CHEMISTRY ONLINE
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# CHEMISTRY

## INORGANIC CHEMISTRY

| | |
|---|---|
| Level & Board | AQA (A-LEVEL) |
| TOPIC: | GROUP 7 HALOGEN |
| PAPER TYPE: | SOLUTION - 1 |
| TOTAL QUESTIONS | 10 |
| TOTAL MARKS | 41 |

# Group 7 the Halogens - 1

1.

(a)

**Sodium chloride reacts with concentrated sulfuric acid Equation:**

$NaCl + H_2SO_4 \rightarrow NaHSO_4 + HCl$

The sulfuric acid in this reaction act as proton donor i.e. Bronsted-Lowry acid

(2)

(b)

**Equation:**

$2NaBr + 2H_2SO_4 \rightarrow Na_2SO_4 + SO_2 + Br_2 + 2H_2O$

**Observation:**

Brown gas or brown fumes evolved

**Role of the sulfuric acid:**

Oxidising agent as an electron acceptor

(3)

(c)

Let x be the oxidation state of chlorine. $NaClO_3$

The equation representing the oxidation states is:

$+1+x-6=0$

for x:

$x=+5$

NaCl (sodium chloride), chlorine exists in the form of chloride ions ($Cl^-$).

The oxidation state of chlorine in chloride ions is $-1$

(1)

(d)

$3Cl_2 + 6NaOH \rightarrow NaClO_3 + 5NaCl + 3H_2O$

In above equation Cl is oxidised ($NaClO_3$) and reduced (NaCl)

(1)

I am Sorry !!!!!

2.

**Formula of D** $AgBr$
**Formula of E** $Ag_2CO_3$
**Formula of F** $CO_2$

**Ionic equation to form E**
$2Ag^+ + CO_3^{2-} \longrightarrow Ag_2CO_3$
**Equation to show the conversion of D into G**
$AgBr + 2NH_3 \longrightarrow Ag(NH_3)_2Br$

(6)

3. **A**

(1)

4. **D**

(1)

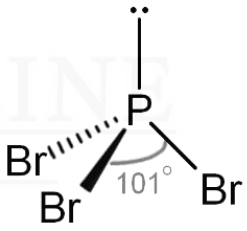
5. **A**

(1)

6.

**(a)**

**Equation:**
$6Br_2 + P_4 \longrightarrow 4PBr_3$
Trigonal pyramidal diagram with angle of 100–108°




(3)

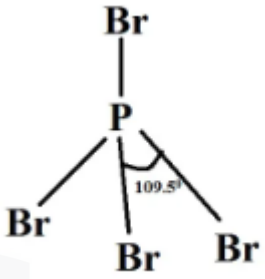
**(b)**

**Shape**

Tetrahedral;

**Bond angle:**

$109.5^{o}$




**(2)**

**7. C**

**(1)**

**8.**

**Test Sequence:**

1. **Add Dilute Nitric Acid:**
   - Apply dilute nitric acid to each of the three samples.
2. **Make a Solution:**
   - Dissolve each sample in water or make a solution.
3. **Add Silver Nitrate:**
   - Introduce silver nitrate solution to each of the three solutions.

**Expected Observations and Conclusions:**

- **Fizzing with Acid:**
  - If fizzing (effervescence) occurs, it indicates the presence of carbonate ions.
  - *Conclusion:* Identify the sample as sodium carbonate ($Na_2\ CO_3$).
  - *Chemical Equation:*
    $Na_2\ CO_3\ (s)+2HNO_3\ (aq)\rightarrow 2NaNO_3\ (aq)+CO_2\ (g)+H_2\ O\ (l)$
  - *Ionic Equation:*
    $Na^{2+}+CO_3^{2-}+2H^{+}+2NO_3^{-}\rightarrow 2Na^{+}+2NO_3^{-}+CO_2+H_2O$
- **White Precipitate with Silver Nitrate:**
  - If a white precipitate forms, it indicates the presence of chloride ions.
  - *Conclusion:* Identify the sample as sodium chloride (NaCl).
  - *Chemical Equation:*
    $AgNO_3\ (aq)+NaCl\ (aq)\rightarrow AgCl\ (s)+NaNO_3\ (aq)$
  - *Ionic Equation:*
    $Ag^{+}+Cl^{-}\rightarrow AgCl\ (s)$
- **No Visible Change with Silver Nitrate:**
  - If there is no visible change or precipitate with silver nitrate, it indicates the absence of chloride ions.

- *Conclusion:* Identify the sample as sodium fluoride (NaF).

**(6)**

**9. C**

**(1)**

**10.**

**(a)**

**i.**

Equation for the reaction between strontium chloride solution and sodium sulfate solution is as:

$SrCl_2(aq) + Na_2SO_4(aq) \rightarrow SrSO_4(s) + 2NaCl(aq)$

**(1)**

**ii.**

**Reaction with Nitric Acid:**

Treat the mixture of strontium carbonate and strontium sulfate with nitric acid. Strontium carbonate will react with nitric acid to form strontium nitrate and carbon dioxide, while strontium sulfate will remain unaffected.

**Reaction for Strontium Carbonate:**

$SrCO_3 + 2HNO_3 \rightarrow Sr(NO_3)_2 + CO_2 + H_2O$

**Strontium Sulfate Remains Unreacted:**

$SrSO_4 + 2HNO_3 \nrightarrow$ No Reaction

**Filtration:**

After the reaction, a mixture of strontium nitrate (dissolved in the solution) and undissolved strontium sulfate is obtained. Perform filtration to separate the solid strontium sulfate from the liquid strontium nitrate solution.

**Recovery of Strontium Sulfate:**

Wash the separated strontium sulfate with distilled water to remove any traces of nitrate ions. After washing, dry the strontium sulfate to obtain the solid salt.

**(2)**

**(b)**

Drinking magnesium sulfate solution is effective in the treatment of barium poisoning. Because insoluble barium sulfate is formed as it removes barium ions as a precipitate.

**(1)**

**(c)**

The test can be conducted for bromide ions using silver nitrate and dilute ammonia solution, follow these steps:

- Take a small sample of the medicine solution in a test tube.
- Add silver nitrate ($AgNO_3$ ) to the solution.
- Observe for the formation of a cream precipitate (or off-white precipitate). This indicates the presence of bromide ions.
- Next, add dilute ammonia solution to the mixture.
- Observe the behavior of the precipitate:
  - If there is no visible change or the precipitate dissolves slightly in dilute ammonia, this suggests the presence of bromide ions .
  - If a cream or off-white precipitate remains after the addition of dilute ammonia, this further confirms the presence of bromide ions.

**(3)**



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