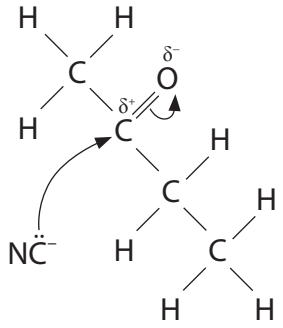
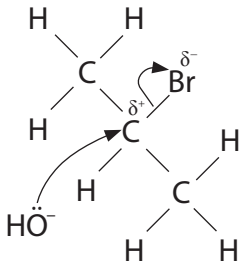
1 The first steps of two **different** reaction mechanisms are shown.

First
Reaction Mechanism



Second
Reaction Mechanism



(a) What do **both** reaction mechanism steps have in common?

(1)

☒ **A** They involve addition.

☒ **B** They involve substitution.

☒ **C** As one bond is made, one bond is broken.

☒ **D** The attack is on a planar group.

(b) Only **one** of the first steps above

(1)

☒ **A** leads to the formation of a racemic mixture.

☒ **B** involves initial attack by a nucleophile.

☒ **C** involves initial attack by an electrophile.

☒ **D** leads to an elimination.

(Total for Question = 2 marks)

2 The reaction of ammonia with propanoyl chloride, C_2H_5COCl, forms

☒ **A** $C_2H_5NH_2$

☒ **B** $C_2H_5CONH_2$

☒ **C** $C_2H_5CH(OH)NH_2$

☒ **D** $C_2H_5CONHC_2H_5$

(Total for Question = 1 mark)

3 The reaction of 1-chloropropane with water containing dissolved silver nitrate in the presence of ethanol is

☒ **A** a redox reaction.

☒ **B** a nucleophilic substitution.

☒ **C** an electrophilic substitution.

☒ **D** a free radical substitution.

(Total for Question = 1 mark)

4 The compound with formula $CH_3CH(NH_2)CH_3$ can be made by reacting alcoholic ammonia with

☒ **A** propane.

☒ **B** propene.

☒ **C** 2-chloropropane.

☒ **D** propan-2-ol.

(Total for Question = 1 mark)

5

$$C_2H_5Br + NaOH \rightarrow C_2H_4 + NaBr + H_2O$$

This reaction is an example of

☒ **A** addition.

☒ **B** elimination.

☒ **C** hydrolysis.

☒ **D** oxidation.

(Total for Question = 1 mark)

6 Nucleophiles are

☒ **A** electron pair donors that attack regions of high electron density.

☒ **B** electron pair donors that attack regions of low electron density.

☒ **C** electron pair acceptors that attack regions of high electron density.

☒ **D** electron pair acceptors that attack regions of low electron density.

(Total for Question 1 mark)

7 When iodomethane, CH_3I, is heated in a sealed tube with an excess of alcoholic ammonia, which of the following **cannot** be formed?

☒ **A** Methylamine, CH_3NH_2

☒ **B** Ethylamine, $CH_3CH_2NH_2$

☒ **C** Dimethylamine, $(CH_3)_2NH$

☒ **D** Ammonium iodide, NH_4I

(Total for Question 1 mark)

8 Which of the following is essential if a species is to act as a nucleophile?

☒ **A** A lone pair of electrons.

☒ **B** A negative charge.

☒ **C** An unpaired electron.

☒ **D** A strongly polar bond.

(Total for Question = 1 mark)

9 Which of these compounds is a secondary halogenoalkane?

☒ **A** $CH_3CH(OH)CH_3$

☒ **B** $CH_3CCl(CH_3)CH_3$

☒ **C** $CH_3CHClCH_3$

☒ **D** $CH_3CH_2CH_2Cl$

(Total for Question = 1 mark)

10 The reaction of the halogenoalkane, C_2H_5Cl, with alcoholic ammonia is

☒ **A** nucleophilic substitution.

☒ **B** electrophilic substitution.

☒ **C** reduction.

☒ **D** elimination.

(Total for Question = 1 mark)

11 The formation of a carbocation from a halogenoalkane is an example of

☒ **A** homolytic fission.

☒ **B** heterolytic fission.

☒ **C** an initiation reaction.

☒ **D** a propagation reaction.

(Total for Question = 1 mark)

12 When a chloroalkane is heated with aqueous sodium hydroxide

☒ **A** no reaction occurs with primary, secondary or tertiary chloroalkanes.

☒ **B** a reaction occurs with primary and secondary chloroalkanes but not with tertiary chloroalkanes.

☒ **C** a reaction occurs with tertiary chloroalkanes but not with primary and secondary chloroalkanes.

☒ **D** a reaction occurs with primary, secondary and tertiary chloroalkanes.

(Total for Question 1 mark)

13 Consider the following organic liquids:

A ethanal

B ethanol

C tetrachloromethane

D trichloromethane

(a) Each liquid is run from a burette. Which liquid would **not** be deflected significantly by a charged rod?

(1)

☒ **A**

☒ **B**

☒ **C**

☒ **D**

(b) Which liquid would react with phosphorus(V) chloride to give a gas which fumes in moist air?

(1)

☒ **A**

☒ **B**

☒ **C**

☒ **D**

(c) Which liquid would you expect to have the peak at the greatest mass/charge ratio in its mass spectrum?

(1)

☒ **A**

☒ **B**

☒ **C**

☒ **D**

(d) Which liquid has an infrared spectrum with a broad absorption due to hydrogen bonding?

(1)

☒ **A**

☒ **B**

☒ **C**

☒ **D**

(Total for Question 4 marks)