

**Solution**

**SCIENCE-1**

**Class 10 - Science & Technology - I**

1. (i) Write the correct alternative.

i. **(a)** critical angle

**Explanation:**

critical angle

ii. **(b)** zinc

**Explanation:**

zinc

iii. **(a)** atomic masses

**Explanation:**

atomic masses

iv. **(a)** Diamond

**Explanation:**

Diamond

v. **(a)** Pale green in colour

**Explanation:**

Pale green in colour

(ii) Answer the following questions.

i. **(b)** False

**Explanation:**

A concave lens is a diverging lens.

ii. **(a)** True

**Explanation:**

True

iii. **(a)** True

**Explanation:**

True

iv. Convex lens

Torch uses concave lens while camera uses convex lens.

v.  $\frac{Gm_1 m_2}{9 d^2}$

2. (i) Give scientific reasons. (Any 2)

i. i. When edible oil is left aside for long time, it undergoes air oxidation.

ii. Due to this, the taste and smell of oil changes and it becomes rancid. If food is cooked in this oil, its taste also changes.

iii. Thus, the oil will become unfit for consumption.

iv. The process of oxidation reaction of oil can be slowed down by storing it in airtight container. Hence, it is recommended to use airtight container for storing oil for long time.

ii. i. The electronic configuration of the outermost shell is same for all the elements belonging to the same group.

ii. So, the number of valence electrons for all the elements in a group is the same.

iii. The valency of an element is determined by the valence electrons.

Hence, elements belonging to the same group have the same valency.

iii. i. Electric bulb works on the principle of heating effect electric of current.

ii. The solenoid type coil of bulb has high resistivity. Hence, it can be heated by passing current through it.

iii. The melting point of tungsten is very high. So, when the tungsten filament is heated at very high temperature, it does not melt.

- iv. The intensity of light emitted by filament depends on the temperature. Hence, when current is passed through the bulb, the filament gets heated to high temperature (up to  $3400^{\circ}\text{C}$ ) and starts glowing.

Hence, tungsten metal is used to make a solenoid type coil in an electric bulb.

(ii) Answer the following questions. (Any 3)

i. **Uses of ethanol:**

- i. It is used as an important commercial solvent in industries. E.g. paints
- ii. Ethanol being good solvent, it is used in medicines such as tincture of iodine (solution of iodine and ethanol), cough mixture and also in many tonics.
- ii. i. **Newton's universal law of gravitation:** Gravitational force between two bodies in the universe is directly proportional to the product of their masses and inversely proportional to the square of the distance between them.
- ii. Gravitational force between the two bodies is given by,

$$F = \frac{Gm_1 m_2}{r^2}$$

When distance between the objects is tripled, the force  $F'$  will be,

$$F' = \frac{Gm_1 m_2}{(3r)^2} = \frac{Gm_1 m_2}{9r^2} = \frac{1}{9} F$$

$\therefore$  Force becomes  $\frac{1}{9}$  times the initial force.

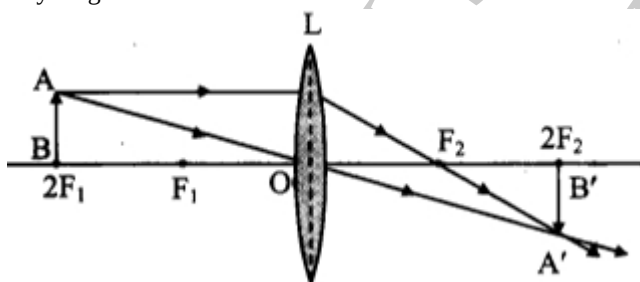
- iii. Consider, the mass  $m_2$  is doubled. Then, the force  $F'$  will be,

$$F' = \frac{Gm_1 (2m_2)}{(r)^2} = 2 \frac{Gm_1 m_2}{r^2} = 2 F$$

$\therefore$  Force becomes double the initial force.

- iii. i. **Communication satellite:** These satellites use specific waves to establish communication between different locations in the world.
- ii. **Earth observation satellite:** These satellites are used in the study of forests, deserts, oceans, polarice on earth's surface. These are also used in exploration and management of natural resources. They also collect information which guides us in case of natural calamities like floods and earthquakes.

iv. Ray diagram:



- v. Given: Speed of light in medium ( $v_2$ ) =  $1.5 \times 10^8 \text{ m/s}$ ,  
velocity of light in vacuum ( $v_1$ ) =  $3 \times 10^8 \text{ m/s}$

To find: Absolute refractive index ( $n$ )

Formula:  $n = \frac{v_1}{v_2}$

Calculation: From formula,

$$n = \frac{3 \times 10^8}{1.5 \times 10^8} = 2$$

The absolute refractive index of the medium is 2.

