

SCIENCE 1 BOARD QB

Question 4 (5 marks)

1. Read the given passage carefully and answer the questions.

We know that the gravitational force of the earth is applied to all objects. This force was used even when you were holding a stone in your hand. But the force you were pushing in the opposite direction with your hand was balancing it so that the stone was stable. When you let go of the hand, only gravitational force is applied to the stone, so the stone falls under its influence. When an object is moving only under the influence of gravitational motion, that motion is called free fall, that is the stone falls. In free fall, the initial velocity is zero and it is increased due to gravitational acceleration over time. At the time of free fall on the earth, the friction of the air opposes the motion of the object. So in the true sense free fall cannot happen in the air. It can happen only in vacuum.

Complete the following statement by choosing the right option.

- i. The stone held in the hand is stable because, on it

- a. two unbalanced forces are exerted.
- b. only the gravitational force of the earth is exerted.
- c. gravitational force of the earth is not exerted.
- d. two balanced forces are exerted.

Ans. The stone held in the hand is stable because two balanced forces are exerted on it.

- ii. Why does free fall not happen on the earth?

Ans. The object experiences force of friction due to air. Thus, the free fall cannot happen on the earth.

- iii. Why does the velocity of the object increase during the free fall?

Ans. The velocity of the object increases due to acceleration due to gravity of the earth.

- iv. Which type of force exerts on the object during free fall?

Ans. During free fall only gravitational force is exerted on the object.

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v. Why does true free fall happen only in vacuum?

Ans. Object experiences free fall when the only force acting on the object is gravitational force. During free fall in air, the frictional force due to air opposes the motion of the object and a buoyant force also acts on the object. Thus, true free fall is possible only in vacuum.

2. Note the relationship between the entries in all the three columns in the table and rewrite the table.

Column-1 (Location)	Column-2 Height from the earth's surface (km)	Column-3 g (m/s^2)
Earth's surface(average)	8.8	0.225
Mount Everest	36.6	9.81
The highest height ever reached by manmade balloon	400	9.8
Orbit of spacecraft	35700	9.77
Orbit of communication satellite	0	8.7

Ans.

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3. Observe the given chart and answer the questions given below

Element	A	B	C	D
Electronic configuration	2, 1	2, 8	2, 8, 1	2, 8, 8

- Which elements are in the same row? (1 mark)
- Which elements have the same column? (1 mark)
- Which elements are in the 18th column? (1 mark)
- Which element is more reactive in A and C? (1 mark)
- Out of elements A and B, which is found in a compound? (1 mark)

- Ans.**
- Elements A and B are in the same row. Similarly, elements C and D are also in the same row.
 - Elements A and C have the same column. Similarly, elements B and D also have the same column.
 - Elements B and D are in the 18th column.
 - Element C is more reactive than element A.
 - Element A will form compounds as it can easily lose its valence electron.

4. XY Compound formed by X (Atomic number 11) and Y (Atomic number 17) then answer the questions given below.

- Determine the position of the element X and Y in the modern periodic table. (1 mark)
- Which type of elements X and Y are metals, nonmetals or metalloids? (1 mark)
- From which block the elements X and Y are? (1 mark)
- Determine the electronic configuration and valency of these elements. (2 marks)

- Ans.**
- Element X is placed in group 1 and period 3.
Element Y is placed in group 17 and period 3.
 - Element X is a metal while element Y is a nonmetal.

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- iii. Element X belongs to s-block and element Y belongs to p-block.
 iv. Electronic configuration of element X is (2, 8, 1). Its valency is 1.
 Electronic configuration of element Y is (2, 8, 7). Its valency is 1.

5. Observe the periodic table given below and write the answers of the questions.

2.7 Table : Modern Periodic Table

The periodic table is organized into four main blocks: s-block (groups 1 and 2), p-block (groups 13-18), d-block (transition metals, groups 3-10), and f-block (lanthanides and actinides, groups 3 and 4). Each element is represented by its atomic number, symbol, name, and atomic mass.

- Write the name and valencies of the elements in the 3rd row. (2 marks)
- Classify the elements in this row in metal, nonmetal and metalloids. (1 mark)
- Which block does nonmetals belong to? (1 mark)
- Write name of any two metalloid elements. (1 mark)

Ans. i. The elements in the third period are Sodium, Magnesium, Aluminium, Silicon, Phosphorus, Sulphur, Chlorine, and Argon.

Their valencies are 1, 2, 3, 4, 3, 2, 1 and 0 respectively.

- ii. Sodium (Na), Magnesium (Mg) and Aluminium (Al) are metals.

Silicon (Si) is a metalloid.

Phosphorus (P), Sulphur (S), Chlorine (Cl) and Argon (Ar) are nonmetals.

- iii. Nonmetals belong to p-block.
 iv. Two metalloid elements: Silicon and Germanium

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6. Make a chart which shows the name of the element, valency, atomic number, electronic configuration in the 2nd row of the modern periodic table and arrange these elements in ascending order of atomic mass.

Ans.

Elements of 2 nd row of modern periodic table								
Name	Lithium	Beryllium	Boron	Carbon	Nitrogen	Oxygen	Fluorine	Neon
Valency	1	2	3	4	3	2	1	0
Atomic number	3	4	5	6	7	8	9	10
Elec. configuration	2, 1	2, 2	2, 3	2, 4	2, 5	2, 6	2, 7	2, 8

Lithium < Beryllium < Boron < Carbon < Nitrogen < Oxygen < Fluorine < Neon

7. What physical and chemical properties of elements did Mendeleev consider in compiling the periodic table? What challenges did Mendeleev face in following periodic law?

Ans. i. The physical and chemical properties of elements that Mendeleev considered while compiling periodic table were:

- The molecular formulae of hydrides and oxides of the elements
- Melting points, boiling points and densities of the elements and their hydrides and oxides

ii. Demerits of Mendeleev's periodic table

- The whole number atomic mass of the elements cobalt (Co) and nickel (Ni) is the same. Therefore there was an ambiguity regarding their sequence in Mendeleev's periodic table.
- Isotopes were discovered long time after Mendeleev put forth the periodic table. As Isotopes have the same chemical properties but different atomic masses, a challenge was posed in placing them in Mendeleev's periodic table.

