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# CHEMISTRY

## ORGANIC CHEMISTRY II

Level & Board	AQA (A-LEVEL)
TOPIC:	ORGANIC SYNTHESIS
PAPER TYPE:	QUESTION PAPER - 3
TOTAL QUESTIONS	10
TOTAL MARKS	/29

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## Organic Synthesis - 3

1. What is the main oxidising agent used in organic chemistry?

(2)

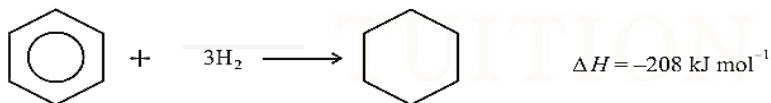
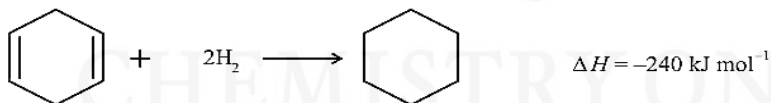
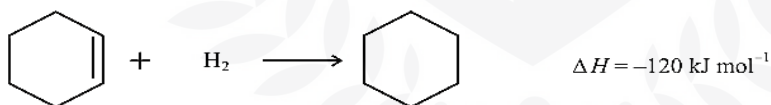
2. When hydrogen cyanide, HCN, is added to ethanal, CH<sub>3</sub>CHO, the resulting solution has no effect on the plane of polarisation of plane polarised light.

This is because

- A. ethanal is not chiral
- B. the product is not chiral
- C. the intermediate is planar
- D. the product is a racemic mixture

(1)

3. Equations for the hydrogenation of three compounds are given below, together with the corresponding enthalpy changes.



Explain, in terms of the bonding in benzene, why the enthalpy change of hydrogenation of benzene is not  $-360 \text{ kJ mol}^{-1}$ .

(3)

4. The rate equation for the reaction between aqueous sodium hydroxide and 2-chloro-2-methylpropane is

$$\text{Rate} = k[\text{2-chloro-2-methylpropane}]$$

The first step in the mechanism of this substitution reaction is

- A. nucleophilic attack by  $\text{OH}^-$  ions on the carbon atom in the C–Cl bond
- B. electrophilic attack by  $\text{OH}^-$  ions on the carbon atom in the C–Cl bond
- C. the breaking of the C–Cl bond to form a carbocation
- D. the simultaneous making of a O–C bond as the C–Cl bond breaks

(1)

5. What are the two main dehydrating agents used?

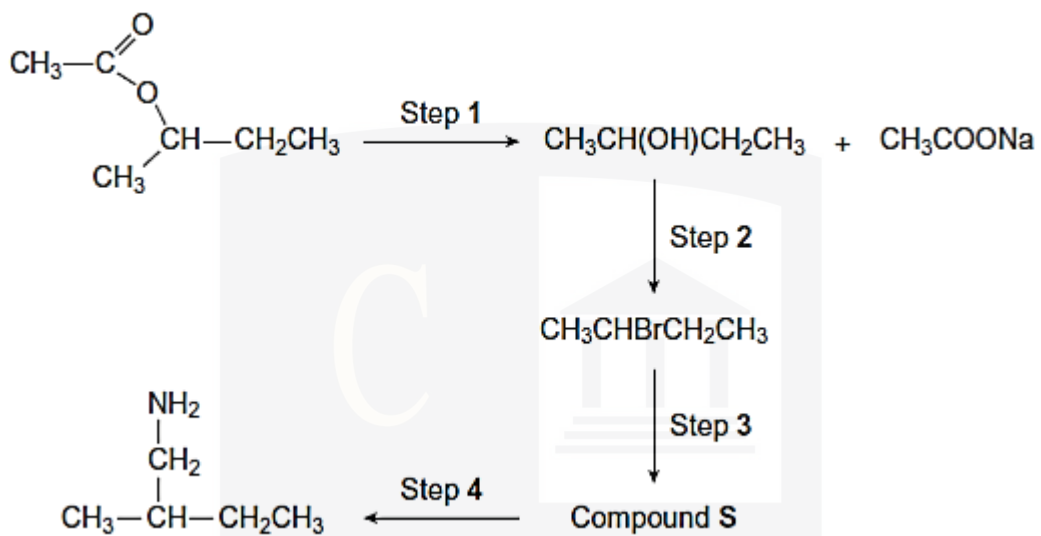
(2)

6. The optical isomers of alanine,  $\text{CH}_3\text{CH}(\text{COOH})\text{NH}_2$

- A. have different melting points
- B. rotate the plane of plane polarised light in opposite directions
- C. react at different rates with ethanoyl chloride,  $\text{CH}_3\text{COCl}$
- D. both occur naturally in protein molecules

(1)

7. A four-step synthesis of compound T is shown.



(a) Give the reagent and conditions for Step 1.

State how you could obtain a sample of the alcohol from the reaction mixture formed in Step 1.

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(3)

(b) Draw the structure of compound S.

For each of Steps 3 and 4, give a reagent and one condition, other than heat.

(5)

8. Benzene,  $C_6H_6$ , reacts with bromoethane,  $CH_3CH_2Br$ , in the presence of a catalyst, to form ethylbenzene,  $C_6H_5CH_2CH_3$ , and hydrogen bromide.

(a) Give the formula of a catalyst for this reaction.

(1)

(b) Give the mechanism for the reaction between benzene and bromoethane, including the formation of the species that reacts with the benzene molecule.

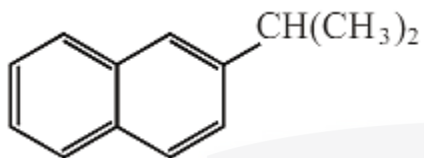
(4)

(c) Name the type of mechanism involved in this reaction.

(1)

9. The Friedel-Crafts reaction enables an alkyl group to be attached to an arene ring.

(a) Suggest the reagent and catalyst you would need to make



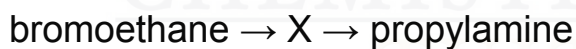
from naphthalene.

(2)

(b) Name the type of reaction and its mechanism.

(2)

10. A two-step preparation of propylamine is shown.



What is X?

- A.  $\text{CH}_3\text{CH}_2\text{CH}_2\text{NH}_2$
- B.  $\text{CH}_3\text{CH}_2\text{CN}$
- C.  $\text{CH}_3\text{CH}_2\text{CH}_2\text{Br}$
- D.  $\text{CH}_3\text{CH}_2\text{NH}_2$

(1)

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