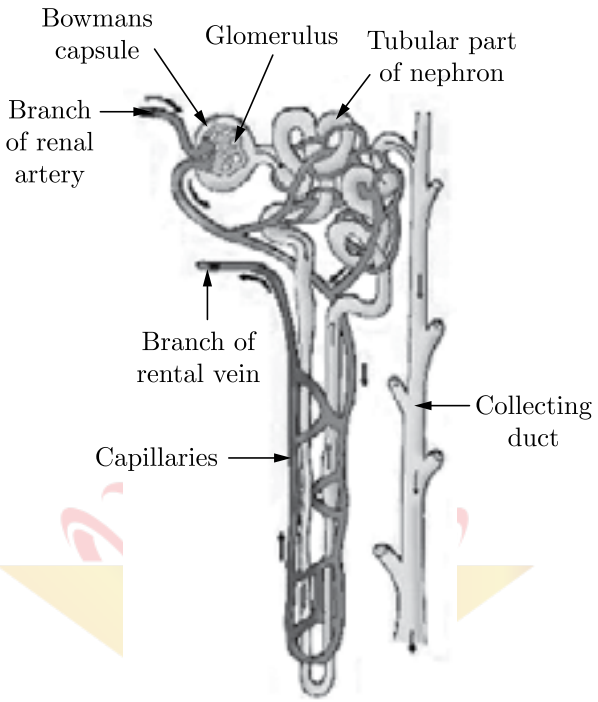


(a) (i) Trachea: It is supported by bony rings for conducting inspired air.
(b) (ii) Ribs: When we breathe out, ribs are lifted.
(c) (iii) Alveoli: Thin-walled sac like structures for exchange of gases.
(d) (iv) Diaphragm: It is pulled up when we breathe in.

8. When a fuse is rated at 8 A, it means:
(a) it will burn if current exceeds 8 A
(b) it will work only if current is 8 A
(c) it has a resistance of 8Ω
(d) it will not work if current is less than 8 A

9. It is important to balance the chemical equations to satisfy the law of conservation of mass. Which of the following statements of the law is incorrect?
(a) The number of atoms of each elements remains the same, before and after a chemical reaction.
(b) The total mass of the elements present in the reactants is equal to the total mass of the elements presents in the products.
(c) Mass can neither be created nor can it be destroyed in a chemical reaction.
(d) The chemical composition of the reactants is the same before and after the reaction.

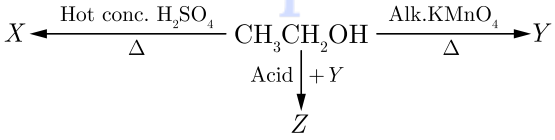
10. Observe the image of a single nephron.



The amount of liquid passing through in the form of glomerular filtrate is approximately 150-180 litres per day whereas the amount of urine flowing out of all the nephrons is only 1.5 to 1.8 litres per day.
Water is getting reabsorbed.
In which part of the nephron could the water be getting reabsorbed?

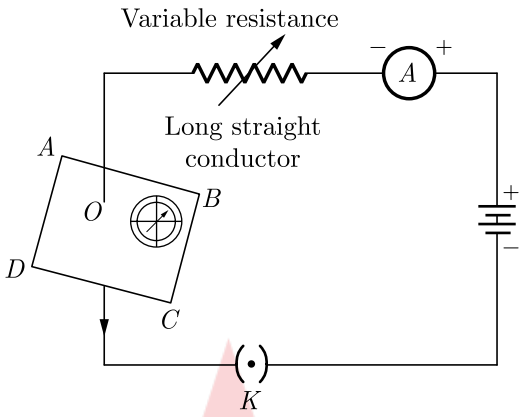
(a) In the long tubular part
(b) In the Bowman's cup
(c) In the glomerulus
(d) In the collecting duct

11. Identify X, Y and Z respectively in the given reaction



(a) $CH_2 = CH_2$, CH_3COOH, $CH_3COOCH_2CH_3$
(b) CH_3COOH, $CH_2 = CH_2$, CH_3COOCH_3
(c) CH_3CH_3, HCHO, CH_3COOH
(d) HCHO, CH_3CH_3, CH_3CH_2COOH

