CBSE -10th- 2007 Examination

SCIENCE

SET-3 Paper & Solution

Time: 2½ Hrs. Max. Marks: 60

General Instructions:

1. The question paper comprises of two Sections, A and B. You are to attempt both the sections.
2. All questions are compulsory.
3. The candidates are advised to attempt all the questions of Section A and Section B separately.
4. There is no overall choice. However, internal choice has been provided in some questions. You are to attempt only one option in such questions.
5. Question numbers 1–4 in Section A and 17, 18 in Section B are very short answer questions. These questions carry one mark each.
6. Question numbers 5–8 in Section A and 19, 20 in Section B are short answer questions and carry two marks each.
7. Question numbers 9–14 in Section A and 21–23 in Section B are also short answer questions and carry three marks each.
8. Question numbers 15, 16 in Section A and 24 in Section B are long answer questions and carry five marks each.

SECTION A

Question 1. Write the type of reactions in the following:

i) Reaction between an acid and a base

ii) Rusting of iron

Solution: i) Neutralization reaction

ii) Oxidation reaction

Marks: 1

Question 2. Give the names of the functional groups.

i. –CHO

ii. C = O

Solution: i) Aldehyde group

ii) Ketone group

Marks: 1

Question 3. Write the function of iris in the human eye?

Solution: Iris is a coloured muscular diaphragm that controls the amount of light entering the eye by adjusting the size of the pupil.

Marks: 1

Question 4. What is the S.I. unit of electrical potential?

Solution: S.I. unit of electrical potential is Volt.

Marks: 1

Question 5. a) Give Arrhenius definition of an acid and a base.

b) Choose strong acid and strong base from the following:

CH_3COOH, NH_4OH, KOH, HCl

Solution: a) According to Arrhenius, a scientist, an acid is a substance which gives H^+ ions in its aqueous solution. Base is a substance which gives OH- ions in its aqueous solution.

b) HCl – Strong Acid
KOH – Strong Base
Marks: 2

Question 6. What are esters? Write an equation to show the formation of an ester.
Solution: Esters are sweet smelling organic compounds. Their functional group is R_1COOR_2, where R_1 and R_2 are alkyl radicals.

$$\underset{\text{Ethanoic acid}}{CH_3COOH} + \underset{\text{(Ethanol)}}{C_2H_5OH} \xrightarrow[\text{Warm}]{H_2SO_4} \underset{\text{Ethyl ethanoate (An ester)}}{CH_3COOC_2H_5} + H_2O$$

Marks: 2

Question 7. What is geothermal energy? What are its advantages?
Solution: The heat energy available from the hot rocks present inside the earth is known as geothermal energy.
Advantages of geothermal energy:
i) It is available throughout the year.
ii) Cost of production of electricity from the source of energy is very less.
iii) It does not cause any pollution.
Marks: 2

Question 8. An electric iron has a rating of 750 W, 220 V. Calculate
i) Current passing through it, and
ii) Its resistance, when in use.
Solution: Power, P = 750 W
Potential difference, V = 220 V
Current, I = ?
Resistance, R = ?
We Know P =VI

$$I = \frac{P}{V} = \frac{750}{220} = 3.41 \text{ A}$$

and $R = \frac{V}{I} = \frac{220}{3.41} = 64.51\ \Omega$

Marks: 2

Question 9. Name the raw materials that are required for the manufacture of washing soda by Solvay process. Describe the chemical reactions involved in the process.
Solution: The raw materials needed for the manufacture of washing soda are: NaCl (sodium chloride), water, ammonia gas and limestone to give CO_2 gas.
Chemical reactions involved:

$$NaCl + H_2O + CO_2 + NH_3 \longrightarrow NH_4Cl + NaHCO_3$$

$$2NaHCO_3 \xrightarrow{\text{Heat}} Na_2CO_3 + CO_2 + H_2O$$

$$\underset{\text{Sodium carbonate}}{Na_2CO_3} + 10H_2O \longrightarrow \underset{\text{Crystals of Washing Soda}}{Na_2CO_3.10H_2O}$$

Marks: 3

Question 10. Write about different chemical processes used for obtaining a metal from its oxides, for metals low in the activity series, metals in the middle of activity series and metals towards the top of the activity series.

Solution: Metals low in the activity series: Oxides of such metals can be reduced to metal by heating alone in the air.

