

## Exercise 1\_2B Enthalpy Change

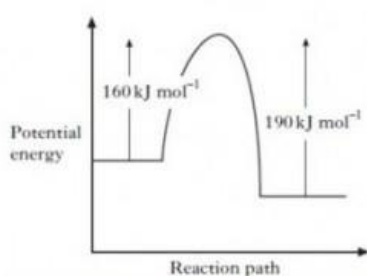
Write the date in the margin of your homework jotter.

Write the title of this Exercise as a heading: Exercise 1\_2B Enthalpy Change



For general revision of this area of the Unit, the [BBC Bitesize website](#) provides the basics and the [Chemguide website](#) will give an in depth understanding – often beyond the scope of the syllabus!

1.



When a catalyst is used, the activation energy of the forward reaction is reduced to  $35 \text{ kJ mol}^{-1}$ . What is the activation energy of the catalysed reverse reaction?

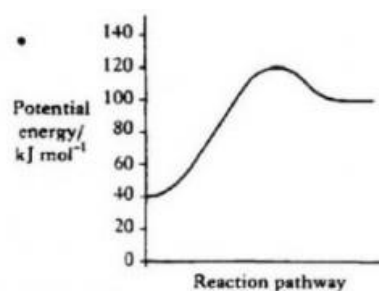
- A  $30 \text{ kJ mol}^{-1}$
- B  $35 \text{ kJ mol}^{-1}$
- C  $65 \text{ kJ mol}^{-1}$
- D  $190 \text{ kJ mol}^{-1}$

2.

The formula for potassium sulfate is

- A  $\text{P}_2\text{SO}_3$
- B  $\text{K}_2\text{SO}_4$
- C  $\text{P}_2\text{SO}_4$
- D  $\text{K}_2\text{S}$

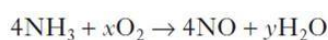
6.



Which of the following sets of data applies to the reaction represented by the above energy diagram?

	Enthalpy change	Activation energy/ $\text{kJ mol}^{-1}$
A	Exothermic	60
B	Exothermic	80
C	Endothermic	60
D	Endothermic	80

7.



The equation will be balanced when

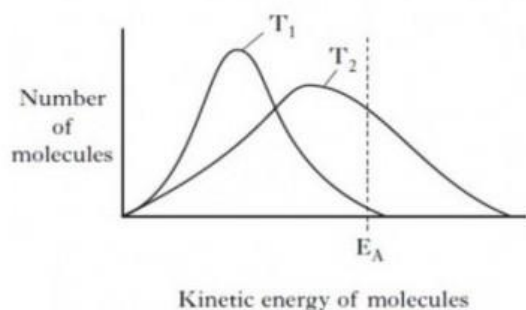
- A  $x = 5, y = 6$
- B  $x = 5, y = 10$
- C  $x = 3, y = 6$
- D  $x = 3, y = 10$

3.

What volume of  $0.25 \text{ mol l}^{-1}$  calcium nitrate is required to make, by dilution with water,  $500 \text{ cm}^3$  of a solution with a **nitrate** ion concentration of  $0.1 \text{ mol l}^{-1}$ ?

- A  $50 \text{ cm}^3$
- B  $100 \text{ cm}^3$
- C  $200 \text{ cm}^3$
- D  $400 \text{ cm}^3$

4.



Which line in the table is correct for a reaction as the temperature decreases from T2 to T1?

	Activation energy ( $E_A$ )	Number of successful collisions
A	remains the same	increases
B	decreases	decreases
C	decreases	increases
D	remains the same	decreases

8.

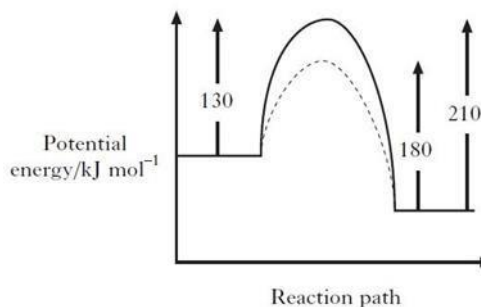
Which of the following particles contains a different number of electrons?

(you may wish to use page 6 of the data book)

- A  $\text{Cl}^-$
- B  $\text{S}^{2-}$
- C Ar
- D  $\text{Na}^+$

9.

