

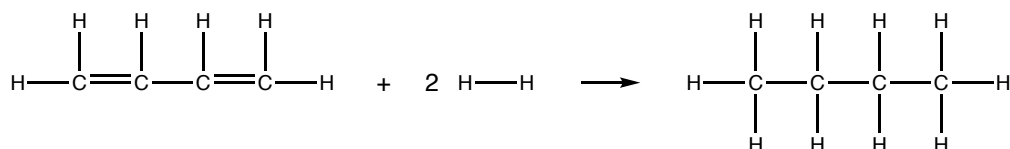


GCSE REVISION 14

Energy changes 1

- 1 a Calculate the energy change in the following reaction using the bond energies given.

[C-C = 348, C-H = 412, C=C = 612, H-H = 436 kJ/mol]



....[E(C-C)+2E(C=C)+6*E(C-H)+2E(H-H)]-10E(C-H).....

.....[348+2(612)+6(412)+2(436)]-[10(412)].....

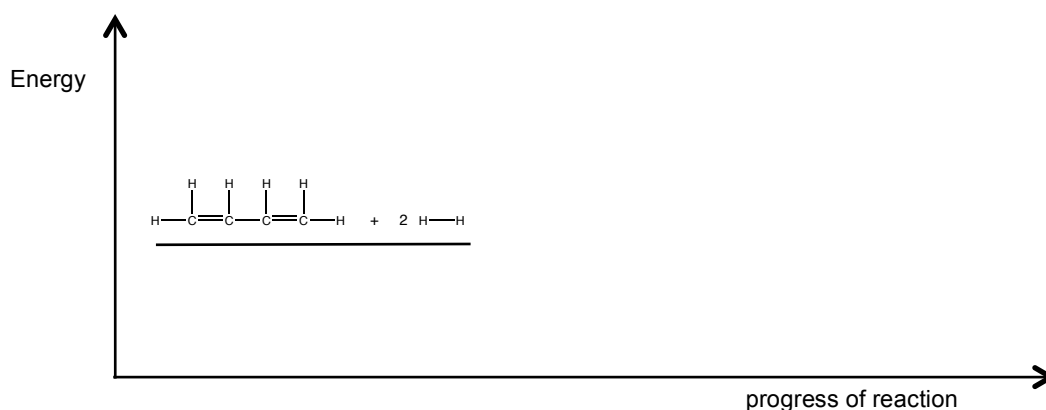
=4916-4120

=796kJ/mol

- b Explain whether this reaction is exothermic or endothermic by discussing bond breaking and making.

This is an endothermic reaction since the products are at a higher energy than the reactants. the enthalpy change of the reaction is positive.

- c Complete the energy profile for this reaction. Draw arrows to show the overall energy change (label "OEC") and the activation energy (label "AE")



- 2 Tick the correct box to show whether each of the following relates to an exothermic or an endothermic reaction.

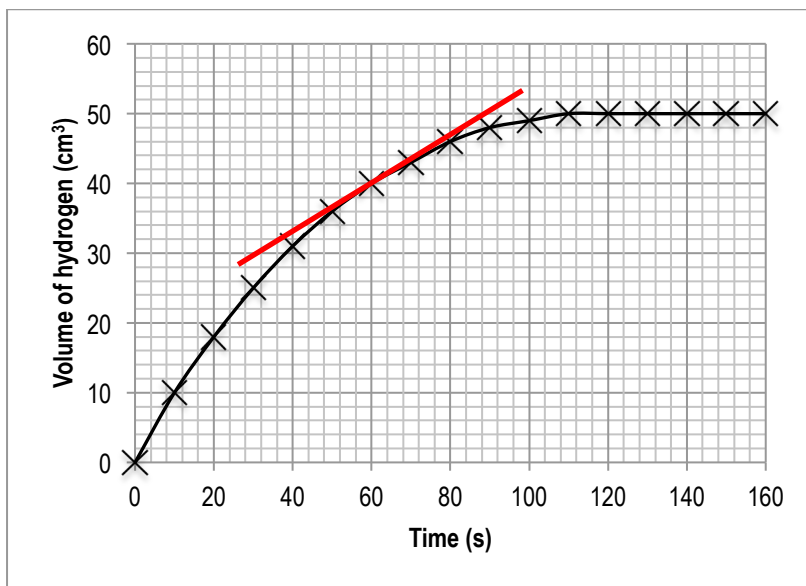
	exothermic	endothermic
energy change is +72 kJ		✓
products have more energy than reactants		✓
neutralisation of hydrochloric acid by sodium hydroxide	✓	
thermal decomposition of copper carbonate	✓	



GCSE REVISION 15

Rates & equilibria 1

- 1 An experiment was carried out to see how the rate of a reaction changes during the reaction. A piece of magnesium was reacted with hydrochloric acid and the volume of hydrogen gas collected recorded. A graph was plotted of the results.



