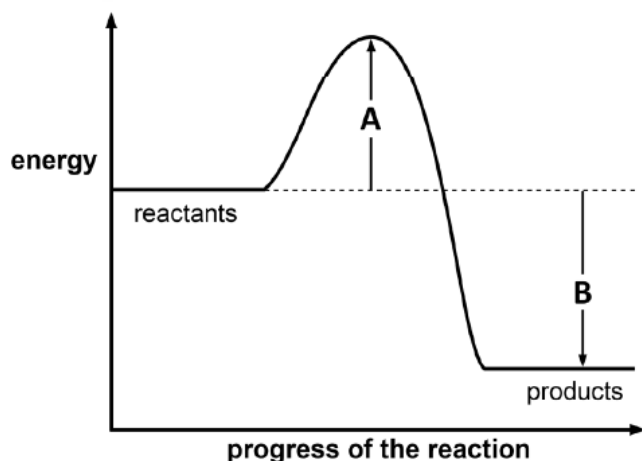


**GCSE Chemistry A (Gateway Science)**  
**J248/03 C1-C3 and C7 Higher (Higher Tier)**

**Question Set 24**

1 Look at the energy profile for a reaction.



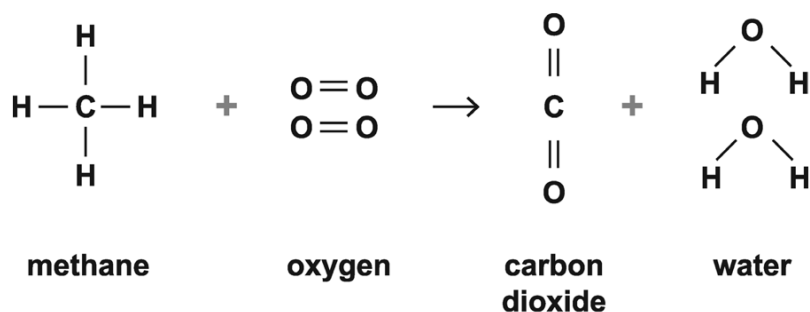
(a) Explain what can be concluded about this reaction?

Include the quantities **A** and **B** in your answer.

[4]

*(see below)*

(b) Look at the equation.



The table shows the bond energies of the bonds involved.

Bond	Bond energy (kJ/mol)
C-H	435
O=O	498
C=O	805
O-H	464

(i) What type of energy change happens when bonds are broken and when bonds are made?

Bonds broken ..... *endothermic* .....

Bonds made ..... *exothermic* .....

[2]

(ii) Calculate the energy change for this reaction.

$$\text{bond broken} = 2736$$

$$\text{bond made} = 3466$$

$$\text{energy change} = 2736 - 3466 = -730$$

Answer = ..... -730 ..... kJ/mol [3]

(c)

When propane reacts with oxygen, energy is given out.

- Propane gives out 50 kJ/g.
- A propane burner is used to boil 200 g of water to make a cup of tea.
- The initial temperature of the water is 15 °C.

What mass of propane (in g) is needed to heat this water?

Use the following equation:

Energy transferred in J = 4.2 J/g°C × mass of water in g × temperature change in °C.

Answer = ..... 1.43 ..... g [5]

### Total Marks for Question Set 24: 14

1 a) The reaction is exothermic as reactants have more energy than products. A is the activation energy (the amount of energy required to get the reaction started). B is the energy change for the reaction and its value is negative.

$$\begin{aligned} \text{c) energy transferred} &= 4.2 \times 200 \times (100 - 15) \\ &= \underline{\underline{71400\text{J}}} \end{aligned}$$

$$50 \text{ kJ} = \underline{\underline{50000\text{J}}}$$

$$\frac{71400}{50000} = \boxed{1.428\text{g}}$$

# The Periodic Table of the Elements

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(0)										
1	2	Key atomic number Symbol name relative atomic mass					17	18									
1 H hydrogen 1.0	2 He helium 4.0	3 Sc scandium 45.0	4 Ti titanium 47.9	5 V vanadium 50.9	6 Cr chromium 52.0	7 Mn manganese 54.9	8 Fe iron 55.8	9 Co cobalt 58.9	10 Ni nickel 58.7	11 Cu copper 63.5	12 Zn zinc 65.4	13 B boron 10.8	14 C carbon 12.0	15 N nitrogen 14.0	16 O oxygen 16.0	17 F fluorine 19.0	18 Ne neon 20.2
19 K potassium 39.1	20 Ca calcium 40.1	21 Y yttrium 88.9	22 Zr zirconium 91.2	23 Nb niobium 92.9	24 Mo molybdenum 95.9	25 Tc technetium	26 Ru ruthenium 101.1	27 Rh rhodium 102.9	28 Pd palladium 106.4	29 Ag silver 107.9	30 Cd cadmium 112.4	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 La lanthanoids	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 209.0	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

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