CHEMISTRY ONLINE
TUITION

Phone: +442081445350

www.chemistryonlinetuition.com

Email:asherrana@chemistryonlinetuition.com

CHEMISTRY

ORGANIC CHEMISTRY

Level & Board	AQA (A-LEVEL)
TOPIC:	ORGANIC ANALYSIS
PAPER TYPE:	QUESTION PAPER - 3
TOTAL QUESTIONS	10
TOTAL MARKS	55

Organic Analysis - 3

1. A student carried out an investigation to compare the rates of hydrolysis of 1-iodopropane and 1-bromopropane.

The student heated hot aqueous sodium hydroxide with each halogenoalkane and found that 1-iodopropane was hydrolysed faster.

The equation for the reaction with 1-iodopropane is shown below.

$CH_3CH_2CH_2I + OH^- \rightarrow CH_3CH_2CH_2OH + I^-$

(a) Outline the mechanism for this hydrolysis of 1-iodopropane.
Show curly arrows and relevant dipoles.
State the name of this type of mechanism.

(4)

(b) Explain why 1-iodopropane is hydrolysed faster than 1-bromopropane.

(2)

2. Bromobutane, $CH_3CH_2CH_2CH_2Br$, can be reacted with hot aqueous sodium hydroxide to prepare butan-1-ol.

$CH_3CH_2CH_2CH_2Br + OH^- \rightarrow CH_3CH_2CH_2CH_2OH + Br^-$

The butan-1-ol produced can be analysed by mass spectrometry.

(a) Predict two fragment ions that you would expect to see in the mass spectrum of butan-1-ol and state the m/z value of each ion.

(3)

(b) State a use of mass spectrometry outside of the laboratory.

(2)

3. Compound X is an atmospheric pollutant emitted from fuel combustion of petrol and diesel vehicles.

Compound X is a potent human carcinogen.

- Analysis of compound X showed the following percentage composition by mass: C, 88.89%; H, 11.1%.
- Mass spectrometry showed a molecular ion peak at m/z = 54.
- Compound X reacts with H2 in the presence of a nickel catalyst in a 1 : 2 molar ratio.

Analyse and interpret this information to determine a possible structure for compound X.
Show all your working.

(5)

4. The following pairs of compounds can be distinguished by simple test−tube reactions.
For each pair of compounds, give a reagent (or combination of reagents) that, when added separately to each compound, could be used to distinguish between them.
State what is observed in each case.

(a) Butan−2−ol and 2−methylpropan−2−ol

(3)

(b) Propane and propene

(3)

I am Sorry !!!!

5. The following pairs of compounds can be distinguished by simple test−tube reactions.

For each pair of compounds, give a reagent (or combination of reagents) that, when added separately to each compound, could be used to distinguish between them.
State what is observed in each case.

(a) Aqueous silver nitrate and aqueous sodium nitrate

(3)

(b) Aqueous magnesium chloride and aqueous barium chloride

(3)

6. A sample of an alcohol was thought to be contaminated with an alkene. Give a reagent that could be used to confirm the presence of an alkene. State what you would observe.

I am Sorry !!!!!

(2)

7. The following pairs of compounds can be distinguished by simple test-tube reactions.
For each pair, give a suitable reagent that could be added separately to each compound to distinguish between them.
Describe what you would observe in each case.

(a) Cyclohexane and cyclohexene

(3)

(b) Butanal and butanone

(3)

8. Propanoic acid can be made from propan-1-ol by oxidation using acidified potassium dichromate(VI).
Propanal is formed as an intermediate during this oxidation.

(a) State the colour of the chromium species after the potassium dichromate(VI) has reacted.

(1)

(b) Describe the experimental conditions and the practical method used to ensure that the acid is obtained in a high yield.

Draw a diagram of the assembled apparatus you would use.

(4)

(c) Describe the different experimental conditions necessary to produce propanal in high yield rather than propanoic acid

(2)

9. Oleic acid can be obtained from vegetable oils.
Oleic acid is an example of an unsaturated compound.
$CH_3(CH_2)_7CH=CH(CH_2)_7COOH$ oleic acid

(a) Deduce the molecular formula and the empirical formula of oleic acid.

(2)

(b) State what is meant by the term unsaturated.

(1)

(c) Identify a reagent for a simple chemical test to show that oleic acid is unsaturated.

State what you would observe when oleic acid reacts with this.

(3)

10. Tollens' reagent is formed by the addition of aqueous ammonia to aqueous silver nitrate.

(a) Identify the silver-containing complex present in Tollens' reagent and state its shape.

(1)

(b) Draw the structure of methanoic acid.

By reference to this structure, suggest why a silver mirror is formed when this acid reacts with Tollens' reagent.

(2)

(c) Deduce the identity of a carbon-containing species formed when methanoic acid reacts with Tollens' reagent.

(3)

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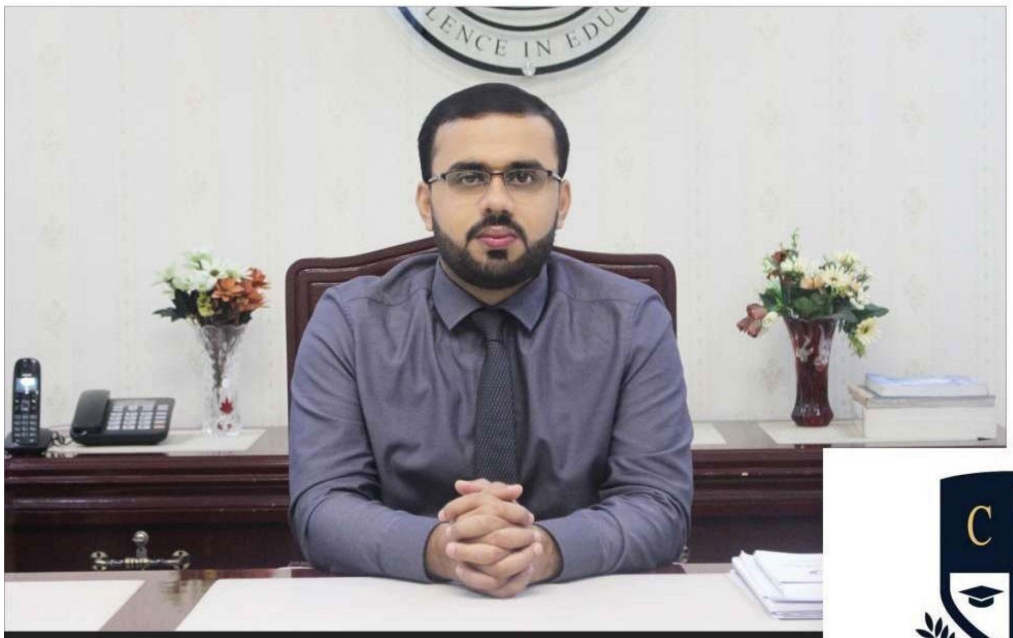

DR. ASHAR RANA

M.B.B.S / MS. CHEMISTRY

CHEMISTRY ONLINE TUITION

Phone: +442081445350
www.chemistryonlinetuition.com
Email: asherrana@chemistryonlinetuition.com

- Founder & CEO of Chemistry Online Tuition Ltd.
- Completed Medicine (M.B.B.S) in 2007
- Tutoring students in UK and worldwide since 2008
- CIE & EDEXCEL Examiner since 2015
- Chemistry, Physics, Math's and Biology 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