CBSE
Class X Science
Sample Paper 5

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. What is the unit of electric charge? (1)

OR

What is meant by saying that the electric potential at a point is 1 volt?

2. A ray of light passes from air into a block of glass. Does it bend towards the normal or away from it? (1)

3. A man stands 10 m away in front of a large plane mirror. How far must he walk before he is 5 m away from his image? (1)

(i) 2.5 m
(ii) 4.5 m
(iii) 7.5 m
(iv) 5 m

4. What is the scientific term for the cessation of the menstrual cycle in females? (1)

5. Why is vegetative propagation practised for growing some types of plants? (1)

6. What is peristalsis? (1)

OR

Name the tissue that transports water and minerals in plants.

7. How does the wall of the stomach protect itself from the action of highly acidic HCl? (1)

8. We do not clean ponds or lakes, but an aquarium needs to be cleaned. Why? (1)

9. Do genetic combination of mothers play a significant role in determining the sex of new born? (1)

OR

Give reason for the appearance of new combinations of characters in the F_2 progeny.

10. How does graphite act as a lubricant? (1)

11. Why are metals called electropositive elements whereas non-metals are called electronegative elements? (1)

OR

What changes in the colour of iron nails and copper sulphate solution do you observe after keeping the iron nails dipped in copper sulphate solution for about 30 minutes?

12. Name an indicator which is pink in alkaline solution but turns colourless in acidic solution. (1)

OR

When a solution is added to a cloth strip treated with onion extract, then the smell of onion cannot be detected. State whether the given solution contains an acid or base.

13. What is wrong with the following chemical equation? (1)

$Mg + O \longrightarrow MgO$

Correct and balance it.

For question numbers 14, 15 and 16, two statements are given—one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.

a) Both A and R are true, and R is the correct explanation of the assertion.
b) Both A and R are true, but R is not the correct explanation of the assertion.
c) A is true, but R is false.
d) A is false, but R is true.

14. **Assertion:** Freely suspended current carrying solenoid comes to rest in N-S direction just like a bar magnet. (1)
Reason: On one end of current carrying straight solenoid behaves as a North pole and other end as a South pole.

15. **Assertion:** Carbon forms covalent bonds. (1)
Reason: Carbon can achieve the inert gas electron arrangement only by sharing of electrons.

OR

Assertion: Diamond is used for making dry cell electrodes but graphite is not. (1)
Reason: Graphite is a good conductor of electricity whereas diamond is a bad conductor of electricity.

16. **Assertion:** Carbon and its compounds used as fuels (1)
Reason: They burn in air releasing a lot of heat energy.

17. Read the following and answer any **four** questions from 17 (i) to 17 (v) (1×4)
M is an element in the form of a powder. M burns in oxygen and the product obtained is soluble in water. The solution is tested with litmus.

i) If M is a metal, then the litmus will turn _____.
   a) Red
   b) Blue
   c) Yellow
   d) Orange

ii) If M is a non-metal, then the litmus will turn _____.
   a) Red
   b) Blue
   c) Yellow
   d) Orange

iii) If M is a reactive metal, then _____ will be evolved when M reacts with dilute sulphuric acid.
   a) Carbon dioxide gas
   b) Hydrogen gas
   c) Nitrogen gas
   d) Oxygen gas

iv) If M is a metal, it will form _____ oxide, which will form _____ solution with water.
   a) Basic, alkaline
   b) Acidic, acidic
   c) Basic, acidic
   d) Acidic basic

v) If M is a non-metal, it will not conduct electricity in the form of _____.
   a) Diamond
   b) Graphite
   c) Cesium
   d) Zinc

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

Shama has a set of five substances. She has a chart stating resistivities of all the substances.

Observe the table

Substance	Resistivity
A	$1.6 \times 10^{-8}\ \Omega$ m
B	$44 \times 10^{-8}\ \Omega$ m
C	$2.63 \times 10^{-8}\ \Omega$ m
D	2300 Ω m
E	$10^{17}\ \Omega$ m

