CBSE EXAMINATION PAPER-2023

SCIENCE

(Solved)

Time allowed : 3 hours | Maximum Marks : 88

General Instructions :

Read the following instructions carefully and follow them :

i. This question paper contains **46 questions.** All questions are **compulsory.**

ii. This question paper is divided into **5 sections.**

iii. **Section A** – questions number **1 to 3** are case based questions

iv. **Section B** – questions number **4 to 23** are multiple choice questions

v. **Section C** – questions number **24 to 32** are very short answer

vi. **Section D** – questions number **33 to 42** are short answer

vii. **Section E** – questions number **43 to 46** are long answer

viii. There is no overall choice given in the question paper. However, an internal choice has been provided in few questions.

ix. Use of calculator is NOT allowed.

Section A

Question 1. Almost all metals combine with oxygen to form metal oxides. Metal oxides are generally basic in nature. But some metal oxides show both basic as well as acidic behaviour. Different metals show different reactivities towards oxygen. Some react vigorously while some do not react at all.

> **(1) What happens when copper is heated in air? Give the equation of the reaction involved.**
>
> [1 Marks]

(2) Why are some metal oxides categorized as amphoteric? Give one example.

[1 Marks]

(3)

Complete the following equations:

(i) $Na_2O_{(s)} + H_2O_{(l)} \rightarrow$

(ii) $Al_2O_3 + 2\ NaOH \rightarrow$?

[2 Marks]

(4)

On burning sulphur in oxygen a colourless gas is produced.

(i) Write chemical equation for the reaction.

(ii) Name the gas formed.

(iii) State the nature of the gas.

(iv) What will be the action of this on a dry litmus paper?

[2 Marks]

Question 2.

In order to trace the inheritance of traits Mendel crossed pea plants having one contrasting character or a pair of contrasting characters. When he crossed pea plants having round and yellow seeds with pea plants having wrinkled and green seeds, he observed that no plants with wrinkled and green seeds were obtained in the F_1 generation. When the F_1 generation pea plants were cross-bred by self-pollination, the F_2 generation had seeds with different combinations of shape and colour also.

(1) Differentiate between dominant and recessive traits.

[1 Marks]

(2)

State the ratio of the combinations observed in the seeds of F_2 generation in the above case. What do you interpret from this result?

[2 Marks]

(3)

Given below is a cross between a pure violet flowered pea plant (V) and a pure white flowered pea plant (v). Diagrammatically explain what type of progeny is obtained in F_1 generation and F_2 generation:

Pure violet flowered plant × Pure white flowered plant.

(V V) (v v)

[2 Marks]

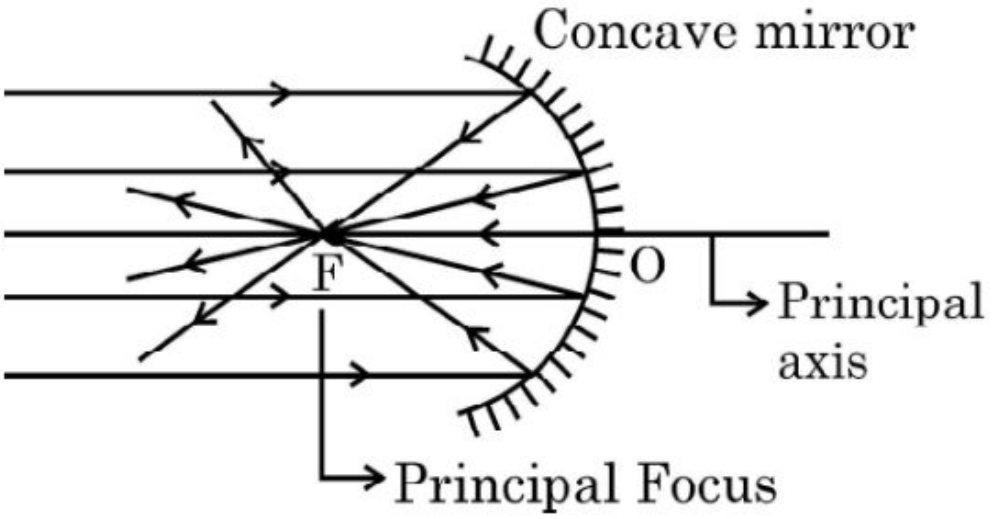
(4)

Write any two pairs of contrasting characteristics of pea plant used by Mendel other than those mentioned above.