Example: HgS is cinnabar ore of mercury metal. This on heating in air changes to metal oxide and metal oxide then on heating gets reduced to mercury metal.

$$2HgS + \underset{(air)}{3O_2} \xrightarrow{Heat} 2HgO + 2SO_2 \uparrow$$

$$2HgO \xrightarrow{Heat} \underset{\text{Mercury metal}}{2Hg} + O_2$$

Metals in the middle of activity series: Metals in the middle of the reactivity series are usually present as sulphides or carbonates. These sulphides and carbonates are converted into metal oxides and then these metal oxides are reduced to corresponding metals by reduction. Coke (carbon) acts as reducing agent.

Example:

$$2ZnS + 3O_2 \longrightarrow 2ZnO + 2SO_2$$

$$ZnO + \underset{(coke)}{C} \xrightarrow{Heat} 2Zn + CO \uparrow$$

Metals on the top of the activity series: As these metals are quite reactive metals, their oxides are reduced by electrolysis method. On passing the current through their molten state, we get the metals at the cathode.

Example:

$$\underset{\substack{\text{Enriched}\\ \text{Bauxite ore}}}{2Al_2O_3} \xrightarrow{Current} 4Al^{3+} + 6O^{2-}$$

At cathode $4Al^{3+} + 12e^- \longrightarrow 4Al$

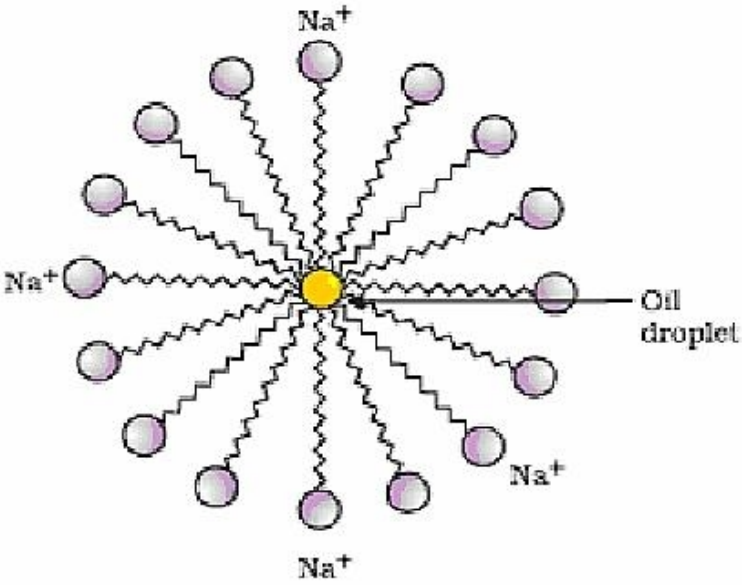
At anode: $6O^{2-} \longrightarrow 3O_2 + 12e^-$

Marks: 3

Question 11. Explain the mechanism of the cleaning action of soaps.

Solution: Most of the dirt is oily in nature. The oil does not dissolve in water. Moreover, soap molecules are sodium or potassium salts of long chair carboxylic acids. Each soap molecule has two parts which are (i) ionic part and (ii) hydrocarbon chain. Ionic part is water-loving or hydrophilic and soluble in water. The hydrocarbon chain is hydrophobic and is not soluble in water. Inside water, the soap molecules have a unique orientation in which its clusters of molecules form a structure called micelle. In the micelle, the ionic parts of soap molecules are oriented towards water and hydrocarbon chain tails away from water (as shown in the diagram).

The oily dirt is collected in centre of the micelle and gets entrapped into it. These micelles stay in water as colloids. Thus, dirt suspended in the micelles is easily rinsed away.



Formation of micelles

Marks: 3

Question 12. A concave lens has focal length of 20 cm. At what distance from the lens a 5 cm tall object be placed so that it forms an image at 15 cm from the lens? Also calculate the size of the image formed.

Solution: Focal length, f = –20cm,

Image distance, v = –15cm

Object height, h = 5 cm

Object distance, u = ?

Image height, h' = ?

