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SAMPLE TEST PAPER 04 FOR CLASS X BOARD EXAM 2021

SUBJECT: SCIENCE

MAX. MARKS : 80

CLASS : X

DURATION : 3 HRS

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. 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.*
- (iii) *Section–B - question no. 21 to 26 are short answer type questions, carrying 2 marks each. Answers to these questions should be in the range of 30 to 50 words.*
- (iv) *Section–C - question no. 27 to 33 are short answer type questions, carrying 3 marks each. Answers to these questions should be in the range of 50 to 80 words.*
- (v) *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.*
- (vi) *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.*
- (vii) *Wherever necessary, neat and properly labeled diagrams should be drawn.*

SECTION – A

1. Explain why carbon forms compounds mainly by covalent bonds?

Ans: Carbon is a tetravalent element and hence forms covalent compounds. Carbon doesn't prefer losing or gaining electrons due to the effective nuclear charge. It prefers sharing electrons to get the stable electronic configuration and hence forms only covalent bonds.

OR

Briefly explain two main reasons why carbon forms such a large number of compounds.

Ans: The two main reasons for the formation of a large number of compounds by carbon are: (i) Catenation: Carbon atom has the ability to form bonds with other atoms of carbon leading to long chains of carbon compounds. (ii) Tetravalency: Having a valency of four or being tetravalent, carbon is capable of bonding with four other atoms of carbon or other elements.

2. Define pollination.

Ans: The transfer of pollen grains from the anther of a stamen to the stigma of a carpel is called pollination.

OR

What do you mean by cross pollination?

Ans: When pollen grains from anther of a flower on one plant are transferred to the stigma of a flower on another similar plant is called cross-pollination.

3. 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, and 14 respectively. Which one of these values is not correct? Write its correct value stating the reason.

Ans: The value of pH for water is not correct. The correct value of pH of water is 7 because it has almost equal concentration of H^+ and OH^- due to which it is neutral.

4. What is baking soda used for?

Ans: Baking soda is used in the kitchen for faster cooking and for raising the dough in batter. It is also used to make crisp pakoras and chips. Baking soda has several other uses which are as follows:

- (i) It is used in antacids as its mild basic nature helps to neutralise acidity in the stomach.
- (ii) The carbon dioxide releases on heating causes bread or cake to raise, making them spongy.
- (iii) It is also used in soda acid fire extinguisher.

5. Which of these statements is incorrect? Give reasons.

- (a) Sugarcane juice and water are mixed and heated to form sweet liquid called molasses.
- (b) Breakdown of complex substances into simpler substances by anaerobic bacteria is called fermentation.
- (c) Glucose and fructose are the final products of fermentation.
- (d) Zymase converts glucose and fructose into ethanol and carbon dioxide.

Ans: In fermentation, glucose and fructose formed by molasses is further converted into ethanol and carbon dioxide. Hence, the incorrect option is (c).

6. A, B and C are three elements which undergo chemical changes according to following equations:

- a. $A_2O_3 + 2B \rightarrow B_2O_3 + 2A$
- b. $3CSO_4 + 2B \rightarrow B_2(SO_4)_3 + 3C$
- c. $3CO + 2A \rightarrow A_2O_3 + 3C$

Which of these metals is most reactive? Give reason to support your answer.

- (a) A (b) B (c) C (d) All of these

Ans: B is most reactive as it displaces both A and C from their solution.

7. Why do cricketers complain of cramps in their muscles during playing?

Ans: During playing there is conversion of pyruvate to lactic acid in muscles under anaerobic conditions which leads to formation of cramps in their muscles.

OR

Where does the digestion of fat take place in our body?

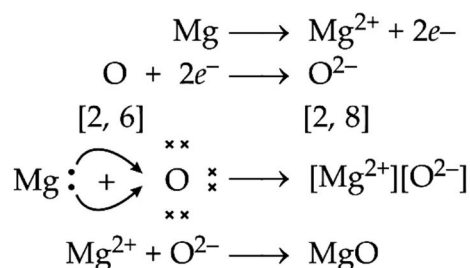
Ans: In the human body fat is digested in the small intestine. Fats are present in the form of large globules which are difficult for enzymes to digest.

8. Why do acids not show acidic behaviour in the absence of water?

Ans: Acids do not show acidic behaviour in the absence of water because the dissociation of hydrogen ions from an acid occurs in the presence of water only. It is the hydrogen ions that are responsible for the acidic behaviour.

9. Show electron dot structure for the transfer of electrons between the atoms during the formation of magnesium oxide.

Ans:



OR

Why ionic compounds do not conduct electricity in their solid state but conduct electricity in their molten or aqueous solution state?

Ans: In solid state the ions present in the ionic compounds are held by strong electrostatic force of attraction so the ions are not free to conduct electricity. But in molten or aqueous solution state the ions are free to move so they can conduct electricity.

10. What is the role of decomposers in the ecosystem?

Ans: Decomposers act upon dead and decay organisms to convert them into simpler forms. These simple substances get mixed up in the soil and are used as nutrients by the producers. From producers it goes to consumers and so on. They maintain the balance in the ecosystem and provide space for new life in ecosystem.

OR

What will happen if we kill all the organisms in one trophic level?

Ans: If we will kill all the organisms in one trophic level the transfer of food energy to the next trophic level will stop i.e., the organisms which are placed higher than this trophic level will die due to lack of food. Similarly the trophic level lower than this one will increase their number. Thus an imbalance would be created in the ecosystem.

11. Give reasons why acquired characters are not inherited?

Ans: Acquired characters are developed by an individual during its life time. They are not present in the DNA of germ cells. They only involve changes in the non-reproductive tissues and hence these characters are not inherited.

12. How does Planaria reproduce? Is this method sexual or asexual?

Ans: Planaria reproduces by the process of regeneration. It is a type of asexual reproduction in which Planaria is cut into any number of pieces and each piece grows into a new organism.