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3. When elements are arranged in an increasing order of atomic masses, the rise in atomic mass does not appear to be uniform. It was not possible, therefore, to predict how many elements could be discovered between two heavy elements.
4. Position of hydrogen: Hydrogen shows similarity with halogens (group VII). For example, the molecular formula of hydrogen is H_2 while the molecular formulae of fluorine and chlorine are F_2 and Cl_2 , respectively. In the same way, there is a similarity in the chemical properties of hydrogen and alkali metals (group I). There is similarity in the molecular formulae of the compounds of hydrogen alkali metals (Na, K, etc.) formed with chlorine and oxygen. On considering the above properties it cannot be decided whether the correct position of hydrogen is in the group of alkali metals (group I) or in the group of halogens (group VII).

Compounds of H	Compounds of Na
HCl	NaCl
H_2O	Na_2O
H_2S	Na_2S

Similarity in hydrogen and halogens

Element (Molecular formula)	Compounds with metals	Compounds with nonmetals
H_2	NaH	CH_4
Cl_2	NaCl	CCl_4

8. Explain the structure of the modern periodic table in short.

- Ans.** i. The modern periodic table consists of seven horizontal rows called the periods and eighteen vertical columns called the groups.
- ii. The arrangement of the periods and groups results in the formation of boxes, where each box corresponds to the position of an element.
- iii. Atomic numbers are serially indicated in the upper part of these boxes.

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- iv. In addition to these seven rows, lanthanide and actinide series are shown separately at the bottom of the periodic table. The first row is lanthanide series and the second row is actinide series.
- v. There are 118 boxes in the periodic table including the two series.
- vi. The entire periodic table is divided into four blocks: s-block, p-block, d-block and f-block.
- vii. **s-block:** contains group 1 and 2 elements
p-block: contains group 13 to 18 elements
d-block: contains group 3 to 12 elements (transition elements)
f-block: contains lanthanide and actinide series
- viii. A zig-zag line is drawn in the p-block of the periodic table. Metals lie on the left side while nonmetals lie on the right side of this line. Metalloids lie along the border of this line.
9. The electronic configuration of an element is 2, 8, 2 then write the answers of the questions given below.
- What is the atomic number of this element?
 - Which column does this element belong to?
 - Which row does this element belong to?
 - The chemical properties of this element will be similar to which of the following elements?
- (Atomic numbers are given in the bracket) N (7), Be (4), Ar (18), Cl (17)
- Ans. i. The atomic number of the element is 12.
- The element belongs to group 2.
 - The element belongs to period 3.
 - The element would resemble beryllium (Be).
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10. Balance the given chemical reaction as per the instructions below. $\text{NaOH} + \text{H}_2\text{SO}_4 \rightarrow \text{Na}_2\text{SO}_4 + \text{H}_2\text{O}$

- Write names of reactants and products of chemical reaction.
- Make a list of the elements in the chemical equation.
- write the number of atoms of reactants and products.
- Balance the equation with proper coefficient and rewrite the equation.
- Oxidation means losing electrons then what is reduction?

Ans. i. Names of reactants: Sodium hydroxide and Sulphuric acid

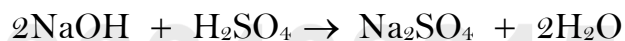
Names of products: Sodium sulphate and water

ii. Elements in the chemical reaction are: Na, O, H and S.

iii.

	Reactants (Left side)	Products (Right side)
Element	Number of atoms	Number of atoms
Na	1	2
O	5	5
H	3	2
S	1	1

iv. Coefficient '2' is added to the reactant 'NaOH' and the product 'H₂O' to balance the equation. The final balanced equation is:



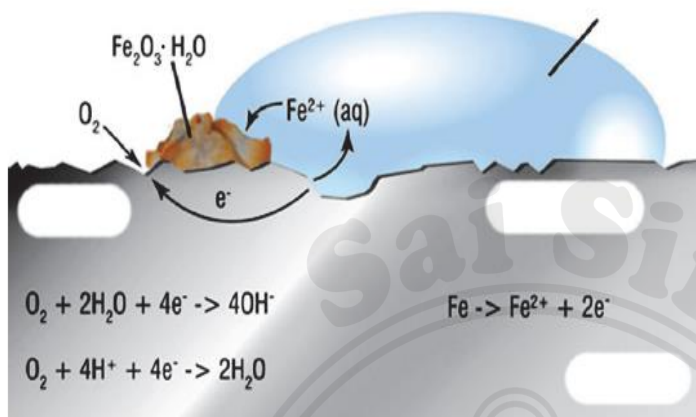
v. Reduction is gain of electrons.

[**Note:** Framing of question (iii) is modified to remove ambiguity from question.]

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11. Observe the following figure and write the answer to the question.



- Which process is shown in the figure?
- Explain the chemical reaction shown in the figure.
- Write the reactions on anode and cathode.

Ans. i. The process shown in the figure is rusting (corrosion) of iron.

- The process involves electrochemical reaction. Different regions on the surface of iron become anode and cathode.

In the anode region, Fe is oxidized to Fe^{2+} . The electron released in the anode region flow through the metal surface to the cathode region where they reduce oxygen.

In the cathode region, O_2 is reduced to form water. When Fe^{2+} ions migrate from the anode region, they react with water (or OH^- ions) and further get oxidized to Fe^{3+} ions.

Fe^{3+} ions form an insoluble hydrated oxide ($\text{Fe}_2\text{O}_3 \cdot \text{H}_2\text{O}$), which is deposited as reddish-brown layer on the surface. It is called rust.



Rust

- Anode region: $\text{Fe}(\text{s}) \rightarrow \text{Fe}^{2+}(\text{aq}) + 2e^-$



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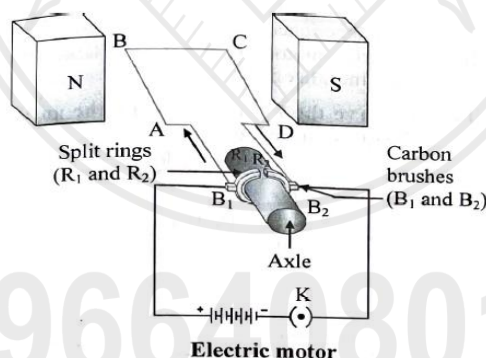
12. Draw a diagram of an electric motor and explain the structure and function of it.

