Past-paper walk-through

Alcohols ▪ 11.6

eXercise

Questions in this set

- 0620/21 N25 Q33 ▪ 1 mark
- 0620/22 N25 Q37 ▪ 1 mark
- 0620/41 N25 Q5 ▪ 20 marks
- 0620/21 J25 Q17 ▪ 1 mark
- 0620/21 J25 Q35 ▪ 1 mark
- 0620/22 J25 Q32 ▪ 1 mark
- 0620/22 J25 Q36 ▪ 1 mark
- 0620/22 M25 Q37 ▪ 1 mark

Reading the mark scheme

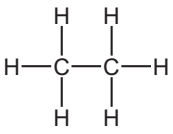
- **B1** a mark that stands on its own – the point is either made or not.
- **M1** a *method* mark: the right approach, even if the number is wrong.
- **A1** an *answer* mark, and it usually needs its M mark first.
- **C1** a working mark on the way to the answer.
- // separates answers the examiner accepts equally.
- **ecf** = error carried forward: a later part is marked on your own earlier answer.
- **owtte** = "or words to that effect" – the wording need not match.

Question 33

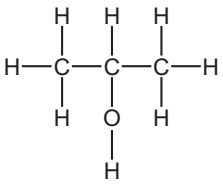
0620/21 N25 ▪ Q33 ▪ 1 mark

33 Which structure represents a compound in the alcohol homologous series?

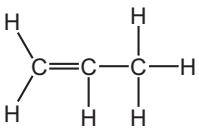
A



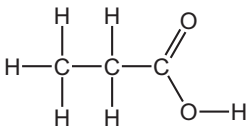
B



C



D



Solution 33

Answer: **B**

Why

- An alcohol contains the –OH group, with the oxygen bonded to one carbon and one hydrogen.
- So look for a structure ending in C–O–H.
- A C–O–C arrangement is an ether and a –COOH is a carboxylic acid.

Question 37

0620/22 N25 ▪ Q37 ▪ 1 mark

37 Ethanol is produced by the fermentation of aqueous glucose or by the catalytic addition of steam to ethene.

Which row shows some advantages and disadvantages of these processes?

	fermentation of aqueous glucose		catalytic addition of steam to ethene	
	advantage	disadvantage	advantage	disadvantage
A	fast reaction	ethanol produced continuously	almost pure ethanol formed	renewable raw material
B	ethanol produced in batches	slow reaction	fast reaction	ethanol produced continuously
C	renewable raw material	ethanol produced in batches	almost pure ethanol formed	slow reaction
D	renewable	dilute aqueous	fast reaction	non-renewable

Question 37

	raw material	ethanol formed		raw material

Solution 37

Answer: **D**

Why

- Fermentation uses a renewable feedstock at low temperature, but is slow, batch-wise and gives impure ethanol.
- The ethene route is fast, continuous and gives pure ethanol, but its feedstock is finite crude oil.
- Each process has one clear advantage and one clear disadvantage – match them the right way round.

Question 5

0620/41 N25 ▪ Q5 ▪ 20 marks

5 This question is about the homologous series of alcohols.

(a) A homologous series is a family of organic compounds whose members have the same general formula.

(i) State the general formula for alcohols.

Question 5

(ii) Give **one other** characteristic that is the same for all members of a homologous series.

Question 5

(b) Ethanol can be manufactured by two methods:

- **method 1** uses glucose as the starting material
- **method 2** uses ethene as the starting material.

(i) Complete Table 5.1.

Table 5.1

	method 1 glucose as starting material	**method 2** ethene as starting material
typical temperature used / °C		
two other essential conditions	1	1
	2	2

Question 5

	2	2

[6]

(ii) Write the symbol equation for the reaction in **method 1**.

Question 5

(iii) Write the symbol equation for the reaction in **method 2**.

Question 5

(c) Butane-1,4-diol has the structural formula HO—CH_2—CH_2—CH_2—CH_2—OH.

(i) Deduce the molecular formula of butane-1,4-diol.

Question 5

(ii) Butane-1,4-diol reacts with ethanoic acid.

Determine the number of moles of ethanoic acid which react fully with **one** mole of butane-1,4-diol.

Question 5

(d) Butanedioic acid has the structural formula HOOC—CH_2—CH_2—COOH.

(i) Deduce the empirical formula of butanedioic acid.

Question 5

(ii) Name the gas formed when butanedioic acid reacts with sodium.

Question 5

(e) Butane-1,4-diol can be represented as shown.

Question 5

Butanedioic acid can be represented as shown.