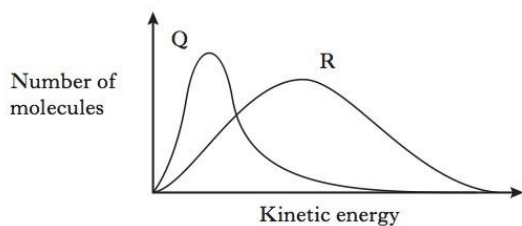
The following potential diagram is for a reaction carried out with and without a catalyst.



The activation energy for the catalysed reaction is

- A  $30 \text{ kJ mol}^{-1}$
- B  $80 \text{ kJ mol}^{-1}$
- C  $100 \text{ kJ mol}^{-1}$
- D  $130 \text{ kJ mol}^{-1}$

5.

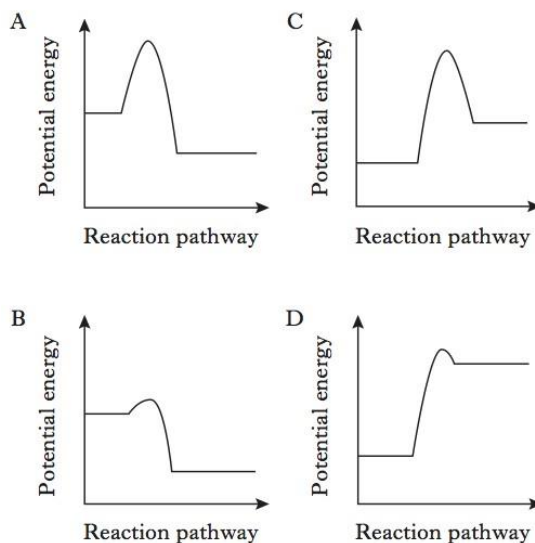


Which line in the table is correct for curves **Q** and **R** in the above graph?

	Curve Q	Curve R
A	1 mol of O <sub>2</sub> at 50 °C	2 mol of O <sub>2</sub> at 100 °C
B	1 mol of O <sub>2</sub> at 100 °C	2 mol of O <sub>2</sub> at 100 °C
C	2 mol of O <sub>2</sub> at 50 °C	1 mol of O <sub>2</sub> at 100 °C
D	2 mol of O <sub>2</sub> at 100 °C	1 mol of O <sub>2</sub> at 100 °C

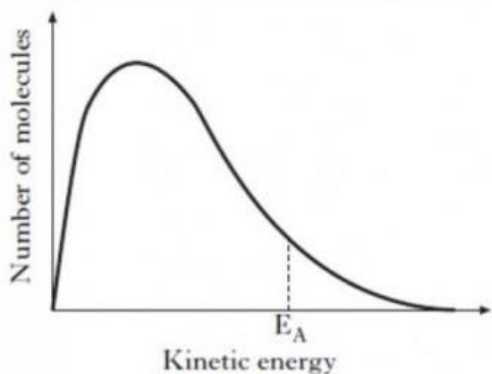
10.

Which of the following diagrams represents an exothermic reaction which is most likely to take place at room temperature?



11.

The graph shows the distribution of kinetic energy for molecules in a reaction mixture at a given temperature.



Why does a small increase in temperature produce a large increase in reaction rate? (1)

12.

Methanoic acid, HCOOH, can break down to carbon monoxide and water by two different reactions, A and B.

**Reaction A (catalysed)**

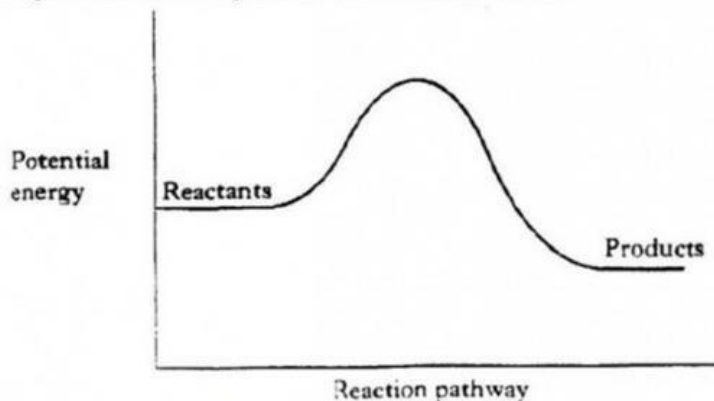


**Reaction B (uncatalysed)**



a) What is the evidence in the equation for Reaction A that the H<sup>+</sup> (aq) acts as a catalyst?