12. If the key in the arrangement is taken out (the circuit is made open) and magnetic field lines are drawn over the horizontal plane ABCD, the lines are:



(a) elliptical in shape
(b) concentric circles
(c) concentric circles near the point O but of elliptical shapes as we go away from it
(d) straight lines parallel to each other

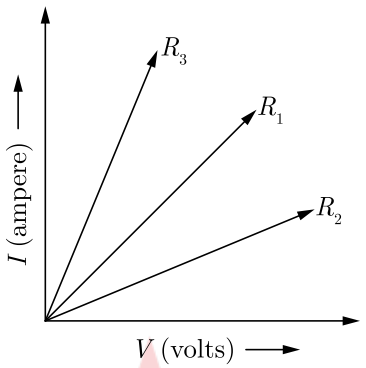
13. The two versions of a trait (character) which are brought in by the male and female gametes are situated on:
(a) two different chromosomes
(b) copies of the same chromosome
(c) any chromosome
(d) sex chromosomes

14. The given figures show movement seen in Mimosa pudica plant when it is touched.

Select the incorrect option regarding this.
(a) The movement is non-directional that occurs due to turgor changes.
(b) The movement is directional that involves growth.
(c) The movement is in response to touch and is called thigmonasty.
(d) The movement is immediate in response to stimulus.

15. The resistance of a resistor is reduced to half of its initial value. In doing so, if other parameters of the circuit remain unchanged, the heating effects in the resistor will become:
(a) half
(b) two times
(c) four times
(d) one-fourth

16. A student plots V-I graphs for three samples of nichrome wire with resistances R_1, R_2 and R_3. Choose from the following statement that holds true for this graph:



(a) $R_1 > R_2 > R_3$
(b) $R_1 = R_2 = R_3$
(c) $R_2 > R_1 > R_3$
(d) $R_3 > R_2 > R_1$

Question no. 17 to 20 are Assertion-Reasoning based questions.

17. **Assertion (A):** In many reptiles, sex determination rely entirely on environmental factors.
Reason (R): The temperature at which fertilised eggs are kept determines whether the animal developing in the eggs will be a male or female.
(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 but 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.

18. **Assertion (A):** A compass needle is placed near a current carrying wire. The deflection of the compass needle decreases when the magnitude of electric current in the wire increases.
Reason (R): The magnitude of the magnetic field produced at a point increases as the current through the wire increases.
(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 but 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.

19. **Assertion (A):** Hydrochloric acid helps in the digestion of food in the stomach.
Reason (R): Hydrochloric acid creates an acidic medium to activate protein digesting enzymes.
(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 but 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.

20. **Assertion (A):** $2H_2S(g) + O_2(g) \longrightarrow 2S(s) + 2H_2O(l)$ is a redox reaction.

Reason (R): In this reaction, oxidation of H_2S to S and reduction of O_2 to H_2O takes place.

(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 but 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.

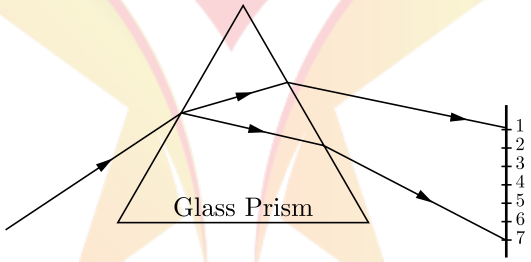
SECTION-B

Question no. 21 to 26 are very short answer questions.

21. What is a rainbow? Draw a labelled diagram to show the formation of a rainbow.

or

A beam of white light falling on a glass prism gets split up into seven colours marked 1 to 7 as shown in the diagram.



Which two positions correspond closely to the colour of

(i) a solution of potassium permanganate

(ii) danger or stop signal lights?

22. What is haemoglobin? State the consequences of deficiency of haemoglobin in our bodies.

23. What is the difference between the organisms belonging to the first and the third trophic levels? Give one example each of the organisms belonging to these two trophic levels.

24. Differentiate between an autotroph and a heterotroph.

25. Write the balanced chemical equations for the following reactions and identify the type of reaction in each case.

(i) Nitrogen gas is treated with hydrogen gas in the presence of a catalyst at 773K to form ammonia gas.

