Exercise 1_2C Enthalpy Change

Write the date in the margin of your homework jotter.

Write the title of this Exercise as a heading: Exercise 1_2C Enthalpy Change

1.

1 mol of hydrogen gas and 1 mol of iodine vapour were mixed and allowed to react. After t seconds, 0·8 mol of hydrogen remained.

The number of moles of hydrogen iodide formed at t seconds was

A 0·2

B 0·4

C 0·8

D 1·6.

2.

$x\,Al(s) + y\,Br_2(\ell) \rightarrow z\,AlBr_3(s)$

This equation will be balanced when

A $x = 1$, $y = 2$ and $z = 1$

B $x = 2$, $y = 3$ and $z = 2$

C $x = 3$, $y = 2$ and $z = 3$

D $x = 4$, $y = 3$ and $z = 4$.

6.

Which of the following is not a correct statement about the effect of a catalyst?

The catalyst

A provides an alternative route to the products

B lowers the energy which molecules need for successful collisions

C provides energy so that more molecules have successful collisions

D forms bonds with reacting molecules.

7.

Which of the following oxides, when shaken with water, would leave the pH unchanged?

A Carbon dioxide

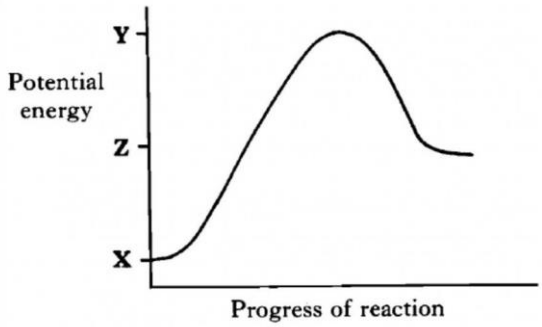
B Copper oxide

C Sodium oxide

D Sulfur dioxide

3.

Refer to the potential energy diagram below.



The energy of activation (E_A) for the forward reaction is given by

A **Y**

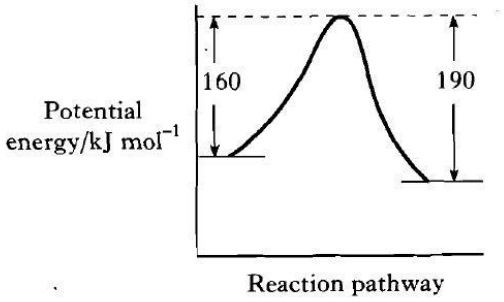
B **Z − X**

C **Y − X**

D **Y − Z.**

4.

The following potential energy diagram is for an uncatalysed reaction.



When a catalyst is used the activation energy of the forward reaction is reduced to 35 kJ mol^{-1}.

What is the activation energy of the catalysed reverse reaction, in kJ mol^{-1}?

A 35

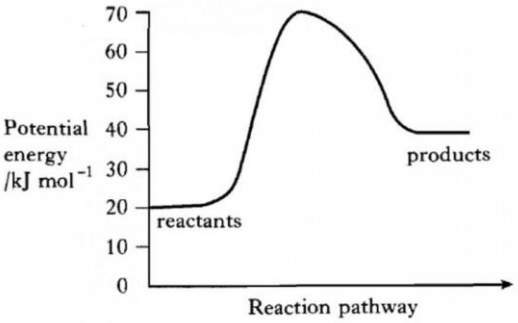
B 65

C 125

D 155

8.

The following potential energy diagram represents the energy changes in a chemical reaction.



The activation energy for the reaction, in kJ mol^{-1}, is

A 20

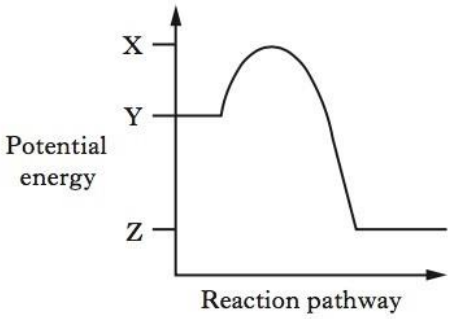
B 30

C 50

D 70.