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

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

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

$$\Rightarrow \frac{1}{u}=\frac{-4+3}{60}$$

$$\Rightarrow \frac{1}{u}=\frac{1}{-60}$$

$\therefore$ u = –60 cm

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

$$\Rightarrow h'=\frac{v}{u}\times h$$

$$h=\frac{-15\times 5}{-60}=\frac{-75}{-60}=1.25 \text{ cm}$$

Marks: 3

Question 13. a) Why is the Solar Cooker box covered with a plane glass plate?
b) Why is energy of water flowing in a river considered to be an indirect form of solar energy?
c) Write one advantage of nuclear fission reaction.
Solution: a) The Solar Cooker box is covered with a plane glass plate to help in trapping the solar heat inside the box through the greenhouse effect.
b) The water cycle in nature occurs due to energy of the sun. Solar energy causes the water to evaporate to form clouds. These water vapours have potential energy. When clouds fall as rain, potential energy of water vapours changes into kinetic energy of water. Some of this rain water flows into the rivers, thus kinetic energy of river water can be considered as indirect form of solar energy.
c) Enormous amount of electrical energy can be produced from fission of 1 atomic mass unit.
Marks: 3

Question 14. a) What is meant by 'Electric Resistance' of a conductor?
b) A wire of length L and resistance R is stretched so that its length is doubled and the area of cross-section is halved. How will its:
i) Resistance change? ii) Resistivity change?
Solution: a) 'Electric resistance' of a conductor is the amount of opposition it offers to the flow of electric current through it. It is numerically equal to the ratio of potential difference across its ends to the current flowing through it.

$$\text{Resistance } (R) = \frac{\text{p.d. } (V)}{\text{Current } (I)}$$

b) We know $R = \rho \frac{l}{A}$

where, R is the resistance,
ρ is the resistivity,
l is the length,
A is the area of cross-section.
When the length is doubled and the area of cross-section is halved, the resistance of the wire becomes

$$R' = \rho \frac{2l}{A/2} = 4\rho \frac{l}{A} = 4R$$

i) New Resistance will be four times of the original resistance.
ii) Resistivity will remain the same because it is a characteristic property of the material of the wire.
Marks: 3

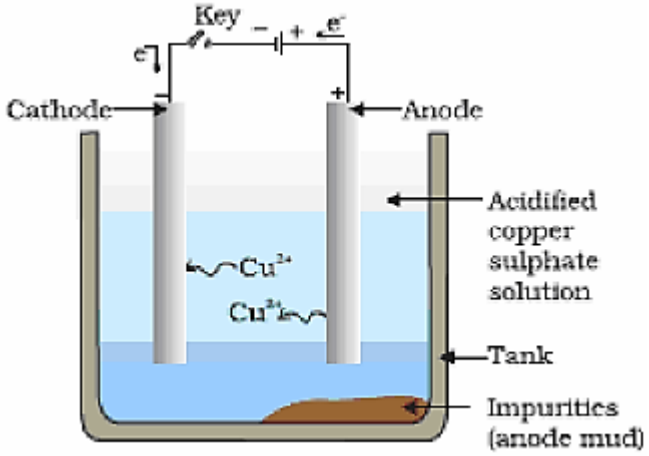
Question 15. a) Name one main ore of zinc metal. Write its formula. How is this metal ore changed into its oxide compound?
b) Explain in brief about electrolytic refining method.

OR

a) Why is sulphuric acid called 'King of Chemicals'?
b) State two ways to prevent the rusting of iron.
c) Why should water be never added dropwise to concentrated sulphuric acid?
Solution: a) Ore of zinc. Zinc blend ore
Formula - ZnS
This ore is changed into metal oxide by roasting it in the presence of air.

$$2ZnS + 3O_2 \xrightarrow[(air)]{\text{Roasting}} \underset{(Heat)}{} 2ZnO + 2SO_2$$

b) Many metals like copper, zinc, tin, nickel, silver etc. are purified by electrolytic refining method. In this method, the impure metal is made the anode and a thin strip of same pure metal is made the cathode. An aqueous solution of that metal salt is used as an electrolyte. The apparatus is set up as shown in the diagram. On passing current through the electrolyte, pure metal from the anode dissolves into the electrolyte. An equivalent amount of the metal from the electrolyte gets deposited on the cathode. The impurities settle down at the bottom of the anode.



OR

a) Sulphuric acid is used for the manufacture of many types of industrial compounds, so, it is called the 'King of Chemicals'.

b) Two ways to prevent rusting of iron:

i) By changing the iron metal to its alloys like stainless-steel, cobalt steel etc.

ii) By painting the iron articles with paint etc.

c) Water should never be added to concentrated sulphuric acid, as this reaction is highly exothermic and the heat generated may splash out solution from the container and cause some accident in the laboratory.

