

Name of the Student: _____

Max. Marks : 25 Marks

Time : 25 Minutes

Q1.

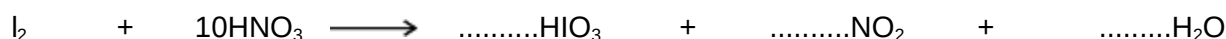
Iodine reacts with concentrated nitric acid to produce nitrogen dioxide (NO_2).

- (a) (i) Give the oxidation state of iodine in each of the following.

 I_2 _____ HIO_3 _____

(2)

- (ii) Complete the balancing of the following equation.

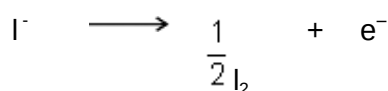
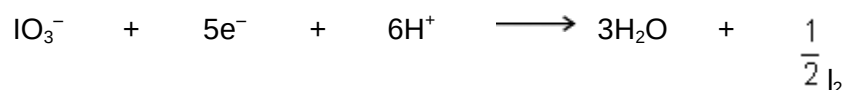


(1)

- (b) In industry, iodine is produced from the
- NaIO_3
- that remains after sodium nitrate has been crystallised from the mineral Chile saltpetre.

The final stage involves the reaction between NaIO_3 and NaI in acidic solution.

Half-equations for the redox processes are given below.



Use these half-equations to deduce an overall ionic equation for the production of iodine by this process. Identify the oxidising agent.

Overall ionic equation

The oxidising agent _____

(2)

- (c) When concentrated sulfuric acid is added to potassium iodide, solid sulfur and a black solid are formed.

(i) Identify the black solid.

(1)

(ii) Deduce the half-equation for the formation of sulfur from concentrated sulfuric acid.

(1)

- (d) When iodide ions react with concentrated sulfuric acid in a different redox reaction, the oxidation state of sulfur changes from +6 to -2. The reduction product of this reaction is a poisonous gas that has an unpleasant smell. Identify this gas.

(1)

- (e) A yellow precipitate is formed when silver nitrate solution, acidified with dilute nitric acid, is added to an aqueous solution containing iodide ions.

(i) Write the **simplest ionic** equation for the formation of the yellow precipitate.

(1)

(ii) State what is observed when concentrated ammonia solution is added to this precipitate.

(1)

(iii) State why the silver nitrate is acidified when testing for iodide ions.

(1)

- (f) Consider the following reaction in which iodide ions behave as reducing agents.



(i) In terms of electrons, state the meaning of the term *reducing agent*.

(1)

- (ii) Write a half-equation for the conversion of chlorine into chloride ions.

(1)

- (iii) Suggest why iodide ions are stronger reducing agents than chloride ions.

(2)

(Total 15 marks)

Q2.

Fluorine and iodine are elements in Group 7 of the Periodic Table.

- (a) Explain why iodine has a higher melting point than fluorine.

(2)

- (b) (i) Draw the shape of the NHF_2 molecule and the shape of the BF_3 molecule.

Include any lone pairs of electrons that influence the shape. In each case name the shape.

Shape of NHF_2

Shape of BF_3

Name of shape of NHF_2 _____

Name of shape of BF_3 _____

(4)

- (ii) Suggest a value for the F—N—F bond angle in NHF_2

(1)

- (c) State the strongest type of intermolecular force in a sample of NHF_2

(1)

- (d) A molecule of NHF_2 reacts with a molecule of BF_3 as shown in the following equation.



State the type of bond formed between the N atom and the B atom in F_2HNBF_3 .

Explain how this bond is formed.

Name of type of bond _____

How bond is formed _____