13. What is an ecosystem?

Ans: An ecosystem is a self-sustaining system where biotic and abiotic organisms of various communities interact with each other. Ponds, forests, grasslands etc., are few examples of ecosystem.

Directions for question numbers 14 to 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 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 (A): Sodium is a metal whereas sulphur is a non-metal.

Reason (R): From left to right metallic character decreases.

Ans: (a) Metallic character of elements decreases in a period from left to right. Hence, sodium which is at left is metal and sulphur is a non-metal. Thus, both assertion and reason is the correct explanation of the assertion.

15. Assertion (A): Urinary bladder and ureters are lined by transitional epithelium.

Reason (R): Ureters carry the urine to urinary bladder where it is stored temporarily.

Ans: (b) Ureters function is to carry urine from kidney to the bladder, it does not depend on the lining it has. Thus, both assertion and reason are true, but reason is not the correct explanation of the assertion.

OR

Assertion (A): The effect of root pressure in transport of water is more important at night.

Reason (R): During day, stomata is open, transpiration takes place which help in transport of water.

Ans: (a) During the day transpiration becomes the main driving force for pulling up of water. But at night since there is no sunlight transpiration do not take place, so water is pulled up due to the root pressure. Thus both assertion and reason are true and reason is the correct explanation of the assertion.

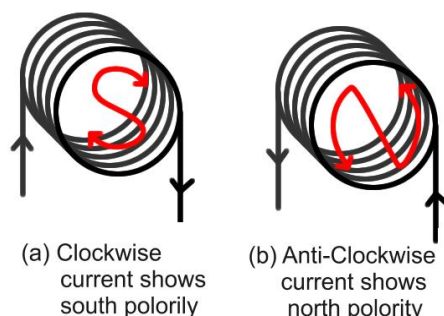
16. Assertion (A): Chemicals and toxins accumulate more and more as you move up the food chain.
Reason (R): Anything that gets into biological tissue, that is not normally there, has the potential to accumulate and magnify.

Ans: (a) Biomagnification is the increase in concentration of toxins up the food chain. Chemicals and toxins accumulate more and more as we move up the food chain, because they do not get broken down in the body. Anything that gets into biological tissue, that is not normally there, has the potential to accumulate and magnify as it moves up the food chain. Thus both assertion and reason are true and reason is the correct explanation of the assertion.

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):

The polarity of ends of current carrying solenoids depends on the direction of current flowing and is given by clock-rule. When an end of solenoid is seen from the front side and if the current flowing appears anticlockwise, then this end will be north-pole and the other end will be south-pole, but if the current is clockwise, then this end will be south-pole and the other end will be north-pole.



(i) The correct statement is:

- (a) If current in wire is vertically upward, the magnetic field lines are clockwise.
- (b) If current in wire is vertically downwards the magnetic field lines are anticlockwise.
- (c) If current in wire is vertically upward, the magnetic field lines are anticlockwise.
- (d) None of these.

(ii) The direction of magnetic field in a current carrying solenoid is determined by:

- (a) Right hand thumb rule
- (b) Left hand thumb rule
- (c) Right hand screw rule
- (d) Maxwell's palm rule

(iii) To find out N-pole in solenoid, we will use:

- (a) galvanometer
- (b) compass
- (c) bar magnet
- (d) horse-shoe magnet

(iv) Strength of magnetic field inside the solenoid depends on:

- (a) strength of current
- (b) number of turns
- (c) nature of core material
- (d) all of these

(v) If we make the current too large in the solenoid, what will happen?

- (a) Magnetic field increased
- (b) Solenoid gets demagnetised
- (c) Solenoid may burnt out
- (d) None of these

Ans: (i) (c) If current in wire is vertically upward, the magnetic field lines are anticlockwise.

(ii) (a) Right hand thumb rule

(iii) (b) compass

(iv) (d) all of these

(v) (d) None of these

18. Read the following and answer any four questions from 18 (i) to 18 (v):

Rear view mirror is a device that allows the driver to see rear ward. It usually finds its place at the top of windscreen inside the cabin. This device is one of the most basic but essential safety devices in the vehicle. It provides assistance to the driver during overtaking, parking in reverse gear etc. Generally, vehicles also have a pair of mirrors attached to the body from outside. They are popular as 'side mirrors' or Outer Rear View Mirrors (ORVM) which serve the same purpose. Almost all modern cars mount their side mirrors on the doors-normally at A-pillar rather than the wings (the portion of the body above the wheel well).



- (i) For a real object, which of the following can produce a real image?
(a) Plane mirror (b) Concave mirror (c) Concave mirror (d) Convex mirror
- (ii) An object at a distance of +15 cm is slowly moved towards the pole of a convex mirror. The image will get...
(a) shortened and real (b) enlarged and real
(c) enlarge and virtual (d) diminished and virtual
- (iii) A convex mirror is used:
(a) by a dentist (b) for shaving
(c) as a rear view mirror in vehicles (d) as a light reflector for obtaining a parallel beam of light
- (iv) The word 'AMBULANCE' is written on the vehicle as:
(a) ECNALUBMA (b) AMBULANCE
(c) AMBUJANCA (d) None of these
- (v) Mark the correct statement:
(a) Convex mirror conform images of objects spread over a large area.
(b) Convex mirrors are used by dentist.
(c) In convex mirror image is formed larger in size, erect and real.
(d) Convex mirror forms real image.

- Ans:** (i) (b) Concave mirror
(ii) (d) diminished and virtual
(iii) (c) as a rear view mirror in vehicles
(iv) (b)
(v) (a) Convex mirror conform images of objects spread over a large area.

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

At the teenage some hormonal changes occur in human body such as thick hair growing in armpits and the genital area between the thighs. The skin frequently becomes oily and we might begin to develop pimples. We begin to be conscious and aware for the changes occurring like menstruation cycle in females, voice changes in males and from the same age capability to fertile starts.