Marks: 5

Question 16. Define the term, 'Critical Angle'. What is meant by 'total internal reflection'?
State two essential conditions for total internal reflection to take place. With the help of a ray diagram, illustrate an application of total internal reflection.

OR

a) What is meant by a 'magnetic field'?

b) How is the direction of magnetic field at a point determined?

c) Describe an activity to demonstrate the direction of the magnetic field generated around a current carrying conductor.

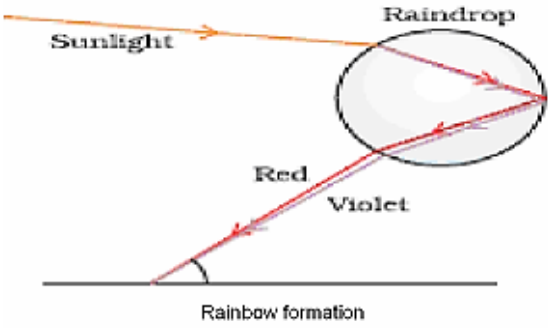
d) What is the direction of magnetic field at the centre of a current carrying circular loop?

Solution: 'Critical angle' is that angle of incidence in the denser medium for which the angle of refraction is 90o in the rarer medium. Total internal reflection: When a ray of light travels from a denser medium to a rarer medium and its angle of incidence is greater than the critical angle, it does not come out in the rarer medium but is totally reflected within the denser medium. This phenomenon is known as 'total internal reflection'.

Two essential conditions for total internal reflection:

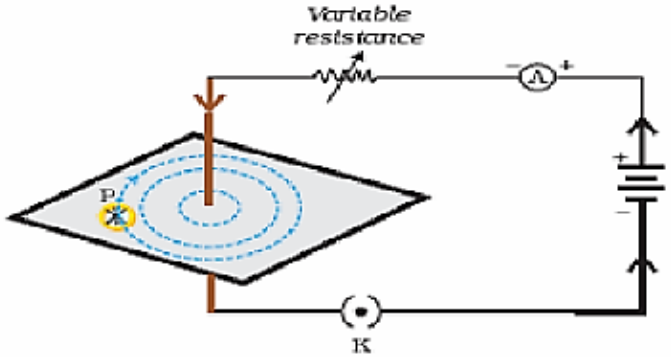
i) Ray of light must travel from denser to rarer medium.

ii) The angle of incidence must be greater than the critical angle for the given pair of media.
An application of total internal reflection: Formation of rainbow in the sky after a rain shower is based on the formation of natural spectrum and total internal reflection of light. Rainbow is caused by the dispersion of sunlight by tiny water droplets present in the atmosphere. The water droplets act like small prisms. They refract the incident sunlight and then reflect it internally and finally refract it again when it comes out of the rain-drop. A rainbow is always formed in a direction opposite to that of the Sun.



OR

a) Magnetic field: The space surrounding a magnet in which magnetic force is exerted is called magnetic field.
b) The direction of magnetic field at a point is determined by placing a small magnetic compass at that point. The direction of north-pole of the compass needle gives the direction of magnetic field at a point.
c) Connect a thick copper wire in an electric circuit having a rectangular cardboard inserted in the wire as shown in the diagram. Then sprinkle some iron filings uniformly on the card-board. Close the key so that the current flows through the copper wire. Gently tap the card-board a few times. You will observe that the iron filings align themselves showing a pattern of concentric circle around the copper wire.



The concentric circles represent the magnetic field lines around the current carrying conductor (copper wire).
d) The direction of magnetic field at the centre of a current carrying circular loop is perpendicular to the plane of the loop.
Marks: 5

SECTION-B

Question 17. Name the term for transport of food from leaves to other parts of the plant.
Solution: Translocation of food.
Marks: 1

Question 18. What is a neuron?
Solution: A neuron is the structural and functional unit of nervous system of animals.
Marks: 1

Question 19. What is lymph? Write its important functions.

OR

State the two vital functions of the human kidney. Name the procedure used in the working of artificial kidney.

Solution: Lymph is an extra cellular fluid of the body which is also involved in transportation. Lymph transports digested and absorbed food fats from the intestine to the blood.

OR

Two vital functions of human kidney:

i) Excretion (Removal) of nitrogenous wastes from the body in the form of urine.

ii) Osmoregulation of ions and water content inside the body organs. The procedure used in the working of artificial kidney is called dialysis.

