

Multiple Choice Answers

Q3: B

Q11: D

Multiple Choice Answers

Q9: B

Q10: A

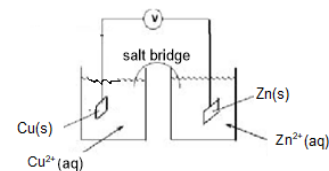
Multiple Choice Answers

Q11: B

1(a)(i)	24 protons 28 neutrons 24 electrons
1(a)(ii)	(⁵⁴ Cr has two) more neutrons (than ⁵² Cr)
1(a)(iii)	(relative) abundance (of each isotope)
1(a)(iv)	The fourth isotope has any value of RIM less than 51.996
1(b)(i)	1s ² 2s ² 2p ⁶ 3s ² 3p ⁶ (3d ⁵ 4s ¹)
1(b)(ii)	6
1(c)(i)	Cr / Cr ₂ O ₇ ²⁻ AND it gains electrons
1(c)(ii)	(+) ⁴
1(c)(iii)	<i>Due to an issue with question 1(c)(iii), the question has been removed from the question paper.</i>
1(c)(iv)	M1 CO ₂ has only instantaneous / temporary dipole–induced dipole forces AND methanal has permanent dipole–permanent dipole (and id-id) forces M2 IMF's in methanal are stronger than IMF's in CO ₂
1(d)(i)	rate of forward and backward (reaction) are the same / equal OR concentrations of reactants and products are constant
1(d)(ii)	closed system
1(d)(iii)	M1 (mixture becomes more) orange M2 forward reaction is endothermic M3 (mixture becomes more) orange M4 equilibrium moves (forwards/right) to compensate for extra acid / H ⁺
1(e)	M1 hydrolysis M2 CrF ₄ + 2H ₂ O → CrO ₂ + 4HF

4(a)	M1: potential difference / voltage / EMF AND between two half-cells / two electrodes (in a cell) M2: (at concentration of) 1 mol dm ⁻³ AND (pressure of) 1 atm / 101 kPa AND (temperature of) 298 K / 25 °C
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4(b)(i)

**M1:** salt bridge labelled **AND** voltmeter / V **AND** wire to electrode and liquid level shown [complete circuit]**M2:** Cu(s) **AND** Cu²⁺(aq)**M3:** Zn(s) **AND** Zn²⁺(aq)4(b)(ii) ions **AND** electrons4(b)(iii) **M1:** Nernst equation $E = E^\ominus + (0.059/z) \log(\text{Zn}^{2+}/\text{Zn})$ **M2:** $E = -0.76 + (0.059 / 2) \log(0.25) = -0.778 \text{ V}$ **OR** $E = -0.76 + (8.31 \times 298) / (96\,500 \times 2) \ln(0.25) = -0.778 \text{ V min 2sf}$

4(c)(i) ((from) +4 (to) +3

4(c)(ii) $\text{Zn} + 2\text{MnO}_2 \rightarrow \text{ZnO} + \text{Mn}_2\text{O}_3$ 4(c)(iii) $E^\ominus(\text{MnO}_2/\text{Mn}_2\text{O}_3) = 1.47 - 1.28 = (+)0.19 \text{ V}$