Nitriles Practice Test

Mr Cole Chemistry

Name ..... Class: .....

Start Time ..... End Time ..... Time Taken .....

Time allowed: 25 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**
Formation of hydroxynitrile – practicalities	1a		2		
Formation of hydroxynitrile – mechanism	1b, 2a		5		
Nucleophilic Substitution	3d		4		
Formation of hydroxynitrile - enantiomers	2b		5		
Polymerisation	2d, 3a, 3b, 3c		5		
Elimination	2c		2		
Total			**23**		

Q1.

This question is about ketones.

(a) Propanone (CH_3COCH_3) reacts with the weak acid HCN to form a hydroxynitrile.

This hydroxynitrile is usually made by reaction of propanone with KCN followed by dilute acid, instead of with HCN

State the hazard associated with the use of KCN

Suggest a reason, other than safety, why KCN is used instead of HCN.

Hazard _____

Why KCN is used _____

_____

(2)

(b) Outline the mechanism for the reaction of propanone with KCN followed by dilute acid.

(4)
(Total 6 marks)

Q2.

Ethanal reacts with potassium cyanide, followed by dilute acid, to form 2-hydroxypropanenitrile.

(a) Name the mechanism for the reaction between potassium cyanide and ethanal.

_____

(1)

(b) The 2-hydroxypropanenitrile formed by the reaction in part **(a)** is a mixture of equal amounts of two isomers.

State the name of this type of mixture.

Explain how the structure of ethanal leads to the formation of two isomers.

Draw 3D representations of the two isomers to show the relationship between them.

Name _____

Explanation _____

_____

_____

_____

3D representations

(5)

(c) 2-Hydroxypropanenitrile can be used in the synthesis of the monomer, acrylonitrile, CH_2=CHCN

Suggest a suitable reagent and conditions for the conversion of 2-hydroxypropanenitrile into acrylonitrile.

Reagent _____

Conditions _____

(2)

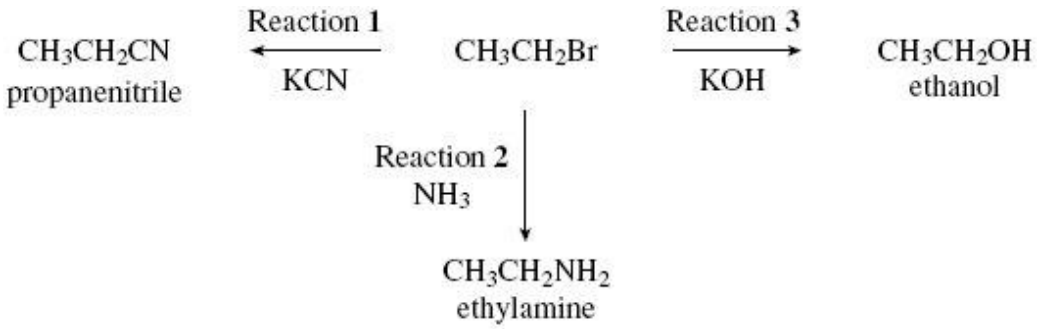
(d) Draw a section of the polymer polyacrylonitrile, showing three repeating units.

(1)

(Total 9 marks)

Q3.

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)