

Question 18 (Answer: **C**)

- In MnO_4^- the four oxygens are -2 each, so manganese is $+7$; in Mn^{2+} it is $+2$.
- Iodide is -1 and iodine as I_2 is 0 .
- So manganese falls from $+7$ to $+2$ and iodine rises from -1 to 0 .

Question 19 (Answer: **C**)

- Let the oxidation number of chromium be x .
- The seven oxygens are -2 each, so $2x + 7(-2) = -2$.
- $2x = 12$, so $x = +6$.

Question 18 (Answer: **A**)

- A more concentrated acid has more particles in the same volume.
- So collisions happen more often and the rate rises.
- But the particles' *energy* is unchanged, so the fraction able to react is exactly the same.

Question 22 (Answer: **B**)

- In HNO_3 the nitrogen is $+5$; in NO_2 it is $+4$.
- A fall in oxidation number is reduction.
- Copper goes from 0 to $+2$, so the copper is oxidised, not reduced.

2(a)(i)	hematite
2(a)(ii)	burning of carbon (coke)

2(a)(iii)	carbon monoxide
2(a)(iv)	$3\text{CO} + \text{Fe}_2\text{O}_3 \rightarrow 2\text{Fe} + 3\text{CO}_2$ M1 species M2 correct equation
2(a)(v)	M1 $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$ M2 $\text{CaO} + \text{SiO}_2 \rightarrow \text{CaSiO}_3$
2(b)	M1 atoms of the same element that have the same number of protons M2 but different numbers of neutrons
2(c)(i)	p = 26 and 26 n = 28 and 32 e = 24 and 23
2(c)(ii)	M1 NaOH(aq) OR $\text{NH}_3\text{(aq)}$ M2 green ppt. (insoluble in excess, ppt. turns brown near surface on standing)
2(d)(i)	a substance that oxidises another substance and is itself reduced M1 'a substance' oxidises another substance M2 is itself reduced
2(d)(ii)	loss of (one) electron
2(d)(iii)	acidified
2(e)	iodine

Question 17 (Answer: C)

- A reducing agent is itself oxidised, so its oxidation number must increase.
- In equation 2 iron goes from 0 to +2, and in equation 3 from +2 to +3 – both oxidised.
- In equation 1 the underlined species is reduced, and equation 4 is a neutralisation with no change at all.

Question 18 (Answer: D)

- In Fe_2O_3 the three oxygens are -2 each, so each iron must be $+3$.
- In the product the iron is an uncombined element, so its oxidation number is 0.
- So the change is from $+3$ to 0 – the iron has been reduced.

Question 21 (Answer: D)

- Reduction is loss of oxygen, or gain of electrons.
- Mercury(II) oxide loses its oxygen to become mercury metal.
- The mercury also goes from $+2$ to 0, gaining electrons – both definitions agree.