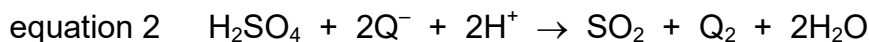


- 21** Equation 1 and equation 2 show two different reactions of halide ion Q^- with concentrated sulfuric acid.



What is Q?

- A** Cl^- or Br^- **B** Br^- or I^- **C** Cl^- only **D** I^- only

- 22** What happens when iodine solution is added to a solution of sodium bromide?

- A** A reaction occurs without changes in oxidation state.
B Bromide ions are oxidised; iodine atoms are reduced.
C Bromide ions are reduced; iodine atoms are oxidised.
D No reaction occurs.

- 23** Which statement is correct?

- A** Nitrogen is unreactive due to the absence of lone pairs in the molecule.
B Aqueous ammonia contains both $NH_3(aq)$ and $NH_4^+(aq)$. The $NH_4^+(aq)$ ion is a Brønsted–Lowry acid.
C High temperatures are needed to supply the energy to break the strong double bonds in nitrogen molecules when they react.
D Atmospheric SO_2 reacts with unburnt hydrocarbons to form a component of photochemical smog.

- 21** In an experiment, 0.600 mol of chlorine gas, Cl_2 , is reacted with an excess of hot aqueous sodium hydroxide. One of the products is $NaClO_3$.

Which mass of $NaClO_3$ is formed?

- A** 21.3g **B** 44.7g **C** 63.9g **D** 128g

22 X and Y are sodium salts of Group 17 elements.

When X reacts with concentrated sulfuric acid, hydrogen sulfide, H_2S , is produced.

When Y reacts with concentrated sulfuric acid, there is no change in the oxidation number of the sulfur.

Which statement is correct?

- A** Aqueous X reduces aqueous bromine.
- B** Aqueous Y reacts with aqueous silver nitrate to give a precipitate which is insoluble in concentrated aqueous ammonia.
- C** X and Y react separately with concentrated sulfuric acid to produce halogens.
- D** When X reacts with concentrated sulfuric acid, six halide ions are needed to reduce one sulfur atom to H_2S .

21 X, Y and Z are three aqueous solutions. Equal volumes of pairs of the solutions are mixed and observations noted.

X mixed with Y shows no reaction.

X mixed with Z shows an immediate reaction.

Z mixed with Y shows no reaction.

What are X, Y and Z?

	X	Y	Z
A	$\text{Br}_2(\text{aq})$	$\text{I}_2(\text{aq})$	$\text{HBr}(\text{aq})$
B	$\text{Cl}_2(\text{aq})$	$\text{I}_2(\text{aq})$	$\text{HBr}(\text{aq})$
C	$\text{HCl}(\text{aq})$	$\text{HI}(\text{aq})$	$\text{Br}_2(\text{aq})$
D	$\text{HCl}(\text{aq})$	$\text{Br}_2(\text{aq})$	$\text{HBr}(\text{aq})$

22 An excess of chlorine gas is bubbled into hot potassium hydroxide solution.

Which chlorine-containing species are present in the final solution?

- A** Cl^- and ClO^-
- B** Cl^- and ClO_3^-
- C** ClO^- and ClO_3^-
- D** ClO_3^- only