- (i) In human beings, the fertilisation occurs in the:
 (a) Uterus (b) Ovaries (c) fallopian tubes (d) vagina
- (ii) The embryo in humans gets nutrition from the mother's blood with the help of a special tissue called:
 (a) Placenta (b) Villi (c) Uterus (d) Womb
- (iii) In human males, the testes lie in the scrotum, because it helps in the:
 (a) process of mating (b) formation of sperms (c) easy transfer of gametes (d) secretion of oestrogen
- (iv) Which among the following diseases is not sexually transmitted?
 (a) Syphilis (b) Influenza (c) HIV-AIDS (d) Gonorrhoea
- (v) Which of the following method of contraception protects from acquiring sexually transmitted diseases?
 (a) Surgery (b) Condoms (c) Copper-T (d) Oral-pills

Ans:

- (i) (c) Fallopian tubes (ii) (a) Placenta
 (iii) (b) Formation of sperms (iv) (b) Influenza
 (v) (b) Condoms

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

All metals do not react with oxygen at the same rate. Different metals show different reactivities towards oxygen. Almost all metals combine with oxygen to form metal oxides. Metal oxides are basic in nature. But some metal oxides, such as aluminium oxide, zinc oxide, etc show both acidic as well as basic behaviour. Most metal oxides are insoluble in water but some like Sodium oxide and potassium oxide dissolve in water to produce alkalis.

- (i) Arrange the metals in the correct order of their reactivity:
 (a) $Mg > Al > Zn > Fe$ (b) $Al > Mg > Fe > Zn$
 (c) $Mg > Zn > Al > Fe$ (d) $Al > Fe > Zn > Mg$
- (ii) Why does the magnesium ribbon need to be cleaned before burning it in air?
 (a) To increase its efficiency.
 (b) To remove the oxide layer from it
 (c) To decrease its efficiency
 (d) All of these
- (iii) What is the reason for the surface of aluminium turns into dull colour after few days as shown in the figure?



- (a) Due to the formation of a stable aluminium oxide layer.
 (b) Due to the reaction with atmospheric dirt particles.
 (c) Due to its ductile nature.
 (d) None of these.

- (iv) Why it is necessary to keep the sodium immersed in kerosene oil?
- (a) Sodium reacts vigorously with the oxygen and water producing a lot of heat/fire.
 (b) Sodium reacts with kerosene to produce by products.
 (c) Sodium is very less reactive metal.
 (d) None of these.
- (v) Aluminium oxide reacts in the following manner with bases. The resultant product is:
- $$\text{Al}_2\text{O}_3 + 2\text{NaOH} \rightarrow$$
- (a) $2\text{AlCl}_3 + 3\text{H}_2\text{O}$
 (b) $2\text{NaAlO}_2 + \text{H}_2\text{O}$
 (c) $\text{Al}_2\text{O}_3 + \text{H}_2\text{O}$
 (d) None of these.

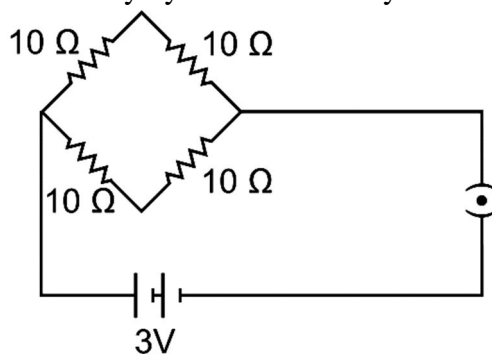
- Ans:** (i) (c) $\text{Mg} > \text{Al} > \text{Zn} > \text{Fe}$
 (ii) (b) To remove the oxide layer from it
 (iii) (a) Due to the formation of a stable aluminium oxide layer.
 (iv) (a) Sodium reacts vigorously with the oxygen and water producing a lot of heat/fire.
 (v) (b) $2\text{NaAlO}_2 + \text{H}_2\text{O}$

SECTION – B

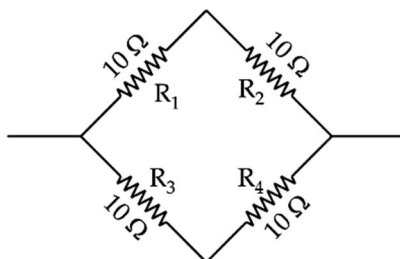
21. Give two examples of decomposers. State their important role in nature.

- Ans:** (i) Decomposers break down complex organic substances into simple inorganic substances that can be absorbed by the plants.
 (ii) Decomposers also help in increasing the fertility of soil, thus replenishing the soil naturally.
 (iii) They also help in removing the biodegradable waste, thus keeping the environment clean.
 Two examples of decomposers are bacteria and fungi.

22. Find the current drawn from the battery by the network of your resistances shown in the figure.



Ans: The given figure can be redrawn as:



Resultant resistance of R_1 and R_2 , $R' = 10 + 10 = 20 \Omega$

Similarly, Resultant of R_3 and R_4 , $R'' = 10 + 10 = 20 \Omega$

Now, overall resultant resistance of circuit, $\frac{1}{R} = \frac{1}{R'} + \frac{1}{R''} \Rightarrow \frac{1}{R} = \frac{1}{20} + \frac{1}{20} = \frac{2}{20}$
 $\Rightarrow \frac{1}{R} = \frac{1}{10} \Rightarrow R = 10 \Omega$

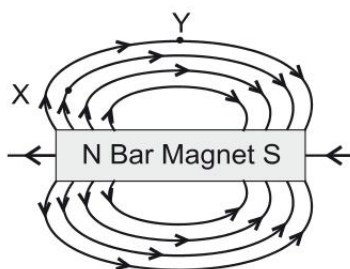
Now, $V = 3$ volt, $I = ?$

By Ohm's law, $V = IR \Rightarrow I = \frac{V}{R} = \frac{3}{10} \Rightarrow I = 0.3$ A

23. (i) Draw magnetic field lines of a bar magnet. "Two magnetic field lines never intersect each other." Why?