[1 Marks]

Question 3.

Hold a concave mirror in your hand and direct its reflecting surface towards the sun. Direct the light reflected by the mirror on to a white card-board hold close to the mirror. Move the card-board bock and forth gradually until you find a bright, sharp spot of light on the board. Thik spot of light is the image of the sun on the sheet of paper, which is also termed as "Principal Focus" of the concave mirror.



(1)

List two applications of concave mirror.

[1 Marks]

(2)

If the distance between the mirror and the principal focus is 15 cm. find the radius of curvature of the mirror,

[1 Marks]

(3)

Draw a ray diagram to show the type of image formed when an object is placed between pole and focus of n concave mirror.

[2 Marks]

(4)

An object 10 cm in size is placed at 100 cm in front of a concave mirror. If its image is formed at the same point where the object is located, find:

(i) focal length of the mirror, and

(ii) magnification of the image formed with sign as per Cartesian sign convention.

[2 Marks]

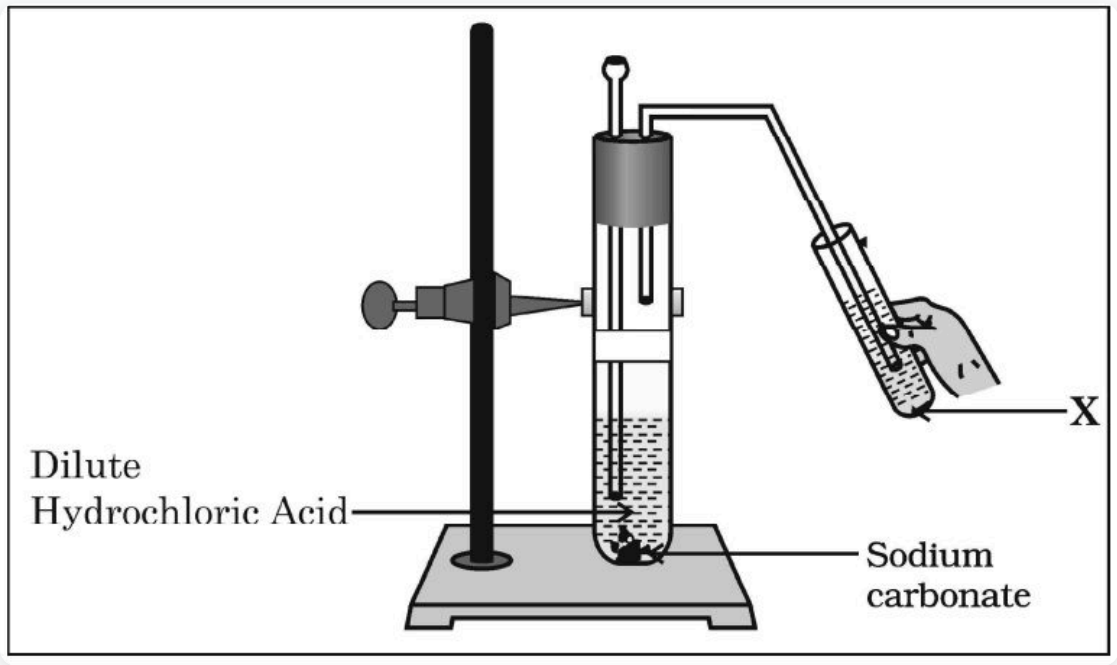
Section B

Question 4.

In the experimental setup given below, it is observed that on passing the gas produced in the reaction in the solution 'X' the solution 'X' first turns milky and then colourless.

The option that justifies the above stated observation is that 'X' is aqueous calcium hydroxide and

[1 Marks]



(A) it turns milky due to carbon dioxide gas liberated in the reaction and after sometime it becomes colourless due to formation of calcium carbonate.

