

Q. 1. (A)

- (i) (D)
- (ii) (D)
- (iii) (D)
- (iv) (B)
- (v) (D)

Q. 1. (B)

- (i) Moseley
- (ii) Specific heat capacity – cal/g· °C
- (iii) True
- (iv) Camera, Periscope (*any one*)
- (v) Inverted image

Q. 2. (A)

- (i)** (1) The weight of a body of mass m on the surface of a planet of mass M and radius R is $W = \frac{GmM}{R^2}$ (in the usual notation).
- (2) For a given body, its mass is constant. G is the universal constant of gravitation. Different planets have different masses and radii such that the ratio (M/R^2) is not the same. Hence, the weight of a body is different on different planets.
- (ii)** (1) The temperature of air in the freezer (deep freeze) compartment of a refrigerator is less than 0 °C.
- (2) When a plastic bottle, completely filled with water, is kept in this compartment, the temperature of water falls below 4 °C and the water expands. Even when water freezes and ice is formed, there is an increase in the volume. It exerts a large pressure on the sides of the bottle and hence the bottle is likely to break.
- (iii)** (1) Ethylene ($\text{CH}_2 = \text{CH}_2$) contains a double bond between carbon atoms.
- (2) Thus, the valencies of the two carbon atoms are not fully satisfied by single covalent bonds. Hence, ethylene is an unsaturated hydrocarbon.

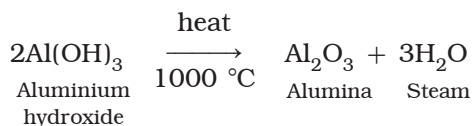
Q. 2. (B)

(i) Data : $v_1 = 3 \times 10^8$ m/s, $v_2 = 2 \times 10^8$ m/s, ${}_2n_1 = ?$

$$\begin{aligned}
 {}_2n_1 &= \frac{v_1}{v_2} \\
 &= \frac{3 \times 10^8}{2 \times 10^8} \\
 &= 1.5
 \end{aligned}$$

The refractive index of the medium with respect to air is 1.5.

(ii) When dry aluminium hydroxide is ignited at 1000°C , alumina (Al_2O_3) is formed and water in the form of steam is given out.



(iii) **Importance of artificial satellites :**

(1) A man-made object orbiting the earth or any other planet is called an artificial satellite. Satellites work on solar energy and hence photovoltaic panels are attached on both sides of the satellite, which look like wings.

(2) Satellites are also installed with various transmitters and other equipment to receive and transmit signals between the earth and the satellites.

These satellites are sent into space to perform various functions such as weather information, broadcasting, military activities, educational programmes, etc. The various functions listed above show the importance of artificial satellites.

(iv) Shell

| | | | |
|----------|----------|----------|----------|
| <u>K</u> | <u>L</u> | <u>M</u> | <u>N</u> |
| ↓ | ↓ | ↓ | ↓ |
| 2 | 8 | 18 | 32 |

Electron capacity

(v) (a) Electric heater

(b) Tungsten

(c) Nichrome

(d) Electric motor

Q. 3.

(i) (a) Reductant : H_2S

(b) Oxidant : SO_2

(c) The chemical reaction in which a reactant gains hydrogen and loses oxygen to form the product is called the reduction reaction.

(ii) (a) $2\text{Al} + 6\text{HCl} \longrightarrow 2\text{AlCl}_3 + 3\text{H}_2\uparrow$

(b) $\text{MnO}_2 + 4\text{HCl} \longrightarrow \text{MnCl}_2 + 2\text{H}_2\text{O} + \text{Cl}_2\uparrow$

(c) $2\text{KClO}_3 \longrightarrow 2\text{KCl} + 3\text{O}_2\uparrow$

- (iii) (a) Diverging type.
 (b) Image formed is always virtual, erect and smaller than object.
 (c) Myopia (Nearsightedness).
- (iv) (1) Fluorine has the electronic configuration (2, 7).
 (2) It requires only one electron to complete the octet.
 (3) The atomic size of fluorine is the smallest among the halogens. Hence, the nuclear attraction on the outermost electrons is maximum. Hence, fluorine is the most reactive among the halogens.

(v) Data : $m_1 = 60 \text{ kg}$, $m_2 = 2000 \text{ kg}$, $r = 10 \text{ m}$

$$F = \frac{Gm_1m_2}{r^2}$$

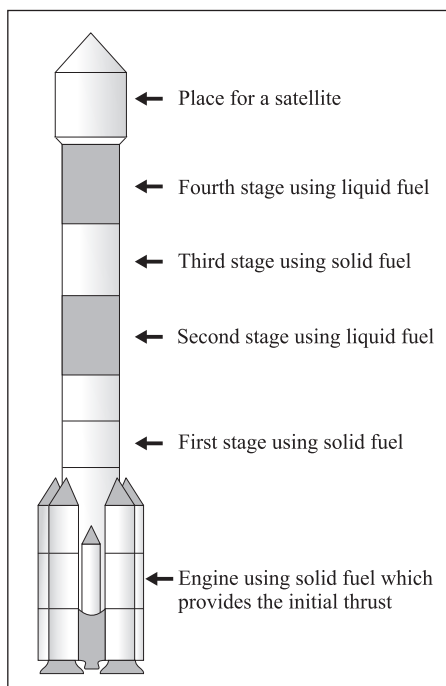
$$= \frac{6.67 \times 10^{-11} \text{ N}\cdot\text{m}^2/\text{kg}^2 \times 60 \text{ kg} \times 2000 \text{ kg}}{(10 \text{ m})^2}$$

$$= 8.004 \times 10^{-8} \text{ N}$$

The gravitational force between the man and the car is $8.004 \times 10^{-8} \text{ N}$.

