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— **TUITION** —

Phone: +442081445350

www.chemistryonlinetuition.com

Email: asherrana@chemistryonlinetuition.com

CHEMISTRY

ORGANIC CHEMISTRY II

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

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Organic Synthesis - 3

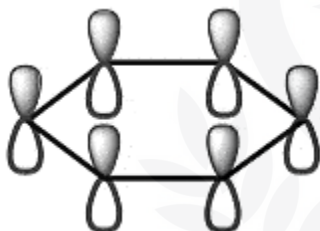
1. Acidified potassium dichromate (VI), $K_2Cr_2O_7 / H_2SO_4$ (2)

2. D (1)

3. The enthalpy change of hydrogenation of benzene is not -360 kJ mol^{-1} due to the following reasons:

Delocalisation / π -system:

Benzene has a delocalized π -electron system due to the overlap of six p-orbitals around the ring.



Stability:

This delocalization gives extra stability to benzene, making it more stable and at a lower energy level compared to a structure with three separate π /double bonds (like cyclohexatriene, the Kekule structure).

So, more energy is needed to break the bonds in benzene, resulting in a less exothermic hydrogenation reaction.

(3)

4. C (1)

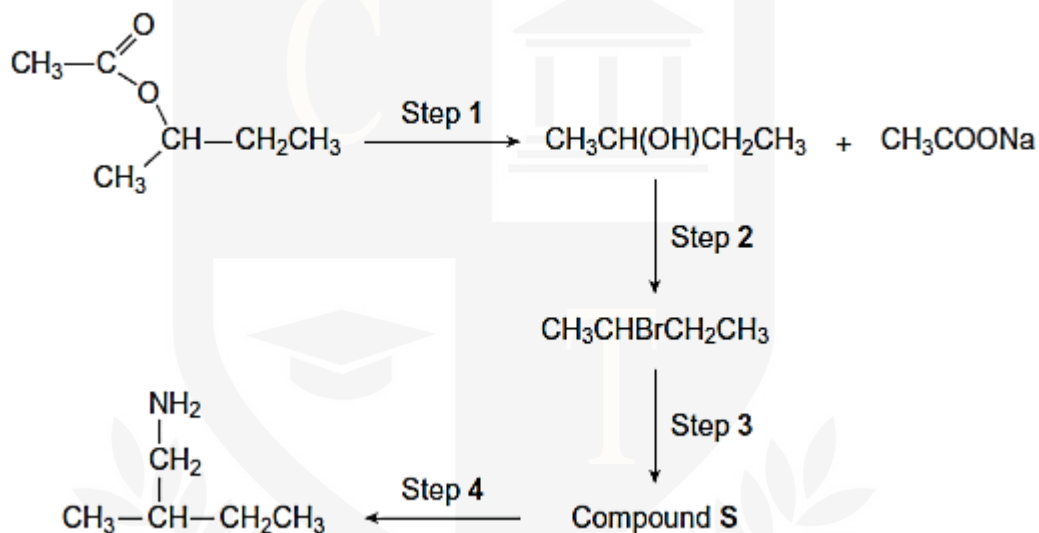
5. Al_2O_3 (vapours passed over it)
Acid-catalysed elimination by H_3PO_4

(2)

6. B

(1)

7. (a)



Reagent and Conditions:

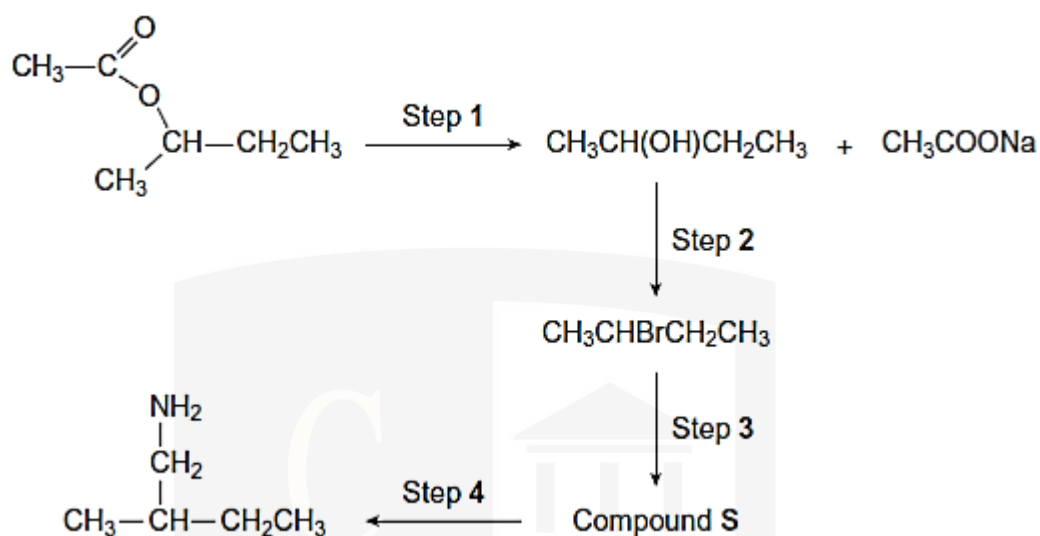
Reagent:
Sodium hydroxide ($NaOH$)