Question 5

Butane-1,4-diol reacts with butanedioic acid to form a polymer.

(i) Draw **two** repeat units of the polymer formed from the reaction of butane-1,4-diol with butanedioic acid.

Show all the atoms and all the bonds in the ester linkages.

Question 5

Question 5

[3]

(ii) State the type of polymerisation when butane-1,4-diol reacts with butanedioic acid.

Question 5

[Total: 20]

IV	V	VI	VII	VIII
				2 He helium 4
6 C carbon 12	7 N nitrogen 14	8 O oxygen 16	9 F fluorine 19	10 Ne neon 20
14 Si silicon 28	15 P phosphorus 31	16 S sulfur 32	17 Cl chlorine 35.5	18 Ar argon 40
32 Ge germanium 73	33 As arsenic 75	34 Se selenium 79	35 Br bromine 80	36 Kr krypton 84
50 Sn tin 119	51 Sb antimony 122	52 Te tellurium 128	53 I iodine 127	54 Xe xenon 131
82 Pb lead 207	83 Bi bismuth 209	84 Po polonium –	85 At astatine –	86 Rn radon –
114 Fl flerovium –	115 Mc moscovium –	116 Lv livermorium –	117 Ts tennessine –	118 Og oganesson –

68 Er erbium 167	69 Tm thulium 169	70 Yb ytterbium 173	71 Lu lutetium 175
100 Fm fermium –	101 Md mendelevium –	102 No nobelium –	103 Lr lawrencium –

Question 5

The Periodic Table of Elements

Group						
						III
	1 H hydrogen 1					
						5 B boron 11
						13 Al aluminium 27
	26 Fe iron 56	27 Co cobalt 59	28 Ni nickel 59	29 Cu copper 64	30 Zn zinc 65	31 Ga gallium 70
	44 Ru ruthenium 101	45 Rh rhodium 103	46 Pd palladium 106	47 Ag silver 108	48 Cd cadmium 112	49 In indium 115
	76 Os osmium 190	77 Ir iridium 192	78 Pt platinum 195	79 Au gold 197	80 Hg mercury 201	81 Tl thallium 204
	108 Hs hassium –	109 Mt meitnerium –	110 Ds darmstadtium –	111 Rg roentgenium –	112 Cn copernicium –	113 Nh nihonium –

	62 Sm samarium 150	63 Eu europium 152	64 Gd gadolinium 157	65 Tb terbium 159	66 Dy dysprosium 163	67 Ho holmium 165
	94 Pu plutonium –	95 Am americium –	96 Cm curium –	97 Bk berkelium –	98 Cf californium –	99 Es einsteinium –

ıture and pressure (r.t.p.).

Question 5

I	II	

Key

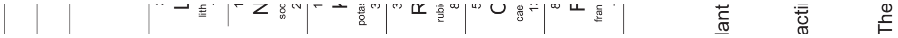
atomic number
atomic symbol
name
relative atomic mass

3 Li lium 7	4 Be beryllium 9					
11 Na dium 23	12 Mg magnesium 24					
19 K ssium 39	20 Ca calcium 40	21 Sc scandium 45	22 Ti titanium 48	23 V vanadium 51	24 Cr chromium 52	25 Mn mangan 55
37 Rb dium 85	38 Sr strontium 88	39 Y yttrium 89	40 Zr zirconium 91	41 Nb niobium 93	42 Mo molybdenum 96	43 Tc techneti –
55 Cs sium 133	56 Ba barium 137	57–71 lanthanoids	72 Hf hafnium 178	73 Ta tantalum 181	74 W tungsten 184	75 Re rheniu 186
87 Fr cium –	88 Ra radium –	89–103 actinoids	104 Rf rutherfordium –	105 Db dubnium –	106 Sg seaborgium –	107 Bh bohriu –

hanoids	57 La lanthanum 139	58 Ce cerium 140	59 Pr praseodymium 141	60 Nd neodymium 144	61 Pm prometh –
noids	89 Ac actinium –	90 Th thorium 232	91 Pa protactinium 231	92 U uranium 238	93 Np neptuni –

e volume of one mole of any gas is 24 dm^3 at room tempe

Question 5



Solution 5

(a)(i)

Mark scheme

- CnH2n+1OH
- 1

(a)(ii)

Mark scheme

- (same) functional group
- 1

Solution 5

(b)(i) Mark scheme

- M1 25–35 M2
- 300 M3
- yeast M4
- acid M5
- absence
- of oxygen M6
- 60 atm
- 6

Solution 5

(b)(ii)