- (vi) (a) → Incident ray
 (b) → Refracted ray
 (c) → Emergent ray
- (vii) The anodizing technique is an application of electrolysis. In this method copper or aluminium article is used as anode and it is coated with a strong film of their oxides by means of electrolysis. This oxide layer is strong and uniform all over the surface. This thin film protects the metals from corrosion. The protection can be further increased by making the oxide layer thicker during the anodization.
- (viii) **Satellite launch vehicle** : A rocket used to carry an artificial satellite to a desired height above the earth's surface and then project it with a proper velocity so that the satellite orbits the earth in the desired orbit is called a launch vehicle. A satellite launch vehicle needs a specific velocity as well as a thrust to reach the desired height above the earth's surface. The velocity and the thrust of a satellite launch vehicle depend on the weight and orbital height of the satellite. Accordingly, the structure of the launch vehicle is decided and designed. The weight of the fuel also contributes a major portion in the total weight of the launch vehicle. This also influences the structure of the launch vehicle. In order to use the fuel optimally, multiple stage launch vehicles are now designed and used.

The Polar Satellite Launch Vehicle (PSLV) developed by ISRO is shown below in a schematic diagram.



Structure of PSLV made by ISRO

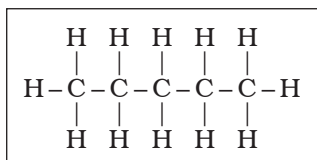
Q. 4.

(i)

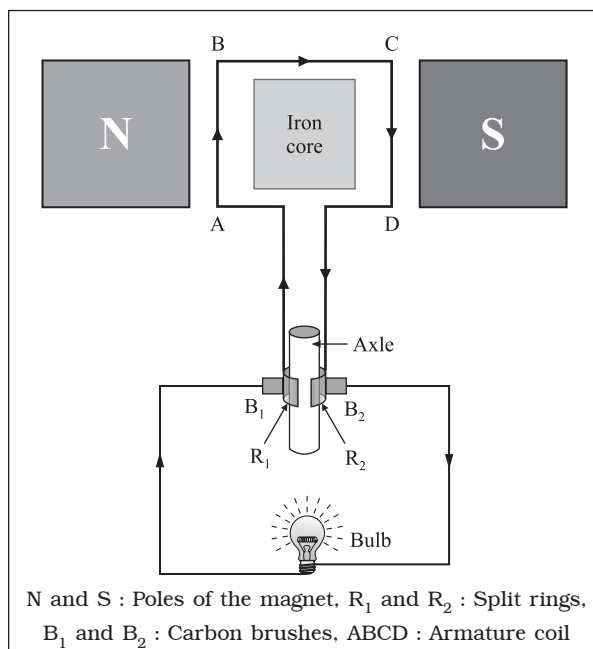
| Sr. No. | Name | Condensed structural formula | Number of carbon atoms | Number of -CH ₂ units |
|---------|------------------|--|------------------------|----------------------------------|
| 1. | Ethene | H ₂ C = CH ₂ | 2 | 0 |
| 2. | Propene | CH ₃ - CH = CH ₂ | 3 | 1 |
| 3. | 1-Butene | CH ₃ - CH ₂ - CH = CH ₂ | 4 | 2 |
| 4. | 1-Pentene | CH ₃ - CH ₂ - CH ₂ - CH = CH ₂ | 5 | 3 |

(a) One methylene unit is extra in the formula of fourth members than the third member of homologous series of alkenes.

(b) Higher homologue of butane (C₄H₁₀) is Pentane (C₅H₁₂) and its structural formula is as under :



(ii) (a) Following figure shows the construction of a DC generator.



Electric DC generator

(b) Working : The axle is rotated with a machine from outside. When the armature coil of the generator rotates in the magnetic field, electric potential difference is produced in the coil due to electromagnetic induction. This produces a current as shown by the glowing of the bulb or by a galvanometer. The direction of the current depends on the sense of rotation of the coil.

In a DC generator, one brush is always in contact with the arm of the coil moving up while the other brush is in contact with the arm of the coil moving down in the magnetic field. Hence, the flow of the current in the circuit is always in the same direction and the current flows so long as the coil continues to rotate in the magnetic field.

(c) Since the current produced in DC generator flows only in one direction and it can change its magnitude but its direction remains the same. Therefore it is called a direct current (DC).