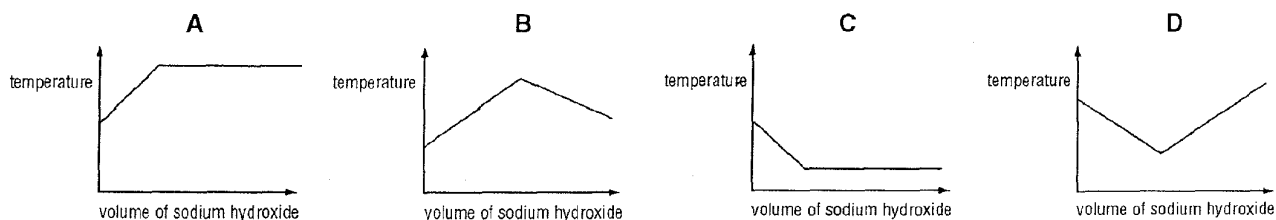


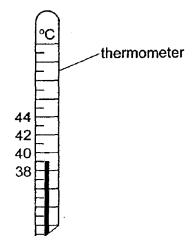
1. For an **exothermic** reaction, ΔH is **negative**. [1]
2. For an **endothermic** reaction, ΔH is **positive**. [1]
3. When solid potassium iodide is added to water, the **temperature** of the mixture **falls**.
Which conclusion can be made from this observation? [1]
Dissolving potassium iodide is endothermic.

4. The reaction between aqueous sodium hydroxide and hydrochloric acid is **exothermic**. Which graph shows the change in temperature when aqueous sodium hydroxide is added to hydrochloric acid until the alkali is present in excess? (D) [1]

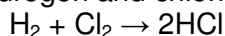


5. A thermometer is placed in water and the temperature is measured as shown. An endothermic change takes place as a solid is dissolved in the water. The temperature changes by 3°C .

What is the final temperature? **36°C** [1]



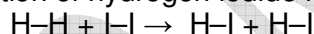
6. Hydrogen and chlorine react together.



Explain, in terms of bond breaking and forming, why is the reaction exothermic? [2]

Energy absorbed during bond breaking is less than energy given out during bond forming, resulting in a negative enthalpy change. Hence it is an exothermic reaction.

7. The formation of hydrogen iodide from hydrogen and iodine is an **endothermic** reaction. [1]



What may be deduced from this information?

A The number of bonds broken is greater than the number of bonds formed.

B The formation of H-I bonds absorbs energy.

C The products possess less energy than the reactants.

D The total energy change in bond formation is less than that in bond breaking. (D)

8. Two compounds were dissolved in water at 28°C . The temperature of each solution was measured immediately after the compound had dissolved.

substance	chemical formula	temperature / $^{\circ}\text{C}$		temperature change / $^{\circ}\text{C}$
		water	solution	
ammonium chloride	NH_4Cl	28	17	-11
calcium chloride	CaCl_2	28	36	+8

(a) Complete the table to show

- (i) the formulae of the two compounds,
(ii) the temperature changes after dissolving.

[4]

- (b) State the type of energy change which takes place when ammonium chloride dissolves in water. Give a reason for your answer. [3]

type of energy change endothermic

reason energy was absorbed from the surrounding, causing temperature of solution to drop and endothermic reaction is one whereby energy is absorbed from surrounding.

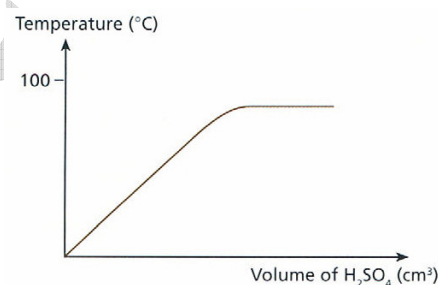


- (a) What type of energy change occurs when bonds are broken? [1]
Endothermic, as heat is absorbed to break chemical bonds.

- (b) What type of energy change occurs when bonds are formed? [1]
Exothermic, as heat is released during bond formation.

- (c) Which is the larger of the energy changes taking place in the reaction above, bond breaking or bond forming? Explain your answer. [2]
Bond formation. The energy produced during bond formation in products is greater than the amount of heat absorbed during bond breaking in reactants.
Hence, the ΔH of the reaction is negative.

10. Concentrated sulphuric acid was added slowly to water and the mixture constantly stirred. The temperature of the mixture was recorded at regular intervals. The results of the experiment are shown in the graph.



- (a) What can you infer from the graph?

The reaction is highly exothermic.

- (b) Why should water never be added to concentrated sulphuric acid?

The heat energy produced during the reaction will cause the water to boil, producing steams that will cause the concentrated acid to spill. [2]

~ The End ~