(B) it turns milky due to formation of calcium carbonate and on passing excess of carbon dioxide it becomes colourless due to formation of calcium hydrogen carbonate which is soluble in water.

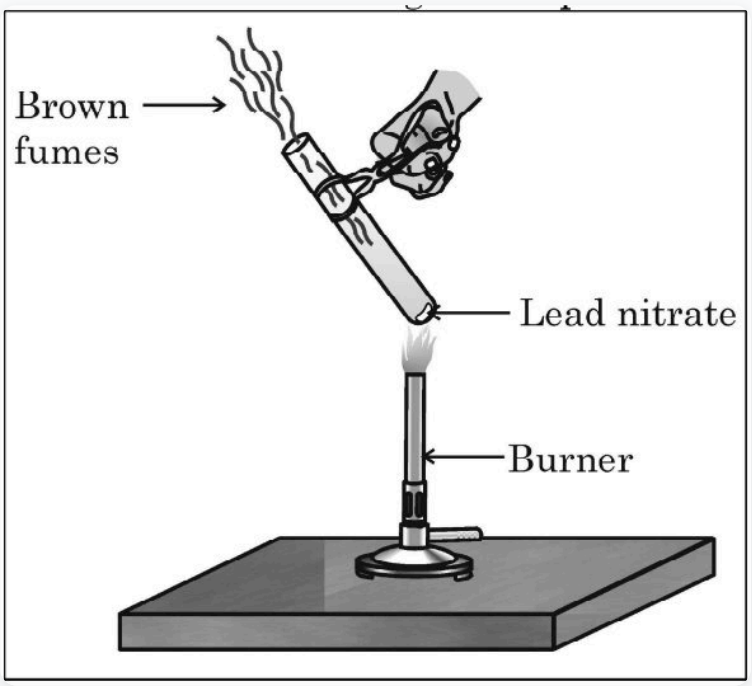
(C) it turns milky due to passing of carbon dioxide through it. It turns colourless as on further passing carbon dioxide, sodium hydrogen carbonate is formed which is soluble in water.

(D) the carbon dioxide liberated during the reaction turns lime water milky due to formation of calcium hydrogen carbonate and after some time it turns colourless due to formation of calcium carbonate which is soluble in water.

Question 5.

The emission of brown fumes in the given experimental set-up is due to

[1 Marks]



(A) oxidation of lead nitrate forming lead oxide and nitrogen dioxide.

(B) thermal decomposition of lead nitrate which produces brown fumes of nitrogen dioxide.

(C) oxidation of lead nitrate forming lead oxide and oxygen.

(D) thermal decomposition of lead nitrate which produces brown fumes of lead oxide.

Question 6.

$MnO_2 + x\ HCl \rightarrow MnCl_2 + y\ H_2O + z\ Cl_2$

In order to balance the above chemical equation, the values of x, y and z respectively are:

[1 Marks]

(A) 2, 2, 1

(B) 6, 2, 2

(C) 4, 2, 1

(D) 4, 1, 2

Question 7.

The table below has information regarding pH and the nature (acidic/basic) of four different solutions. Which one of the options in the table is correct?

[1 Marks]

Option	Solution	Colour of pH paper	Approximate pH value	Nature of solution
(a)	Lemon juice	Orange	3	Basic
(b)	Milk of magnesia	Blue	10	Basic
(c)	Gastric juice	Red	6	Acidic
(d)	Pure water	Yellow	7	Neutral

(A) B

(B) D

(C) A

(D) C

Question 8.

A metal 'X' is used in thermite process. When X is burnt in air it gives an amphoteric oxide 'Y'. 'X' and 'Y' are respectively:

[1 Marks]

(A) Al and Al_2O_3

(B) Al and Al_2O_4

(C) Fe and Fe_3O_4

(D) Fe and Fe_2O_3

Question 9.

