# Mark scheme

## Reactions of organic compounds

Chemistry 0620 · Questions from Paper 3, Paper 4 and Paper 6

Total marks

**103**

**MARKS FOR EACH QUESTION**

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 11 | 12 | 12 | 7 | 10 | 11 | 8 | 12 | 12 | **103** |

**Question 1** **[8]**

**1** **(a)** 3rd and 5th boxes ticked (sugar and water) (1 mark each) [2]

**(b)** (fractional) distillation [1]
**IGNORE**: fractionation

**(c)** O-H at right [1]
**ALLOW**: OH

**(d)** octanol [1]

**(e)** from ethene and steam [1]
**ALLOW**: from ethene and water
AND any two of: [2]
high temperature / heat / stated temperature between 150 and 1000 °C
catalyst / phosphoric acid
high pressure / stated pressure between 50-100 atm
**NOTE**: allow sulfuric acid (1) dilute with water (1) heat (1)

**[Total: 8]**

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## Question 2 [11]

| | | |
|---|---|---|
| 2(a)(i) | B | 1 |
| 2(a)(ii) | D | 1 |
| 2(a)(iii) | C | 1 |
| 2(a)(iv) | D | 1 |

| | | |
|---|---|---|
| 2(b) | • $C_2H_4$ / correct displayed formula (1)<br>• steam (1)<br>• 1 mark each for any two of:<br>– catalyst<br>– high temperature / heat<br>– high pressure | 4 |
| 2(c) | making chemicals: naphtha (1)<br><br>kerosene: jet <u>fuel</u> (1)<br><br>fuel oil: <u>fuel</u> for ships / <u>fuel</u> for (home) heating (1) | 3 |

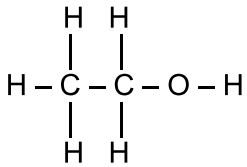
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**Question 3** **[12]**

**3** **(a)** **(i)** carbon dioxide [1]
allow $CO_2$

**(ii)** any one of: [1]
- room temperature OR temperature quoted from 20–40°C /
ignore low temperature / high temperature
- yeast / enzymes / zymase
ignore catalyst alone
ignore microbes / viruses / bacteria
- absence of oxygen / anaerobic
- pH 7 / pH near neutral

**(b)** **(i)** H – O – H [1]
not $H_2O$



[1]

allow – OH in place of – O – H
not $C_2H_5OH$

**(ii)** aqueous bromine / bromine water [1]
allow bromine / aqueous (acidified) potassium permanganate

turns colourless / decolourises [1]
ignore goes clear

**(c)** carbon dioxide [1]
water [1]

**(d)** homologous [1]
similar [1]
functional [1]

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## Question 4 [12]

| | | |
|---|---|---|
| **4**(a)(i) | circle around one or both COOH groups | **1** |
| **4**(a)(ii) | $C_5H_6O_4$ | **1** |
| **4**(a)(iii) | orange (1)<br>to colourless (1) | **2** |
| **4**(b) | (family / group of similar) **compounds** with similar chemical properties (1)<br>having the same functional group (1) | **2** |
| **4**(c) | magnesium ethanoate (1)<br>hydrogen (1) | **2** |
| **4**(d) | 88 (2)<br>If 2 marks not scored 1 mark for 32 (for O)<br>OR 8 (for H) | **2** |
| **4**(e) | ethene (1)<br>steam / water (1) | **2** |

## Question 5 [7]

**5** any 7 from: [7]

known mass or volume of fats/oil (1)

add organic solvent (1)

shake/stir (1)

add drops of bromine water (1)

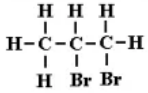
until orange colour seen (1)

read and record volume/number of drops (1)

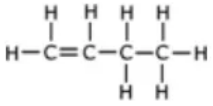
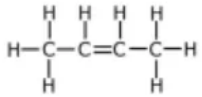
compare oils (1)

conclusion (1)

