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# CHEMISTRY

## INORGANIC CHEMISTRY II

Level & Board	AQA (A-LEVEL)
TOPIC:	OPTICAL ISOMERISM
PAPER TYPE:	QUESTION PAPER - 3
TOTAL QUESTIONS	10
TOTAL MARKS	45

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## Optical Isomerism - 3

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

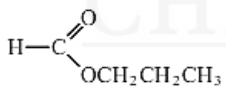
(a) Name alcohol X.

(1)

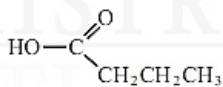
(b) Name and outline the mechanism for the reaction occurring when alcohol X is converted into 2,3-dimethylbut-2-ene in the presence of a strong acid.

(3)

2. Consider the following pair of isomers



C



D

(a) Name compound C.

(1)

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**(b)** Identify a reagent which could be used in a test-tube reaction to distinguish between C and D. In each case, state what you would observe.

**(3)**

**3.** This question is about butan-2-ol.

**(a)** Write an equation for the reaction of butan-2-ol with ethanoic acid, showing clearly the structure of the organic product.

**(2)**

**(b)** Name the type of organic compound formed and suggest a use for this compound.

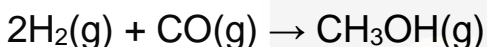
**(2)**

**(c)** Give a homogeneous catalyst for the reaction and state the meaning of the term homogeneous.

**(2)**

4. Hydrogen and carbon monoxide were mixed in a 2:1 mole ratio.

The mixture was allowed to reach equilibrium according to the following equation at a fixed temperature and a total pressure of  $1.75 \times 10^4$  kPa.



The equilibrium mixture contained 0.430 mol of carbon monoxide and 0.0850 mol of methanol.

- (a)** Calculate the number of moles of hydrogen present in the equilibrium mixture.

**(2)**

- (b)** Calculate the mole fraction of hydrogen in the equilibrium mixture.

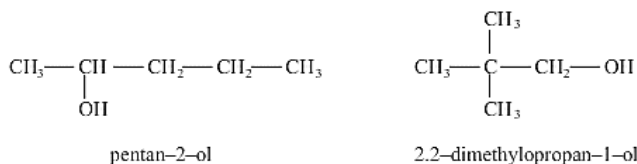
**(2)**

- (c)** Calculate the partial pressure of hydrogen in the equilibrium mixture.

**(3)**

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5. The structures of two alcohols of formula  $C_5H_{11}OH$  are shown below.



- (a) A third alcohol of formula  $C_5H_{11}OH$  is tertiary.

Draw the graphical formula and give the name of this alcohol.

(2)

- (b) Draw the graphical formulae of two alkenes formed when pentan-2-ol is heated with concentrated sulphuric acid.

(2)

- (c) State the type of reaction taking place.

(1)

- (d) Explain why the type of reaction taking place does not occur when 2,2-dimethylpropan-1-ol is heated with concentrated sulphuric acid.

(1)

6. Two isomeric esters E and F formed from methanol have the molecular formula  $C_6H_{12}O_2$ . Isomer E has only 2 singlet peaks in its proton n.m.r. spectrum.

Isomer F is optically active.

Draw the structures of these two isomers.

(2)

7. Choose an alkene with molecular formula  $C_4H_8$  which reacts with HBr to form two structural isomers.

Give the structures of these two isomers and name the type of structural isomerism shown.

Outline a mechanism for the formation of the major product.

(6)

8. Explain why ethanoyl chloride reacts readily with nucleophiles.

Write an equation for one nucleophilic addition–elimination reaction of ethanoyl chloride.

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(4)

9. Give the name and graphical formula of  $C_4H_8O_2$ .

(2)

10. Compound X is converted into compound Y by the reactions outlined below



(a) Give the name of compound X.

(1)

(b) State the type of reaction taking place in Step 1.

(1)

(c) Write an equation for the reaction taking place in Step 3.

(2)

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