Select washing soda from the following:

[1 Marks]

(A) $Na_2CO_3 \cdot 10H_2O$

(B) $NaHCO_3$

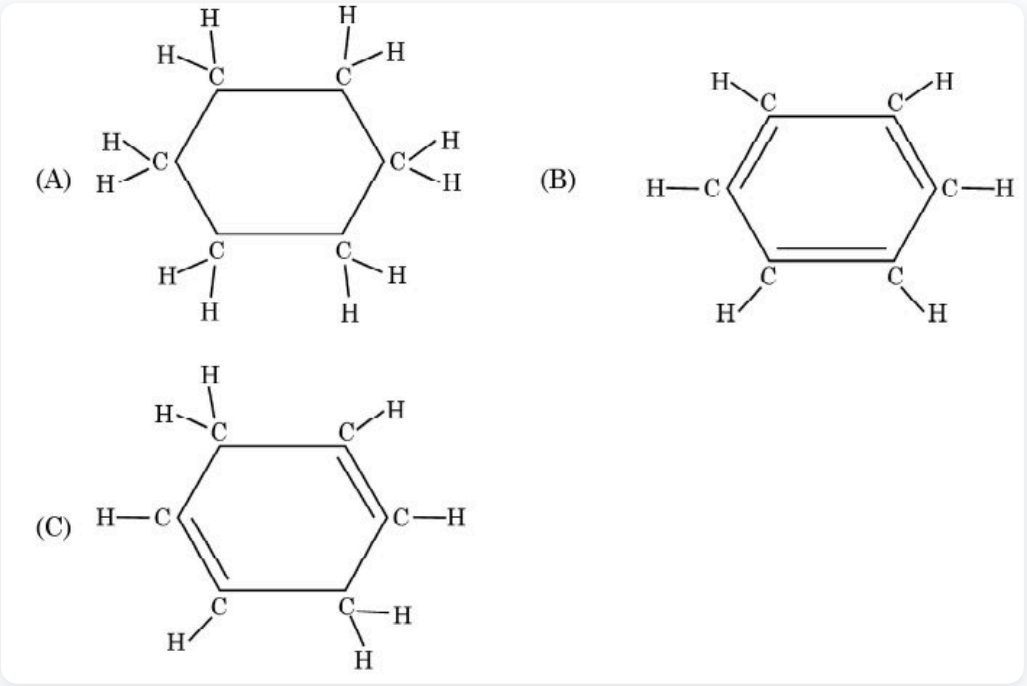
(C) NaOH

(D) $Na_2CO_3 \cdot 5H_2O$

Question 10.

Consider the structures of the three cyclic carbon compounds A, B and C given below and select the correct option from the following :

[1 Marks]



(A) A is an isomer of hexane, B is benzene and C is an isomer of hexene.

(B) A is a saturated cyclic hydrocarbon and B and C are unsaturated cyclic hydrocarbons.

(C) A is cyclohexane and B and C are the isomers of benzene.

(D) A and C are isomers of hexane and B is benzene.

Question 11.

An organism which breaks down the food material outside the body and then absorbs it is

[1 Marks]

(A) a bacteria, Rhizobium

(B) a plant parasite, Cuscuta

(C) a fungi, Rhizopus

(D) an animal parasite, Tapeworm

Question 12.

Consider the following statements about small intestine and select the one which is NOT correct:

[1 Marks]

(A) The villi of the small intestine absorb water from the unabsorbed food before it gets removed from the body via the anus.

(B) The length of the small intestine in animals differs as it depends on the type of food they eat.

(C) The small intestine receives secretions from liver and pancreas.

(D) The small intestine is the site of complete digestion of food.

Question 13.

The statement that correctly describes the characteristic(s) of a gene is:

[1 Marks]

(A) In individuals of a given species, a specific gene is located on a particular chromosome.

(B) A gene is not the information source for making proteins in the cell.

(C) All the inherited traits in human beings are not controlled by genes.

(D) Each chromosome has only one gene located all along its length.

Question 14.

Select from the following the correct statement about tropic movement in plants:

[1 Marks]

(A) It is a growth related movement.

(B) It is due to stimulus of touch and temperature.

(C) It does not depend upon the direction of stimulus received.

(D) It is observed only in roots and not in stems.

Question 15.

Select the INCORRECT match (between the plant and its vegetative part) from the following:

[1 Marks]

(A) Money-plant, stem

(B) Bryophyllum, leaf

(C) Potato, stem

(D) Rose, root

Question 16.

