



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?

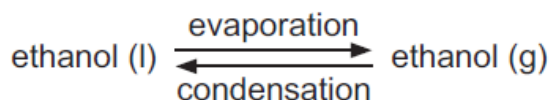
Tick (✓) **one** box.

|          |                          |
|----------|--------------------------|
| Methanol | <input type="checkbox"/> |
| Ethanol  | <input type="checkbox"/> |
| Propanol | <input type="checkbox"/> |

Explain your answer.

[2]

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



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

[1]

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

[1]

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

Suggest a piece of equipment he could use.

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

[2]

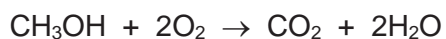
(b) Ethanol can be used as a biofuel. The combustion of ethanol is an **exothermic** reaction.

Explain why combustion is an exothermic reaction.

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

[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.

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

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

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

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

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

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

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