CBSE

Class X Science

Sample Paper 4

Time: 3 hrs **Total Marks: 80**

General Instructions:

(i) The question paper comprises four sections A, B, C and D. There are 36 questions in the question paper. All questions are compulsory.

(ii) Section–A - question no. 1 to 20 - all questions and parts thereof are of one mark each.

(iii) These questions contain multiple choice questions (MCQs), very short answer questions and assertion - reason type questions. Answers to these should be given in one word or one sentence.

(iv) Section–B - question no. 21 to 26 are short answer type questions, carrying 2 marks each. Answers to these questions should in the range of 30 to 50 words.

(v) Section–C - question no. 27 to 33 are short answer type questions, carrying 3 marks each. Answers to these questions should in the range of 50 to 80 words.

(vi) Section–D – question no. - 34 to 36 are long answer type questions carrying 5 marks each. Answer to these questions should be in the range of 80 to 120 words.

(vii) There is no overall choice. However, internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.

(viii) Wherever necessary, neat and properly labelled diagrams should be drawn.

SECTION A

1. How many covalent bonds are there in a molecule of ethane (C_2H_6)? (1)

OR

Write the name and formula of the 2nd member of homologous series having general formula C_nH_{2n}.

2. Name two metals which react with very dilute HNO_3 to evolve hydrogen gas. (1)

3. Among the alkaline earth metals, which element has high metallic character? (1)

i) Be
ii) Mg
iii) Ca
iv) Sr

4. Why should the resistance of an ammeter be very small? (1)

5. What is tyndall effect? (1)

6. What is the name of the phenomenon in which the right side of an object appears to be left side of the image in a plane mirror? (1)

OR

What name is given to the ratio of sine of angle of incidence to the sine of angle of refraction?

7. If the image formed by a convex lens is of the same size as that of the object, what is the position of the image with respect to the lens? (1)

8. Which property of light makes a pencil cast a shadow when it is held in front of a light source? (1)

9. Name the rule for finding the direction of magnetic field produced by a straight current-carrying conductor. (1)

OR

What is the shape of a current-carrying conductor whose magnetic field pattern resembles that of a bar magnet?

10. Why do walls of the trachea not collapse when there is less air in it? (1)

11. Newly formed DNA copies may not be identical at times. Give reason. (1)

OR

If a tall pea plant is crossed with a dwarf pea plant, what is the ratio of dwarf plants in the F_2 generation?

12. Which methodology is preferred for reducing the problem of waste disposal? (1)

OR

Give reason why a food chain cannot have more than four trophic levels.

13. In addition to CO_2 and chlorophyll, which other raw materials are required by plants to make food during photosynthesis? (1)

For question numbers 13 and 14, two statements are given—one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (i), (ii), (iii) and (iv) as given below:

i) Both A and R are true, and R is the correct explanation of the assertion.
ii) Both A and R are true, but R is not the correct explanation of the assertion.
iii) A is true, but R is false.
iv) A is false, but R is true.

14. **Assertion:** Aluminium displaces iron from iron oxide.
Reason: Metals placed at the top of the reactivity series can displace metals placed below them. (1)

15. **Assertion:** Transpiration cools leaf surface.
Reason: Transpiration helps in translocation of sugar in plants. (1)