If four identical resistors, of resistance 8 Ω, are first connected in series so as to give an effective resistance R_s, and then connected in parallel so as to give an effective resistance R_p, then the ratio R_s/R_p is

[1 Marks]

(A) 0.5

(B) 2

(C) 16

(D) 32

Question 17.

1. In domestic electric circuits the wiring with 15 A current rating is for the electric devices which have

[1 Marks]

(A) lower power ratings such as fan.

(B) non-metallic bodies and low power

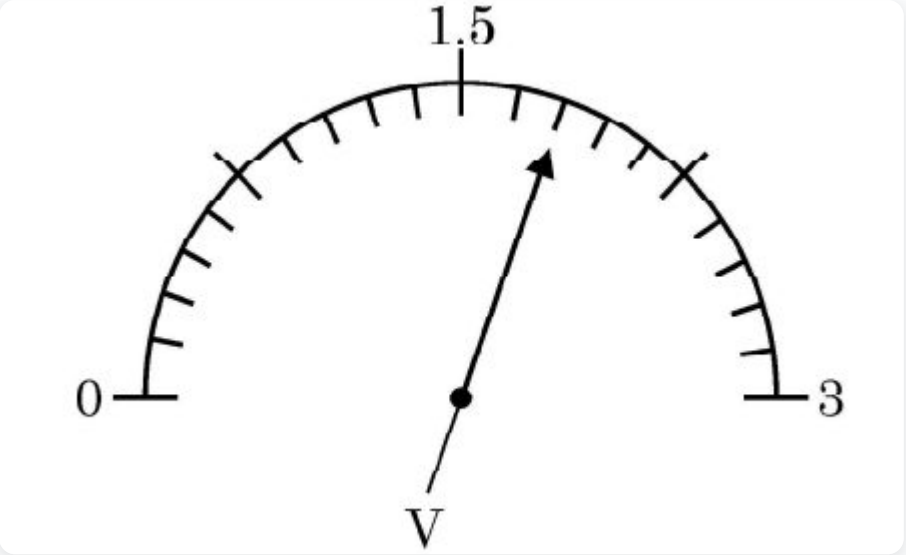
(C) higher power ratings such as geyser.

(D) metallic bodies and low power ratings.

Question 18.

In the following diagram, the position of the needle is shown on the scale of a voltmeter. The least count of the voltmeter and the reading shown by it respectively are:

[1 Marks]



(A) 0.05 V and 1.6 V

(B) 0.05 V and 1.8 V

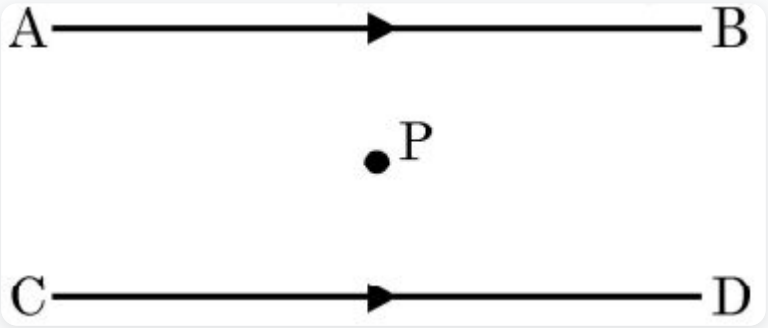
(C) 0.15 V and 1.8 V

(D) 0.15 V and 1.6 V

Question 19.

The resultant magnetic field at point 'P' situated midway between two parallel wires (placed horizontally) each carrying a steady current I is

[1 Marks]



(A) in the vertically upward direction.

(B) in the same direction as the current in the wires.

(C) in the vertically downward direction.

(D) zero

Question 20.

Assertion (A): The colour of aqueous solution of copper sulphate turns colourless when a piece of lead is added to it.

Reason (R): Lead is more reactive than copper, and hence displaces copper from its salt solution.

[1 Marks]

(A) Both A and R are true but R is not the correct explanation of A.

(B) Both A and R are true and R is the correct explanation of A.

(C) A is true but R is false.

(D) A is false but R is true.

Question 21.