(ii) An electric oven of 1.5 kW is operated in a domestic circuit (220 V) that has a current rating of 5 A. What result do you expect in this case? Explain.

Ans: (i) Two magnetic field lines never intersect each other. The direction of magnetic field lines is always from North pole to South pole. If two magnetic field lines intersect, then at point of intersection the compass needle is showing two different directions of magnetic field which is impossible.



(ii) Given: Power (P) = 1.5 kW = 1.5 x 1,000 = 1,500 W Voltage, (V) = 220 V

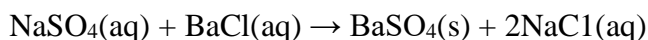
We know, $P = V \times i$

$$\Rightarrow I = \frac{P}{V} = \frac{1,500}{220} = 6.8 \text{ A}$$

Now, the current drawn by the oven is 6.8 A which is very high but the fuse in this circuit has only 5 A capacity. When a very high current of 6.8 A flows through 5 A fuse, the fuse wire will get heated too much. As a result, the fuse wire will melt and break the circuit thereby cutting off the power supply.

24. What is double displacement reaction? Give two points of difference between displacement and double displacement reaction.

Ans: Double displacement reactions are chemical reactions where there is an exchange of ions between the reactants. When sodium sulphate reacts with barium chloride it produces barium sulphate which comes as a precipitate. The other product is sodium chloride which remains in solution. The precipitate is insoluble and such a reaction is called a precipitate reaction.



S. No.	Displacement Reaction	Double Displacement Reaction
1	In these reactions more reactive metal displaces the less reactive metal.	In these reactions exchange of ions between the two reactants takes place.
2	These reactions are slow.	These reactions are fast.

OR

Identify the type of chemical reaction in the following statements and define each of them.

(i) Digestion of food in the body

(ii) Heating of manganese dioxide with aluminium powder

Ans: (i) Digestion of food is an example of decomposition reaction because the food we eat mainly contains carbohydrates, proteins, fats. These are decomposed into smaller units such as glucose, amino acids and fatty acids in the presence of enzymes in the body.

(ii) It is an example of displacement reaction as more reactive metal Al displaces Mn from its solution.

25. The position of five elements in the periodic table are shown below:

	Group 1	Group 2	Group 15	Group 16
Period 1		A		B
Period 3	C		D	E

(i) What are the numbers of valence electrons in B?

(ii) Name the element which have smallest atomic radius.

(iii) Name the element that will form basic oxide.

Ans: (i) The elements in Group 16 have 6 valence electrons. So, B has 6 valence electrons.

(ii) B will have smallest atomic radius as atomic radius increases down the group and decreases across a period.

(iii) Group 1 and Group 2 elements have 1 and 2 valence electrons respectively. They lose these electrons easily to form cations. So, C and A will form basic oxides.

OR

(i) Name the element with atomic number 17. Write its electronic configuration.

(a) To which period does it belong.

(b) To which group does it belong.

(ii) Write down two drawbacks of Newland's law of octaves.

Ans: (i) Chlorine has atomic number 17.

(a) It belongs to group 17,

(b) period 3. Electronic configuration of chlorine (Cl) is (2, 8, 7)

(ii) Drawbacks of Newland's law of octaves are:

(a) The law was applicable to elements up to calcium only.

(b) It contained only 56 elements. Further it was assumed by Newland's that only 56 elements existed in nature and no more elements would be discovered in future.

26. With the help of suitable examples explain why certain characters of traits earned by people during their lifetime are not passed onto the next generation. How can these characters be passed on?

Ans: The characters or traits earned by a person during his or her lifetime are examples of acquired traits. They are not parts of the genetic makeup and hence are not inherited. They could develop due to use or disuse of organs or due to direct effect of the environment on the organism. Developing powerful muscles by body building exercises is not a hereditary character that will pass on to the next generation. When characters develop due to some effect on the gene they can be inherited. Suppose the cells in a person undergo mutation due to some reason they produce a change in the genotype. This may result in some changes in character of the individual. These changes are inherited.

SECTION – C

27. (i) What is presbyopia? State its cause. How is it corrected?

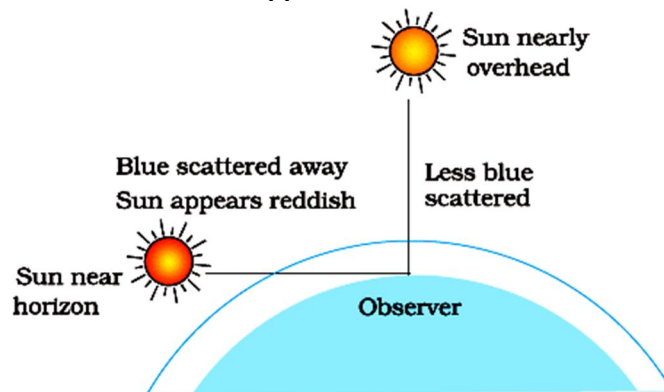
(ii) What do you mean by Tyndall effect? Give an example of Tyndall effect. Which property of light is responsible for this effect.

(iii) Why does the sun appear reddish early in the morning? Explain with the help of a labelled diagram.

Ans: (i) Presbyopia: Presbyopia is a defect of vision in which a person is unable to see nearby as well as far off objects clearly. Causes: It is caused due to gradual weakening of the ciliary muscles/diminishing flexibility of the eye lens. Correction: It can be corrected by the use of bifocal lenses.

(ii) The scattering of light by particles in its path is called Tyndall effect. This effect is observed when a beam of sunlight passes through a canopy of a dense forest. Scattering of light is responsible for this effect.

