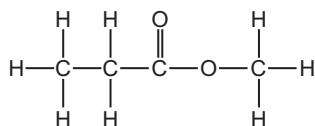


37 What is produced by the bacterial oxidation of ethanol?

- A ethene
- B sodium ethanoate
- C ethyl ethanoate
- D vinegar

35 The structure of an ester is shown.

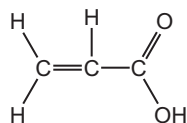


What is the name of this ester?

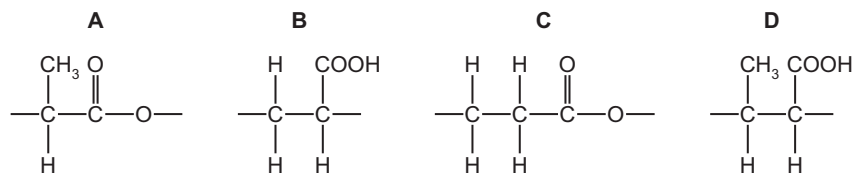
- A ethyl methanoate
- B methyl ethanoate
- C propyl methanoate
- D methyl propanoate

38 Propenoic acid is an organic compound that is both an alkene and a carboxylic acid.

The structure of propenoic acid is shown.



Which structure represents one repeat unit of the addition polymer formed from propenoic acid?



38 Which statement about ethanoic acid is correct?

- A Ethanol is reduced by bacteria to produce ethanoic acid.
- B Ethanoic acid reacts with magnesium to produce a salt of formula CH_3COOMg .
- C Ethanoic acid and methanol react in the presence of an acid catalyst to produce ethyl methanoate.
- D Ethanol reacts with acidified aqueous potassium manganate(VII) to produce ethanoic acid.

6 Compound E shown in Fig. 6.1 is an ester.

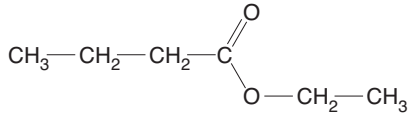


Fig. 6.1

- (a) On Fig. 6.1, draw a circle around all the atoms which make up the ester linkage. [1]
- (b) Name compound E. [1]
- (c) Deduce the empirical formula of compound E. [1]
- (d) Compound E is produced when two different compounds react together in the presence of a catalyst.
- (i) Name the **two** compounds that react together to produce compound E.
- 1 [2]
- 2 [1]
- (ii) Suggest a suitable catalyst for this reaction. [1]
- (e) Determine the number of unbranched esters which have the molecular formula C₅H₁₀O₂. [1]
- (f) All unbranched esters with the molecular formula C₅H₁₀O₂ combust completely to form carbon dioxide and water only.
- Write the symbol equation for the complete combustion of C₅H₁₀O₂. [1]
- [Total: 8]

The Periodic Table of Elements

Group																		
I	II	Key										III	IV	V	VI	VII	VIII	
		atomic number atomic symbol name relative atomic mass										1 H hydrogen 1						
3 Li lithium 7	4 Be beryllium 9											5 B boron 11	6 C carbon 12	7 N nitrogen 14	8 O oxygen 16	9 F fluorine 19	10 Ne neon 20	
11 Na sodium 23	12 Mg magnesium 24											13 Al aluminum 27	14 Si silicon 28	15 P phosphorus 31	16 S sulfur 32	17 Cl chlorine 35.5	18 Ar argon 40	
19 K potassium 39	20 Ca calcium 40											31 Ga gallium 70	32 Ge germanium 73	33 As arsenic 75	34 Se selenium 79	35 Br bromine 80	36 Kr krypton 84	
37 Rb rubidium 85	38 Sr strontium 88											49 In indium 115	50 Sn tin 119	51 Sb antimony 122	52 Te tellurium 128	53 I iodine 127	54 Xe xenon 131	
55 Cs caesium 133	56 Ba barium 137											81 Tl thallium 204	82 Pb lead 207	83 Bi bismuth 209	84 Po polonium —	85 At astatine —	86 Rn radon —	
87 Fr francium —	88 Ra radium —											113 Nh nihonium —	114 Fl flerovium —	115 Mc moscovium —	116 Lv livermorium —	117 Ts tennessine —	118 Og oganeson —	

6 This question is about organic compounds.

(a) Organic compound **Q** has the following composition by mass.

C, 50.00%; H, 5.56%; O, 44.44%

Calculate the empirical formula of compound **Q**.

empirical formula = [3]

(b) Organic compound **R** has the empirical formula CHO and a relative molecular mass of 116.

Determine the molecular formula of compound **R**.

molecular formula = [1]

(c) Carboxylic acids react with alcohols to form esters.

(i) Name the other product that is formed when a carboxylic acid reacts with an alcohol.

..... [1]

(ii) Name the **type** of catalyst that is used when a carboxylic acid reacts with an alcohol.

..... [1]

(iii) Ester **S** has the structural formula $\text{CH}_3\text{CH}_2\text{COOCH}_2\text{CH}_2\text{CH}_2\text{CH}_3$.

