

A Level OCR Chemistry

Chapter 19 – answers

Question	Answers	Extra information	Mark	AO Spec reference
1(a)	$[\text{Fe}(\text{H}_2\text{O})_6]^{2+} + 4\text{Cl}^- \rightarrow \text{FeCl}_4^{2-} + 6\text{H}_2\text{O}$		1	5.3.1 AO1
1(b)	Octahedron to Tetrahedron Cl^- ligands are larger So fewer can fit round the ion	Direction of change must be clear	1 1 1 1	5.3.1 AO1
1(c)(i)	Increase (more molecules are formed at the end)		1	5.3.1 AO1
1(c)(ii)	Optical		1	5.3.1 AO1
2(a)	Transport oxygen		1	5.3.1 AO1
2(b)	Bonds to haemoglobin/iron Displaces oxygen	Allow prevents oxygen bonding/ binding	1 1	5.3.1 AO1
2(c)	$V = 200 \times 0.01 = 2$ $P = 10\,000 \text{ T} = 298$ $n = \frac{PV}{RT}$ $n = \frac{10000 \times 2}{8.31 \times 298}$ $n = 8.076$ Moles $\text{CH}_4 = 8.076$ Mass $\text{CH}_4 = 8.076 \times 16 = 129 \text{ g}$	Can be seen in calculation Or correct workings Allow rounding to 3 s.f.	1 1 1 1 1	2.1.3 AO2 MS0.0,2,2,2.3,2.4

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3(a)	Geometric		1	5.3.1 AO1
3(b)	Square planar		1	5.3.1 AO1
3(c)	Both amines will not be able to bond with DNA So will not disrupt replication		1 1	5.3.1 AO3
3(d)	Toxic/Kills normal cells Disrupts DNA of healthy/normal cells	Allow references to hair loss, etc.	1 1	5.3.1 AO3
4(a)	Can form 2 co-ordinate/dative bonds with metal ion		1 1	5.3.1 AO1
4(b)	$\text{Fe}^{3+}(\text{aq}) + 3\text{C}_2\text{O}_4^{2-}(\text{aq}) \rightarrow [\text{Fe}(\text{C}_2\text{O}_4)_3]^{3-}(\text{aq})$		1	5.3.1 AO1
4(c)	Optical Because the two isomers are not superimposable mirror images	Allow diagrams to explain	1 1	5.3.1 AO1
4(d)	$[\text{Fe}(\text{H}_2\text{O})_6]^{3+} + 3\text{NH}_3 \rightarrow [\text{Fe}(\text{H}_2\text{O})_3(\text{OH})_3] + 3\text{NH}_4^+$ Yellow solution Brown precipitate	1 mark for species 2 mark for charges Allow yellow/brown Allow orange/brown	1 1 1 1	5.3.1 AO1
4(e)	$K_a = \frac{[\text{H}^+][\text{A}^-]}{[\text{HA}]} = \frac{[\text{H}^+]^2}{[\text{HA}]}$ $[\text{H}^+] = \sqrt{5.4 \times 10^{-2} \times 1.50} = 0.285$ Diprotic so $[\text{H}^+] = 0.285 \times 2 = 0.570$ $\text{pH} = -\log(0.570)$ $= 0.24$	Can be awarded from correct calculation	1 1 1 1	5.1.3 AO2 MS0.1,0.4

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5(a)	$[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$		1	5.3.1 AO1
5(b)	$K_a = \frac{[\text{H}^+]}{[\text{HA}]}$ $[\text{H}^+] = 10^{-1.62} = 0.023988$ $[\text{HA}] = 5.75 \times 10^{-4} / 5.76 \times 10^{-3}$ $= 0.0999 = 0.10 \text{ mol dm}^{-3}$		1 1 1 1	5.1.3 AO2
6(a)(i)	$[\text{Cr}(\text{H}_2\text{O})_6]^{3+} + 6\text{NH}_3 \rightarrow [\text{Cr}(\text{NH}_3)_6]^{3+} + 6\text{H}_2\text{O}$ Violet/grey/blue/dark green solution to purple solution $[\text{Cu}(\text{H}_2\text{O})_2]^{2+} + 4\text{NH}_3 \rightarrow [\text{Cu}(\text{NH}_3)_4(\text{H}_2\text{O})_2]^{2+} + 2\text{H}_2\text{O}$ blue solution to dark blue solution		1 1 1 1	5.3.1 AO1
6(a)(ii)	$[\text{Mn}(\text{H}_2\text{O})_6]^{2+} + 2\text{OH}^- \rightarrow [\text{Mn}(\text{OH})_2(\text{H}_2\text{O})_4] + 2\text{H}_2\text{O}$ Pale pink solution to pale brown precipitate $[\text{Cr}(\text{H}_2\text{O})_6]^{3+} + 3\text{OH}^- \rightarrow [\text{Cr}(\text{OH})_3(\text{H}_2\text{O})_3] + 3\text{H}_2\text{O}$ Violet/grey/blue/dark green solution to dark green solution		1 1 1 1	5.3.1 AO1
6(b)(i)	$\text{Cu}^{2+} + \text{I}^- \rightarrow \text{Cu}^+ + \frac{1}{2} \text{I}_2$		1	5.3.1 AO1
6(b)(ii)	Disproportionation $2\text{Cu}^+ \rightarrow \text{Cu} + \text{Cu}^{2+}$		1 1	5.3.1 AO1

Skills box answers:

- a) It would be difficult to determine which compound is causing which result. / It would be difficult to see colours
- b) FeI_2 / Iron(II) iodide (must state oxidation state)
 $\text{Fe}^{2+}(\text{aq}) + 2\text{OH}^-(\text{aq}) \rightarrow \text{Fe}(\text{OH})_2(\text{s})$
 $\text{Ag}^+(\text{aq}) + \text{I}^-(\text{aq}) \rightarrow \text{AgI}(\text{s})$
- c) CuCO_3 / copper carbonate
 $\text{Cu}^{2+}(\text{aq}) + 2\text{OH}^-(\text{aq}) \rightarrow \text{Cu}(\text{OH})_2(\text{s})$
 $\text{CO}_3^{2-}(\text{s}) + 2\text{H}^+(\text{aq}) \rightarrow \text{CO}_2(\text{g}) + \text{H}_2\text{O}(\text{l})$