Conditions:
Aqueous (warm)

Method:
Fractional distillation to separate the reaction mixture.

(3)

(b)



Structure of Compound S:

Compound S is 3-pentanenitrile ($\text{CH}_3\text{CH}(\text{CN})\text{CH}_2\text{CH}_3$).

Reagent and Condition for Step 3:

Reagent:
Potassium cyanide (KCN)

Condition:
Alcoholic (or ethanolic)

Reagent and Condition for Step 4:

Reagent:
Hydrogen (H_2) or Lithium aluminium hydride (LiAlH_4) or Sodium (Na)

Condition:
Nickel (Ni) or Platinum (Pt) or Palladium (Pd) catalyst, or ether (ethoxyethane) for LiAlH_4 , or ethanol for Na

8.

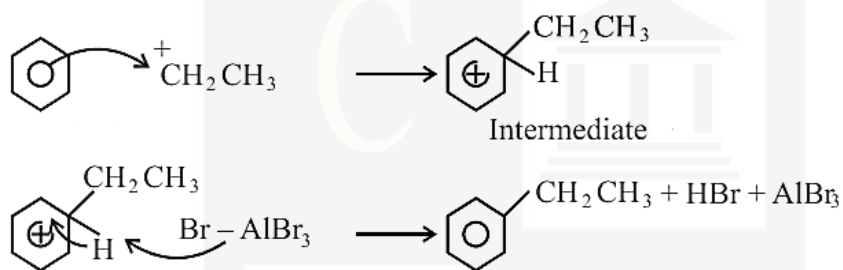
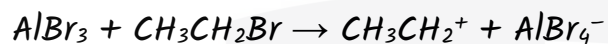
(a)

Formula of a catalyst for the reaction: $AlBr_3 / FeBr_3 / AlCl_3$

(1)

(b)

Species that reacts with benzene molecule:



(4)

(c)

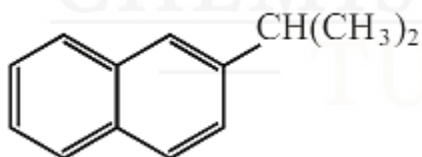
Name of the type of mechanism:

Electrophilic substitution

(1)

9.

(a)



from naphthalene.

Reagent:

2-chloropropane (also known as isopropyl chloride, $ClCH(CH_3)_2$)

1-chloropropane ($ClCH_2CH_2CH_3$)

Catalyst:

Aluminum chloride (AlCl_3)

Iron(III) chloride (FeCl_3)

So,

Reagent:

2-chloropropane ($\text{ClCH}(\text{CH}_3)_2$)

Catalyst:

Aluminum chloride (AlCl_3)

(2)

(b)

Name of the type of reaction and its mechanism:

Electrophilic substitution

(2)

10. B

(1)

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DR. ASHAR RANA



- Founder & CEO of Chemistry Online Tuition Ltd.
- Tutoring students in UK and worldwide since 2008
- Chemistry, Physics, and Math's Tutor

CONTACT INFORMATION FOR CHEMISTRY ONLINE TUITION

- UK Contact: 02081445350
- International Phone/WhatsApp: 00442081445350
- Website: www.chemistryonlinetuition.com
- Email: asherrana@chemistryonlinetuition.com
- Address: 210-Old Brompton Road, London SW5 OBS, UK