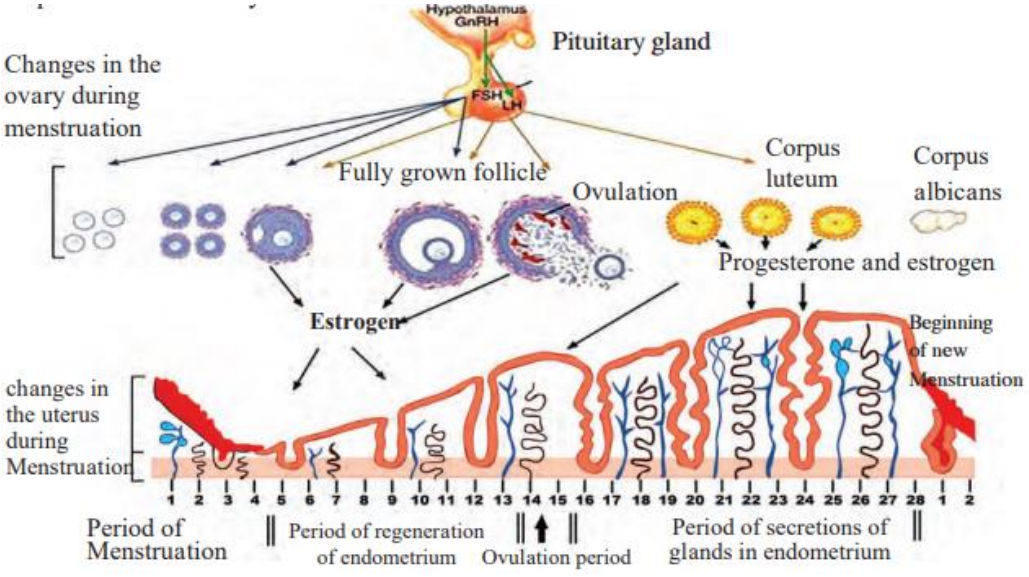
OR

Assertion: Villi are present on the inner wall of the small intestine.
Reason: Villi helps to absorb the digested food.

16. **Assertion:** Sexual reproduction generates recombination.
Reason: Sexual reproduction involves crossing over. (1)

Answer Q. No 17 - 20 contain five sub-parts each. You are expected to answer any four subparts in these questions.

17. Read the following and answer any **four** questions from 17 (i) to 17 (v) (1×4)
Female reproductive system undergoes some changes at puberty and those changes repeat at the interval of every 28 – 30 days. These repetitive changes are called as menstrual cycle. Menstrual cycle is a natural process, controlled by hormones.



i) Which of the following hormone does not play a role in menstrual cycle?
   a) FSH
   b) LH
   c) Estrogen
   d) Testosterone

ii) Release of the oocyte is termed
   a) Ovulation
   b) Fertilisation
   c) Menstruation
   d) Gestation

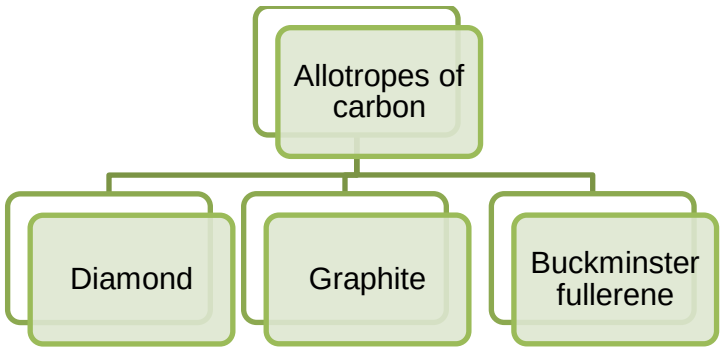
iii) If oocyte is not fertilized within 24 hours, corpus luteum becomes inactive and transforms into
   a) Blastocyst
   b) Corpus albicans
   c) Zygote
   d) Ovule

iv) The release of hormones involved in the menstrual cycle is regulated by the
   a) Adrenal gland
   b) Pituitary gland
   c) Thyroid gland
   d) Placenta

v) When does ovulation occur?
   a) Day 5
   b) Day 13
   c) Day 18
   d) Day 1

18. Read the following and answer any **four** questions from 18 (i) to 18 (v) (1×4)

The various physical forms in which an element can exist are called the allotropes of the element. Three allotropes of carbon are:

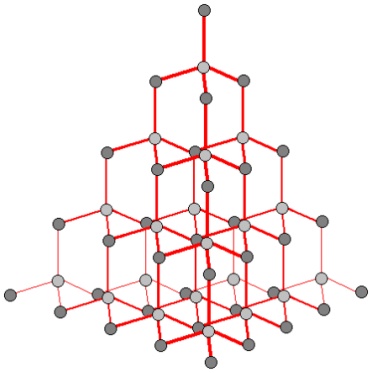


In diamond, each carbon atom is bonded to four other carbon atoms, forming a three dimensional. It is a non-conductor of electricity since there are no free electrons in a diamond crystal. In graphite, each carbon atom is bonded to three other carbon atoms in the same plane, giving a hexagonal array. It is a very good conductor of electricity due to the presence of free electrons. Fullerene is an allotrope of carbon containing clusters of 60 carbon atoms joined together to form spherical molecules. There are 60 carbon

atoms in a molecule of buckminsterfullerene, so its formula is C_{60}. The allotrope was named buckminsterfullerene after the American architect Buckminster Fuller.

i) Which has a 2D hexagonal layered structure?
   a) Graphite
   b) Diamond
   c) Fullerene
   d) all of these

ii) What structure is shown in the diagram?



   a) Graphite
   b) Diamond
   c) Fullerene
   d) all of these

iii) Which is a semiconductor?
   a) Graphite
   b) Diamond
   c) Fullerene
   d) all of these

iv) Which answer shows the correct number of C-C covalent bonds in its allotropes?
   a) Diamond 3, Graphite 3, fullerene 3
   b) Diamond 4, Graphite 3, fullerene 3
   c) Diamond 4, Graphite 3, fullerene 4
   d) Diamond 4, Graphite 4, fullerene 3

v) Three of the following applications of graphite follow from structure-related properties. Which application in the list is not associated with graphite?
   a) Use as a semiconductor.
   b) Use as a lubricant.
   c) Use in pencil leads.
   d) Use in electrodes.

19. Read the following and answer any four questions from 19 (i) to 19 (v) (1×4)

Aditi wants to project the image of a candle flame on screen 60 cm in front of a mirror by keeping the flame at a distance of 15 cm from its pole.

i) The type of mirror that must be used is
   a) Plane mirror
   b) Concave mirror
   c) Plano – convex mirror
   d) Convex mirror

ii) The linear magnification of the image produced is
   a) 1
   b) – 4
   c) +4
   d) – 1

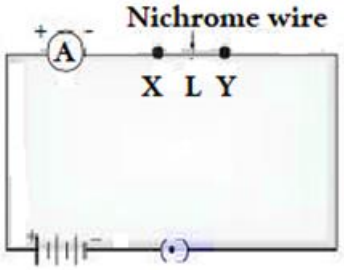
iii) The linear magnification indicates that the image is
   a) real, inverted and magnified
   b) virtual, erect and magnified
   c) real, inverted and same size as that of image
   d) virtual, erect and of same size as that of image

iv) The distance between the object and its image is
   a) 75 cm
   b) 15 cm
   c) 45 cm
   d) 60 cm

v) The object is placed
   a) At focus
   b) Between pole and focus
   c) At centre of curvature
   d) Between centre of curvature and principal focus

20. Read the following and answer any 4 questions from 20 (i) to 20 (v) (1× 4)

In the below circuit, a nichrome wire of length 'L' is connected between points X and Y and note the ammeter reading. The experiment is performed and repeated by inserting another nichrome wire of same thickness but twice the length i.e. '2L'.



i) What are the changes observed in the ammeter readings?
   a) Ammeter readings decreases, becomes half
   b) Ammeter readings increases, becomes two times
   c) Ammeter readings increases becomes quadrupled
   d) Ammeter reading decreases becomes one – fourth

ii) What change is occurred in ammeter reading if instead of changing the length the area of cross – section is doubled?
   a) Ammeter readings decreases, becomes half
   b) Ammeter readings increases, becomes two times
   c) Ammeter readings increases becomes quadrupled
   d) Ammeter reading decreases becomes one – fourth

iii) If the resistors of 5 ohms and 10 ohms are connected in series in the above circuit. What is the ratio of the current passing through the two resistors?
   a) 2:1
   b) 3:1
   c) 1:2
   d) 1:1

iv) If the resistors are connected in parallel
   a) Current across each resistor is same and voltage changes
   b) Current and voltage across each resistor is same
   c) Current across each resistor varies and voltage remains same
   d) Current changes, voltage changes

v) SI unit of current is denoted as
   a) A
   b) C
   c) I
   d) J

SECTION B

21. How are water and minerals absorbed by the plant? (2)

OR

How do plants respire?