She has to choose an appropriate substance for performing electrical tasks. Which of the above substance according to you –

i) Can be used as an insulator
   a) A
   b) B
   c) B as well as C
   d) E

ii) Can be used for domestic wiring
   a) A
   b) B
   c) A as well as C
   d) D

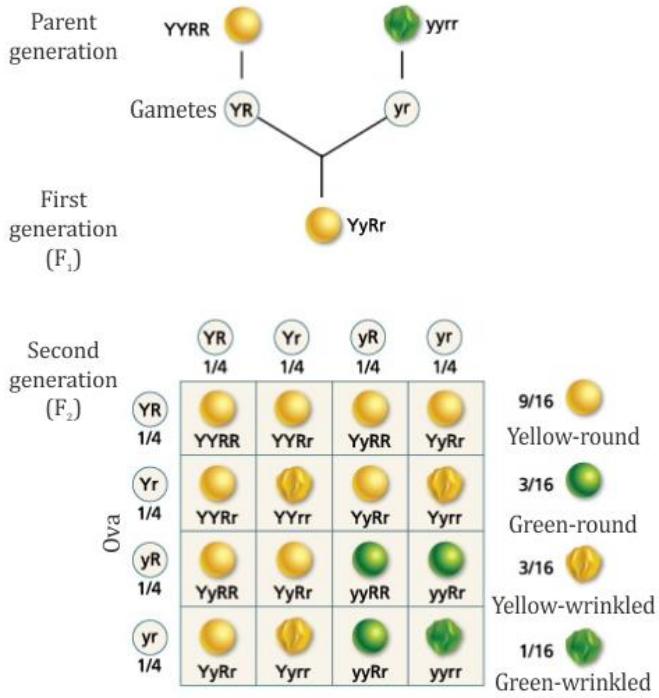
iii) Can be utilised in making solar cells and transistors
   a) A
   b) B
   c) C
   d) D

iv) Is an alloy
   a) A
   b) B
   c) C
   d) E

v) Behaves as a semiconductor
   a) A
   b) D
   c) C
   d) E

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

Mendel conducted dihybrid cross which involved two pairs of contrasting characters. The results obtained were amazingly unique. Mendel is known as the Father of Genetics.



i) Which two pairs of contrasting characters are involved in the above parental cross?
   a) Round, yellow and green wrinkled
   b) Round green and yellow wrinkled
   c) Wrinkled yellow and round green
   d) Flat yellow and constricted green

ii) What is the genotype of the parent with round and wrinkled seeds?
   a) RRYY
   b) RRyy
   c) RrYy
   d) rrYY

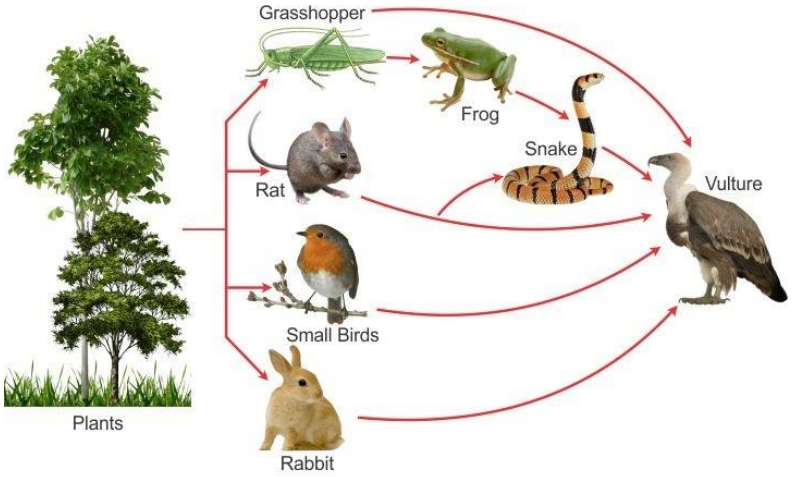
iii) In the F_1 generation, what is the phenotype of the offspring?
   a) Round and yellow
   b) Green and round
   c) Green and wrinkled
   d) Round and wrinkled

iv) How many heterozygous offspring are produced in the F_2 generation, if a total of 16 offspring are produced?
   a) 12
   b) 14
   c) 16
   d) 4

v) What is the ratio of parental combination to recombinants?
   a) 1:7
   b) 3:4
   c) 1:3
   d) 3:1

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

Several interconnected food chains form a food web. A food web is similar to a food chain but the food web is comparatively larger than a food chain. When there are more cross interactions between different food chains, the food web gets more complex. This complexity in a food web leads to a more sustainable ecosystem.



