



Oxford Cambridge and RSA

**GCSE Chemistry A (Gateway Science)**  
**J248/03 C1-C3 and C7 Higher (Higher Tier)**

**Question Set 6**

1 Simple distillation can be used to separate mixtures of liquids.

A scientist is using simple distillation to separate a mixture alcohols.

Look at the table. It shows the boiling points of three alcohols.

Alcohol	Boiling point (°C)
Methanol	65
Ethanol	78
Propanol	97

(a) (i) Which alcohol will be distilled first?

Tick (✓) **one** box.

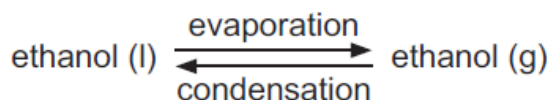
Methanol	<input checked="" type="checkbox"/>
Ethanol	<input type="checkbox"/>
Propanol	<input type="checkbox"/>

Explain your answer.

Because it has the lowest boiling point

[2]

(ii) Simple distillation uses evaporation and condensation to separate mixtures.



Describe the change in the **arrangement** of particles as substances evaporate.

[1]

Particles become more further away from each other and distributed randomly

(iii) Describe the change in the **movement** of particles as substances evaporate.

[1]

The particles move randomly faster

(iv) The scientist wants to improve the separation of the mixture of alcohols.

Suggest a piece of equipment he could use.

Fractional distillation - it has glass beads which alcohol vapours can condense and evaporate repeatedly

Explain how this will improve the separation of the mixture of alcohols.

thus distilling many times. [2]

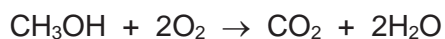
(b) Ethanol can be used as a biofuel. The combustion of ethanol is an **exothermic** reaction.

Explain why combustion is an exothermic reaction.

Use ideas about bond breaking and bond making in your answer.

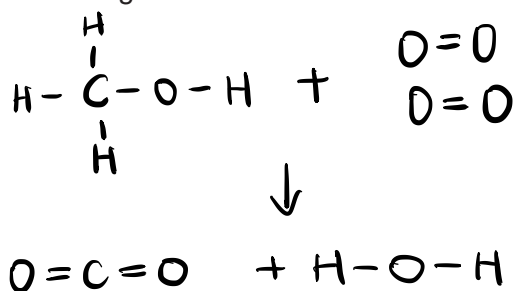
Because energy released by forming new bonds is greater than the energy needed to break the original bonds. [1]

- (c) (i) Methanol is another biofuel that can be used in combustion reactions.



Look at the table. It shows some bond energies.

Bond	Bond energy (kJ/mol)
C-H	413
O=O	498
C-O	358
C=O	805
O-H	464



Calculate the energy transferred to break all the bonds in the reactants.

$$413 \times 3 + 358 + 464 + 498 \times 2 = 3057$$

Energy transferred = ..... 3057 ..... kJ/mol [2]

- (ii) Calculate the energy transferred when all the bonds form in the products.

$$805 \times 2 + 464 \times 2 = 2538$$

Energy transferred = ..... 2538 ..... kJ/mol [2]

- (iii) Use your answers to parts (i) and (ii) to calculate the energy change for this reaction.

$$-3057 + 2538 = -519$$

Energy change = ..... -519 ..... kJ/mol [1]

**Total Marks for Question Set 6: 12**

# The Periodic Table of the Elements

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(0)										
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1 H hydrogen 1.0	2 He helium 4.0	3 Li lithium 6.9	4 Be beryllium 9.0	5 B boron 10.8	6 C carbon 12.0	7 N nitrogen 14.0	8 O oxygen 16.0	9 F fluorine 19.0	10 Ne neon 20.2	11 Na sodium 23.0	12 Mg magnesium 24.3	13 Al aluminium 27.0	14 Si silicon 28.1	15 P phosphorus 31.0	16 S sulfur 32.1	17 Cl chlorine 35.5	18 Ar argon 39.9
19 K potassium 39.1	20 Ca calcium 40.1	21 Sc scandium 45.0	22 Ti titanium 47.9	23 V vanadium 50.9	24 Cr chromium 52.0	25 Mn manganese 54.9	26 Fe iron 55.8	27 Co cobalt 58.9	28 Ni nickel 58.7	29 Cu copper 63.5	30 Zn zinc 65.4	31 Ga gallium 69.7	32 Ge germanium 72.6	33 As arsenic 74.9	34 Se selenium 79.0	35 Br bromine 79.9	36 Kr krypton 83.8
37 Rb rubidium 85.5	38 Sr strontium 87.6	39 Y yttrium 88.9	40 Zr zirconium 91.2	41 Nb niobium 92.9	42 Mo molybdenum 95.9	43 Tc technetium	44 Ru ruthenium 101.1	45 Rh rhodium 102.9	46 Pd palladium 106.4	47 Ag silver 107.9	48 Cd cadmium 112.4	49 In indium 114.8	50 Sn tin 118.7	51 Sb antimony 121.8	52 Te tellurium 127.6	53 I iodine 126.9	54 Xe xenon 131.3
55 Cs caesium 132.9	56 Ba barium 137.3	57-71 lanthanoids	72 Hf hafnium 178.5	73 Ta tantalum 180.9	74 W tungsten 183.8	75 Re rhenium 186.2	76 Os osmium 190.2	77 Ir iridium 192.2	78 Pt platinum 195.1	79 Au gold 197.0	80 Hg mercury 200.6	81 Tl thallium 204.4	82 Pb lead 207.2	83 Bi bismuth 209.0	84 Po polonium	85 At astatine	86 Rn radon
87 Fr francium	88 Ra radium	89-103 actinoids	104 Rf rutherfordium	105 Db dubnium	106 Sg seaborgium	107 Bh bohrium	108 Hs hassium	109 Mt meitnerium	110 Ds darmstadtium	111 Rg roentgenium	112 Cn copernicium	113 Nh nihonium	114 Fl flerovium	115 Mc moscovium	116 Lv livermorium	117 Ts tennessine	118 Og oganeson

**Key**  
 atomic number  
**Symbol**  
 name  
 relative atomic mass

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