



## EXAM PAPERS PRACTICE

Boost your performance and confidence with these topic-based exam questions

Practice questions created by actual examiners and assessment experts

Detailed mark scheme

Suitable for all boards

Designed to test your ability and thoroughly prepare you

Level: CIE AS and A Level (9701)

Subject: Chemistry

Topic: CIE Chemistry

Type: Mark Scheme

2002



1583

Chemistry CIE AS & A Level  
To be used for all exam preparation for 2025+

---

# CHEMISTRY

# AS and A

This to be used by all students studying CIE AS and A level Chemistry (9701) But students of other boards may find it useful

---

## Mark Scheme

Answer 1

The correct answer is A because:

- When concentrated sulfuric acid ( $\text{H}_2\text{SO}_4$ ) reacts with a halogen it acts as both an acid and an oxidising agent.
  - Products formed due to  $\text{H}_2\text{SO}_4$  acting as an acid: hydrogen halide and sodium hydrogen sulfate.
  - As  $\text{H}_2\text{SO}_4$  acts as an oxidising agent the halogen is acting as a reducing agent.
- Only bromine and iodine are strong enough reducing agents to reduce the concentrated sulfuric acid ( $\text{H}_2\text{SO}_4$ ).
  - For example, in potassium bromide; the bromide ions are oxidised to bromine.
  - The bromide ions reduce the sulfuric acid to sulfur dioxide gas.
- Therefore, a series of steps take place in the reaction of KBr and  $\text{H}_2\text{SO}_4$ :
  1. Sulfuric acid acts as an acid and donates a proton to the bromide ion:
    - $\text{KBr} + \text{H}_2\text{SO}_4 \rightarrow \text{KHSO}_4 + \text{HBr}$
  2. The HBr gets oxidized and the sulfuric acid is reduced:
    - $2\text{HBr} + \text{H}_2\text{SO}_4 \rightarrow \text{Br}_2 + \text{SO}_2 + 2\text{H}_2\text{O}$
- The complete list of products from both steps of this reaction are potassium hydrogensulfate ( $\text{KHSO}_4$ ), hydrogen bromide ( $\text{HBr}$ ), bromine ( $\text{Br}_2$ ), sulfur dioxide ( $\text{SO}_2$ ) and water ( $\text{H}_2\text{O}$ ).



## Answer 2

The correct answer is **B** because:

- In hot concentrated sulfuric acid, the astatide ion acts as a strong reducing agent.
- The sulfuric acid is reduced to hydrogen sulfide gas, and the astatide is oxidised to astatine.
- This is an example of a **redox** reaction:
  - $8\text{NaAt (s)} + 5\text{H}_2\text{SO}_4 \text{ (l)} \rightarrow 4\text{Na}_2\text{SO}_4 \text{ (s)} + 4\text{At}_2 \text{ (s)} + \text{H}_2 \text{ (g)} + 4\text{H}_2\text{O (l)}$
- As you go down the group the reducing power of the Group 17 atoms increases, or it is more easily oxidised.

A is incorrect as following the solubility trend that AgI is insoluble. AgAt will also be insoluble.

C is incorrect as a halogen atom can only displace a less reactive halide ion from its salt. Astatine is less reactive than chlorine so no reaction would take place.

D is incorrect as sulfur dioxide is also produced.

## Answer 3

The correct answer is D because:

- The test has to be done in solution, so the powders were added to water.
- When acidified silver nitrate is added a pale yellow colour is seen.
  - The pale yellow colour shows the presence of sodium iodide.
- When the concentrated ammonia was added the precipitate partially dissolved and leaves a darker yellow precipitate.
  - The darker yellow precipitate confirms the presence of sodium iodide.
  - The partial dissolving of the precipitate confirms the presences of sodium chloride.

A is incorrect as the precipitate would not partially dissolve when concentrated aqueous ammonia was added.

B & C are incorrect as the precipitate would be a cream colour when aqueous silver nitrate was added.

#### Answer 4

The correct answer is C because:

- In reaction 1 there is no change in the oxidation state of sulfur.
  - Both hydrogen and potassium have an oxidation state of +1 meaning that the sulfur oxidation state in these compounds is +6.
- In reaction 2 the bromide ions reduce the sulfuric acid to sulfur dioxide gas, this decreases the oxidation state of the sulfur from +6 in the sulfuric acid to +4 in the sulfur dioxide.
  - A change in the oxidation state of 2.
- In reaction 3 the reduction of sulfuric acid (oxidation state +6) is more complex.
  - The first stage is to sulfur dioxide (sulfur oxidation state +4).
  - Then to sulfur (oxidation state 0).
  - And then to hydrogen sulfide (sulfur oxidation state -2).
  - This makes the greatest change in oxidation state in this reaction 8 (from +6 to -2).

# EXAM PAPERS PRACTICE

Copyright

© 2024 Exam Papers Practice