22. Define vegetative propagation. Give two advantages of this method. (2)

23. From amongst the metals sodium, calcium, aluminium, copper and magnesium, name the metal: (2)

(i)Which reacts with water only on boiling, and

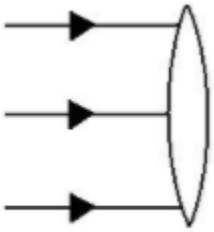
(ii)Another which does not react even with steam.

OR

A copper plate was dipped in $AgNO_3$ solution. After certain time, silver from the solution was deposited on the copper plate. State the reason why it happened.

24. Write the chemical formula of washing soda and baking soda. Which of these two is an ingredient of antacids? How do antacids provide relief in stomach ache? (2)

25. (a) What type of lens is shown in the diagram on the right? What will happen to the parallel rays of light? Show by completing the ray diagram. (2)



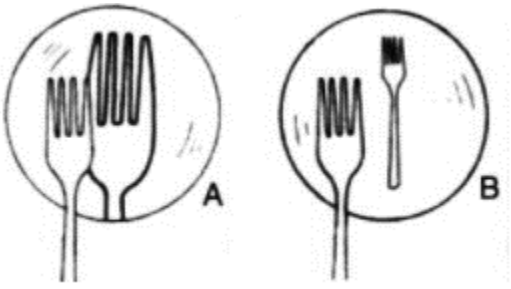
(b) Your eye contains a convex lens. Why is it unwise to look at the sun?

26. The diagrams show the appearance of a fork when placed in front of and close to two mirrors A and B, turn by turn.

(a) Which mirror is convex?

(b) Which mirror is concave?

Give reasons for your choice. (2)



SECTION C

27. What is translocation? Why is it essential for plants? (3)

OR

Offspring formed due to sexual reproduction have better chances of survival. Why? Is this statement always true?

28. A pea plant with blue flowers denoted by BB is cross-bred with a pea plant with white flowers denoted by ww. (3)

(a) What is the expected flower colour in the F_1 progeny?

(b) What will be the percentage of plants bearing white flowers in the F_2 generation when the flowers of F_1 plants are self-pollinated?

(c) State the expected ratio of the genotypes BB and Bw in the F_2 progeny.

29. The circulatory system of humans undergoes a switch-over process. (3)

(a) Identify the stage at which it takes place.

(b) Mention its importance.

30. In the electrolysis of water, (3)

(a) Name the gas collected at the anode and the cathode.

(b) Why is the volume of the gas collected at one electrode double than that collected at the other?

(c) What would happen if dil. H_2SO_4 is not added to water?

31. An element P belongs to Group 17 and the third period of the periodic table. (3)

(a) Write the electronic configuration of the element. What is its valency?

(b) Predict its nature, whether it is a metal or a non-metal.

(c) Give the formula of the compound formed when it combines with an element Q having a valency three. (3)

32. A brown substance 'X' on heating in air forms a compound 'Y'. When hydrogen gas is passed over 'Y', it changes to 'X' again. (3)

Name substances 'X' and 'Y'.

Name the processes occurring during the two changes.

Write the chemical equations involved.

33. The image of an object placed at 30 cm in front of a lens is obtained on a screen at a distance of 60 cm from it. Find the focal length of the lens. What would be the height of the image if the object is 2 cm high? (3)

SECTION D

34. (5)

(a) You are provided with three test tubes A, B, C which contain distilled water, an acidic solution and a basic solution. If you are only given blue litmus paper, how will you identify the nature of the solutions in the three test tubes?

