7.3 Halogen Compounds (A Level Only)

Question Paper

Course	CIE A Level Chemistry
Section	7. Organic Chemistry (A Level Only)
Topic	7.3 Halogen Compounds (A Level Only)
Question Set	Structured Questions
Difficulty	Easy

Time Allowed 20

Score /15

Percentage /100

Check your answers

Question 1a

At room temperature and pressure, bromine reacts with benzene, in the presence of a halogen carrier to produce bromobenzene. This is an electrophilic substitution reaction.

The electrophile is the bromonium ion, Br^+ and is generated when bromine reacts with the halogen carrier, e.g. $AlBr_3$.

Complete the mechanism in Fig. 1.1 to show how the bromonium ion is produced by adding any full and partial charges and curly arrows.

Fig. 1.1

[2 marks]

Question 1b

Complete the mechanism in Fig. 1.2 to show how bromobenzene is produced from Br^+ and benzene. Include any relevant charges and curly arrows.

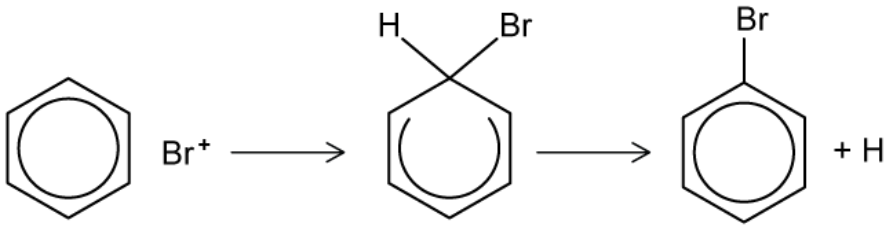

Fig. 1.2

[3 marks]

Question 1c

Write an equation to show the regeneration of the catalyst.

[1 mark]

Question 2a

Methylbenzene can react with chlorine under different conditions to give the monochloro derivatives **F** and **G**. shown in Fig. 2.1.

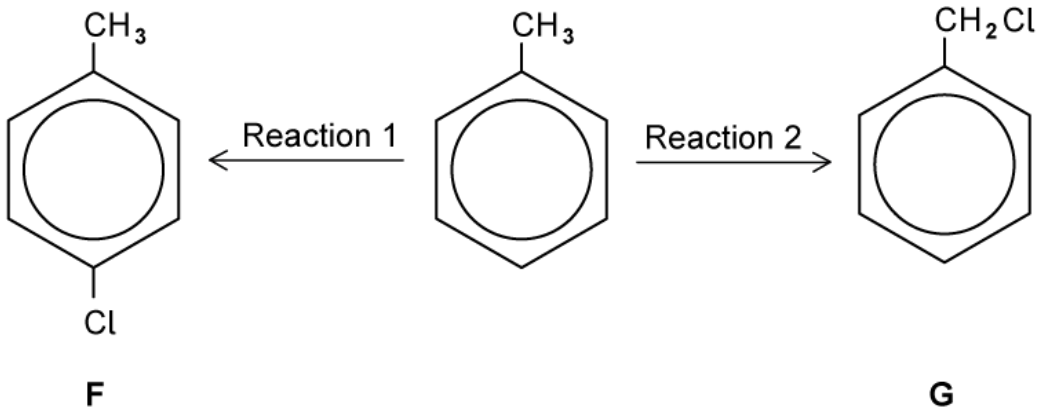

Fig. 2.1

Suggest reagents and conditions for each reaction.

reaction 1 .....

reaction 2 .....

[2 marks]

Question 2b

Identify the type of reaction mechanism that occurs in each reaction in Fig. 2.1.

reaction 1 .....

reaction 2 .....

[2 marks]

Question 2c

When the reagent used in reaction 1 is present in excess, further organic products are formed.

Draw the structure of one of these organic products and give its name.

Structure

Name .....

[2 marks]

Question 3a

2-bromopentane is a halogenoalkane and bromobenzene is a halogenoarene.

State which is the most reactive compound.

[1 mark]

Question 3b

The average bond enthalpy of a C–Br bond is 276 kJ mol^{-1}. Suggest whether the bond enthalpy of the C–Br bond in bromobenzene is greater or less than the average bond enthalpy and state what this means about the strength of the C–Br bond in bromobenzene.

[1 mark]

Question 3c

2–bromopentane readily undergoes nucleophilic substitution with a hydroxide ion, OH^-, to form pentan-2–ol whereas bromobenzene requires extreme conditions to react when attacked by a nucleophile, such as OH^-.

Suggest what happens, under standard conditions, as a hydroxide ion approaches a molecule of bromobenzene.

[1 mark]