(i) Which living being occupies the lowest level in the above web?
   a) Plants
   b) Small birds
   c) Frog
   d) Vulture

(ii) What forms the food of a snake?
   a) Frog and small birds
   b) Rat and frog
   c) Small birds and grasshopper
   d) Grasshopper and rat

(iii) Which link would get directly disturbed if the population of grasshopper is wiped out?
   a) Frog
   b) Snake
   c) Vulture
   d) Small birds

(iv) Which organisms in the above food web do not act as herbivores?
   a) Small birds
   b) Grasshoppers
   c) Rat
   d) Snake

(v) In the given food web, vulture is said to be
   a) Herbivore
   b) Omnivores
   c) Apex carnivore
   d) Producer

SECTION B

21. A substance 'X' is used in the kitchen for making tasty crispy pakoras and is also an ingredient of antacid. Name substance 'X'. (2)

(a) How does 'X' help to make cakes and bread soft and spongy.

(b) Is the pH value of a solution of 'X' lesser than or greater than 7.0?

OR

Acetic acid is a typical acid. Write the equation in each case for its reaction with a

(a) Metal

(b) Base/alkali

22. (2)

(a) Name a metal which is placed low in the activity series and exists as a liquid at room temperature.

(b) Write the name and formula of its ore.

23. Light travels more quickly through water than through glass. (2)

(a) Which is optically denser: water or glass?

(b) If a ray of light passes from glass into water, which way will it bend: towards the normal or away from the normal?

OR

If the focal length of a convex mirror is 25 cm, what is its radius of curvature?

24. The values of potential difference V applied across a resistor and the corresponding values of current I flowing in the resistor are given below: (2)

Potential difference, V (in volts)	2.5	5.0	10.0	15.0	20.0	25.0
Current, I (in amperes)	0.1	0.2	0.4	0.6	0.8	1.0

i) What is the nature of the V-I graph plotted for the above values of potential difference and current?

ii) Which law is illustrated by such type of graph?

25. Discuss spore formation in fungi. (2)

26. What is excretion? How do unicellular organisms remove their wastes? (2)

SECTION C

27. How are the alveoli designed to maximise the exchange of gases? (3)

OR

Describe the concept of trophic levels.

28. (3)

(a) Name two constituents of baking powder.

(b) How does baking powder differ from baking soda?

(c) Explain the action of baking powder in the making of cake (or bread). Write the equation of the reaction involved.

29. Explain giving one example for each of the following chemical reactions: (3)

(a) Double decomposition reaction

(b) Thermal decomposition reaction

(c) Displacement reaction

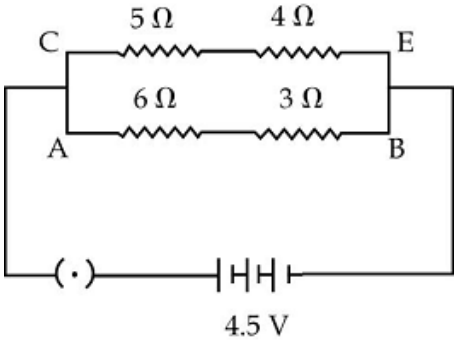
30. (3)

(a) For what position of the object does a convex lens form an erect and virtual image?

(b) What is regular reflection of light?

(c) What type of mirror is used as a shaving mirror? Support your answer with a reason.

31. Study the circuit and find the (3)



(a) Total resistance in arm CE

(b) Current in arm AB

(c) Potential difference across the 4-ohm resistor

32. How does the strength of the magnetic field at the centre of a circular coil of a wire depend on? (3)

(a) Radius of the coil

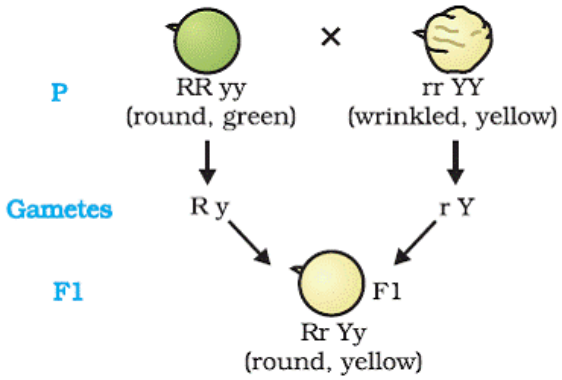
(b) Number of turns of wire in the coil

(c) Draw the magnetic lines of force in case of a circular coil of a wire

33. (3)

(a) How many characters are transmitted in the following cross? Name them.

