Q1 (20 July 2021 Shift 1)

Given below are two statements. One is labelled as Assertion $\mathbf{A}$ and the other is labelled as Reason $\mathbf{R}$.

Assertion A : Sharp glass edge becomes smooth on heating it upto its melting point.

Reason R : The viscosity of glass decreases on melting.

Choose the most appropriate answer from the options given below.

(1) $\mathbf{A}$ is true but $\mathbf{R}$ is false

(2) Both $\mathbf{A}$ and $\mathbf{R}$ are true but $\mathbf{R}$ is NOT the correct explanation of $\mathbf{A}$.

(3) $\mathbf{A}$ is false but $\mathbf{R}$ is true.

(4) Both $\mathbf{A}$ and $\mathbf{R}$ are true and $\mathbf{R}$ is the correct explanation of $\mathbf{A}$.

Q2 (20 July 2021 Shift 2)

Diamond has a three dimensional structure of C atoms formed by covalent bonds. The structure of diamond has face centred cubic lattice where 50% of the tetrahedral voids are also occupied by carbon atoms. The number of carbon atoms present per unit cell of diamond is ___

Q3 (22 July 2021 Shift 1)

A copper complex crystallising in a CCP lattice with a cell edge of 0.4518 nm has been revealed by employing X-ray diffraction studies. The density of a copper complex is found to be 7.62 g cm^{-3}. The molar mass of copper complex is _____ gmol^{-1} (Nearest integer)

$\left[\text{ Given : } \mathrm{N_A} = 6.022 \times 10^{23} \text{ mol}^{-1}\right]$

Q4 (27 July 2021 Shift 1)

The parameters of the unit cell of a substance are

$a = 2.5,\ b = 3.0, c = 4.0, \alpha = 90^\circ, \beta = 120^\circ \gamma = 90^\circ$

The crystal system of the substance is :

(1) Hexagonal

(2) Orthorhombic

(3) Monoclinic

(4) Triclinic

Q5 (27 July 2021 Shift 2)

Select the correct statements.

(A) Crystalline solids have long range order.

(B) Crystalline solids are isotropic.

(C) Amorphous solid are sometimes called pseudo solids.

(D) Amorphous solids soften over a range of temperatures.

(E) Amorphous solids have a definite heat of fusion. Choose the most appropriate answer from the options given below.

(1) (A), (B), (E) only

(2) (B), (D) only

(3) (C), (D) only

(4) (A), (C), (D) only

Answer Key

Q1 (2) **Q2** (8) **Q3** (106) **Q4** (3)

Q5 (4)

Q1

Hence given statement (A) is not correct

But statement (B) is correct

Q2

Carbon atoms occupy FCC lattice points as well as half of the tetrahedral voids

therefore number of carbon atoms atoms per unit cell $= 8$

Q3

$$\mathrm{d}\left(\frac{\mathrm{gm}}{\mathrm{cc}}\right)=\frac{4\times\frac{\mathrm{M}}{\mathrm{N_A}}}{(\mathrm{acm})^3}$$

$$7.62=\frac{4\times \mathrm{M}/6.022\times10^{23}}{\left(0.4518\times10^{-7}\ \mathrm{cm}\right)^3}\Rightarrow \mathrm{M}=105.8\ \mathrm{g/mol}$$

Q4

$\mathrm{a}\neq\mathrm{b}\neq\mathrm{c}$ and $\alpha=\gamma=90^\circ\neq\beta$

are parameters of monoclinic unit cell.

Q5

Crystalline solids have definite arrangement of constituent particles and have long range order.

(C), (D) Different constituent particles of an amorphous solid have different bond strengths and

soften over a range of temperatures.