9.

A reaction has the following potential energy diagram.



The activation energy for the forward reaction is

A X − Y

B Y − X

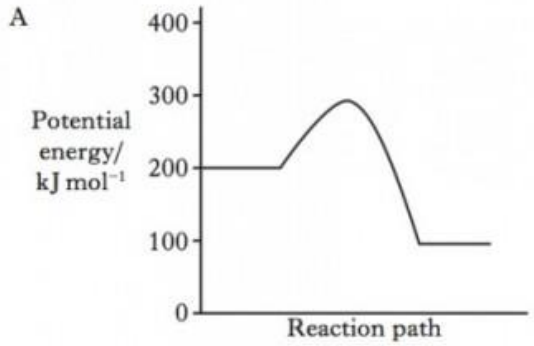
C Y − Z

D Z − Y.

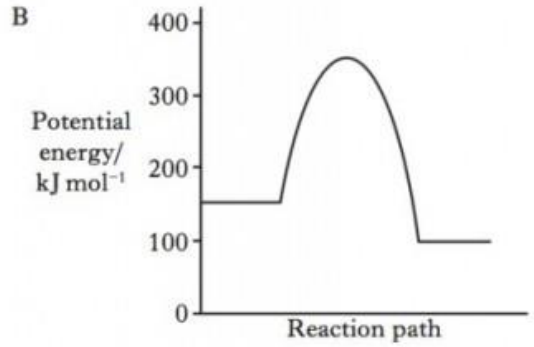
5.

Which of the following potential energy diagrams represents the most exothermic reaction?

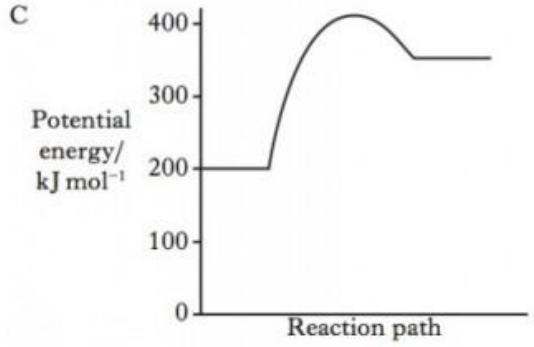
A



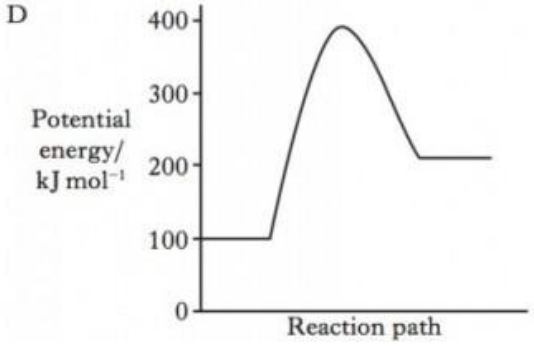
B



C

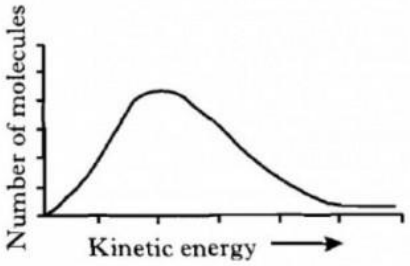


D



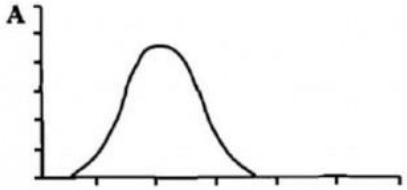
10.

The graph shows the distribution of kinetic energies of the molecules in a sample of gas.