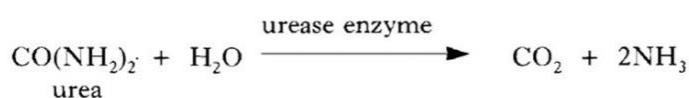
b) The energy diagram for the **catalysed** reaction is shown below.



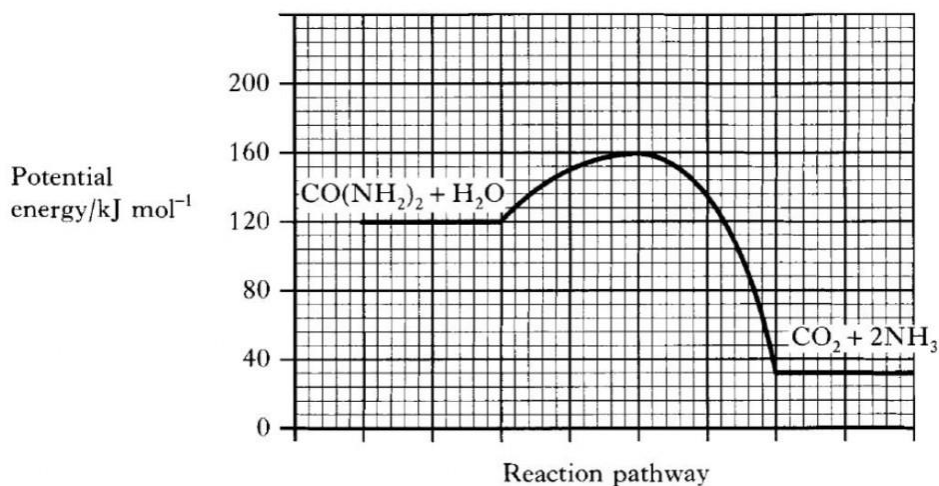
In your jotter, copy the diagram and add a line to show the reaction pathway for the **uncatalysed** reaction.

13.

Urea is a substance found in human urine. The enzyme urease catalyses the hydrolysis of urea.



The graph shows the potential energy diagram for a urease catalysis of urea.

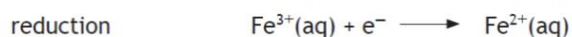
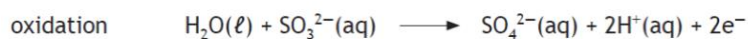


- (i) What is the enthalpy change for the reaction? .
- (ii) Acid is a **less** effective catalyst than urease for this reaction.

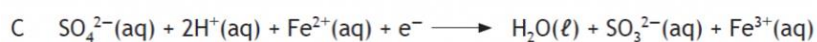
Add a curve to the potential energy diagram to show the hydrolysis when acid is used as the catalyst.

14.

The ion-electron equations for the oxidation and reduction steps in the reaction between **sulfite ions** and **iron(III) ions** are given below.



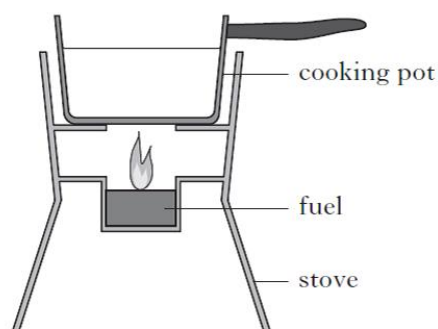
The redox equation for the overall reaction is



15.

Different fuels are used for different purposes.

(a) Ethanol,  $C_2H_5OH$ , can be used as a fuel in some camping stoves.



(i) The enthalpy of combustion of ethanol given in the data booklet is  $-1367 \text{ kJ mol}^{-1}$ .

Using this value, calculate the mass of ethanol, in g, required to raise the temperature of 500 g of water from  $18^\circ\text{C}$  to  $100^\circ\text{C}$ .

**Show your working clearly.**

(ii) Suggest **two** reasons why less energy is obtained from burning ethanol in the camping stove than is predicted from its enthalpy of combustion.

(b) Petrol is a fuel used in cars.

Energy released when 1.00 g of petrol burned/kJ	48.0
Volume of 1.00 g of petrol/ $\text{cm}^3$	1.45

A car has a 50.0 litre petrol tank.

Calculate the energy, in kJ, released by the complete combustion of one tank of petrol.



A marking guide for this Homework is available (password required).