

## Halogenoalkanes - Questions by Topic

Q1.

Which compound is hydrolysed most rapidly?

(1)

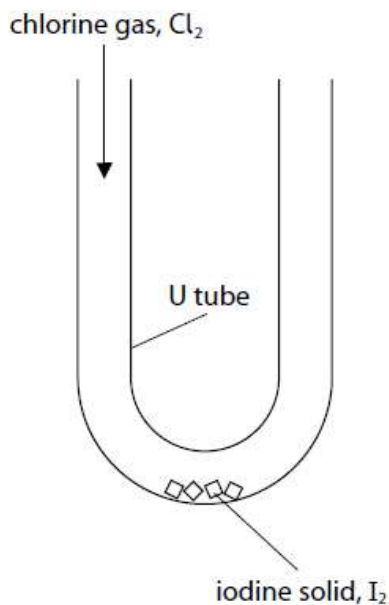
- A 1-chloropropane
- B 1-chlorobutane
- C 2-chloro-2-methylpropane
- D 2-chlorobutane

**(Total for question = 1 mark)**

Q2.

Iodine monochloride, ICl, is a covalent compound produced by the reaction of iodine with chlorine. Iodine monochloride is a dark brown liquid at room temperature.

The equipment shown can be used to pass chlorine over solid iodine to produce iodine monochloride.



When excess chlorine is passed through the U tube, the iodine monochloride reacts to produce iodine trichloride in an equilibrium reaction.

(a) Write a chemical equation for the reaction of iodine with chlorine to produce iodine monochloride. Include state symbols.

(2)

(b) The iodine monochloride molecule has a permanent dipole. Complete the following table using the electronegativity data from your Data Booklet and hence show the dipole on the diagram of the iodine monochloride molecule.

(1)

Element	Electronegativity
Cl	
I	



(c) Iodine monochloride reacts with propene to form two isomeric products. This is an addition reaction that is similar to the reaction of propene with hydrogen halides.

(i) Draw the skeletal formulae of both isomers.

(2)

(ii) Explain which of these isomers is the major product.

(3)

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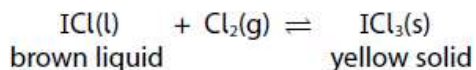
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(d) The equation for the reaction between iodine monochloride and chlorine is:



(i) State and justify **one** precaution that must be taken when preparing iodine trichloride.

(2)

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(ii) Give the oxidation number of iodine in both iodine-containing compounds in the equilibrium.

(1)

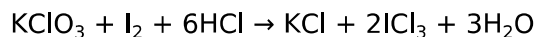
I in ICl

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I in ICl<sub>3</sub>

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(iii) Iodine trichloride can also be made by reacting potassium chlorate(V) with iodine in hydrochloric acid. The equation for the reaction is



By considering oxidation numbers for chlorine, explain whether or not this reaction is a disproportionation.

(2)

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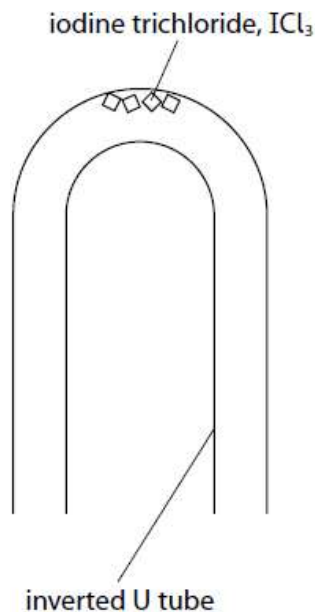
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(e) Chlorine gas has a molar volume of 24 000 cm<sup>3</sup> mol<sup>-1</sup> under the conditions used in this reaction.

(i) Show that the density of chlorine gas is approximately 3 g dm<sup>-3</sup>.

(2)

(ii) Air has an average density of  $1.25 \text{ g dm}^{-3}$ . If the U-tube used in part (d) is inverted, as shown in the diagram, the solid yellow iodine trichloride produced in the equilibrium reaction turns to a brown liquid.



Explain this observation.

(3)

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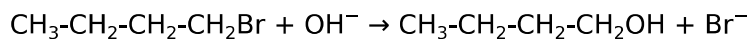
(f) A mass of 0.64 g of iodine reacted with fluorine to form 1.31 g of a fluoride of iodine. Calculate the empirical formula of this compound of iodine and fluorine.

(2)

**(Total for question = 20 marks)**

Q3.

1-bromobutane reacts with alkali:



The mechanism and type of reaction is:

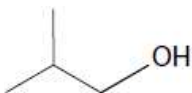
(1)

- A** electrophilic addition
- B** electrophilic substitution
- C** nucleophilic addition
- D** nucleophilic substitution

**(Total for question = 1 mark)**

Q4.

2-methylpropan-1-ol has the skeletal formula:



(a) 2-methylpropan-1-ol can be converted to 1-bromo-2-methylpropane.

Give the reagents and conditions used for this reaction.

(2)

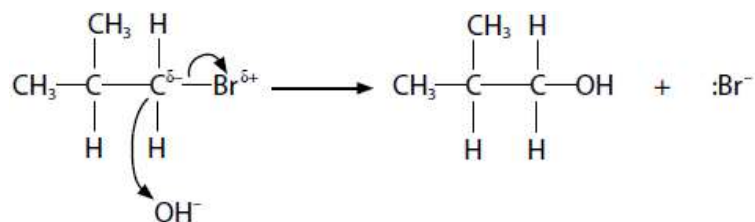
Reagents

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Conditions

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(b) 1-bromo-2-methylpropane can be converted back to 2-methylpropan-1-ol by heating with aqueous alkali. A student suggested the following mechanism for the reaction.



Identify and correct the three mistakes in the mechanism shown.

(3)

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(c) 1-bromo-2-methylpropane can be converted to 2-methylpropene.

Give the reagents and conditions used for this reaction.

(2)

Reagents

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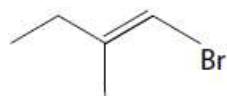
Conditions

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**(Total for question = 7 marks)**

Q5.

Give the systematic name for the following molecule.



(1)

- A** E-1-bromo-2-methylbut-2-ene
- B** E-2-methyl-1-bromobut-1-ene
- C** E-1-bromo-3-methylpent-2-ene
- D** E-1-bromo-2-methylbut-1-ene

**(Total for question = 1 mark)**