(iii) At sunrise, when the sun is near the horizon, sunlight has to travel a much longer distance of the atmosphere. As a result, the light travelling from the sun loses most of the blue light due to scattering because its wavelength is small. The red light of long wavelength is scattered a little and reaches the observer. As a result, the sun appears to be red.



28. Give reasons:

- (i) Sometimes we cough while swallowing food.
- (ii) Stem also respire along with leaves of plants.
- (iii) Diameter of afferent arteriole is bigger than efferent arteriole.

Ans: (i) Epiglottis is a flap like structure which closes the opening of respiratory tract while swallowing food, so that food particles will enter into the oesophagus. Sometimes due to incomplete closure of epiglottis, some food particles enters into the respiratory tract which causes coughing that forces out the food particles from the respiratory tract.

(ii) Stem contains minute openings called lenticels through which gaseous exchange occurs similarly, stomata which are present on the surface of leaves. So, stems also respire through lenticels and leaves respire through stomata.

(iii) The diameter of afferent arteriole is bigger than efferent arteriole which helps in building of a high hydrostatic pressure in the blood flowing through the glomerulus so that the liquid portion of the blood gets filtered out through the glomerulus and gets collected in Bowman's capsule which is known as glomerular filtrate. This process of filtration of blood under high pressure is known as ultrafiltration.

OR

- (i) List three characteristics of lungs which makes it an efficient respiratory surface.
- (ii) How are alveoli designed to maximise the exchange of gases?
- (iii) During breathing cycle, what is the advantage of residual volume of air in the lungs?

Ans: (i) The characteristics of lungs which makes it efficient respiratory surface are:

- (a) Lungs contain an extensive network of blood vessels.
- (b) It is delicate and thin.
- (c) Lungs cover a large surface area.

(ii) Gaseous exchange occurs between alveoli and the blood vessels surrounding alveoli. Alveoli are tiny sac like structures present in lungs which increases the surface area for gaseous exchange and lungs contain about 300 - 350 million alveoli. They have very thin walls making the diffusion of gases more convenient. They are surrounded by numerous tiny blood capillaries which facilitates for efficient gaseous exchange. When we inhale air the alveoli expands like a balloon allowing more amount of oxygen to get inside it.

(iii) Due to the residual volume of air in the lungs, there is sufficient time for oxygen to get absorbed and for carbon dioxide to be released. It also prevents the lungs from collapsing.

29. Nitrogen (atomic number 7) and phosphorus (atomic number 15) belong to group 15 of the periodic table. Write their electronic configuration. Which of these will be more electronegative and why?

Ans: Nitrogen atomic number = 7, electronic configuration = 2, 5 and Phosphorus atomic number = 15, electronic configuration = 2, 8, 5.

Both the elements belong to group 15 of the periodic table. Nitrogen will be more electronegative than phosphorus. As we know, electronegativity is the tendency of elements to attract electrons towards themselves. Electronegativity decreases down the group. As we move down the group, the valence electrons go further away from the nucleus. The effective nuclear charge experienced by valence electrons is decreasing as the valence electrons are farther away from the nucleus. Hence, the metallic character increases down a group. The hold of the atom on the nucleus decreases and so they are lost easily. Hence, the elements down become electropositive which is an indication of metallic nature. From this behaviour it is also possible to predict the nature of oxides formed by the elements as oxides of metals are basic while oxides of non-metals are acidic in general.

30. (i) A coil of insulated wire is connected to a galvanometer. What would be seen if a bar magnet with its South pole towards one face of the coil is:

- (a) Moved quickly toward it
- (b) Moved quickly away from it
- (c) Placed near its one face

These activities are then repeated with North pole of the magnet. What will be the observations?

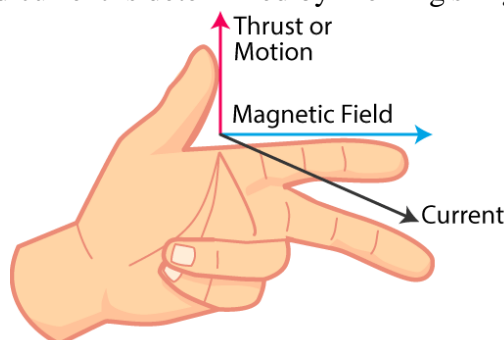
- (ii) Name and define the phenomenon involved in the given activities.
- (iii) Name the rule which can determine the direction of current in each case.

Ans: (i) A coil of insulated wire is connected to a galvanometer and if a bar magnet with its South pole towards one face of the coil is:

- (a) Moved quickly towards it, the galvanometer is deflected towards the left.
- (b) Moved quickly away from it, the galvanometer is deflected towards the right.
- (c) If the magnet is held stationary inside the coil, the deflection of the galvanometer is zero.

If this activity is repeated with North pole of the magnet then galvanometer will show deflections as when the magnet is pushed into the coil, the galvanometer is deflected towards the right. If the magnet is withdrawn from the coil, the galvanometer is deflected towards the left and if the magnet is held stationary inside the coil, the deflection of the galvanometer is zero.

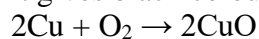
- (ii) The phenomenon involved in this activity is electromagnetic induction. The production of electric current by moving a magnet inside a fixed coil of wire is called electromagnetic induction.
- (iii) The direction of induced current is determined by Fleming's Right Hand Rule.



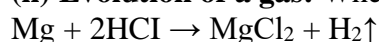
31. Define a chemical reaction. State four observations which help us to determine that, a chemical reaction has taken place. Write one example of each observation with a balanced chemical equation.

Ans: The process which transforms one or more substances into new substances by rearrangement of atoms of the reacting substances to form products with new properties is called a chemical reaction. The four observations that help us to determine a chemical reaction has occur are:

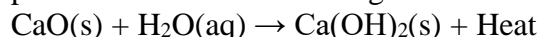
(i) **Change in colour:** When copper which is a reddish brown coloured powder reacts with oxygen it gives black colour copper(II) oxide.