Assertion (A): Genes inherited from the parents decide the sex of a child.

Reason (R): X chromosome in a male child is inherited from his father.

[1 Marks]

(A) Both A and R are true and R is the correct explanation of A.

(B) A is true but R is false.

(C) Both A and R are true but R is not the correct explanation of A.

(D) A is false but R is true.

Question 22.

Assertion (A): Blood clotting prevents excessive loss of blood.

Reason (R): Blood clotting is due to blood plasma and white blood cells present in the blood.

[1 Marks]

(A) Both A and R are true but R is not the correct explanation of A.

(B) Both A and R are true and R is the correct explanation of A.

(C) A is true but R is false.

(D) A is false but R is true.

Question 23.

Assertion (A): The strength of the magnetic field produced at the centre of a current-carrying circular coil increases on increasing the number of turns in it.

Reason (R): The current in each circular turn has the same direction and the magnetic field due to each turn adds up.

[1 Marks]

(A) A is false but R is true.

(B) A is true but R is false.

(C) Both A and R are true and R is the correct explanation of A.

(D) Both A and R are true but R is not the correct explanation of A.

Section C

Question 24.

(i) A compound 'X' which is prepared from gypsum has the property of hardening when mixed with proper quantity of water.

Identify 'X' and write its chemical formula.

(ii) State the difference in chemical composition between baking soda and baking powder.

[2 Marks]

Question 25.

Write balanced chemical equation for the reaction that occurs when:

(i) blue coloured copper sulphate crystals are heated and

(ii) Sodium hydrogen carbonate is heated during cooking.

[2 Marks]

Question 26.

(a) Write the role of insulin in regulating blood sugar levels in human body. Mention the disease caused due to it.

(b) How is the timing and the amount of release of insulin in the blood regulated?

[2 Marks]

Question 27.

Name the type of blood (oxygenated / deoxygenated) transported by each of the following mentioning the path (i.e. from one organ (which place) to another (which place)).

(i) Vena cava

(ii) Pulmonary artery

[2 Marks]

Question 28.

With the help of a schematic flow chart, show the breakdown of glucose in a cell to provide energy -

(i) in the presence of oxygen

(ii) in lack of oxygen

[2 Marks]

Question 29.

Name the part of the human excretory system where nephrons are found.

Write the structure and function of nephrons.

[2 Marks]

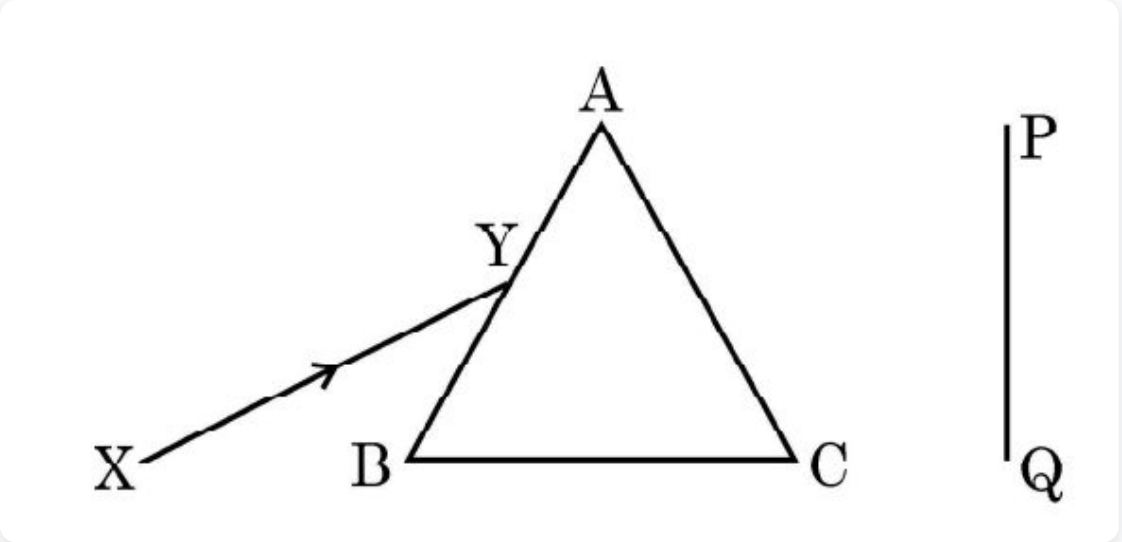
Question 30.