(b) How is plaster of Paris prepared from gypsum? For what purpose is it used in hospitals?

OR

Five solutions A, B, C, D and E when tested with universal indicator showed pH as 4, 1, 11, 7 and 9, respectively. Which solution is (5)

(a) Neutral
(b) Strongly alkaline
(c) Strongly acidic
(d) Weakly acidic
(e) Weakly alkaline

35. (5)

(a) Draw a schematic representation of transport and exchange of oxygen and carbon dioxide during transportation of blood in human beings and label on it: Lung capillaries, Pulmonary artery to lungs, Aorta to body, Pulmonary veins from lungs.

(b) What is the advantage of separate channels in mammals and birds for oxygenated and deoxygenated blood?

36.

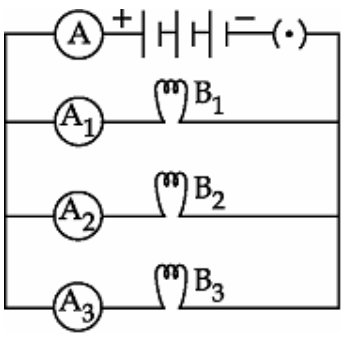
(a) List the factors on which the resistance of a conductor depends. (5)

(b) A 4-kW heater is connected to a 220-V power source. Calculate

(i) Electric current passing through the heater
(ii) Resistance of the heater
(iii) Electric energy consumed in a 2-hour use of the heater

OR

What is meant by the statement 'the potential difference between two points is 1 V'? Study the circuit shown in which three identical bulbs B1, B2 and B3 are connected in parallel with a battery of 4.5 V.



(a) What will happen to the glow of the other two bulbs if bulb B_3 gets fused?

(b) If the wattage of each bulb is 1.5 W, what readings will the ammeter A show when all the three bulbs glow simultaneously?

(c) Find the total resistance of the circuit.

CBSE
Class X Science
Sample Paper 4 – Solution

SECTION A

1. There are 7 covalent bonds in a molecule of ethane.

OR

C_nH_{2n}: Alkene
2nd member = C_3H_6 (propene)

2. Manganese (Mn) and magnesium (Mg) react with very dilute HNO_3 to evolve hydrogen gas.

3. (d) In a group, the metallic character increases from top to bottom. So, Sr has high metallic character.

4. The resistance of an ammeter should be very small so that it may not change the value of the current flowing in the circuit.

5. The scattering of light by colloidal solution is called tyndall effect.

6. Lateral inversion

OR

Refractive index

7. At 2F (At twice the focal length)

8. Light travels in straight lines.

9. Maxwell's right-hand thumb rule.

OR

Solenoid

10. Rings of cartilage are present in the trachea. These rings support the trachea and do not allow the trachea to collapse when there is less air in it.

11. Newly formed DNA copies may not be identical at times if there are errors or inaccuracies in DNA copying.

OR

If a tall pea plant is crossed with a dwarf pea plant, the plants obtained in the F2 generation will be in the ratio of 3 Tall:1 Dwarf.

12. The 3R approach- reduce the use of resources, reuse the available resources and recycle the used up resources is mostly preferred for reducing the problem of waste disposal.

OR

Only 10% of the energy gets transferred from one trophic level to the next. So after 3 or 4 trophic levels, the energy available for passing on is too less to support another trophic level. Very little usable energy remains after 4 trophic levels. Hence the number of trophic levels in a food chain is limited.

13. In addition to CO_2 and chlorophyll, plants require water and sunlight to make food by the process of photosynthesis.

14. (i) Both assertion and reason are true, and reason is the correct explanation of the assertion. Aluminium is placed above than iron in the the reactivity series hence it can displace iron from iron oxide.

15. (iii) Assertion is true but reason is false. Transpiration helps in loss of water from the plants making the plant cooler. But it does not assist in the translocation of sugar in plants.