Name the carboxylic acid and the alcohol which react together to form ester **S**.

carboxylic acid

alcohol

(d) Fig. 6.1 shows part of a polymer structure.

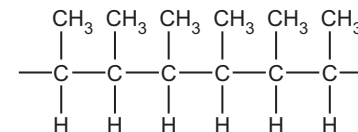


Fig. 6.1

(i) Name the type of polymerisation that is used to produce this polymer.

..... [1]

(ii) Suggest why it is **not** possible to write the molecular formula of this polymer.

..... [1]

(iii) State the number of monomer units that are needed to make the part of the polymer structure shown in Fig. 6.1.

..... [1]

(iv) Draw the displayed formula of the monomer used to make this polymer.

[2]

$$\begin{array}{c} \text{R} \\ | \\ -\text{C}- \\ | \\ \text{H} \end{array}$$

Fig. 6.2

- (i) Complete Fig. 6.2 to show all the atoms and all the bonds in the two functional groups of the amino acid. [2]
- (ii) Part of a natural polyamide structure is shown in Fig. 6.3.

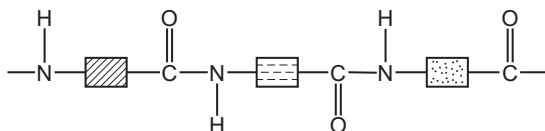


Fig. 6.3

On Fig. 6.3, draw a circle around **one amide linkage.**

- (iii) State the name given to natural polyamides made from amino acids.

..... [1]

[Total: 17]

The Periodic Table of Elements

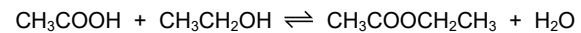
Group												
I	II	Key					III	IV	V	VI	VII	VIII
		atomic number atomic symbol name relative atomic mass										
1							1					
3	4						5	6	7	8	9	10
Li lithium 7	Be beryllium 9						B boron 11	C carbon 12	N nitrogen 14	O oxygen 16	F fluorine 19	Ne neon 20
11	12						13	14	15	16	17	18
Na sodium 23	Mg magnesium 24						Al aluminium 27	Si silicon 28	P phosphorus 31	S sulfur 32	Cl chlorine 35.5	Ar argon 40
19	20						21	22	23	24	25	26
K potassium 39	Ca calcium 40						Sc scandium 45	Ti titanium 48	V vanadium 51	Cr chromium 52	Mn manganese 55	Fe iron 56
37	38						39	40	41	42	43	44
Rb rubidium 85	Sr strontium 88						Y yttrium 89	Zr zirconium 91	Nb niobium 93	Mo molybdenum 96	Tc technetium —	Ru ruthenium 101
55	56						57-71 lanthanoids	72	73	74	75	76
Cs caesium 133	Ba barium 137						72	Hf hafnium 178	Ta tantalum 181	W tungsten 184	Re rhenium 186	Os osmium 190
87	88						89-103 actinoids	104	105	106	107	108
Fr francium	Ra radium						104	Rf rutherfordium	Db dubnium	Sg seaborgium	Bh bohrium	Hs hassium
							118					
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							213	114	115	116	117	118
							Nh nihonium	Fl flerovium	Mc moscovium	Lv livermorium	Ts tennessine	Og oganesesson

57	La	lanthanum	139
58	Ce	cerium	140
59	Pr	praseodymium	141
60	Nd	neodymium	144
61	Pm	promethium	—
62	Sm	samarium	150
63	Eu	europlum	152
64	Gd	gadolinium	157
65	Tb	terbium	159
66	Dy	dysprosium	163
67	Ho	holmium	165
68	Er	erbium	167
69	Tm	thulium	169
70	Yb	ytterbium	173
71	Lu	lutetium	175

89	Ac	actinium	
90	Th	thorium	
91	Pa	protactinium	
92	U	uranium	
93	Np	neptunium	
94	Pu	plutonium	
95	Am	americium	
96	Cm	curium	
97	Bk	berkelium	
98	Cf	californium	
99	Es	einsteinium	
100	Fm	fermium	
101	Md	mendelevium	
102	No	nobelium	
103	Lr	lawrencium	

The volume of one mole of any gas is 24 dm^3 at room temperature and pressure (r.t.p.).

14 The equation represents the reaction between ethanoic acid and ethanol.



Which type of reaction does this show?

- A addition
- B neutralisation
- C reduction
- D reversible

36 Some properties of an organic compound, J, are listed.

- It is a liquid at room temperature.
- It is soluble in water.
- A solution of J reacts with calcium carbonate to form carbon dioxide.
- A solution of J has a pH of 3.

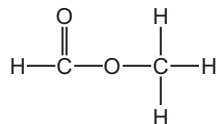
In which homologous series does J belong?

- A alkane
- B alkene
- C alcohol
- D carboxylic acid

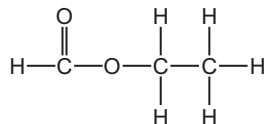
33 Methanol reacts with ethanoic acid to form an ester.

What is the displayed formula for this ester?

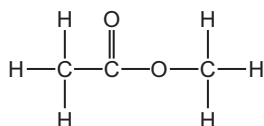
A



B



C



D