(ii) Ethene is burnt in the presence of oxygen to form carbon dioxide, water and releases heat and light.

or

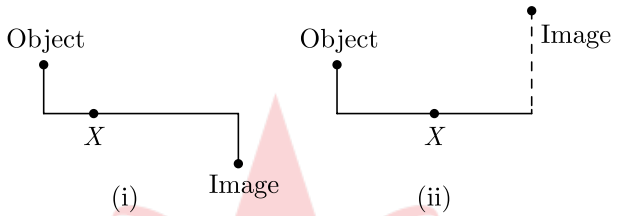
Blue litmus solution is added to two test tubes A and B containing dilute HCl and NaOH solution respectively. In which test tube a colour change will be observed? State the colour change and give its reason.

26. Trace the sequence of events which occur when a bright light is focused on your eyes.

SECTION-C

Question no. 27 to 33 are short answer questions.

27. The nature, size and position of image of an object produced by a lens or mirror are as shown below. Identify the lens/mirror (X) used in each case and draw the corresponding complete ray diagram, (size of the object about half of the image).



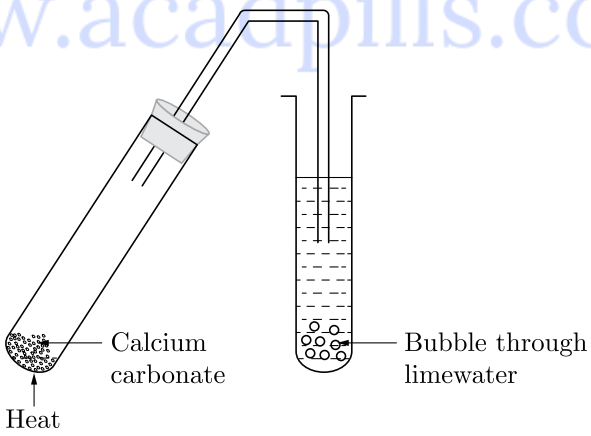
28. (i) State Snell's law of refraction of light.
(ii) When a ray of light travelling in air enters obliquely into a glass slab, it is observed that the, Light ray emerges parallel to the incident ray but it is shifted sideways slightly. Draw a labelled ray diagram to illustrate it.

29. (i) Draw the pattern of magnetic field lines due to a magnetic field through and around a current carrying circular loop.
(ii) Name and state the rule to find out the direction of magnetic field inside and around the loop.

or

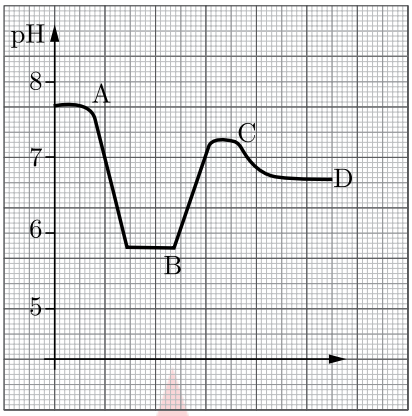
What is a solenoid? Draw the pattern of magnetic field lines of
(i) a current carrying solenoid and a bar magnet.
(ii) List two distinguishing features between the two fields.

30. You are given a white solid which is calcium carbonate, $CaCO_3$.



(i) What happens to the white solid after heating?
(ii) What will you observe in the lime water during the heating process?
(iii) Write the reactions involved.

31. The graph shows how the pH of the soil in a farmer's field changed over a period of time



(i) At which point A, B, C or D did the farmer apply lime to the field.
(ii) What is the importance of pH in our daily life?
(iii) Give two examples showing importance of neutralisation in our daily life.

32. (i) State the role played by the following in the process of digestion:
(a) Enzyme trypsin
(b) Enzyme lipase
(ii) List two functions of finger like projection present in the small intestine.

or

(i) Write the correct sequence of steps followed during journey of oxygen rich blood from lungs to various organs of human body.
(ii) What happens when the system of blood vessels develop a leak?

33. How can we help in reducing the problem of waste disposal? Suggest any three methods.

SECTION-D

Question no. 34 to 36 are Long answer questions.