Ans. Electric motor:

It is a device which converts electrical energy into mechanical energy.

Construction: Electric motor consists of following parts:

1. **Rectangular coil:** Rectangular loop of copper wire having resistive coating.
2. **Strong magnet:** Coil is placed between the north pole and south pole of a magnet (such as a horseshoe magnet) in such a way that its branches AB and CD are perpendicular to the direction of magnetic field.
3. **Split ring:** The two ends of the loop are connected to the two halves (X and Y) of the split ring.
4. **Axle:** The two halves of the ring have resistive coating on their inner surfaces and are tightly fitted on the axle.
5. **Carbon brushes:** The two halves of the split ring, X and Y have their outer conducting surfaces in contact with the two stationary carbon brushes. (E and F), respectively.



Working:

- (i) When the circuit is completed, the current flows in the branch AB of the loop from A to B through the carbon brushes E and F.
- (ii) Since the direction of the magnetic field is from north pole to south pole, according to the Fleming's left hand rule, a force is exerted on the branch AB in downward direction and CD in upward direction.
- (iii) Thus, the loop and the axle start rotating in an anticlockwise direction.

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- (iv) After half rotation, the current in a loop starts
- (v) Therefore, a force is exerted on the branch CD in downward direction and on the branch AB in the upward direction, and the loop continues to rotate in the anticlockwise direction.

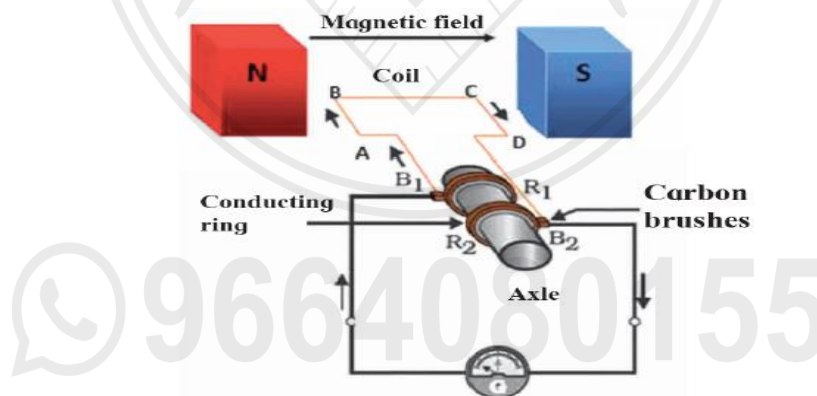
13. Explain the structure and function by drawing a diagram of an electric generator.

Ans. Electric Generator (AC)

A generator which converts mechanical energy into electrical energy in the form of alternating current is called A.C. generator.

Construction:

1. **Rectangular Coil:** copper wire coil ABCD
2. **Strong magnets:** Coil is kept between the two pole pieces of a magnet.
3. **Rings:** The two ends of the coil are connected to the conducting rings R_1 and R_2 .
4. **Axle:** Both the rings are fixed to the axle, but there is a resistive coating in between the ring and the axle.
5. **Brushes:** The stationary carbon brushes B_1 and B_2 are connected to a galvanometer.



Electric generator (AC)

Working:

- i. When the axle is rotated with the help of a machine from outside, the coil ABCD starts rotating.

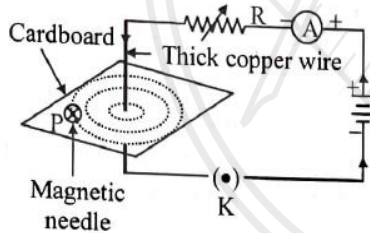
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- ii. On rotating the axle, the branch AB move upwards and branch CD move downwards hence coil ABCD rotates clockwise.
- iii. According to Fleming's right-hand rule, electric current flows in the direction $A \rightarrow B \rightarrow C \rightarrow D$. Therefore, current flows from B_2 to B_1 in the external circuit through galvanometer.
- iv. After half rotation, the branch AB and CD exchange their position and the induced current flows as $D \rightarrow C \rightarrow B \rightarrow A$.
- v. Since, branch BA is in contact with brush B_1 and branch DC is in contact with B_2 , current flow from B_1 to B_2 in the external circuit i.e., in the direction opposite to the previous half rotation.
- vi. This repeats after every half rotation and in this way, alternate current is produced using AC generator.

14. Explain the magnetic field created by current around a conductor from the figure.

Ans. i.



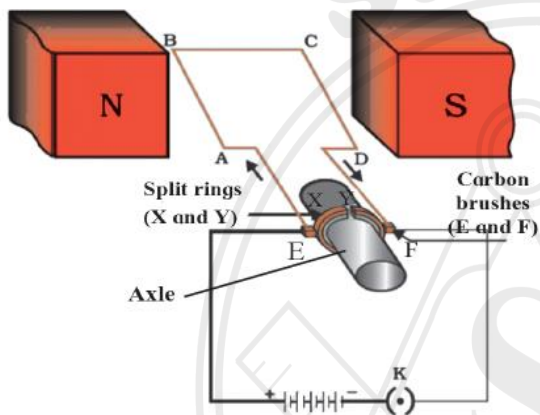
- ii. A cardboard is placed around a thick copper wire. A magnetic needle is used to check the magnetic field around the wire.
- iii. When a large current flows through the thick wire, magnetic needle shows deflection. The magnetic needle kept at different points on the cardboard around the wire stands in different directions.
- iv. The magnetic field produced around a current carrying conductor is in the form of concentric circles.
- v. The deflection in the needle changes according to the current in the conductor. For a given current, if we move the compass needle away from the wire, its deflection decreases.

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- vi. The direction of the magnetic field formed around the conductor depends on the direction of the current and is given by the right hand thumb rule.
- vii. If the thumb of the right hand indicates the direction of the current then, the curled fingers indicate the direction of the magnetic field formed.