- a Draw a tangent to the line to find the rate at 40 seconds.
34cm³

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- b Explain why the reaction slows down.
the reaction is fastest at the start but slows down later due to the loss of the magnesium during the reaction

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- 2 Hydrochloric acid reacts with sodium thiosulfate in a flask to form a precipitate that increases the turbidity of the mixture. The time taken for the mixture to become too cloudy to see a cross on a piece under the flask can be used to investigate factors that affect the reaction rate.

- a A student carried out an experiment to see how changing the concentration of the acid affects the reaction rate. List four key control variables in this experiment.

- | | |
|--------------------------------|----------------------------|
| 1 Pressure | 3 rate of reaction |
| 2 frequency of collision | 4 reactant particles |

- b Explain why increasing the concentration of the acid would increase the rate of reaction.

Increasing the concentration of the acid/reactants increases the rate of reaction because most of the reacting ions are present to form the reacting products. This can be depicted where the concentrations are low and only a few ions are reacting. when the acid concentrations are high, there is a limit that is reached at the point where the increasing acid concentration has little effect on the rate of reaction.

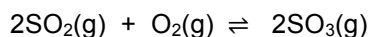
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- 3 Catalysts increase the rate of chemical reactions. Explain, in simple terms, how they work.

Catalysts speeds up the rate of reaction by reducing the activation energy for a given reaction. The average kinetic energy of the molecules does not change. the energy required decreases.

- 4 Sulfur dioxide reacts with oxygen to form sulfur trioxide in a reaction that reaches a state of dynamic equilibrium in a closed system. The forward reaction is exothermic.



- a What is happening when a reaction is in dynamic equilibrium?

Increase in temperature causes a decrease in the equilibrium value.

- b What would happen to the yield of sulfur trioxide if the temperature was increased? Explain your answer.

an increase in temperature is an endothermic reaction and therefore it will shift the equilibrium to the right side resulting to more nitrogen dioxide being formed.

- c What would happen to the yield of sulfur trioxide if the pressure was increased? Explain your answer.

an increase in pressure favors the side with the lower gas volume. this is because, an increase in pressure would move the equilibrium to the right and more sulfur trioxide being formed.



GCSE REVISION 16

Chemical reactions 3

1 Complete **word** equations for each of the following reactions. Write **no reaction** if no reaction takes place.

- a) nitric acid + zinc → Zinc nitrate+nitric oxide+water
- b) potassium hydroxide + sulfuric acid → potassium sulfate+water
- c) water + potassium → potassium hydroxide+hydrogen gas
- d) iron (Fe) + oxygen → iron oxide
- e) thiol (C₂H₅SH) + oxygen → No reaction
- f) ethanol (C₂H₅OH) + oxygen → carbon dioxide+water
- g) hydrochloric acid + lead oxide → lead(II)oxide+water
- h) copper carbonate + nitric acid → copper nitrate+carbon dioxide gas

2 Complete the table about the following reactions by ticking the correct boxes.

equation	transfer of		type of reaction	
	protons	electrons	redox	acid-base
$\text{Cl}_2 + 2\text{KBr} \rightarrow 2\text{KCl} + \text{Br}_2$		☒	☒	
$\text{Mg} + \text{H}_2\text{SO}_4 \rightarrow \text{MgSO}_4 + \text{H}_2$		☒	☒	
$\text{MgO} + \text{H}_2\text{SO}_4 \rightarrow \text{MgSO}_4 + \text{H}_2\text{O}$	☒			☒

3 Classify each of the following metals as having high / medium / low reactivity.

- a) potassium high reactivity b) copper medium reactivity c) iron low reactivity

4 a) Complete the table to show the products of the electrolysis of the following compounds.

compound	state	product at positive electrode	product at negative electrode
sodium bromide	molten	Hydroxide ion	Sodium ion
copper nitrate	aqueous	nitric gas	oxygen gas
potassium iodide	aqueous	Potassium ions	Iodide ions

b) Write balanced half equations for the following electrolysis conversions.

- i) $\text{I}^- \rightarrow \text{I}_2$ $\text{I}_2 + 2\text{e}^- \rightarrow 2\text{I}^-$
- ii) $\text{Na}^+ \rightarrow \text{Na}$ $\text{Na}^+ + \text{e}^- \rightarrow \text{Na}$
- iii) $\text{OH}^- \rightarrow \text{O}_2$ $\text{O}_2 + \text{H}$
- iv) $\text{H}^+ \rightarrow \text{H}_2$ $2\text{H}^+ + \text{e}^- \rightarrow \text{H}_2$