OR

(i) Both assertion and reason are true, and reason is the correct explanation of the assertion. Villi are richly supplied with blood vessels which help in absorption of digested food in the small intestine.

16. (i) Both assertion and reason are true, and reason is the correct explanation of the assertion. Sexual reproduction involves fusion of two different gametes and crossing over which results in variation and recombination.

17.

i) d) Testosterone is involved in the male reproductive system.
ii) a) Release of oocyte under the effect of luteinizing hormone is called ovulation.
iii) b) If oocyte is not fertilized within 24 hours, corpus luteum becomes inactive and transforms into corpus albicans.
iv) b) The release of hormones involved in the menstrual cycle is regulated by the pituitary gland.
v) b) Ovulation occurs in the middle of the menstrual cycle around day 13 or 14.

18.

i) (a) Graphite has a 2D hexagonal layered structure.
ii) (b) Dimond has each carbon atom is bonded to four other carbon atoms, forming a three dimensional structure.
iii) (c) Fullerene is a acts as a semiconductor.
iv) (b) The number of C-C covalent bonds in Diamond are 4, Graphite are 3 and fullerene are 3.
v) (a) Graphite is not used as a semiconductor.

19.

i) b) concave mirror

As the image has to be obtained on the screen Aditi must be use concave mirror.

ii) b) – 4

m = -v/u

v = - 60 cm

u = -15 cm

Thus,

Linear magnification of image produced, m = – 4 cm

iii) a) real, inverted and magnified

Negative sign indicates that image is real and inverted and value 4 which greater than one indicates that the image formed is enlarged or magnified.

iv) c)

v = - 60 cm

u = - 15 cm

Thus,

v – u = -60 + (-15) = - 45 cm

Negative sign indicates that the image formed is at the same side as that of the object.

v) d) between centre of curvature and principal focus

By mirror formula,

$$\frac{1}{f}=\frac{1}{v}+\frac{1}{u}$$

$$\frac{1}{f}=\frac{1}{-60}+\frac{1}{-15}$$

Thus,

$$f=-12 \text{ cm}$$

This indicates that the object is placed between principal focus and centre of curvature.

20.

i) a) ammeter reading decreases, becomes half

The increase in length of wire increases the resistance in the circuit and thus, the current decreases. Hence the ammeter readings are reduced and becomes half the initial readings.

ii) b) ammeter reading increases and becomes two times

When the area of wire increases, the resistance decreases thus the current in the circuit will increase. Thus, the ammeter readings will increase and becomes twice the initial readings.

iii) d) 1:1

When resistors are connected in series the current flowing through all resistors is same. Thus, the ratio of the currents for these two resistors is 1:1

iv) c) current across each resistor varies and voltage remains same

When the resistors are connected in parallel to each other the voltage across each resistor is same while the current changes.

v) a) A

SI unit of current is denoted as A (Ampere).

SECTION B

21. In the roots, cells in contact with the soil actively take up the ions. It creates a difference in the concentration of these ions between roots of soil. To eliminate this difference, water moves into the roots from the soil. Thus, water and minerals are absorbed by the plants.

OR

Plants exchange gases through stomata and large intercellular spaces. These ensure that all cells are in contact with air. When the plant respires, the stomata allows CO_2 to move out and O_2 to enter into the leaves.

22. Vegetative propagation is a mode of asexual reproduction in which new plants are formed from stem, leaves, roots, and buds of the individual vegetative parts of the plants.

Advantages:

(i) Offspring are genetically identical and this leads to the preservation of useful traits.

(ii) It is a rapid and economical method.

23.

(i) Aluminium reacts with water only on boiling.

(ii) Copper does not react even with steam.

OR

Silver gets deposited on the copper plate because copper is more reactive than silver and hence displaces silver from silver nitrate solution.

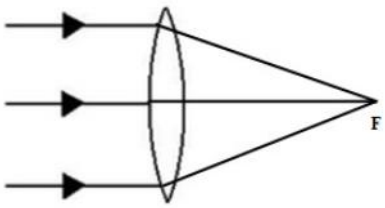
24. Washing soda: $Na2CO3.10H2O$

Baking soda: $NaHCO3$

Baking soda is an ingredient of antacids. It neutralizes HCl released in stomach and eases stomachache.