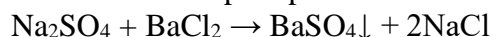
(ii) **Evolution of a gas:** When magnesium reacts with dilute HCl hydrogen gas is evolved.



(iii) Change in temperature: When water is added to solid calcium oxide a highly vigorous and exothermic reaction occurs which is accompanied by hissing noise. Due to large amount of heat produced water starts boiling and a chemical compound called slaked lime is produced.



(iv) Formation of a precipitate: When barium chloride solution reacts with sodium sulphate solution a white precipitate of barium sulphate is formed.



32. What is vegetative propagation? State two advantages and two disadvantages of this method.

Ans: Vegetative propagation is a method of asexual reproduction in plants where new plants are produced from vegetative parts of plants like root, stem and leaves. While animals cannot use this method of reproduction whereas plants can. This method is used to produce new plants by layering or grafting as in rose, jasmine, sugarcane and grapes for agriculture purposes.

The advantages of vegetative propagation are as follows:

(i) Plants raised by vegetative propagation can bear flowers and fruits earlier than those produced by seeds.

(ii) It helps in the propagation of plants like banana, orange, jasmine and rose that have lost the capacity to produce seeds.

The disadvantages of vegetative propagation are as follows:

(i) The plants produced by this method are more prone to diseases than the parent plant.

(ii) As there is no scope of genetic variation there is no chance to develop better varieties.

33. (i) What is (a) the highest, (b) the lowest total resistance that can be secured by combinations of four coils of resistance 4 Ω , 8 Ω , 12 Ω , 24 Ω ?

(ii) Derive the equation for resistivity. On what factors does the resistance of a conductor depend?

Ans: (i) (a) When all the resistors are connected in series, then the equivalent resistance will be highest. Thus, total resistance (R) = 4 + 8 + 12 + 24 = 48 Ω .

Therefore, 48 Ω is the highest resistance.

(b) When all the resistors are connected in parallel, then the equivalent resistance is lowest.

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \frac{1}{R_4} \Rightarrow \frac{1}{R} = \frac{1}{4} + \frac{1}{8} + \frac{1}{12} + \frac{1}{24}$$

$$\Rightarrow \frac{1}{R} = \frac{6+3+2+1}{24} = \frac{12}{24} = \frac{1}{2}$$

$$\Rightarrow R = 2 \Omega.$$

Therefore, 2 Ω is the lowest resistance.

(ii) We know that, $R \propto l$ and $R \propto 1/A$

From equations (1) and (2), we get $R \propto \frac{l}{A} \Rightarrow R = \frac{\rho \times l}{A}$

where ρ is the constant known as resistivity of the material of the conductor.

$$\text{Now, Resistivity, } \rho = \frac{R \times A}{l}$$

where R = Resistance of the conductor,

A = Area of cross-section of the conductor, and l = Length of the conductor.

The resistance of a conductor depends on the following factors:

(a) Length of the conductor,

(b) Area of cross-section of the conductor,

(c) Nature of the material of the conductor and

(d) Temperature of the conductor.

SECTION – D

34. At what distance from the concave lens of focal length 20 cm, should a 6 cm tall object be placed so that it forms an image at 15 cm from the lens? Also, determine the size of the image formed.

Given: $f = -20$ cm, $h = 6$ cm, $v = -15$ cm

To find $u = ?$ and $h' = ?$

Lens formula is given by, $\frac{1}{u} - \frac{1}{v} = \frac{1}{f}$

$$\Rightarrow \frac{1}{-15} - \frac{1}{v} = \frac{1}{-20} \Rightarrow \frac{1}{v} = \frac{1}{-15} - \frac{1}{-20}$$

$$\Rightarrow \frac{1}{v} = \frac{1}{-15} + \frac{1}{20} \Rightarrow \frac{1}{v} = \frac{-4+3}{60} = \frac{-1}{60}$$

Therefore, $u = -60$ cm

Height of image given by magnification $m = \frac{h'}{h} = \frac{v}{u} \Rightarrow h' = \frac{-15 \times 6}{-60}$

$$\Rightarrow h' = 1.5 \text{ cm}$$

OR

A concave lens of focal length 15 cm forms an image 10 cm from the lens. How far is the object placed from the lens? Draw the ray diagram.

Focal length of concave lens, $f = -15$ cm

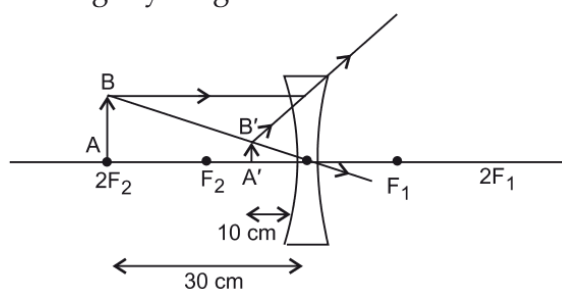
Image distance, $v = -10$ cm

According to the lens formula, $\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$

Substituting the values, we get $\frac{1}{-10} - \frac{1}{u} = \frac{1}{-15}$

$$\Rightarrow -\frac{1}{u} = \frac{-1}{15} + \frac{1}{10} \Rightarrow -\frac{1}{u} = \frac{-2+3}{30} \Rightarrow -\frac{1}{u} = \frac{1}{30} \Rightarrow u = -30 \text{ cm}$$