(b) Define dominant trait and recessive trait.



SECTION D

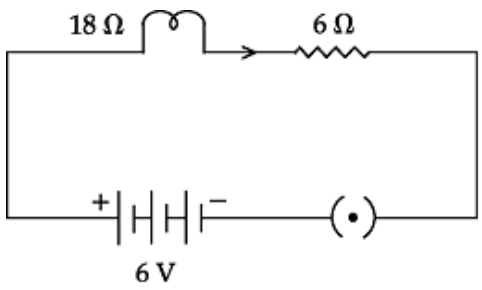
34. (5)

(a) What is electromagnetic induction?

(b) Describe the various methods of producing induced current.

(c) A coil of insulated copper wire is connected to a galvanometer. What will happen if a bar magnet is held stationary inside the coil?

OR



In the given circuit, calculate

(a) Total resistance of the circuit

(b) Current flowing through the circuit

(c) Potential difference across the lamp and the resistor

35. Which element has (5)

(a) Two shells, both of which are completely filled with electrons

(b) The electronic configuration 2, 8, 2

(c) A total of three shells with four electrons in the valence shell

(d) A total of two shells with three electrons in the valence shell

(e) Twice as many electrons in the second shell as in the first shell

36. (5)

(a) Draw a neat diagram of the respiratory system and label the following parts:

(i) Lungs, (ii) Trachea, (iii) Bronchus, (iv) Diaphragm

(b) Name the respiratory pigment in human beings and discuss its role.

(c) Why is the rate of breathing in aquatic organisms faster than that in terrestrial organisms?

OR

(a) What is regeneration of an organism? With a neat diagram, describe regeneration in Planaria.

(b) How does the embryo get nourishment inside the mother's body?

(c) List the changes seen in the ovule and ovary after fertilisation.

CBSE
Class X Science
Sample Paper 5 – Solution

SECTION A

1. Coulomb

OR

Electric potential at a point is 1 volt means 1 joule of work is done in moving 1 unit positive charge from infinity to that point.

2. A ray of light travelling from air to glass block, will bend towards the normal.

3. (iii) 7.5 m

To be 5 m away from his image, the man must be standing 2.5 m away from the mirror.

Thus, image distance + object distance = 2.5 m + 2.5 m = 5 m

Initially, he is 10 m away from the mirror. So, the man must walk a distance of 10 m – 2.5 m = 7.5 m.

4. The cessation of menstrual cycles at the end of a woman's reproductive years is termed menopause.

5. Vegetative propagation is performed in the plants which do not have viable seeds or seeds which are dormant. Plants which have desirable superior traits are also vegetatively propagated because it results in producing identical plants.

6. Peristalsis is the movement that refers to the constriction and relaxation of muscles of the esophagus, intestine, and stomach which helps in bringing down the food with the food pipe into the stomach.

OR

Xylem tissue transports water and minerals in plants.

7. The wall of the stomach releases mucus and protects itself from the action of highly acidic HCl.

8. An aquarium is an artificial and incomplete ecosystem compared to pond or lakes which are natural, self-sustaining and complete ecosystem where there is a perfect recycling of materials. Therefore, it needs to be cleaned.

9. No, mothers have no role in determining the sex of the new born. Mothers have a pair of X chromosome. And all children will inherit an 'X' chromosome from their mother regardless of whether they are boys or girls.

OR

An organism can inherit each character independently. So, in the F2 progeny new combination of character appears. Tall/Short and round/wrinkled seed trait are independently inherited.

10. Graphite is used as a lubricant in the form of graphite powder or mixed with petroleum jelly or with any lubricant oil to form graphite grease.

11.

(a) Metals are electropositive elements because they can form positive ions by losing electrons.

(b) Non-metals are electronegative elements because they can form negative ions by gaining electrons.

OR

Iron nail gets covered with a red-brown coating of copper metal; the blue colour of copper sulphate solution fades gradually.

12. Phenolphthalein.

OR

Base.

13. Oxygen should be in molecular form, O_2

$2Mg + O_2 \longrightarrow 2MgO$

14. b) Both A and R are true and R is not correct explanation of A.

Assertion statement tells the relation between Earth's geographical N-S pole and magnetic N-S pole whereas reason statement gives the property of solenoid.

15. (a) Both A and R are true, and R is the correct explanation of the assertion.