34. Differentiate between the following:
(i) Pollen tube and style
(ii) fission in Amoeba and Plasmodium
(iii) Fragmentation and regeneration
(iv) Bud of Hydra and bud of Bryophyllum
(v) Vegetative propagation and spore formation

or

(i) What is puberty?
(ii) Describe in brief the functions of the following parts in the human male reproductive system:
(a) Testes
(b) Seminal vesicle
(c) Vas deferens
(d) Urethra
(iii) Why are testes located outside the abdominal cavity?
(iv) State how sperms move towards the female germ cell.

35. With the help of a diagram of experimental setup, describe an activity to show that the force acting on a current carrying conductor placed in a magnetic field increases with increase in field strength.

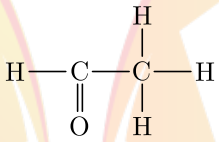
36. The compounds methanal, ethanal, propanal and butanal belong to the homologous series called aldehydes. The table shows some information on these four aldehydes.

Name	**Formula**	**Boiling Point/°C**	**Solubility in water**
Methanal	HCHO	−21	very soluble
Ethanal	CH_3CHO	21	very soluble
Propanal	CH_3CH_2CHO	49	soluble
Butanal	$CH_3CH_2CH_2CHO$	76	slightly soluble

(i) List two characteristics of this homologous series using the information shown in the table.
(ii) Compare the molecular formulae of the four aldehydes listed in the table. What conclusion can you make?
(iii) Draw the electronic structure of ethanal. You need to show only the outer shell electrons.

or

(i) Compare soaps and detergents on the basis of their composition and cleansing action in hard water.
(ii) What happens when ethanol is treated with sodium metal? State the behaviour of ethanol in this reaction.
(iii) Draw the structure of cyclohexane.
(iv) Name the following compound



SECTION-E

Question no. 37 to 39 are case-based/data-based questions with 2 to 3 short sub-parts. Internal choice is provided in one of these sub-parts.

37. Manoj wanted to fix the rear-view mirror of his bike. He knows that rear-view mirror is an essential safety device in the vehicle and allows him to see objects at the backside of his vehicle.

He bought two mirrors M_1 and M_2, out of which M_1 is curved inwards and M_2 is curved outwards.

(i) Based on the given situation, which mirror should Manoj need to fix as his rear-view mirror and why?

(ii) An object is placed at the centre of curvature of M_1. Find the distance between its image and pole.

(iii) Manoj did some preliminary experiment with mirror M_1 and found that magnification of the real image of an object placed at 10 cm in front of it is 3, at what distance is the image located?

or

(iv) An object is placed 60 cm in front of M_2. The image formed by the mirror is located 30 cm behind the mirror. What is the object's magnification?

38. When a silvery grey powder of a solid (A) is mixed with a powder of solid (B) no reaction occurs. But if the mixture is ignited and lighted using magnesium ribbon a reaction occurs with evolution of large amount of heat forming product (C) which settles down as liquid metal and the solid product (D) formed floats on the liquid (C) in solid form reacts with moisture to form rust.

The amount of heat generated during the reaction is so high that the reaction is used in welding of electric conductors, joints in railway tracks.

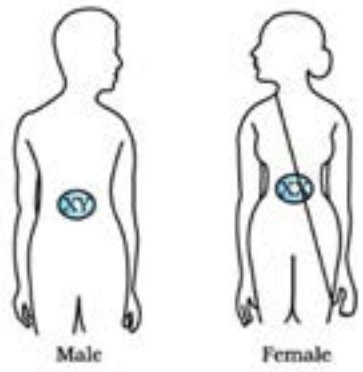
(i) Identify (A), (B), (C) and (D). Write the balanced chemical equation for the reaction. Name the type of reaction.

(ii) If (A) reacts with air on heating that will be the nature of oxide formed?

or

(iv) Does oxide of (A) react with aqueous NaOH and/or HCl. Give balanced chemical equations.

39. Sex determination is the method by which distinction between males and females is established in a species. The sex of an individual is determined by specific chromosomes. These chromosomes are called sex chromosomes. X and Y chromosomes are called sex chromosomes. The normal chromosomes other than the sex chromosomes of an individual are known as autosomes.



(i) A normal baby girl receives her X chromosome from whom: mother, father, both mother and father or either from mother or father?

(ii) Which vital function is not controlled by autosomes?

(iii) A couple has six daughters. What is the possibility of them having a girl next time?

or

(iv) Do genetic combination of mothers play a significant role in determining the sex of a new born?