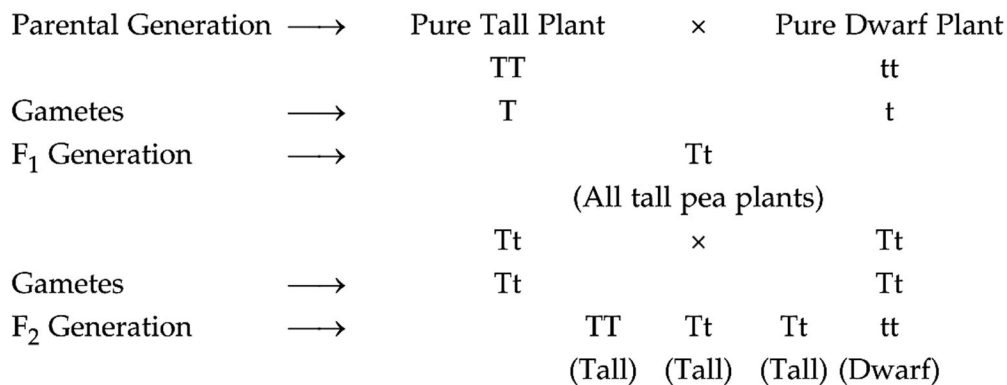
The negative value of u indicates that the object is placed 30 cm in front of the lens. This is shown in the following ray diagram.



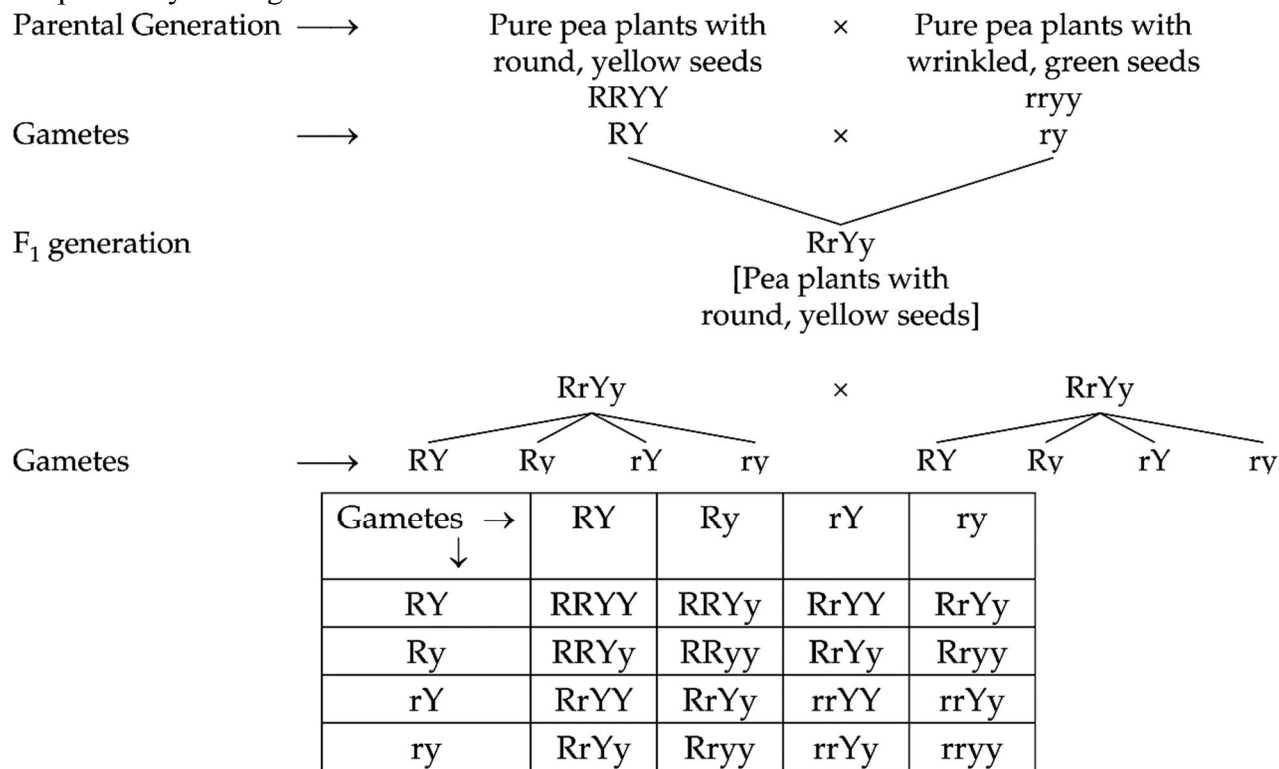
35. How do Mendel's experiments show that the:

- (i) Traits may be dominant or recessive
- (ii) Traits are inherited independently.

Ans: (i) When Mendel crossed pure tall pea plants with pure dwarf pea plants in F_1 generation only tall plants were produced. When these F_1 plants were self-pollinated in F_2 generation both tall and dwarf plants were produced in the ratio of 3: 1. In F_1 generation only tall plants were found so it showed that tall is a dominant character. In F_2 generation dwarf plants also appeared which shows that dwarf is a recessive trait which express only in recessive condition.



(ii) When Mendel crossed pure pea plants with round, yellow seeds with pure plants with wrinkled, green seeds in F₁ generation all pea plants with round and yellow seeds were produced. This shows that round and yellow are dominant characters whereas green and wrinkled are recessive characters. Again when these F₁ plants were crossed round, yellow pea plants as well as green, wrinkled seeds pea plants were produced. But in addition to these two new characters were produced i.e., round and green, wrinkled and yellow seeds pea plants were produced. This shows that two pair of characters combine in F₁ generation but they get separated and behave independently in F₂ generation.



OR

- (i) What are dominant and recessive traits?
- (ii) Is it possible that a trait is inherited but may not be expressed in the next generation? Give a suitable example to justify this statement.
- (iii) What are homologous structures? Give an example.
- (iv) “The sex of a new born child is a matter of chance and none of the parents may be considered responsible for it.” Justify this statement with the help of a flow chart showing sex-determination in human beings.

