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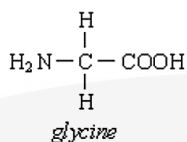
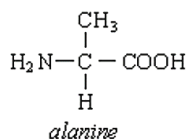
INORGANIC CHEMISTRY II

Level & Board	AQA (A-LEVEL)
TOPIC:	OPTICAL ISOMERISM
PAPER TYPE:	QUESTION PAPER - 4
TOTAL QUESTIONS	10
TOTAL MARKS	49

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Optical Isomerism - 4

1. The structures of the amino acids alanine and glycine are shown below.



(a) Give the systematic name for alanine.

(1)

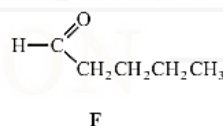
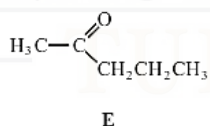
(b) Alanine exists as a pair of stereoisomers. Explain the meaning of the term stereoisomers.

(2)

(c) State how you could distinguish between the stereoisomers.

(2)

2. Consider the following pair of isomers



(a) Name compound E.

(1)

(b) Identify a reagent which could be used in a test-tube reaction to distinguish between E and F.

In each case, state what you would observe.

(3)

3. Alcohol X has the structure $(\text{CH}_3)_2\text{C}(\text{OH})\text{CH}(\text{CH}_3)_2$.

Write an equation for the reaction between alcohol X and ethanoyl chloride.

Name and outline a mechanism for this reaction, using ROH to represent the alcohol in the mechanism.

(4)

4. Butanone reacts with reagent S to form compound T which exists as a racemic mixture.

Dehydration of T forms U, $\text{C}_5\text{H}_7\text{N}$, which can represent a pair of geometrical isomers.

(a) State the meaning of the term racemic mixture and suggest why such a mixture is formed in this reaction.

(3)

(b) Identify reagent S, and draw a structural formula for each of T and U.

(3)

5. But-1-ene and other products can be made by the dehydration of butan-2-ol.

(a) Outline a mechanism for the dehydration of butan-2-ol into but-1-ene.



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(3)

(b) Explain why but-1-ene does not show geometrical isomerism.

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(2)

(c) An alternative dehydration of butan-2-ol produces geometrical isomers.

Draw the structure of one of these geometrical isomers and give its full name.

(2)

6. In a mixture of the three gases at equilibrium, the partial pressure of carbon monoxide was 7550 kPa, the partial pressure of hydrogen was 12300 kPa and the partial pressure of methanol was 2710 kPa.

(a) Write an expression for the equilibrium constant, K_p , for this reaction.

(2)

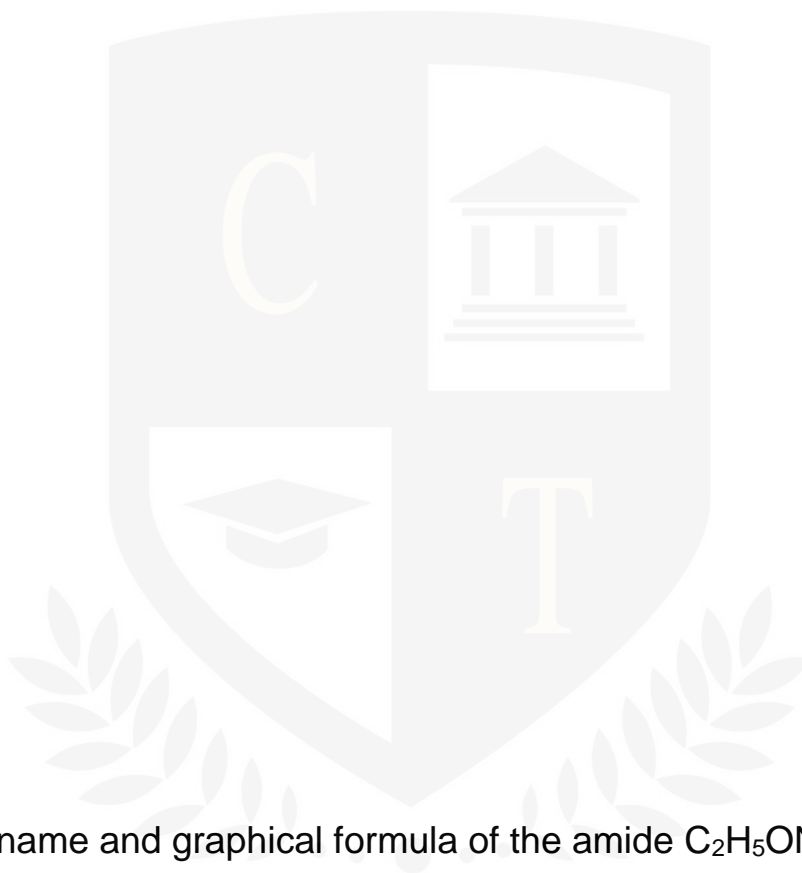
(b) Calculate the value of the equilibrium constant, K_p , for the reaction under these conditions and state its units.

(2)

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7. Using HCN and a suitable carbonyl compound with molecular formula C_3H_6O , outline a mechanism for an addition reaction in which two isomers are produced.

Give the structures of the two isomers formed and state the type of isomerism shown.



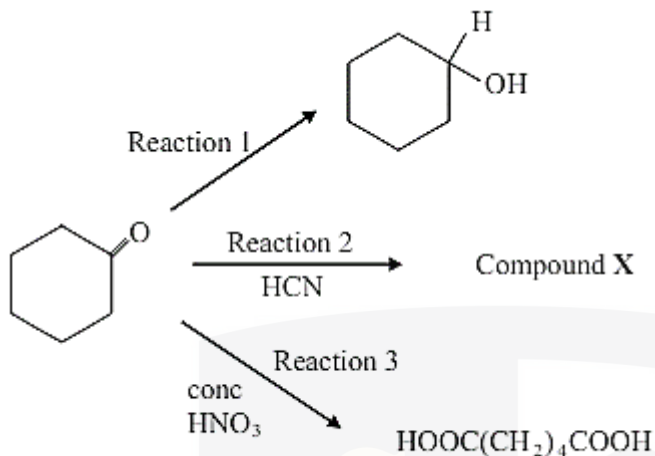
(6)

8. Give the name and graphical formula of the amide C_2H_5ON .

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(2)

9. Consider the following three reactions of cyclohexanone, $C_6H_{10}O$.



(a) Give a suitable reagent for Reaction 1.

(1)

(b) Name the type of reaction and outline a mechanism for Reaction 2.

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(4)

(c) Name the organic product of Reaction 3.

(1)

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(d) Calculate the maximum mass of this organic product that could be formed if 2.40 g of cyclohexanone were allowed to react in Reaction 3.

(4)

10. Which one of the following reaction mixtures would give a product capable of exhibiting optical isomerism?

- A.** $\text{CH}_3\text{CH}=\text{CH}_2 + \text{HBr}$
- B.** $\text{CH}_3\text{CH}_2\text{CH}_2\text{Br} + \text{NaOH}$
- C.** $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH} + \text{H}_2\text{SO}_4$
- D.** $\text{CH}_3\text{CH}_2\text{CHO} + \text{HCN}$

(1)

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