A narrow beam XY of white light is passing through a glass prism ABC as shown in the diagram:

Trace it on your answer sheet and show the path of the emergent beam as observed on the screen PQ.

Name the phenomenon observed and state its cause.

[2 Marks]



Question 31.

It is observed that the power of an eye to see nearby objects as well as far off objects diminishes with age.

(i) Give reason for the above statement.

(ii) Name the defect that is likely to arise in the eyes in such a condition.

(iii) Draw a labelled ray diagram to show the type of corrective lens used for restoring the vision of such an eye.

[2 Marks]

Question 32.

How do harmful chemicals get accumulated progressively at each trophic level in a food chain?

[2 Marks]

Section D

Question 33.

(a) Identify the reducing agent in the following reactions:
(i) $4NH_3 + 5O_2 \rightarrow 4NO + 6H_2O$

(ii) $H_2O + F_2 \rightarrow HF + HOF$

(iii) $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$

(iv) $2H_2 + O_2 \rightarrow 2H_2O$

(b) Define a redox reaction in terms of gain or loss of oxygen.

[3 Marks]

Question 34.

(a) Suggest one remedial measure each to counteract the change in pH in human beings in following cases :
(i) Production of too much acid in stomach during indigestion
(ii) Stung by a honey bee / nettle leaves
(b) Fresh milk has a pH of 6. When it changes into curd will its pH increase or decrease ? Why?

[3 Marks]

Question 35.

(i) State the role of ATP in cellular respiration.

(ii) What ensures sufficient exchange of gases in plants?

(iii) State the conditions on which the direction of diffusion of gases in plant depend upon.

[3 Marks]

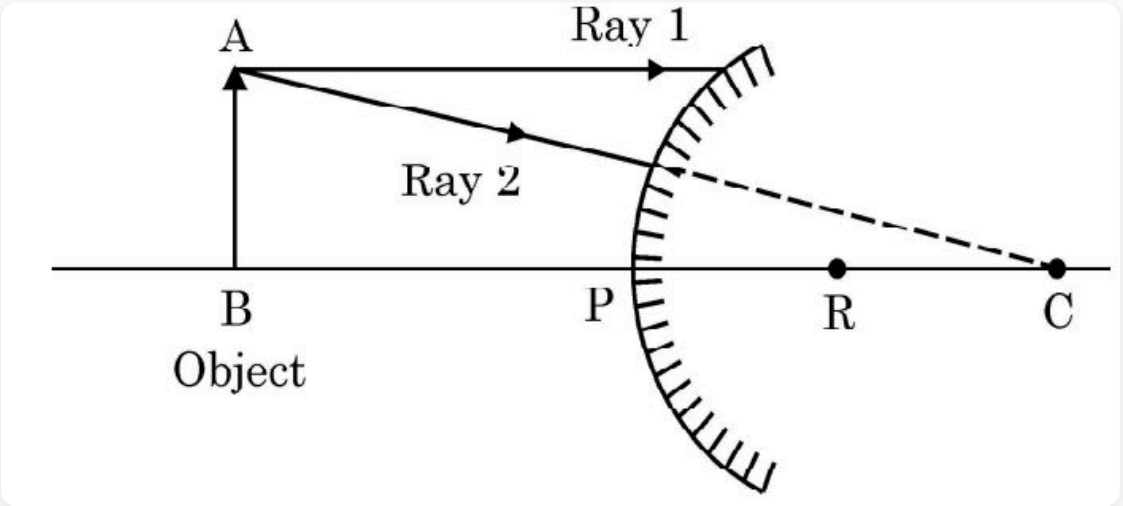
Question 36.

(a) Complete the following ray diagram to show the formation of image

(b) Mention the nature, position and size of the image formed in this case.

(c) State the sign of the image distance in this case using the Cartesian sign convention.

[3 Marks]



Question 37.