3. Answer the following questions. (Any 5)

- (i) i. Anode reaction:  $2\text{O}^{2-} \longrightarrow \text{O}_2 + 4\text{e}^-$
- ii. Cathode reaction:  $\text{Al}^{3+} + 3\text{e}^- \longrightarrow \text{Al}_{(l)}$
- iii. Alumina has a very high melting point ( $> 2000^{\circ}\text{C}$ ). The purpose of mixing 'cryolite' and 'fluorspar' with 'alumina' in the electrolytic reduction of alumina is to carry out the process at a much lower temperature. Addition of cryolite and fluorspar reduces the melting point of alumina to about  $1000^{\circ}\text{C}$ .
- (ii) i. The reaction type: Decomposition reaction
- ii. Reactant: Calcium carbonate
- Products: Calcium oxide, carbon dioxide
- iii.  $\text{CaCO}_{3(s)} + \text{Heat} \rightarrow \text{CaO}_{(s)} + \text{CO}_{2\uparrow}$
- Calcium carbonate                      Calcium oxide                      Carbon dioxide

(iii) **Given:** Potential difference ( $V$ ) = 220 V ,

Power of bulb 1 ( $P_1$ ) = 50 W ,

Power of bulb 2 ( $P_2$ ) = 60 W ,

To find: Total current (I)

Formulae: i.  $P = VI$

ii.  $I = I_1 + I_2$

Calculation: Since both the bulbs are connected in parallel, the potential difference will be same.

From formula (i),

$$I_1 = \frac{P_1}{V} = \frac{50}{220} \text{ A}, I_2 = \frac{P_2}{V} = \frac{60}{220} \text{ A}$$

From formula (ii),

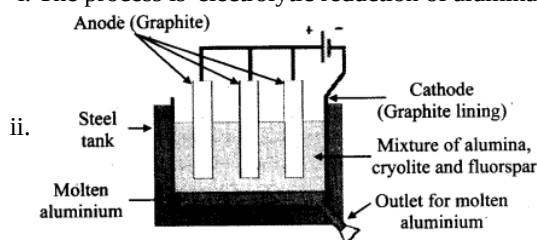
Total current is given by,

$$I = \frac{50}{220} + \frac{60}{220} = \frac{50+60}{220}$$

$$\therefore I = \frac{110}{220} = \frac{1}{2} = 0.5 \text{ A}$$

The total current flowing in the main conductor is 0.5 A.

(iv) i. The process is 'electrolytic reduction of alumina'.



(v) i. The value of  $g$  will not be the same everywhere on the surface of the earth.

ii. The shape of the earth is not exactly spherical and hence the distance of a point on the surface of the earth from its centre differs somewhat from place to place.

iii. Due to its rotation, the earth bulges at the equator and is flatter at the poles. Its radius is largest at the equator and smallest at the poles.

iv. Hence, the value of ' $g$ ' is the highest at the poles ( $9.832 \text{ m/s}^2$ ) and decreases slowly with decreasing latitude. It is the lowest at the equator ( $9.78 \text{ m/s}^2$ ).

(vi) The halogen family belongs to group 17 of the periodic table.

Name of any four halogens are as follows:

Fluorine, Chlorine, Bromine and Iodine.

(vii) i. Ray AB: Incident ray

ii. Ray CD: Refracted ray

iii. Ray GH: Emergent ray

(viii) A manmade object which revolves around the earth or any other planet in a fixed orbit it is called an artificial satellite.

Depending on their functions, satellites are classified into following categories:

i. **Weather satellite:** These satellites are used to study and forecast weather conditions on the earth.

ii. **Communication satellite:** These satellites use specific waves to establish communication between different locations in the world.

iii. **Broadcast satellite:** These satellites are used to telecast different television programs all over the world.

iv. **Navigational satellite:** These satellites help in locating any place on earth's surface by fixing the location in terms of its precise latitude and longitude.

v. **Military satellite:** These satellites collect information for security aspects of nation.

vi. **Earth observation satellite:** These satellites are used in the study of forests, deserts, oceans, polar ice on earth's surface. These are also used in exploration and management of natural resources. They also collect information which guides us in case of natural calamities like flood and earthquake.

4. Answer the following question. (Any 1)

(i) i. **Physical nature:** Ionic compounds are solids and are hard due to strong inter-ionic forces of attraction. They are generally brittle and break into pieces when pressure is applied.

ii. **Melting and boiling points:** Ionic compounds have high melting and boiling points as considerable amount of energy is required to break the strong inter-ionic forces of attraction.

- iii. **Solubility:** Ionic compounds are generally soluble in water because water molecules orient in a particular manner around the ions which are separated by dissociation process. This results in new force of attraction between the ion and surrounding water molecules replacing the original intermolecular attraction. Ionic compounds are insoluble in kerosene and petrol because new attractive force cannot be established in these solvents.
- iv. **Electrical conductivity:** Ionic compounds conduct electricity in molten state or in its aqueous solution. Conduction of electricity in these states is due to movement of charged particles (i.e., ions) towards the oppositely charged electrodes. However, in solid state, ionic compounds do not conduct electricity as movement of the ions is not possible due to their rigid structure.

(ii)

Sr. No.	Common Name	Structural Formula	IUPAC Name
i.	Ethylene	$\text{CH}_2 = \text{CH}_2$	Ethene
ii.	Acetylene	$\text{HC} \equiv \text{CH}$	Ethyne
iii.	Acetic acid	$\text{CH}_3\text{-COOH}$	Ethanoic acid
iv.	Methyl alcohol	$\text{CH}_3\text{-OH}$	Methanol
v.	Acetone	$\text{CH}_3\text{-OH-CH}_3$	Propan-2-one