## Question 6 [10]

| | | |
|---|---|---|
| **6**(a) | hydrocarbon | **1** |
| **6**(b)(i) | (only) one product is formed | **1** |
| **6**(b)(ii) | <br>3 single bonded C atoms<br>entire molecule correct | **2** |
| **6**(b)(iii) | orange (1) to colourless (1) | **2** |

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| | | |
|---|---|---|
| 6(b)(iv | structure of but-1-ene<br><br>structure of but-2-ene<br> | 2 |
| 6(c) | $C_3H_8 + Cl_2 \rightarrow C_3H_7Cl + HCl$<br>$HCl$ as product<br>rest of equation | 2 |

**Question 7** **[11]**

7 **(a)** **(i)** same molecular formula / same number of C and H atoms [1]
different structural formula or structure [1]
same compound = [1]

**(ii)** correct **formula** of but-2-ene / methylpropene / methyl cyclopropane [1]

**(iii)** bromine / bromine water / aqueous bromine [1]
brown to colourless **not** clear [1]
stays brown [1]
brom**ide** loses the first mark only

**OR** alkaline potassium manganate(VII) [1]
from purple/pink to green/brown [1]
stays purple [1]

**OR** acidic potassium manganate(VII) [1]
from purple/pink to colourless **not** clear [1]
stays purple [1]

**(b)** heat / high temperature (temperature need not be stated, but if it is stated it must be 500ºC or above) [1]

catalyst (need not be named, but if they are named accept any metal oxide or zeolite / aluminosillicates / silicon dioxide) [1]
**not** nickel/platinum

**(c)** (1,2)dibromobutane [1]
if numbers given must be correct
butane [1]
butanol [1]
**accept** butan-1-ol or butan-2-ol **not** but-1-ol / but-1-anol / buthanol

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## Question 8 [8]

| | | |
|---|---|---|
| **8**(a) | correctly circled ester link (including 2 C atoms and 2 O atoms) | **1** |
| **8**(b) | ethyl butanoate | **1** |
| **8**(c) | $C_3H_6O$ | **1** |
| **8**(d)(i) | **M1** butanoic acid<br>**M2** ethanol | **2** |
| **8**(d)(ii) | acid | **1** |
| **8**(e) | 4 | **1** |
| **8**(f) | $2C_5H_{10}O_2 + 13O_2 \rightarrow 10CO_2 + 10H_2O$ | **1** |

## Question 9 [12]

| | | |
|---|---|---|
| **9**(a)(i) | ultraviolet light | **1** |
| **9**(a)(ii) | $CH_4 + Cl_2 \rightarrow CH_3Cl + HCl$ | **1** |
| **9**(a)(iii) | substitution | **1** |
| **9**(a)(iv) | $NaCl$ | **1** |
| **9**(b) | all bonding pairs correct (1)<br>H atoms have 2 electrons and C and O atoms have 8 electrons (1) | **2** |
| **9**(c)(i) | methyl propanoate | **1** |
| **9**(c)(ii) | water | **1** |
| **9**(c)(iii) | molecular formula = $C_4H_8O_2$ (1)<br>correct ester link showing all atoms and all bonds (1)<br>rest of molecule (1) | **3** |
| **9**(c)(iv) | (acid) catalyst | **1** |

## Question 10 [12]

| | | |
|---|---|---|
| **10**(a) | $C_nH_{2n+1}OH$ (1) | **1** |
| **10**(b) | not all atoms are C or H | **1** |
| **10**(c)(i) | $C_2H_4$ | **1** |
| **10**(c)(ii) | glucose | **1** |
| **10**(d) | $C_2H_5OH + 3O_2 \rightarrow 3H_2O + 2CO_2$<br>species (1) correct equation (1) | **2** |
| **10**(e)(i) | $C_3H_5O_2$ | **1** |
| **10**(e)(ii) | any one ester link (1)<br>rest of molecule (1) | **2** |
| **10**(e)(iii) | water | **1** |
| **10**(f)(i) | carboxylic acid | **1** |
| **10**(f)(ii) | structure of ethanedioic acid | **1** |

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