15. Observe the figure and write the answers to the questions asked.



- i. The structure shown in the figure is of which device?
- ii. Explain the principle on which this device works.
- iii. Write any three uses of this device.

Ans. i. The figure shows the construction of electric motor.

- ii. **Principle of electric motor:**

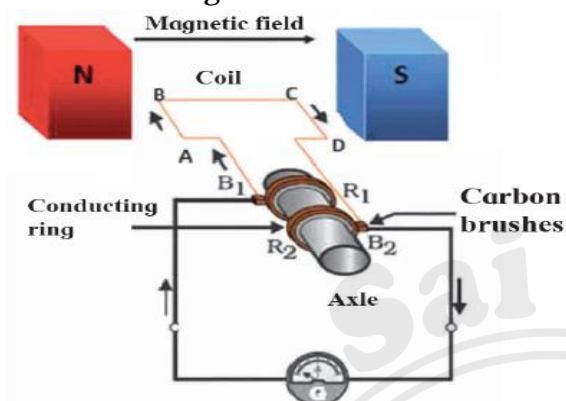
Electric motor works on the principle that a current carrying conductor placed in a magnetic field experiences a force.

- iii. Electric motor is used in fans, washing machines, fax machines etc.

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16. Observe the figure and write the answers to the questions asked.



- The structure shown in the figure is of which device?
- Explain the principle on which this device works.
- Write any three uses of this device.

Ans. i. The figure shows construction of electric generator.

ii. **Principle of electric generator:**

Electric generator works on the principle of electromagnetic induction. When the coil of electric generator rotates in a magnetic field, magnetic field induces a current in this coil. This induced current then flows into circuit connected to the coil.

iii. Generator is used in power plants for generation of electricity.

17. Read the passage and answer the questions based on it.

If heat is exchanged between a hot and cold object, the temperature of the cold object goes on increasing due to gain of energy and the temperature of the hot object goes on decreasing due to loss of energy. The change in temperature continues till the temperatures of both the objects attain the same value. In this process, the cold object gains heat energy and the hot object loses heat energy. If the system of both the objects is isolated from the environment by keeping it inside a heat resistant box then no energy can flow from inside the box or come into the box. In this situation we get the following principle.

Heat energy lost by the hot object = Heat energy gained by the cold object. This is called the 'Principle of heat exchange'.

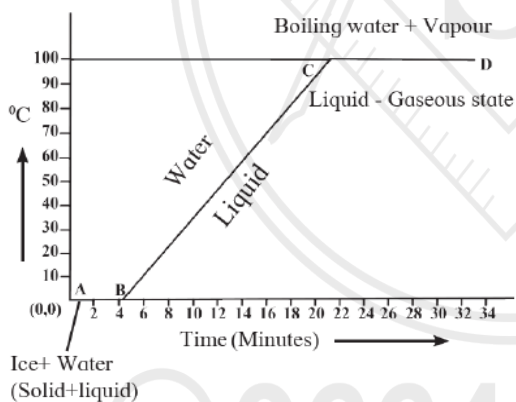
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- Where does heat transfer take place?
- In such a situation which principle of heat do you perceive?
- How can this principle be explained in short?
- measuring the property of which substance this principle is used ?

- Ans.**
- Heat is transferred from hot object to cold object.
 - During the transfer of heat from hot object to cold object we perceive the principle of heat exchange.
 - As inside the heat resistant box, the heat lost by hot object exactly equals heat gained by cold object. Principle of heat exchange is stated as:
In an isolated system,
Heat energy lost by hot object = Heat energy gained by cold object.
 - Specific heat of the substance is measured using the principle of heat exchange.

18. Explain the following temperature-time graph.



- Ans.**
- The graph shown is a temperature-time graph of Ice transforming into water and steam.
 - AB shows that**, at constant temperature of 0°C ice changes to water.
 - The temperature at which ice changes to water, is called melting point of ice i.e. 0°C.
 - Now, water at 0°C starts heating and its temperature gradually increases to 100°C.
 - BC shows** increase in temperature from 0°C to 100°C without a change in state.
 - CD shows that**, at constant temperature of 100°C, water changes to vapour.

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- (vii) The temperature at which water changes to vapour is called boiling point of water
i.e. 100°C

19. Explain with a ray diagram the position, size, and the nature of the various images formed by convex lenses.

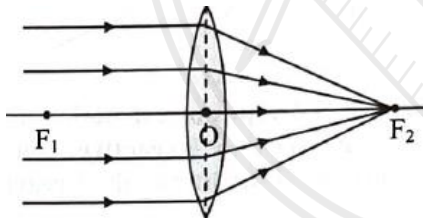
- An object is at infinity.
- An object beyond $2F_1$.
- An object at $2F_1$.
- An object is in between F_1 and $2F_1$.
- An object is at focus F_1 .
- An object is in between F_1 and O.

Ans. i. Object at infinity:

Position of image: At focus F_2

Size of the image: Highly diminished or point sized.

Nature of the image: Real and inverted.

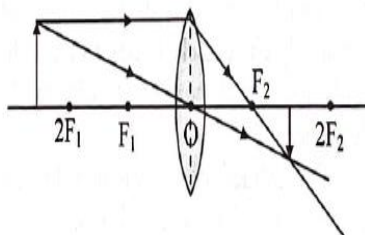


ii. Object beyond $2F_1$:

Position of image: Between F_2 and $2F_2$

Size of the image: Diminished

Nature of the image: Real and inverted



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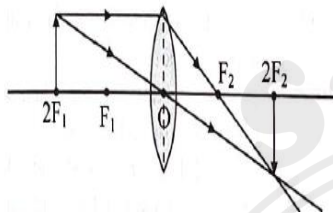
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iii. Object at $2F_1$:

Position of image: At $2F_2$

Size of the image: Same size

Nature of the image: Real and inverted

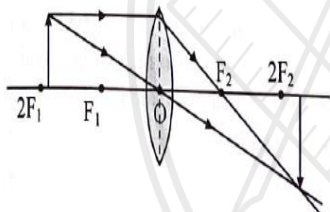


iv. Object between F_1 and $2F_1$:

Position of image: Beyond $2F_2$

Size of the image: Enlarged

Nature of the image: Real and inverted

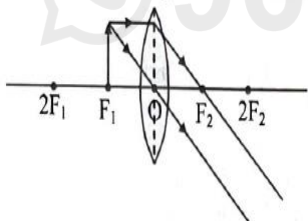


v. Object at focus F_1 :

Position of image: At infinity

Size of the image: Highly enlarged

Nature of the image: Real and inverted



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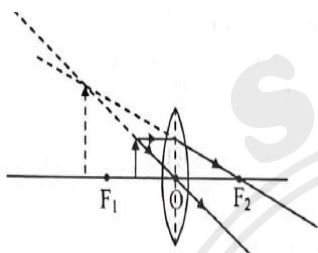
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vi. Object between F_1 and O:

Position of image: Same side of the lens as the object

Size of the image: Enlarged

Nature of the image: Virtual and erect



20. Explain in brief types of extraction of highly reactive, moderately reactive and less reactive metals according to their reactivity.

Ans. i. **Extraction of highly reactive metals:**

- Highly reactive metals such as sodium, magnesium and calcium are obtained by electrolytic reduction.
- The metals are deposited at the cathode (negatively charged electrode), whereas chlorine gas is liberated at the anode (positively charged electrode).

E.g., For extraction of sodium metal, cathode and anode reactions are as follows:



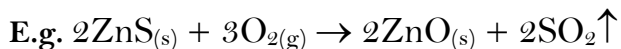
ii. **Extraction of moderately reactive metals:**

- Moderately reactive metals such as iron, zinc, lead, copper usually occur in the form of their sulphide salts or carbonate.
- It is easier to obtain metals from their oxides rather than sulphides or carbonates.

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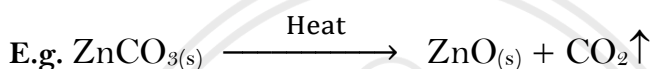
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- c. Therefore, the sulphide ores are strongly heated in excess of air to transform them into oxides. This process is called roasting.



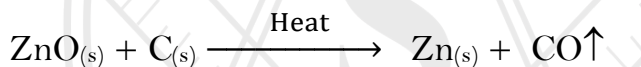
Zinc	Zinc	Sulphur
sulphide	oxide	dioxide

- d. Carbonate ores are strongly heated in a limited supply of air to transform them into oxides. This process is called calcination.



Zinc	Zinc	Carbon
carbonate	oxide	dioxide

- e. The oxide so obtained is reduced to metal by using suitable reductant such as carbon.



Zinc	Carbon	Zinc	Carbon
oxide			monoxide

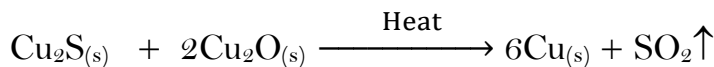
- f. The metal thus obtained can be further refined by electrolysis.

iii. Extraction of less reactive metals:

- a. Less reactive metals such gold, silver, platinum are found in free state in nature.
- b. However, the reserves of copper in free state are very few. It is found mainly in the form of Cu_2S . Copper is obtained from Cu_2S ore just by heating in air.



Copper(I)	Oxygen	Copper(I)	Sulphur
sulphide		oxide	dioxide



Copper(I)	Copper(I)	Copper	Sulphur
sulphide	oxide		dioxide

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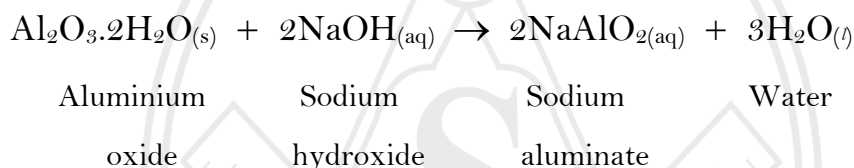
c. The copper metal thus obtained can be further refined electrolytically.

21. Explain Bayer's process of concentration of bauxite with chemical equations.

Ans. i. Bauxite is the main ore of aluminium with silica (SiO_2), ferric oxide (Fe_2O_3) and titanium oxide (TiO_2) as impurities in it.

ii. In this process, the bauxite ore is first crushed and then it is leached by heating with hot concentrated caustic soda (NaOH) solution under high pressure for 2 to 8 hrs at 140 to 150°C in a tank called digester.

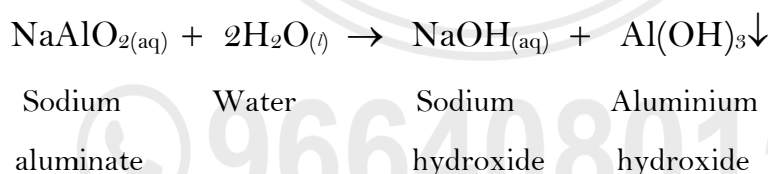
iii. Aluminium oxide, being amphoteric in nature, dissolves in aqueous NaOH solution, forming water soluble sodium aluminate.



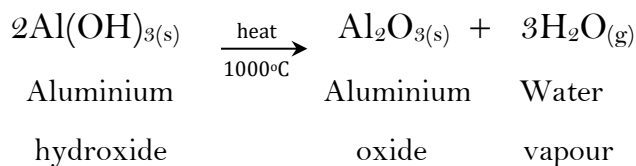
iv. The iron oxide present in the gangue does not dissolve in aqueous NaOH solution and is separated by filtration.

v. However, silica from the gangue dissolves in aqueous NaOH solution forming water soluble sodium silicate.

vi. The solution of sodium aluminate is diluted with water and then cooled to 50°C. This gives aluminium hydroxide as a precipitate.



vii. The aluminium hydroxide is then filtered, washed, dried and calcined by heating at 1000 °C to get pure aluminium oxide, called alumina.