Mark scheme

- $C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2$ **M1**
- $C_6H_{12}O_6$ as the only reactant on left **M2**
- correct equation
- 2

Solution 5

(b)(iii)

Mark scheme

- $C_2H_4 + H_2O \rightarrow C_2H_5OH$ M1
- both $C_2H_4 + H_2O$ only on left M2
- correct equation
- 2

Solution 5

(c)(i)

Mark scheme

- C4H10O2
- 1

(c)(ii)

Mark scheme

- 2
- 1

Solution 5

(d)(i)

Mark scheme

- C2H3O2
- 1

Solution 5

(d)(ii)

Mark scheme

- hydrogen
- 1
- 0620/41
- October/November 2025

Solution 5

(e)(i)

Mark scheme

- M1 any one correct fully displayed ester link between any two blocks M2
- three fully displayed inter-block ester links with correct orientation M3
- fully correct diagram showing two complete repeat units of polyester including continuation bonds
- 3

Solution 5

(e)(ii)

Mark scheme

- condensation (polymerisation)
- 1

Question 17

0620/21 J25 ▪ Q17 ▪ 1 mark

17 Ethanol is warmed with acidified aqueous potassium manganate(VII).

Which row describes the type of reaction of the ethanol and the colour change observed in the reaction mixture?

	type of reaction	colour change
A	oxidation	colourless to purple
B	oxidation	purple to colourless
C	reduction	colourless to purple
D	reduction	purple to colourless

Solution 17

Answer: **B**

Why

- Acidified manganate(VII) is an oxidising agent, so the ethanol is oxidised to ethanoic acid.
- The manganate(VII) is itself reduced to Mn^{2+}.
- So the purple colour fades to colourless.

Question 35

0620/21 J25 ▪ Q35 ▪ 1 mark

35 Industrially, ethanol is produced by fermentation or by the reaction of ethene with steam.

Which row is correct?

	fermentation	ethene + steam
A	uses a temperature of 100 °C	uses a temperature of 350 °C
B	needs the presence of yeast	does **not** need a catalyst
C	slow reaction	fast reaction
D	high yield of ethanol	low yield of ethanol

Solution 35

Answer: **C**

Why

- Fermentation uses yeast at about $30\,^{\circ}\mathrm{C}$ on a renewable sugar feedstock, as a batch process.
- Hydrating ethene uses a catalyst at about $300\,^{\circ}\mathrm{C}$ and high pressure, continuously, from crude oil.
- So the low temperature and the enzyme belong to fermentation, the high temperature to the ethene route.

Question 32

0620/22 J25 ▪ Q32 ▪ 1 mark

32 What is the structural formula of butan-2-ol?

A $CH_3CH_2CH_2OH$

B $CH_3CH(OH)CH_3$

C $CH_3CH_2CH_2CH_2OH$

Question 32

D $CH_3CH_2CH(OH)CH_3$

Solution 32

Answer: **D**

Why

- Butan-2-ol has four carbons in a chain, so the skeleton is $CH_3CH_2CH_2CH_3$.
- The "2" means the –OH is on the second carbon.
- That gives $CH_3CH_2CH(OH)CH_3$.

Question 36

0620/22 J25 ▪ Q36 ▪ 1 mark

36 Ethanol can be made by the fermentation of aqueous glucose and by the catalytic addition of steam to ethene.

What are two advantages of making ethanol by the catalytic addition of steam to ethene rather than by the fermentation of aqueous glucose?

A faster reaction and renewable raw materials

B purer product and faster reaction

C renewable raw materials and continuous process

D uses more energy and forms a purer product

Solution 36

Answer: **B**

Why

- Hydrating ethene is a continuous process, so it runs without stopping to re-charge a vessel.
- It is also much faster, and gives pure ethanol directly rather than a dilute aqueous mixture.
- Fermentation's advantage is its renewable feedstock, which is not what this question asks for.

Question 37

0620/22 M25 ▪ Q37 ▪ 1 mark

37 Which statements describe disadvantages of manufacturing ethanol by fermentation?

1 The process uses a renewable resource.

2 The process produces impure ethanol.

3 The process requires a high temperature.

4 The process is slow.

A 1 and 3 **B** 1 and 4 **C** 2 and 3 **D** 2 and 4

Solution 37

Answer: **D**

Why

- Using a renewable resource is an advantage, not a disadvantage.
- Fermentation is slow and gives dilute, impure ethanol that must then be distilled – real disadvantages.
- It runs at only about $30\,^{\circ}\mathrm{C}$, so the high-temperature claim is wrong.