Marks: 2

Question 20. Name the two hormones secreted by pancreas. Write one function of each hormone named.

Solution: Two hormones secreted by pancreas:

i) Insulin

ii) Glucagon

Insulin hormone controls the sugar level (glucose) in the blood to normal level.

Glucagon hormone increases the sugar level in the blood.

Marks: 2

Question 21. a) What is fertilization? Distinguish between external fertilization and internal fertilization.

b) What is the site of fertilization in human beings?

Solution: a) Fertilization is the process of fusion of male gamete with the female gamete (ovum) to produce zygote cell.

External fertilization takes place outside the body of the female while internal fertilization takes place inside the sexual tract of the female.

b) Fallopian tube (oviduct) is the site of fertilization in the human beings.

Marks: 3

Question 22. Define the terms:

i) Analogous

ii) Vestigial

iii) Sex chromosome

Solution: i) Analogous organs are those organs which have same function but different basic structures in different animals.

Example: Wings of insects and wings of birds.

ii) Vestigial organs are the organs which are functionless and reduced in size in an organism but are functional and of normal size in organisms of its race.

Example: Third eye membrane and tail bones in the human beings.

iii) Sex chromosomes are the chromosomes which determine the sex of the offspring (next generation).

Example: XX chromosomes in human female. XY chromosomes in human male.

Marks: 3

Question 23. Give any two ways in which biodegradable substances would affect the environment.

OR

Suggest three ways to maintain a balance between environment and development to survive.

Solution: Biodegradable substances affect the environment in the following ways:

i) These substances are decomposed by the action of micro-organisms. This causes foul smell.

ii) During the process of decaying of biodegradable substances, various types of gases are released which cause air pollution.

OR

Three ways to maintain balance between environment and development:

i) Judicious use of natural resources and replenishing of such resources which can be replenished like growing of trees in the forests.

ii) Protecting the wild animals from hunting and preserving their natural habitats.

iii) Managing the waste and pollutant materials by decomposing and recycling of such materials.

Marks: 3

Question 24. a) Draw the diagram of cross-section of a leaf and label the following in it:

i) Chloroplast

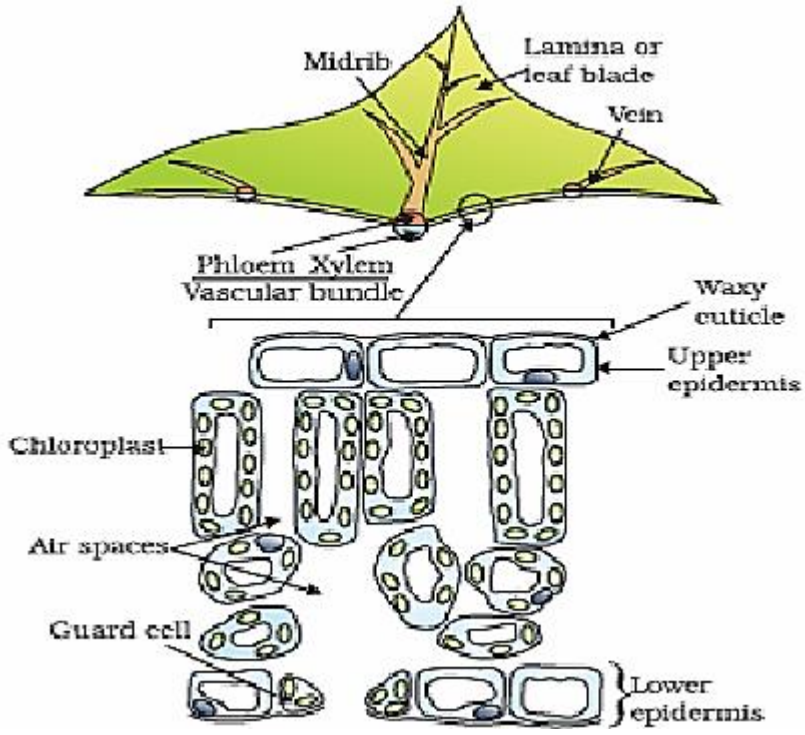
ii) Guard cell

iii) Lower epidermis

iv) Upper epidermis

b) Name the two stages in photosynthesis.

Solution: (a)



b) Two stages in photosynthesis:

i) Light reactions

ii) Dark reactions

Marks: 5