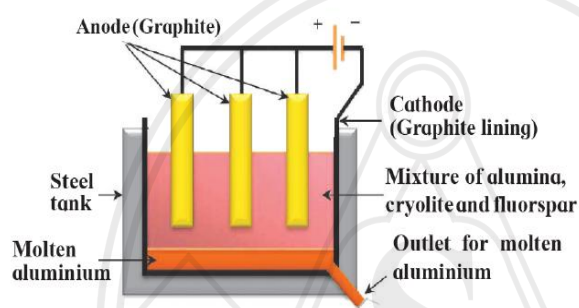


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Question 4 (5 marks)

22. Explain in brief electrolytic reduction of alumina with a neat, labelled diagram.

- Ans.** i. The pure alumina obtained from bauxite ore by Bayer's process or Hall's process is electrolysed to obtain metallic aluminium.
- ii. Alumina has a very high melting point ($>2000\text{ }^{\circ}\text{C}$).
- iii. Electrolysis of alumina is carried out in an electrolytic cell at a much lower temperature by dissolving it in molten cryolite (Na_3AlF_6) and fluorspar (CaF_2). Addition of cryolite and fluorspar reduces the melting point to about $1000\text{ }^{\circ}\text{C}$.



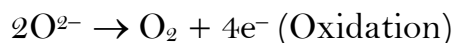
Electrolytic reduction of alumina

- iv. The electrolytic cell is a large steel tank having a lining of carbon (graphite) on the inner side. The carbon lining acts as cathode. A set of carbon (graphite) rods dipped in the molten electrolyte acts as anode.
- v. On passing electric current, electrolysis of alumina takes place.
- vi. Aluminium is formed at the cathode and oxygen gas is liberated at the anode.
- vii. The electrode reactions are as follows:

Cathode:



Anode:

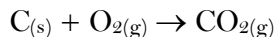


- viii. The molten aluminium is heavier than the electrolyte used and hence, it sinks to the bottom of the tank from where it is removed periodically.

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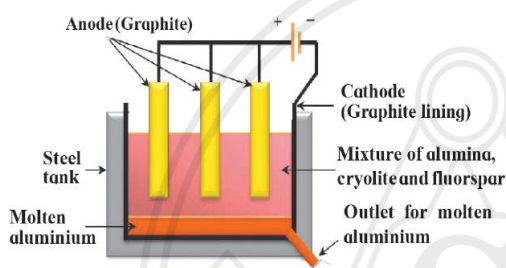
Question 4 (5 marks)

- ix. The oxygen gas liberated at the anode reacts with the carbon anode and forms carbon dioxide gas.



- x. As the anode gets oxidized during the electrolysis of alumina, it has to be replaced from time to time.

23. Observe the figure and answer the following.



- Write the name of the method.
- What is used as anode and cathode in this method?
- Write molecular formula and use of cryolite.
- Write anode reaction.
- Write cathode reaction.

Ans. i. The method shown is electrolytic reduction of alumina.

- ii. A set of graphite rods dipped in the molten electrolyte acts as anode and the graphite lining acts as cathode.

- iii. Molecular formula of cryolite: Na_3AlF_6

Use of cryolite: Addition of cryolite reduces the melting point of alumina to about 1000°C .

- iv. Anode reaction: $2\text{O}^{2-} \rightarrow \text{O}_2 + 4\text{e}^-$

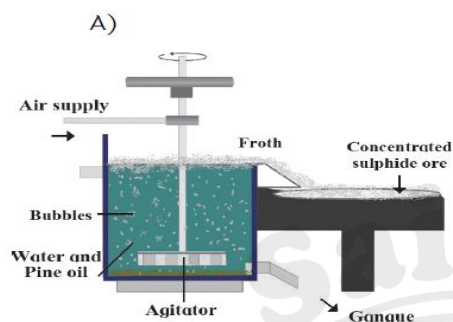
- v. Cathode reaction: $\text{Al}^{3+} + 3\text{e}^- \rightarrow \text{Al}_{(l)}$

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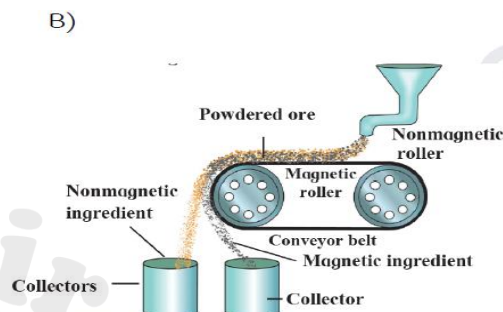
Question 4 (5 marks)

24. Observe the figure and name and explain in brief the following methods

A.



B.



Ans. i. The method shown in the figure is froth floatation method.

- The froth floatation process is based on two opposite properties of the particles, hydrophilic and hydrophobic.
- The metal sulphide particles are hydrophobic. Due to this property, they get wetted mainly with oil. On the other hand, gangue particles are hydrophilic and get wetted by water.
- In this method, the finely divided metal ore is added in a big tank containing large amount of water. To this, certain vegetable oil (pine oil, eucalyptus oil, etc.) is added for the formation of froth. A rotating agitator at the centre of the floatation tank agitates the mixture and draws air into it to form bubbles. As a result, foam is formed which carries metal sulphide particles. The foam rises to the surface of water and floats. Therefore, this method is called froth floatation process.
- This method is used to separate metal sulphide ores such as zinc blende (ZnS) and copper pyrite (CuFeS_2).

ii. The method shown in the figure is magnetic separation method.

- The magnetic separation process is based on the differences in magnetic properties of the ore components.
- This method requires an electromagnetic machine which consists of a nonmagnetic conveyor belt moving over two rollers, one of which is magnetic in nature while other is nonmagnetic.

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Question 4 (5 marks)

- c. Powdered ore is dropped over the moving belt near nonmagnetic roller. Two collector vessels are placed below magnetic roller.
- d. The nonmagnetic particles are carried further along with belt and fall in the collector vessel placed away from magnetic roller. At the same time, the magnetic portion of the ore is attracted by the magnetic roller and falls in the collector vessel near the magnetic roller.

25. Answer the questions in the following passage.

The minerals from which the metal can be separated economically are called ores. Ores contain many types of impurities such as soil, sand and rocky substances along with the metal compounds. These impurities are called gangue. Metals can be extracted from their ores by means of various methods of separation. The process of extraction of metal in pure state from the ores is also a part of metallurgy.

Ores are taken out from the mines and the gangue is usually separated from the ore at the site itself by various methods. Then the ores are carried out to the place where metals are produced. Here metals are extracted in pure form. Then metals are further purified by different methods of purification. this entire process is called metallurgy.

