

SECTION B

Answer ALL the questions. Write your answers in the spaces provided.

13 This question is about the fluorides BF_3 , NF_3 , OF_2 and O_2F_2 .

(a) (i) For BF_3 , name the shape of the molecule and give the FBF bond angle.

(2)

Shape.....

Bond angle

*(ii) For the NF_3 molecule, draw the shape you would expect and suggest the FNF bond angle. Explain why the molecule has this shape and bond angle.

(4)

Shape

Bond angle

Explanation

.....
.....
.....

(iii) Draw a diagram to show the bonding in the single product of the reaction between BF_3 and NF_3 .

Identify the type of bond that forms between these two molecules.

(2)

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(b) (i) What is the oxidation number of oxygen in OF_2 ?

(1)

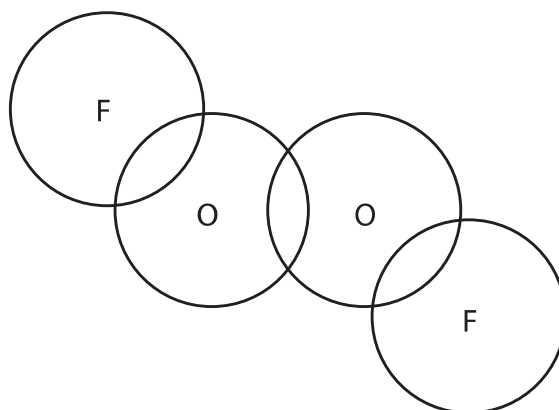
(ii) When water reacts with OF_2 , oxygen is one of the products. Suggest an equation for this reaction.

State symbols are not required.

(1)

(c) Complete the diagram with dots and crosses to show the outer shell electrons in the O_2F_2 molecule.

(1)



(Total for Question 13 = 11 marks)



P 4 6 6 5 8 A 0 1 1 2 4

14 (a) The rates of hydrolysis of three bromoalkanes are compared.

2 cm³ of ethanol is added to three test tubes, **A**, **B** and **C**.

Three drops of bromoalkane are added to each of these three test tubes.

1-bromobutane is added to test tube **A**.

2-bromobutane is added to test tube **B**.

2-bromo-2-methylpropane is added to test tube **C**.

2 cm³ of hot aqueous silver nitrate solution is added to each test tube.

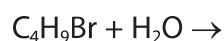
(i) Explain why ethanol is added to each test tube.

(1)

(ii) Complete the general equation for the hydrolysis of these bromoalkanes.

State symbols are not required.

(1)



(iii) Eventually a precipitate is formed in each test tube. Give the colour of the precipitate formed and write the ionic equation, with state symbols, for its formation.

(2)

Colour

Ionic Equation



(iv) Identify the reagent you could add to dissolve the precipitate.

(1)

(v) Give the order in which the precipitates form in the test tubes **A**, **B** and **C**, giving the fastest first.

(1)

*(vi) State how the rates of hydrolysis depend on the structure of the bromoalkane. Suggest a reason for this difference. You are not required to give detailed mechanisms for the reactions.

(2)

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P 4 6 6 5 8 A 0 1 3 2 4

- (b) (i) When 1-bromobutane reacts with an alcoholic solution of sodium hydroxide, a different reaction occurs.

Draw a fully labelled diagram to show the apparatus needed for carrying out this reaction in the laboratory and collecting the gaseous organic product.

(2)



(ii) Name the organic product for this reaction and draw its **skeletal** formula.

(2)

Name

Skeletal formula

(c) 1-bromobutane reacts with alcoholic ammonia when heated under pressure.

(i) State the type and mechanism of this reaction.

(2)

Type

Mechanism

(ii) Name the organic product of this reaction.

(1)

(Total for Question 14 = 15 marks)