$NaHCO3 + HCl \rightarrow NaCl + CO2 + H2O$

25. (a) The lens shown in convex. the parallel rays will converge to a point called focus (F).



(b) It is unwise to look at the sun because the convex lens focusses a lot of sun rays into our eyes and this may damage them.

26. (a) Mirror B is convex since it forms a smaller image of fork.

(b) Mirror A is concave since it forms a larger image of fork.

SECTION C

27. Transportation of organic solutes in plants is called translocation. It is necessary because all the cells need food to carry out their vital functions. Translocation occurs in the upward as well as downward directions and in the storage organs of roots, fruits, seeds and growing organs.

OR

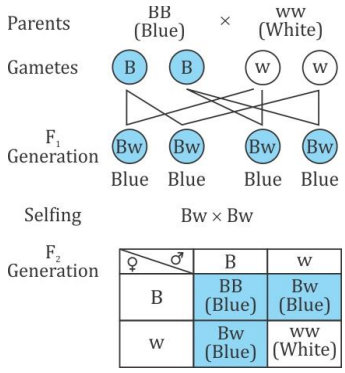
Offspring formed due to sexual reproduction have better chances of survival because

- Sexual reproduction introduces genetic variation in the offspring which is essential for evolution and survival of the species.
- Offspring exhibit heterosis or hybrid vigour which enables them to adapt better to the changing environment.
- Enhanced traits allow the offspring to be tolerant and survive under adverse conditions.

However, during sexual reproduction, there is crossing over and random selection due to which the offspring produced may have traits which are inferior to the parents.

Hence, it is not always true that the offspring formed by sexual reproduction have better chances of survival.

28.



(a) The F_1 progeny is expected to have plants with blue flowers.

(b) ¼ of the F_2 generation bears white flowers. So, 25% of the F_2 progeny bears white flowers in the F_2 generation when the flowers of F_1 plants are self-pollinated.

(c) The ratio of the genotype BB and Bw in the F_2 progeny is 1 (BB):2 (Bw).

29.

(a) Before birth, the infant's lungs are not involved in its blood circulation. The switch-over takes place just after birth. Blood flow through the umbilical cord, ductus arteriosus and foramen ovale stops, while blood flow through the heart and pulmonary blood vessels begins.

(b) Before birth, the infant's lungs cannot be involved in respiration because the foetus is lying in the amniotic fluid. But after birth, circulation becomes normal involving all the chambers of the heart and the lungs.

30.

(a) Hydrogen is liberated at the cathode and oxygen is liberated at the anode.

(b) The molecule of water contains two atoms of hydrogen and one atom of oxygen; hence, the volume of gas collected at one electrode is double the volume of gas collected at the other electrode.

(c) Water does not dissociate. So, to make it an electrolyte, dilute sulphuric acid is added.

31.

(a) Electronic configuration of the element is 2, 8, 7 and its valency is 1.

(b) Non-metal

(c) The formula of the compound formed when element X combines with an element Y is PQ3.

32.

(a) X: Copper (Cu)
Y: Copper oxide (CuO)

(b) First - Oxidation of X; Second - Reduction of Y

(c) $2Cu + O_2 \rightarrow 2CuO$

$CuO + H2 \rightarrow Cu + H2O$

33. Object distance, u = -30 cm

Image distance, v = 60 cm

From the lens formula,

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$\therefore \frac{1}{f} = \frac{1}{60} - \frac{1}{-30} = \frac{1}{60} + \frac{1}{30}$$

$$\therefore \frac{1}{f} = 0.05$$

$$\therefore f = 20 \text{ cm}$$

Height of the object, h = 2 cm

From the magnification formula,

$$m = \frac{v}{u} = \frac{h'}{h}$$

$$\therefore h' = \frac{v}{u}h = \frac{60}{-30} \times 2 = -4 \text{ cm}$$

SECTION D

34.

