Multiple Choice Answers

Q5: A

Multiple Choice Answers

Q6: C

Multiple Choice Answers

Q6: B

Q24: C

Multiple Choice Answers

Q7: D

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 / $Cr_2O_7^{2-}$ **AND** it gains electrons
1(c)(ii)	(+)4
1(c)(iii)	*Due to an issue with question 1(c)(iii), the question has been removed from the question paper.*
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** $CrF_4 + 2H_2O \rightarrow CrO_2 + 4HF$

1(a)(i)	(halogens can) remove electron(s) (from a reactant)
1(a)(ii)	$2Al + 3Cl_2 \rightarrow 2AlCl_3$
1(a)(iii)	purple (gas) disappears
1(b)(i)	**M1** Br—Br is weaker (than Cl—Cl) **AND** Br atoms are larger **M2** less (significant) overlap of orbitals (in Br-Br)
1(b)(ii)	HCl is more thermally stable
1(b)(iii)	**M1** (enthalpy change / energy change) when one mole of a compound / substance is formed **M2** from its (constituent) elements in their standard state(s)
1(b)(iv)	**M1** $(6 \times -92) - (2 \times -46) =$ **M2** -460 ($kJ\,mol^{-1}$)
1(b)(v)	**M1** (trigonal) pyramidal **M2** three bonding pairs **AND** one lone pair (of electrons)
1(c)(i)	<table><tr><th></th><th>NaCl</th><th>NaBr</th><th>NaI</th></tr><tr><td>with $Ag^+(aq)$</td><td>white precipitate</td><td>**M1** cream / off-white ppt</td><td>**M2** yellow ppt</td></tr><tr><td>with conc. H_2SO_4</td><td>acid – base</td><td>acid – base, then redox</td><td>acid – base, then redox</td></tr><tr><td>observations with conc. H_2SO_4</td><td>**M3** steamy fumes **OR** fizzing</td><td>**M4** brown liquid **OR** fizzing</td><td>• black solid • yellow solid • effervescence</td></tr></table>
1(c)(ii)	**M1** black solid = iodine / I_2 **AND** yellow solid = sulfur / $S_{(8)}$ **M2** effervescence = hydrogen sulfide / $H_2S(g)$
1(d)(i)	**M1** $MgCl_2$ (is ionic and) has mobile ions **M2** $SiCl_4$ is covalent **AND** no charge carriers **OR** (no ions and) no delocalised electrons **OR** no mobile / moving ions
1(d)(ii)	**M1** $MgCl_2$ pH = 7 **M2** $SiCl_4$ pH 0 – 4