Most metals being reactive do not occur in nature in free state but are found in combined state as their salts such as oxides, carbonates, sulphides and nitrates. however, the most unreactive metals that are not affected by air, water and other natural factors like silver, gold, platinum, generally occur in free state. The compounds of metals that occur in nature along with the impurities are called minerals.

- i. **What are Ores?**
- ii. **Which processes are involved in the branch of metallurgy? What is metallurgy?**
- iii. **Which metals are found in free state?**
- iv. **In what form are metals found in combined state?**
- v. **What is gangue?**

SCIENCE 1 BOARD QB

Question 4 (5 marks)

- Ans.** i. The minerals from which the metal can be separated economically are called ores.
- ii. The extraction of metals from their ores by various methods of separation and further purification to obtain pure metals are involved in the branch of metallurgy.
- The extraction of metals from their ores and then refining them for use is known as metallurgy.
- iii. Metals such as silver, gold and platinum are found in free state.
- iv. Metals are found in combined state as their salts such as oxides, carbonates, sulphides and nitrates.
- v. The unwanted impurities of soil, sand, rocky substances, etc., present in the ore are called gangue.

26. Explain the difference between a bayer's process and a hall's process by explaining the bayer's process?

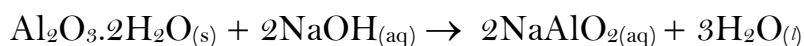
Ans. i. Difference between Bayer's process and Hall's process:

In Bayer's process, aluminium ore is heated with concentrated caustic soda while in Hall's process, it is heated with aqueous sodium carbonate to obtain water soluble sodium aluminate.

In Bayer's process, solution of sodium aluminate is diluted with water to obtain aluminium hydroxide while in Hall's process, sodium aluminate is converted to aluminium hydroxide by reaction with CO_2 .

ii. Bayer's process:

- a. In this process, the bauxite ore is first crushed and then it is leached by heating with hot concentrated caustic soda (NaOH) solution under high pressure for 2 to 8 hrs at 140 to 150°C in a tank called digester.
- b. Aluminium oxide, being amphoteric in nature, dissolves in aqueous NaOH solution, forming water soluble sodium aluminate.

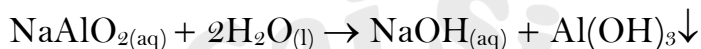


Aluminium	Sodium	Sodium	Water
oxide	hydroxide	aluminate	

SCIENCE 1 BOARD QB

Question 4 (5 marks)

- c. The iron oxide present in the gangue does not dissolve in aqueous NaOH solution and is separated by filtration. However, silica from the gangue dissolves in aqueous NaOH solution forming water soluble sodium silicate.
- d. The solution of sodium aluminate is diluted with water and then cooled to 50°C. This gives aluminium hydroxide as a precipitate.



Sodium Water Sodium Aluminium
aluminate hydroxide hydroxide

- e. The aluminium hydroxide is then filtered, washed, dried and calcined by heating at 1000°C to get pure aluminium oxide, called alumina.

27. What is corrosion? Give solutions by giving examples of corrosion?

Ans. i. The process of slow degradation of the metals due to the attack of atmospheric gases, moisture, acids, etc. on the surface of metals is called corrosion.

1. Galvanizing

In this method a thin layer of zinc is applied to prevent corrosion of iron or steel. For example, shining iron nails, pins, etc. In this method corrosion of zinc occurs first because zinc is more electropositive than iron. After a few rainy seasons the zinc layer goes away and the Inner Iron gets exposed. Then Iron starts rusting.

2. Tinning

In this method a layer of molten tin is deposited on metals. We call this as '*kalhaee*'. A greenish layer forms on the surface of a copper or brass vessel. This greenish layer is poisonous. If buttermilk or curry is placed in such a vessel it gets spoiled. Tinning is done to prevent all such damages.

3. Anodization

In this method metals like copper, aluminium are coated with a thin and strong layer of their oxides by means of electrolysis. For this the copper or aluminium article is used as anode. As this oxide layer is strong and uniform all over the surface, it is useful for prevention of the corrosion of the metal.

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Question 4 (5 marks)

For example, when aluminium is anodised, a thin layer of aluminum oxide is formed. It obstructs the contact of the aluminium with oxygen and water. This prevents further oxidation. This protection can be further increased by making the oxide layer thicker during the anodization.

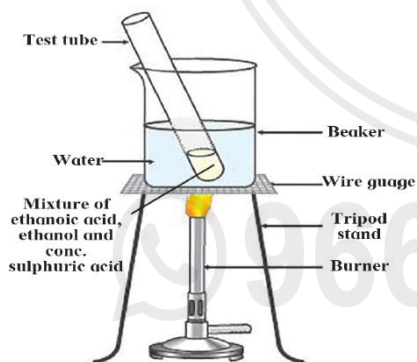
4. Electroplating

In this method a less reactive metal is coated on a more reactive metal by electrolysis. Silver plated spoons, gold plated ornaments are the examples of electroplating.

5. Alloying

Majority of the metallic substances used presently are in the form of alloys. The main intention behind this is to decrease the intensity of corrosion of metals. The homogenous mixture formed by mixing a metal with other metals or nonmetals in certain proportion is called an alloy. For example, bronze is an alloy formed from 90% copper and 10% tin. Bronze statues do not get affected by sun and rain. Stainless steel does not get stains with air or water and also does not rust. It is an alloy made from 74% iron, 18% chromium and 8% carbon. In recent times various types of alloys are used for minting coins.

28. Observe the figure and write the answers to the following question.



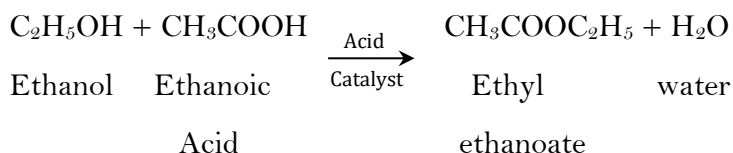
- Write the name of the reaction shown in the following figure.
- Write the above chemical reaction in the form of a balanced equation.
- Write the name of the product produced in the above reaction, write a use.
- Write the name of the catalyst used in the above reaction.