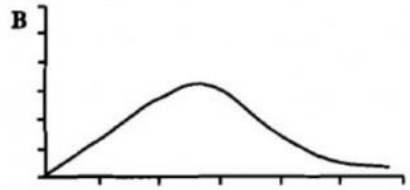


Which graph would show the kinetic energies of the molecules when the sample is cooled by 10 °C

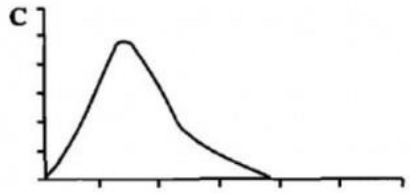
A



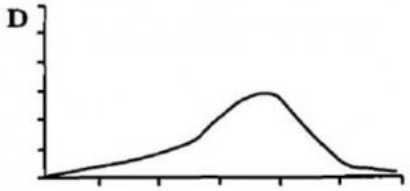
B



C



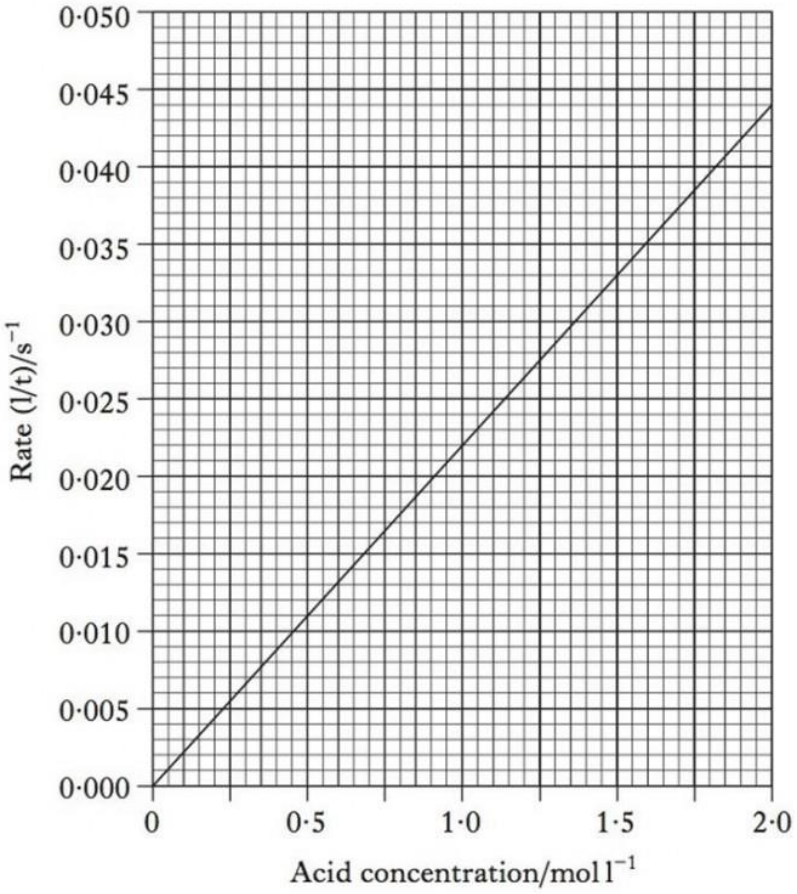
D



11.

(*a*) A student investigated the effect of changing acid concentration on reaction rate. Identical strips of magnesium ribbon were dropped into different concentrations of excess hydrochloric acid and the time taken for the magnesium to completely react, recorded.

A graph of the student's results is shown below.