Carbon forms covalent bonds because it can achieve the inert gas electron arrangement only by sharing of electrons.

OR

(d) A is false, but R is true.

Graphite is used for making dry cell electrodes but diamond is not because graphite is a good conductor of electricity whereas diamond is a bad conductor of electricity.

16. (a) Both A and R are true, and R is the correct explanation of the assertion.

Carbon and its compounds used as fuels because they burn in air releasing a lot of heat energy.

17.

i) blue
ii) red
iii) hydrogen gas
iv) basic, alkaline
v) graphite

18.

i) d) E
Substance E can be used as an insulator.
ii) c) A as well as C
Substances A and C can be used for the purpose of domestic wiring.
iii) d) D
Substance D can be used to make solar cells.
iv) b) B
An alloy has resistivity higher than a pure metal but lesser than a semiconductor. Thus, substance B is an alloy.
v) b) D
Substance D is semiconductor.

19.

i) a) The parental generation in the given dihybrid cross involves round and yellow seeds and green wrinkled seeds.
ii) b) The genotype of the parent with round and wrinkled seeds is RRyy.
iii) a) In the F_1 generation, the offspring produce round and yellow seeds.
iv) b) Out of the total 16 offspring produced in the F_2 generation, 14 are heterozygous.
v) a) Out of the total 16 offspring produced in the F_2 generation, there are only 2 parental combinations- YYRR, yyrr, rest 14 are recombinants.

20.

i) a) Plants occupy the lowest trophic level in a food chain or a food web as they are the producers.
ii) b) Rat and frog are consumed by the snake in the given food web.
iii) a) Frogs are dependent on grasshoppers as food.
iv) d) Snakes are carnivores which feed either on frogs or rats.
v) c) Vulture feeds on rat, snake, small birds, rabbits and grasshoppers. It is said to be apex or top carnivore.

SECTION B

21.

(a)

$$\underset{\left(\begin{smallmatrix}\text{sodium hydrogen}\\ \text{carbonate}\end{smallmatrix}\right)}{2NaHCO_3} \xrightarrow{\text{Heat}} \underset{\left(\begin{smallmatrix}\text{Sodium}\\ \text{carbonate}\end{smallmatrix}\right)}{Na_2CO_3} + H_2O + CO_2$$

When CO_2 gas escapes as bubbles it leaves behind pores which make the cake or bread soft and spongy.

(b) It is a salt of a strong base, so the pH of the solution will be more than 7.

OR

(a) $2CH_3COOH + Zn \rightarrow (CH_3COO)_2Zn + H_2$

(b) $CH_3COOH + NaOH \rightarrow CH_3COONa + H_2O$

22.

(a) Hg - Mercury

(b) HgS – Cinnabar

23.

(a) Glass is optically denser than the water.

(b) The ray will bend away from the normal.

OR

Focal length (f) = 25 cm

Radius of curvature (R) =?

We know that

f = R/2

25=R/2

R= 25 x 2

R = 50 cm

24.

i) Straight line graph

ii) Ohm's law is illustrated when nature of V- I graph is straight line.

25. Spore formation is a method of asexual reproduction. Plants like ferns, moss, fungi reproduce by this method. Spores are unicellular reproductive bodies present in sac called sporangia. When spores mature sporangia burst and spores are carried to different location by air, wind, water. When spores fall on a suitable ground, they germinate and develop new individuals.

26. The biological process of removing harmful metabolic wastes from the body is called excretion. Unicellular organisms remove their wastes through simple diffusion.

SECTION C

27. A large number of alveoli in the lungs provides a large surface area for the exchange of gases. Walls of alveoli contain an extensive network of blood vessels. The walls are extremely thin and made of a single layer of cells.

OR

In a food chain, the trophic levels are consecutive steps followed in the process of energy flow and each step or level is dependent on the other for food. Different trophic levels are

- Producers: They form the first trophic level and are able to manufacture their own food (green plants).
- Primary consumers: They form the second trophic level and are generally plant eaters (herbivores).
- Secondary consumers: They form the third trophic level and are flesh eaters (carnivores).
- Tertiary consumers: They form the fourth trophic level and feed on secondary consumers.

28.

(a) Sodium hydrogen carbonate and tartaric acid.

(b) Baking powder is a mixture of baking soda and tartaric acid, whereas baking soda is only sodium hydrogen carbonate.