Give reasons for the following :

(a) Danger signals installed at airports and at the top of tall buildings are of red colour.

(b) The sky appears dark to the passengers flying at very high altitudes.

(c) The path of a beam of light passing through a colloidal solution is visible.

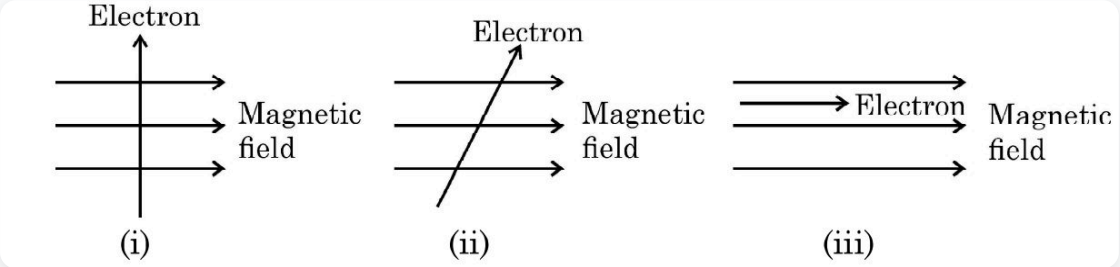
[3 Marks]

Question 38.

(i) State the rule used to find the force acting on a current carrying conductor placed in a magnetic field.

(ii) Given below are three diagrams showing entry of an electron in a magnetic field. Identify the case in which the force will be (1) maximum and (2) minimum respectively. Give reason for your answer.

[3 Marks]



Question 39.

(i) Draw the pattern of magnetic field lines of

(1) a current carrying solenoid

(2) a bar magnet

(ii) List two distinguishing features between the two fields.

[3 Marks]

Question 40.

(i) Why does a kitchen garden called an artificial ecosystem while a forest is considered to be a natural ecosystem?

(ii) While designing an artificial ecosystem at home, write any two things to be kept in mind to convert it into a self-sustaining system. Give reason to justify your answer.

[3 Marks]

Question 41.

(i) Construct a food chain of four trophic levels comprising the following:

Hawk, snake, plants, rat.

(ii) 20,000 J of energy was transferred by the producers to the organism of second trophic level. Calculate the amount of energy that will be transferred by organisms of the third trophic level to the organisms of the fourth trophic level.

[3 Marks]

Question 42.

(i) State the role of ATP in cellular respiration.

(ii) What ensures sufficient exchange of gases in plants?

(iii) State the conditions on which the direction of diffusion of gases in plant depend upon.

[3 Marks]

Section E

Question 43.

A saturated organic compound A belongs to the homologous series of alcohols.

On heating A with concentrated sulphuric acid at 443K, it forms an unsaturated compound B with molecular mass 28 u.

The compound B on addition of one mole of hydrogen in the presence of nickel changes to a saturated hydrocarbon C.

(i) Identify A, B and C.

(ii) Write the chemical equations showing the conversion of A into B.

(iii) What happens when compound C undergoes combustion?

(iv) State one industrial application of hydrogenation reaction.

(v) Name the products formed when compound A reacts with sodium.

[5 Marks]

Question 44.

(i) With the help of diagram, show the formation of micelles when soap is applied on oily dirt.

(ii) Take two test tubes X and Y with 10 mL of hard water each. In test tube X add a few drops of soap solution and in test tube Y add a few drops of detergent solution. Shake both for the same period.

(1) In which test tube will the formation of foam be more? Why?

(2) In which test tube is a curdy solid formed? Why?

[5 Marks]

Question 45.

(a) Name the parts of a bisexual flower that are not directly involved in reproduction.

(b) Differentiate between self pollination and cross pollination. List any two significance of pollination.

(c) What is the fate of ovules and ovary after fertilization in a flower?

[5 Marks]

Question 46.

(a) An electric iron consumes energy at a rate of 880 W when heating is at the maximum rate and 330 W when the heating is at the minimum. If the source voltage is 220 V, calculate the current and resistance in each case.
(b) What is heating effect of electric current ?
(c) Find an expression for the amount of heat produced when a current passes through a resistor for some time.

[5 Marks]