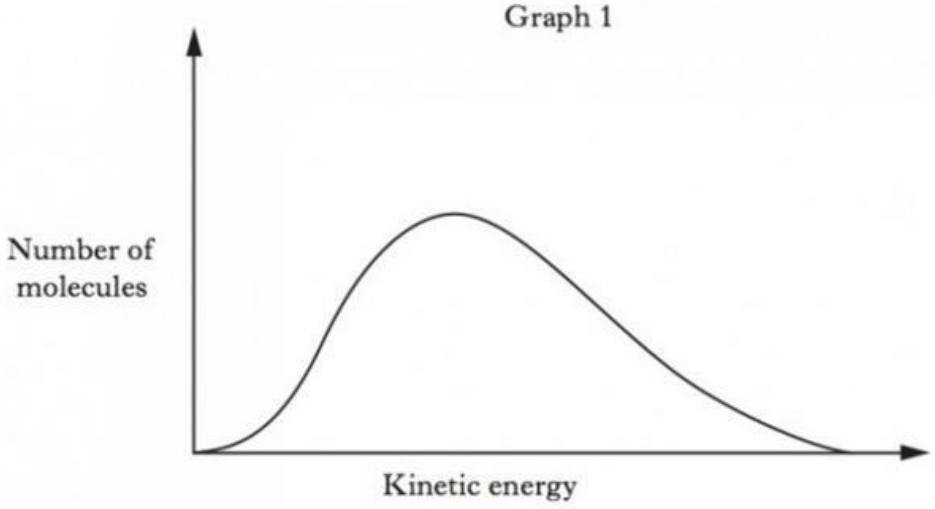
Use information from the graph to calculate the reaction time, in seconds, when the concentration of the acid was 1.5 mol l^{-1}.

12.

(*b*) The rate of a reaction can also be altered by changing the temperature or using a catalyst.

(i) Graph 1 shows the distribution of kinetic energies of molecules in a gas at 100 °C.

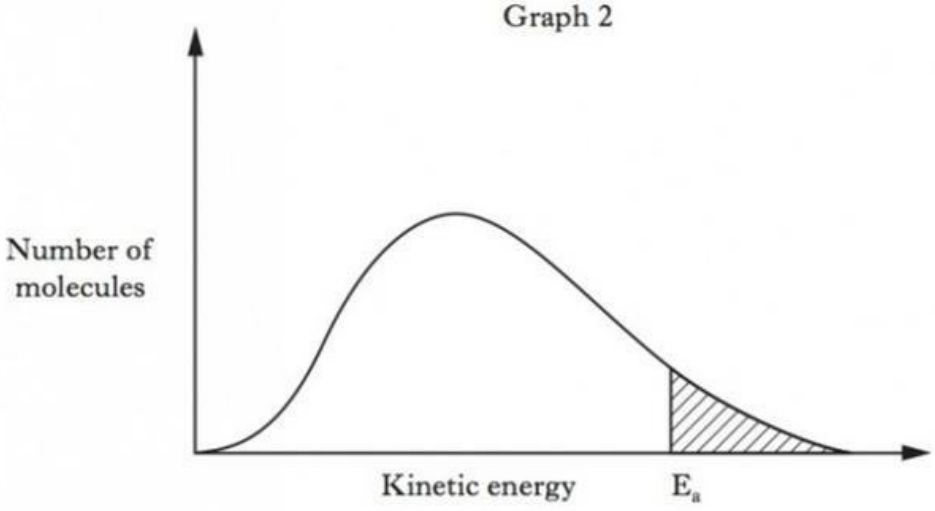
Graph 1



Add a second curve to Graph 1 to show the distribution of kinetic energies at 50 °C. **1**

(ii) In Graph 2, the shaded area represents the number of molecules with the required activation energy, E_a.