Ans. i. The reaction shown in the figure is esterification.

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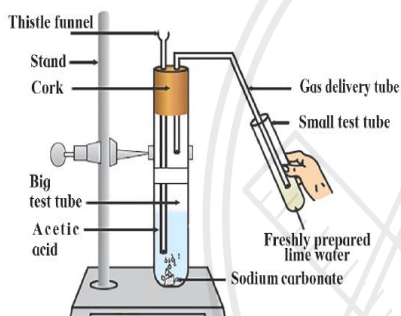
Question 4 (5 marks)

- ii. Balanced equation of the reaction between ethanol and ethanoic acid is as follows:



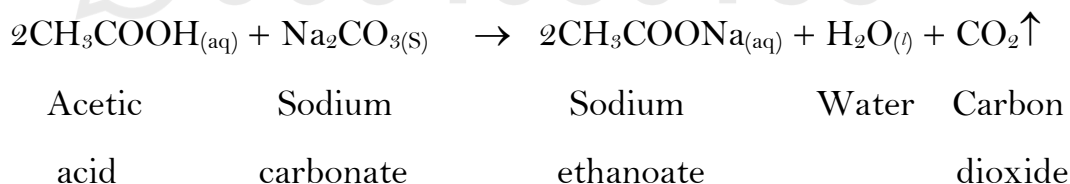
- iii. The product formed is ethyl ethanoate.
Use: It is used for making fragrances and flavouring agents.
- iv. Catalyst used in the reaction is concentrated sulphuric acid.

29. Write the answers to the questions by observing the following figure.



- Write the chemical reaction shown in the figure above in the form of a balanced equation.
- Write the name of the gas coming out of the large test tube in the above chemical reaction.
- Why do small bubbles of lime appear in the small test tube?
- What is the change in colour of lime net?

- Ans. i. Balanced equation of the reaction between acetic acid and sodium carbonate is as follows:



- ii. The gas formed in the large test tube is carbon dioxide (CO_2) gas.

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Question 4 (5 marks)

- iii. The carbon dioxide gas produced in big test tube passes through bent gas delivery tube to the small test tube containing lime water. Hence, bubbles are seen in the small test tube.
- iv. Lime water turns milky

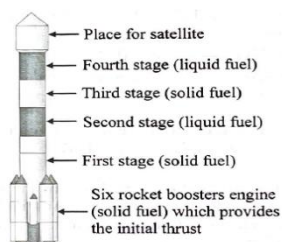
30. Write the names of India's satellite series and launchers?

Ans.

India's Satellite series	Launcher
Indian National Satellite (INSAT)	Geosynchronous Satellite Launch Vehicle (GSLV)
Geosynchronous satellite (GSAT)	Geosynchronous Satellite Launch Vehicle (GSLV)
Indian Regional Navigation Satellite System (IRNSS)	Polar Satellite Launch Vehicle (PSLV)
Indian Remote Sensing Satellite (IRS)	Polar Satellite Launch Vehicle (PSLV)

31. What is a satellite launcher? Explain the external layout of a satellite launcher made by ISRO (I.S.R.O.) with diagrams.

- Ans. i. The vehicles which help to place satellites in their specific orbits are called satellite launch vehicles.
- ii. Polar satellite launch vehicle (PSLV) designed by ISRO is shown in a figure below. The PSLV is a four stage satellite launch vehicle. Each of these stages contains fuel which is burned and each stage is detached from the vehicle after reaching specific height. There is a place at the top of the fourth stage, to keep the polar satellite to be launched.



SCIENCE 1 BOARD QB

Question 4 (5 marks)

- iii. Amongst the four stages, first stage along with six rocket booster engines provides the initial thrust to the launcher. This stage contains solid fuel.
- iv. The second and fourth stages have liquid fuel in them, whereas the third stage works on the solid fuel.
- v. Second and third stages increase the velocity of the PSLV and help it attain the desirable height. The fourth i.e., the last stage sets the satellite into its desired orbit.

32. Read the following paragraphs and write the answers.

Mars is the second closest celestial object to Earth after the Moon. It was sent to Mars by many nations. But since the campaign was difficult, almost half of the campaigns were not successful. But we have done something that we should be proud of. Launched by ISRO in November 2013 at a very low cost, the Mars rover was launched into Mars orbit in September 2014 and gained important information about the surface and atmosphere of Mars.

- i. After the moon, which is the closest celestial object to the earth?
- ii. When did ISRO launch Mars spacecraft?
- iii. What important information did ISRO's Mars rover get?
- iv. Explain that critical velocity does not depend on the mass of the satellite?

- Ans.**
- i. Next to the moon, mars is the nearest celestial object to the earth.
 - ii. The spacecraft '*Mangalyaan*' made by ISRO using minimum expenses was launched in November 2013.
 - iii. ISRO's Mangalyaan obtained very useful information about the surface of the Mars and the atmosphere around it.
 - iv. Consider the satellite of mass m revolving at height h around the planet of mass M and radius R with speed v as shown in the figure given above. As the satellite is moving in circular orbit, centripetal force acting on it is provided by the gravitational force of the planet,
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Question 4 (5 marks)

$$\text{i.e., } \frac{mv^2}{r} = \frac{GMm}{r^2}$$

$$\text{But } r = R + h$$

$$\therefore v^2 = \frac{GM}{(R+h)}$$

$$\therefore v = \sqrt{\frac{GM}{R+h}}$$

Hence, critical velocity does not depend on the mass of the satellite.

33. Explain the need and importance of space missions.

- Ans.**
- Due to space missions, the world has come closer. It has become very easy to contact a person in any part of the world within, seconds.
 - Due to internet, every information is available at our fingertips. We can gather information about worldwide events sitting at home.
 - Use of satellites can give us advance alerts about various natural calamities, so that, we can take proper precautions.
 - During war, the aerial surveillance can be used to get information about the enemy actions.
 - It is also possible to explore the fossil reserves and minerals in the earth.

In this way, due to its innumerable applications, the space mission or space technology has become an inevitable part of development nation.

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