Ans: (i) The trait which can express its effect over contrasting trait is called dominant trait whereas the trait which cannot express its effect over contrasting trait or which gets suppressed by the contrasting trait is called recessive trait. The inherited trait which is not expressed will be a recessive trait.

(ii) In Mendel's experiment, when pure tall pea plants were crossed with pure dwarf pea plants, only tall pea plants were obtained in F₁ generation. On selfing the pea plants of F₁ generation both

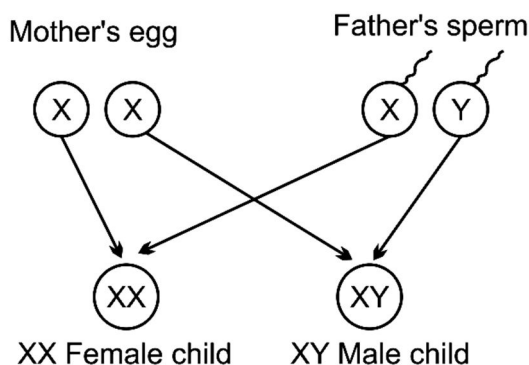
tall and dwarf pea plants were obtained F₂ generation. Reappearance of the dwarf pea plants in F₂ generation proves that the dwarf trait was inherited but not expressed in F₁ generation. The recessive trait does not express itself in the presence of the dominant trait. So, it is possible that one trait may be inherited but may not be expressed in an organism.

(iii) The structures which have the same basic design but different functions are called homologous structures or homologous organs. Example: Forelimbs of a man, a lizard, a frog they have same basic design of bones but perform different functions.

(iv) The sex of a new born depends on what happens at the time of fertilization.

(a) If a sperm carrying X chromosome fertilizes the ovum carrying X chromosome, then the girl child will be born and the child will have XX combination of sex chromosomes.

(b) If a sperm carrying Y chromosome fertilizes the ovum carrying X chromosome, then the child born will be a boy and the child will have XY combination of sex chromosome.

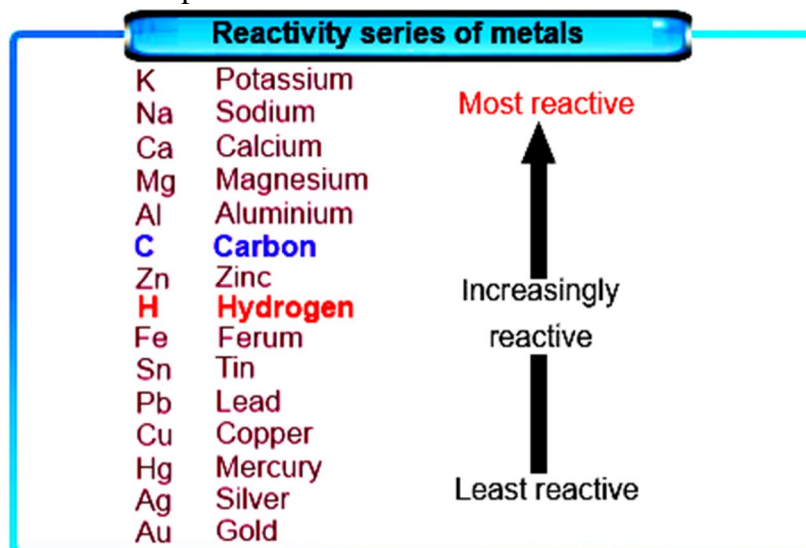


36. (i) What is reactivity series? How does the reactivity series of metals help in predicting the relative activities of various metals?

(ii) (a) Why is white phosphorus kept immersed under water?

(b) With the help of examples, describe how metal oxides differ from non-metal oxides.

Ans: (i) The reactivity series is a list of metals arranged in the order of their decreasing activities. After performing their displacement experiments the following series known as reactivity or activity series has been developed.



The metals at the bottom of the activity series are the least reactive. They are often found in a free state. For example, gold, silver, platinum and copper are found in a free state. The metals in the middle of the activity series (Zn, Fe, Pb) are moderately reactive. They are found in the earth's crust as oxides, sulphides and carbonates. The metals at the top of the activity series are so active that they are never found in nature as free elements (K, Na, Ca, Mg, Al).

(ii) (a) White phosphorus has very low ignition temperature and can start burning even at room temperature when it comes in contact with air. So, it is kept immersed under water as it does not react with water.

(b) 1. Metal oxides are basic in nature and turn red litmus to blue. Example: Magnesium oxide. But non-metal oxides are either neutral or acidic in nature. Example: Carbon monoxide which is neutral in nature. Acidic non-metal oxides turns blue litmus red. Example: Carbon dioxide.

2. Metal oxides reacts with acids forming salts and water.

Example: $\text{MgO} + 2\text{HCl} \rightarrow \text{MgCl}_2 + \text{H}_2\text{O}$

Non-metal oxides reacts with bases to form salt and water.

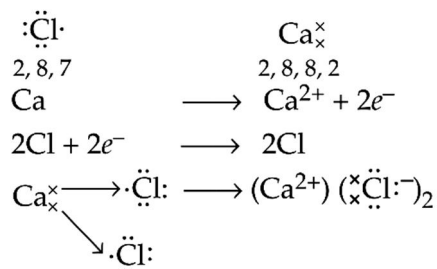
Example: $\text{Ca}(\text{OH})_2 + \text{CO}_2 \rightarrow \text{CaCO}_3 + \text{H}_2\text{O}$

OR

(i) Write electron dot diagram for chlorine (At. No. 17) and calcium (At. No. 20). Show the formation of calcium chloride by transfer of electrons.

(ii) Identify the nature of calcium chloride and explain three physical properties of such compound.

Ans: (i) Electron dot structure



(ii) It is an ionic compound having formula CaCl_2 .

Physical properties of ionic compounds are:

(i) It is hard and soluble in water.

(ii) It has high melting and boiling point.

(iii) It is good conductor of electricity in molten state.

