

## CHEMISTRY

### CLASS XII

#### COMPETENCY BASED EXAM – JULY 2025

#### Solutions

**Q1.** The molality of a solution containing 36 g of glucose ( $M = 180 \text{ g/mol}$ ) in 250 g of water is:

- A. 0.2 m
- B. 0.8 m
- C. 0.4 m
- D. 0.6 m

**Reasoning:** Moles of glucose =  $(36/180 = 0.2)$ . Mass of solvent = 0.25 kg. Molality =  $(0.2/0.25 = 0.8)$ .

Correction: Actually 0.8 m.

Correct Answer: B. 0.8 m

**Q2.** Which colligative property is most suitable for determining molar mass of a solute?

- A. Relative lowering of vapor pressure
- B. Elevation of boiling point
- C. Depression of freezing point
- D. Osmotic pressure

**Answer:** D. Osmotic pressure

**Reasoning:** Osmotic pressure can be measured accurately even for dilute solutions, making it most reliable.

#### **Q3. Assertion-Reason**

Assertion (A): Depression in freezing point is a colligative property.

Reason (R): It depends on the number of solute particles present in solution, not their nature.

- A. Both A and R are true, and R is the correct explanation of A
- B. Both A and R are true, but R is not the correct explanation of A
- C. A is true, R is false
- D. A is false, R is true

**Answer:** A. Both A and R are true, and R is the correct explanation of A

**Q4.** Van't Hoff factor ( $i$ ) for 0.1 M  $\text{Na}_2\text{SO}_4$  solution assuming complete dissociation is:

- A. 1
- B. 2
- C. 3
- D. 4

**Answer:** C. 3

**Reasoning:**  $\text{Na}_2\text{SO}_4 \rightarrow 2\text{Na}^+ + \text{SO}_4^{2-}$ , total particles = 3.

**Q5.** Which of the following solutions will have the highest osmotic pressure at 298 K?

- A. 0.1 M glucose
- B. 0.1 M NaCl
- C. 0.1 M  $\text{K}_2\text{SO}_4$
- D. 0.1 M urea

**Answer:** C. 0.1 M  $\text{K}_2\text{SO}_4$

**Reasoning:** Osmotic pressure  $\propto i \times M$ . For  $\text{K}_2\text{SO}_4$ ,  $i = 3$ , so effective concentration = 0.3 M.

### Electrochemistry

**Q6.** The standard reduction potential of  $\text{Zn}^{2+}/\text{Zn}$  is  $-0.76$  V and that of  $\text{Cu}^{2+}/\text{Cu}$  is  $+0.34$  V. The EMF of the cell:

$\text{Zn} | \text{Zn}^{2+} || \text{Cu}^{2+} | \text{Cu}$  is:

- A.  $+1.10$  V
- B.  $-1.10$  V
- C.  $+0.42$  V
- D.  $-0.42$  V

**Answer:** A.  $+1.10$  V

**Reasoning:**  $E^\circ_{\text{cell}} = E^\circ_{\text{cathode}} - E^\circ_{\text{anode}} = 0.34 - (-0.76) = 1.10$  V.

### Q7. Assertion-Reason

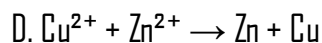
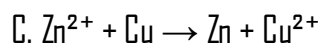
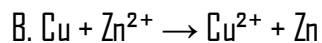
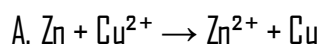
Assertion (A): In electrolysis of molten NaCl, sodium metal is deposited at cathode.

Reason (R):  $\text{Na}^+$  ions are reduced at cathode to form sodium metal.

- A. Both A and R are true, and R is the correct explanation of A
- B. Both A and R are true, but R is not the correct explanation of A
- C. A is true, R is false
- D. A is false, R is true

**Answer:** A. Both A and R are true, and R is the correct explanation of A

**Q8.** The cell reaction for Daniell cell is:



**Answer:** A.  $\text{Zn} + \text{Cu}^{2+} \rightarrow \text{Zn}^{2+} + \text{Cu}$

**Reasoning:** Zn oxidizes,  $\text{Cu}^{2+}$  reduces.

**Q9.** The molar conductivity of a strong electrolyte:

A. Increases with dilution

B. Decreases with dilution

C. Remains constant

D. First increases then decreases

**Answer:** A. Increases with dilution

**Reasoning:** Due to decrease in interionic interactions, ions move more freely.

**Q10. Assertion-Reason**

Assertion (A): Electrolytic conductance decreases with increase in concentration of electrolyte.

Reason (R): Increase in concentration increases interionic attraction, reducing mobility of ions.

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

B. Both A and R are true, but R is not the correct explanation of A

C. A is true, R is false

D. A is false, R is true

**Answer:** A. Both A and R are true, and R is the correct explanation of A