(c) When baking powder mixes with water, sodium hydrogen carbonate reacts with tartaric acid to evolve carbon dioxide which gets trapped in the wet dough and bubbles out slowly making the cake soft and spongy.

29.

(a) Double decomposition reaction: This is a type of chemical reaction in which two compounds in a solution react to form two new compounds by mutual exchange of radicals.

$$NaCl_{(s)} + AgNO_3 \longrightarrow AgCl_{(s)} \downarrow + NaNO_{3(aq)}$$

(b) Thermal decomposition reaction: A decomposition reaction brought about by heat is known as thermal decomposition.

$$2HgO_{(s)} \xrightarrow{\Delta} 2Hg_{(s)} + O_{2(g)}$$

(c) Displacement reaction: It is a chemical reaction in which a more active element displaces a less active element from its salt solution.

$$CuSO_4 + Zn \rightarrow ZnSO_4 + Cu$$

30.

(a) When the object lies between the optical centre and the focus of the lens, a convex lens forms an erect and virtual image.

(b) When a parallel beam of light falls on a smooth and highly polished surface, the reflected beam is also parallel and directed in a fixed direction. Such reflection of light is called regular reflection.

Concave mirrors are used as shaving mirrors to see a large image of the face. This is because when the face is held within the focus of a concave mirror, an enlarged image of the face is seen in the concave mirror. This helps in getting a smooth shave.

31. Total resistance in arm CE

$CE = 5\Omega + 4\Omega = 9\Omega$

Current in arm AB

$= \frac{4.5V}{9\Omega} = 0.5A$

Current in arm CE=

$\frac{4.5\ A}{9\ \Omega}$

= 0.5 A

So, the potential difference across the 4 Ω resistor

$= 4\Omega \times 0.5A = 2V$

32.

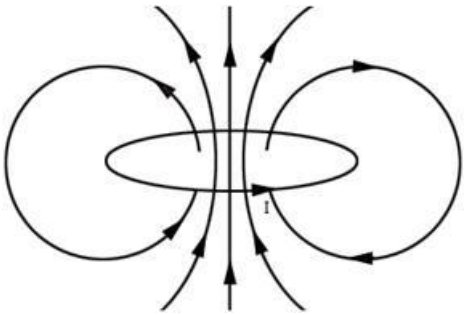
(a) The strength of the magnetic field (B) is inversely proportional to the radius of the circular loop (r).

$B \propto \frac{1}{r}$

(b) The strength of the magnetic field (B) is directly proportional to the number of turns in the coil (N).

$B \propto N$

(c) The magnetic field lines will be as shown below.



33.

(a) Two characters. They are shape of seed and colour of seed.

(b) A dominant trait is a genetic trait which is considered dominant if it is expressed in a person who has only one copy of that gene.

A recessive trait is a genetic trait which is expressed only when two copies of the same gene are present.

SECTION D

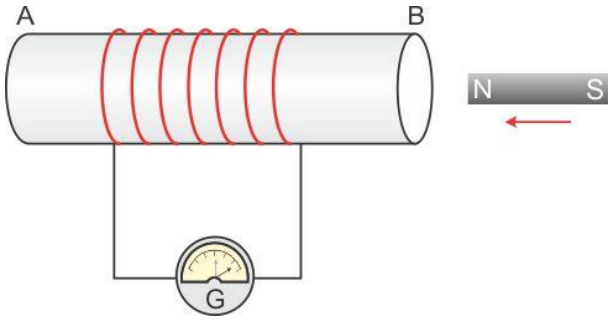
34.

(a) The process by which a changing magnetic field in a conductor induces a current in another conductor is called electromagnetic induction.

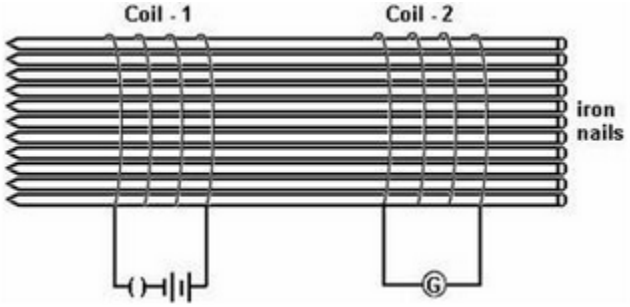
(b)

(i) By moving a magnet towards or away from a coil

We take a coil with several turns and it is connected to a sensitive galvanometer. When a bar magnet is moved towards the coil, we see a deflection in the galvanometer. This deflection dies down after some time. The deflection is because of the induced current.



