



Name _____ Class: _____

Start Time _____ End Time _____ Time Taken _____

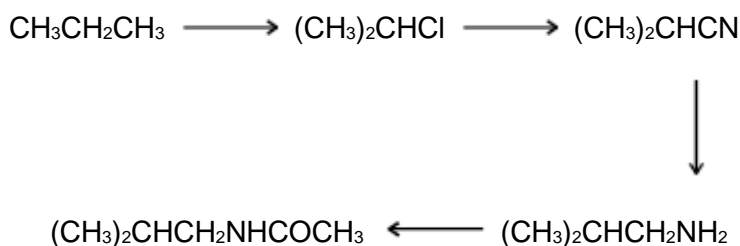
Time allowed: 30 minutes**INSTRUCTIONS TO CANDIDATES**

- This document is designed to be used as a practice test.
- Complete the test under exam conditions in one sitting.
- Optional: Before marking it, go through the paper with a set of notes and improve your answers.
- Mark the test using the mark scheme make corrections on the paper.
- Complete the table on the front page.
- Improve your notes so that they better reflect your weaknesses.
- Make a note of your strengths and weaknesses for future revision.

Success Criteria	Questions in Paper	Mark	Out of	%	Rank Order
Synthesis	1		1		
Elimination - Mechanism	2a, 4d		4, 4		
Nucleophilic Substitution – theory	2b, 4a		1, 1		
Nucleophilic Substitution – ammonia	2c, 4c		3, 1		
Reactivity of halogenoalkanes	3		1		
Nucleophilic Substitution – Mechanism	4b		2		
CFCs	5a, 5b, 5d		3, 2, 1		
Le Chatelier's Principle	5c		3		
Total			27		

**Q1.**

Which one of the following types of reaction mechanism is **not** involved in the above sequence?



- A free-radical substitution
- B nucleophilic substitution
- C elimination
- D nucleophilic addition-elimination

(Total 1 mark)

Q2.

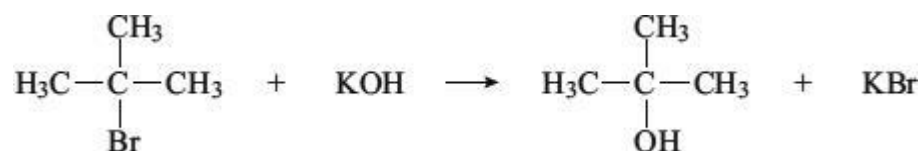
- (a) Name and outline a mechanism for the reaction of 2-bromo-2-methylpropane with ethanolic potassium hydroxide to form the alkene 2-methylpropene, $(\text{CH}_3)_2\text{C}=\text{CH}_2$

Name of mechanism _____

Mechanism

(4)

- (b) When 2-bromo-2-methylpropane reacts with aqueous potassium hydroxide, 2-methylpropan-2-ol is formed as shown by the following equation.



State the role of the hydroxide ions in this reaction.

(1)



- (c) Write an equation for the reaction that occurs when $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{Br}$ reacts with an excess of ammonia. Name the organic product of this reaction.

Equation _____

Name of product _____

(3)

(Total 8 marks)

Q3.

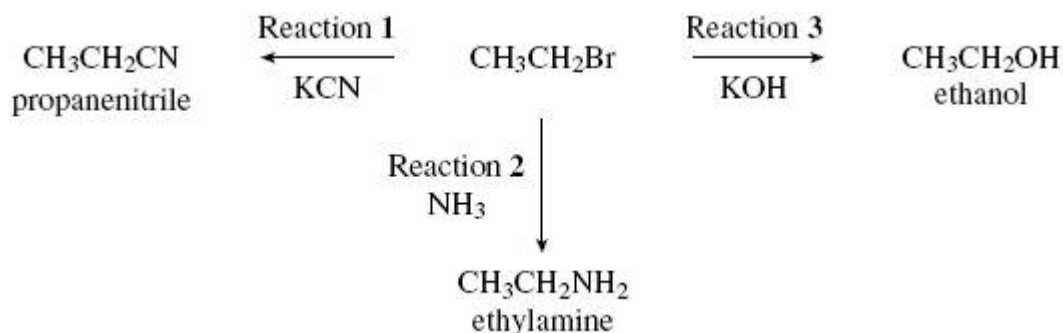
Which one of the following statements explains best why fluoroalkanes are the least reactive haloalkanes?

- A Fluorine is much more electronegative than carbon.
- B The F^- ion is the most stable halide ion.
- C The C–F bond is the most polar carbon–halogen bond.
- D The C–F bond is the strongest carbon–halogen bond.

(Total 1 mark)

Q4.

Nucleophiles react with bromoethane in substitution reactions. This type of reaction is illustrated in the following scheme.



- (a) State what is meant by the term *nucleophile*.

(1)



- (b) Outline a mechanism for the reaction of potassium cyanide with bromoethane (Reaction 1).

(2)

- (c) Explain why an excess of ammonia is needed in Reaction 2 to produce a high yield of ethylamine.

(1)

- (d) When potassium hydroxide reacts with bromoethane, ethene can also be formed. Name and outline a mechanism for this reaction.

Name of mechanism _____

Mechanism

(4)

(Total 8 marks)

**Q5.**

Oxygen and ozone (O₃) both occur as gases in the upper atmosphere.

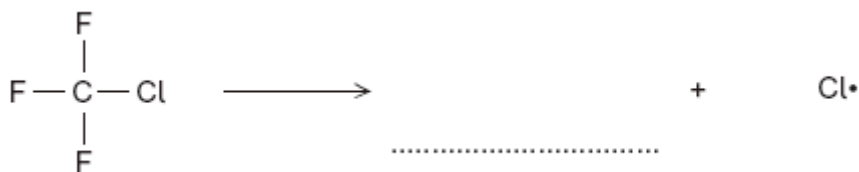
Chlorine atoms catalyse the decomposition of ozone and contribute to the formation of a hole in the ozone layer.

These chlorine atoms are formed from chlorofluorocarbons (CFCs) such as CF₃Cl

- (a) (i) Give the IUPAC name of CF₃Cl

(1)

- (ii) Complete the following equation that shows the formation of a chlorine atom from a molecule of CF₃Cl



(1)

- (iii) State what the • represents in Cl•

(1)

- (b) Write two equations that show how chlorine atoms catalyse the decomposition of ozone into oxygen.

Equation 1 _____

Equation 2 _____

(2)



- (c) An equilibrium is established between oxygen and ozone molecules as shown below.



- (i) State Le Chatelier's principle.

(1)

- (ii) Use Le Chatelier's principle to explain how an increase in temperature causes an increase in the equilibrium yield of ozone.

(2)

- (d) Chemists supported the legislation to ban the use of CFCs. Modern refrigerators use pentane rather than CFCs as refrigerants. With reference to its formula, state why pentane is a more environmentally acceptable refrigerant.

(1)

(Total 9 marks)