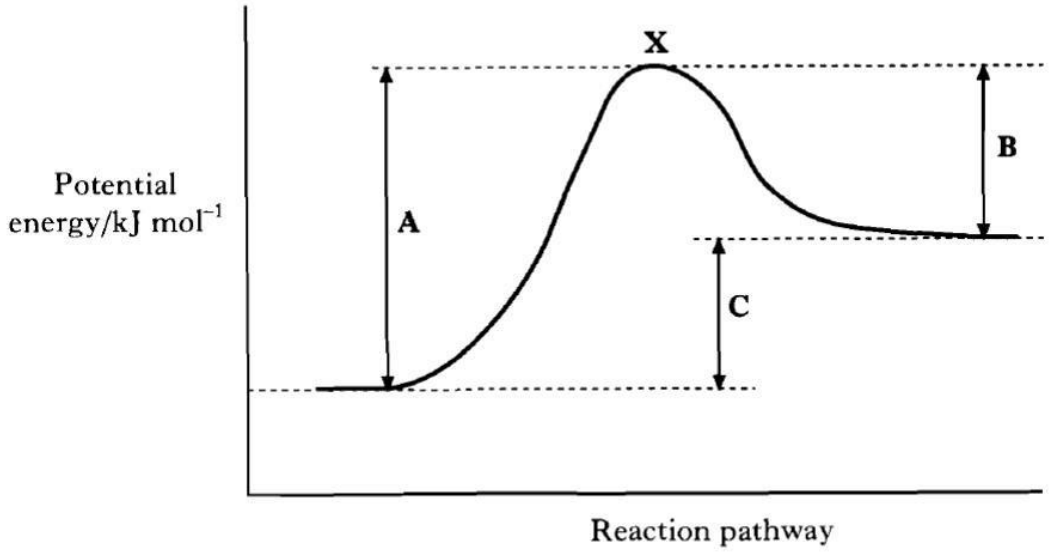
Graph 2



Draw a line to show how a catalyst affects the activation energy. **1**

13.

The diagram below shows energy changes **A**, **B** and **C** for a reversible reaction.



(*a*) What could be used to decrease both **A** and **B** but **not** change **C**?

(*b*) Give the name of the unstable arrangement of atoms formed at point **X**.

14.

The table shows the colours of some ionic compounds in solution.

Compound	*Colour*
copper sulfate	blue
copper chromate	green
potassium chloride	colourless
potassium chromate	yellow

The colour of the chromate ion is

A blue

B green

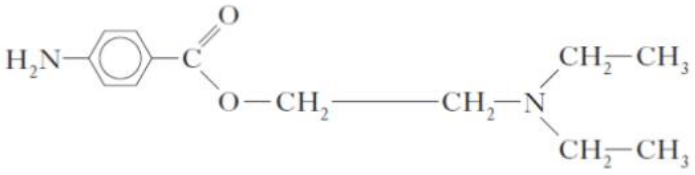
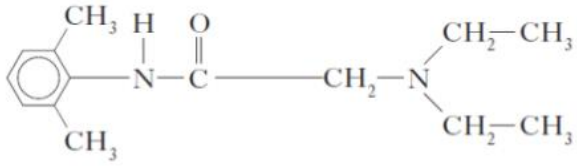
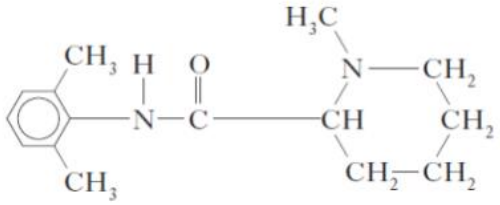
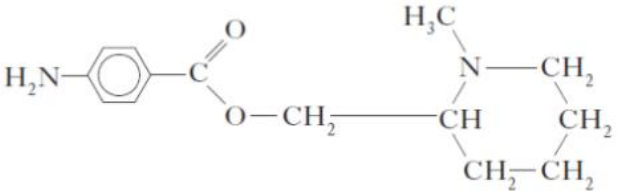
C colourless

D yellow.

15.

Dental anaesthetics are substances used to reduce discomfort during treatment.

(*b*) The table below shows the duration of numbness for common anaesthetics.

Name of anaesthetic	Structure	Duration of numbness/ minutes
procaine		7
lidocaine		96
mepivacaine		114
anaesthetic **X**		

Estimate the duration of numbness, in minutes, for anaesthetic **X**.

(*c*) The maximum safe dose of lidocaine for an adult is 4·5 mg of lidocaine per kg of body mass.

1·0 cm^3 of lidocaine solution contains 10 mg of lidocaine.

Calculate the maximum volume of lidocaine solution that could be given to a 70 kg adult.

Show your working clearly.

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