(a)

(i) Test the three solutions with blue litmus paper; one solution will change blue litmus to red. It is an acidic solution.

(ii) Test the remaining two solutions with red litmus [Changed in activity (i)]. One solution will change it again to blue. It is a basic solution.

(iii) The remaining third solution is distilled water.

(b) Plaster of Paris is prepared by heating gypsum to a temperature of 100°C.
Plaster of Paris is used in hospitals for setting fractured bones in the right position to ensure correct healing.

OR

(a) Neutral: Solution D with pH 7

(b) Strongly alkaline: Solution C with pH 11

(c) Strongly acidic: Solution B with pH 1

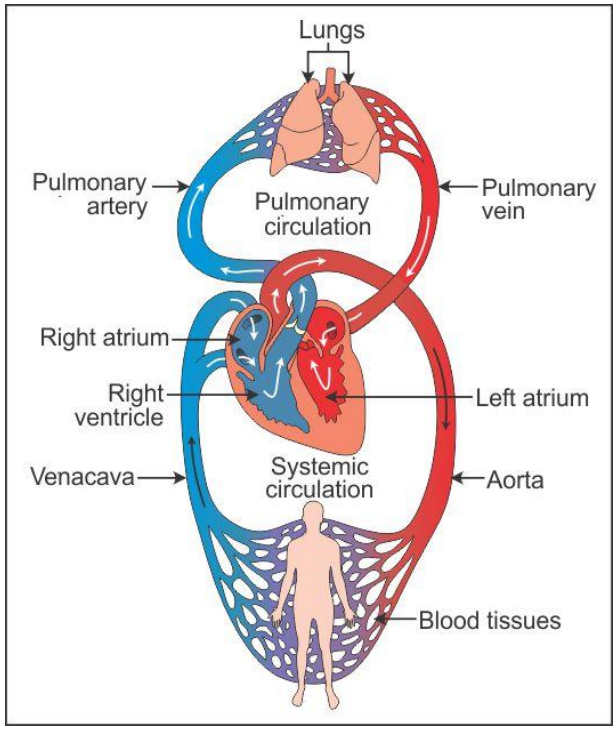
(d) Weakly acidic: Solution A with pH 4

(e) Weakly alkaline: Solution E with pH 9

pH is inversely proportional to hydrogen ion concentration. Hence, the pH can be arran-ged in the increasing order of the concentration of hydrogen ions as 11 < 9 < 7 < 4 < 1.

35.

(a) A schematic representation of transportation and exchange of oxygen and carbon dioxide during transportation of blood in human beings:



(b) It is necessary to separate oxygenated and deoxygenated blood in mammals and birds because they need high energy and large amount of oxygen. The separation of oxygenated and deoxygenated blood provides high oxygen supply to the organs.

36.

(i) Power is

$$P = VI$$

$$\therefore I = \frac{P}{V} = \frac{4000}{220} = 18.18 \text{ A}$$

(ii) Resistance and power are related as

$$P = \frac{V^2}{R}$$

$$\therefore R = \frac{V^2}{P} = \frac{220^2}{4000} = 12.1\ \Omega$$

(iii) Energy consumed by the heater is

$$E = Pt$$

$$\therefore E = 4 \text{ kW} \times 2\text{h}$$

$$\therefore E = 8 \text{ kWh}$$

OR

Potential difference of 1 volt means that one joule of work is done to move a charge of one coulomb from one point to another.

(a) If bulb B_3 gets fused, then the other two bulbs will continue glowing with the same brightness.

(b) When the bulbs are in parallel, wattage will be added (4.5 W) and the ammeter reading would be 45/45 = 1.0 ampere.

(c) Because the ammeter reading is 1.0 ampere, the resistance of the combination is

$$\frac{4.5\ \text{V}}{1.0\ \text{A}} = 4.5\ \Omega$$