(ii) By varying current in one coil, an induced emf is produced in the other coil.



Two coils of insulated copper wire are wrapped on few long iron rods. Coil-1 is connected to a battery through a switch and Coil-2 is connected to a galvanometer. Now, the current is switched on in Coil-1. A momentary deflection is seen in the galvanometer attached to Coil-2. The deflection is due to current induced in Coil-2 momentarily as the magnetic field builds up along the axis of Coil-1 when the current is switched on.

(c) When a bar magnet is held stationary inside the coil, there will be no deflection in the galvanometer indicating that no current is produced in the coil.

OR

(a) Total resistance R = R1 + R2 = $18\ \Omega + 6\ \Omega = 24\ \Omega$

(b) Current flowing through the circuit, I = V/R = 6/24 = 0.25 A

(c) Potential difference across the lamp, V1 = $IR_1 = 0.25 \times 18 = 4$

Potential difference across the resistor R2, V2 = $IR_2 = 0.25 \times 6 = 1.5$ V

35.

(a) Elements with comparatively filled shells are noble gas elements and they belong to Group 18. Since the element has two shells, it must be present in neon (Ne) with electronic configuration 2, 8.

(b) The electronic configuration suggests that this element belongs to the third period and second group, i.e. magnesium (Mg).

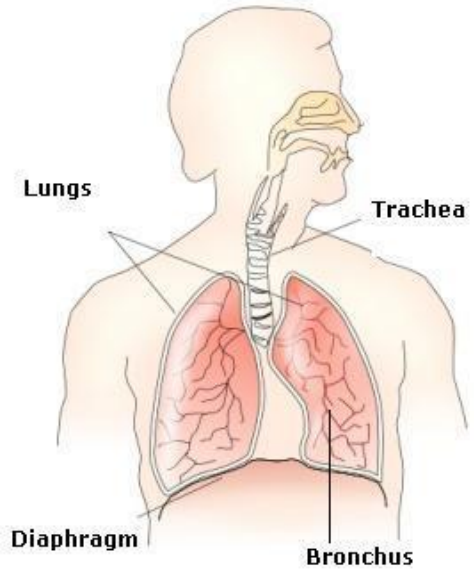
(c) The element with three shells is present in the third period and has four valence electrons. It must belong to Group 14. So, it is silicon with electronic configuration 2, 8, 4.

(d) The element with two shells is expected to be present in the second period and it has three electrons in its valence shell. This means it is in Group 13 and is boron (B) with electronic configuration 2, 3.

(e) This element has two shells, and the first shell has only two electrons. Therefore, as the given second shell has twice the electrons present in first shell, i.e. four, the electronic configuration is 2, 4, and the element is carbon (C).

36.

(a) Respiratory system:



(b) Haemoglobin

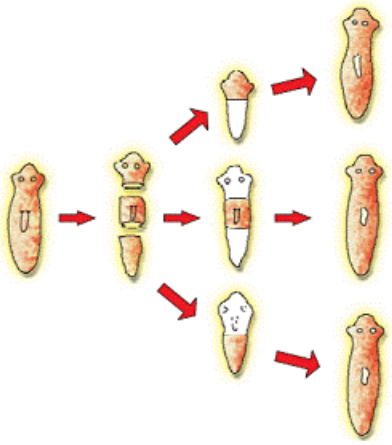
Role of haemoglobin: It is an iron–protein compound in red blood cells which gives blood its red colour and transports oxygen and carbon dioxide.

(c) The rate of breathing in aquatic organisms is much faster than that in terrestrial organisms because the amount of dissolved oxygen in water is fairly low compared to the amount of oxygen in the air.

OR

(a) Planaria can be cut into any number of pieces, and each piece grows into a complete organism. This process is called regeneration. It is carried out by specialised cells in the organism.

Regeneration in Planaria



(b) The embryo gets nutrition from the mother's blood with the help of a special tissue called the placenta. It provides a large space and area for glucose and oxygen to pass from the mother to the embryo. The developing embryo also produces waste substances which can be moved by transferring them into the mother's blood through the placenta.

(c) The ovule develops a tough coat and is gradually converted to a seed. The ovary grows rapidly and ripens to form a fruit.