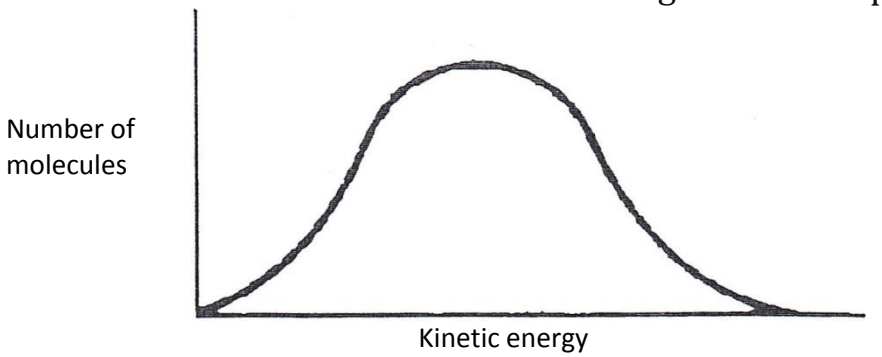
9. The diagram shows the distribution of kinetic energies in a sample of gas at 20°C.



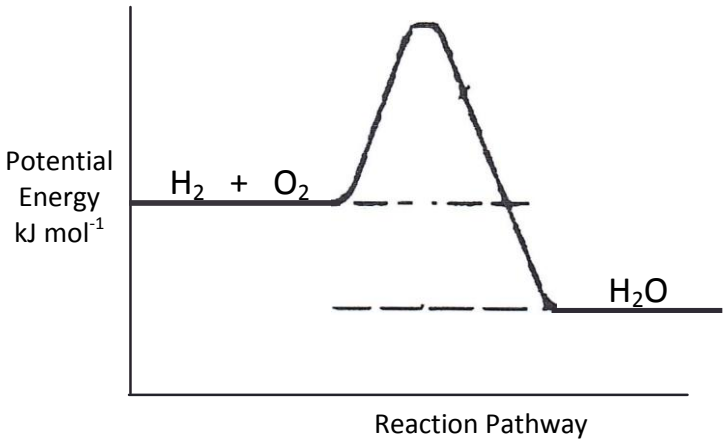
a) Copy the diagram and add another line to show the kinetic energy distribution of the molecules at 30°C.

b) Draw a line to represent the activation energy of a reaction which is slow at 20°C.

c) With reference to the completed diagram, explain why an increase of 10°C can lead to a large increase in reaction rate.

10. What is meant by the term 'activation energy'?

11.



a) Copy the above diagram and then draw arrows to represent :-

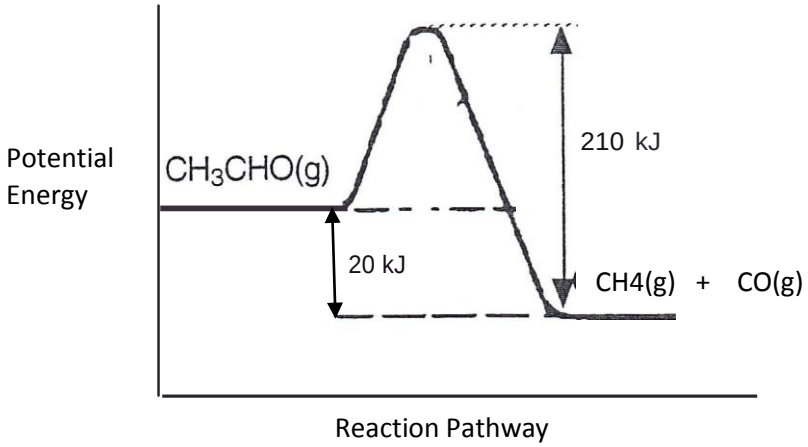
i) the energy of activation for the forward reaction (label it E_{AF})

ii) the enthalpy change for the reaction (label it ΔH)

b) Explain why hydrogen and oxygen do not react when mixed.

c) Explain why hydrogen and oxygen react violently when the mixture is supplied with energy from a lighted splint.

12.



The potential energy diagram above, which is not drawn to scale, shows the decomposition of ethanol to methane and carbon monoxide.

a) What is the value for the activation energy for the forward reaction?

b) What is the enthalpy change for the reaction?

c) Iodine vapour catalyses the reaction. Copy the above diagram (no graph paper required) and on it show by means of a dotted line the reaction pathway for the catalysed reaction.

d) Is the iodine vapour a homogeneous or a heterogeneous catalyst? Explain your answer.

13. $2HI\ (g) \rightleftharpoons H_2\ (g) + I_2\ (g)$

The reaction above is reversible. The activation energy for the forward reaction is 183 kJ and the reverse reaction is 157 kJ.

a) On a piece of graph paper show how the potential energy varies as the reaction proceeds.

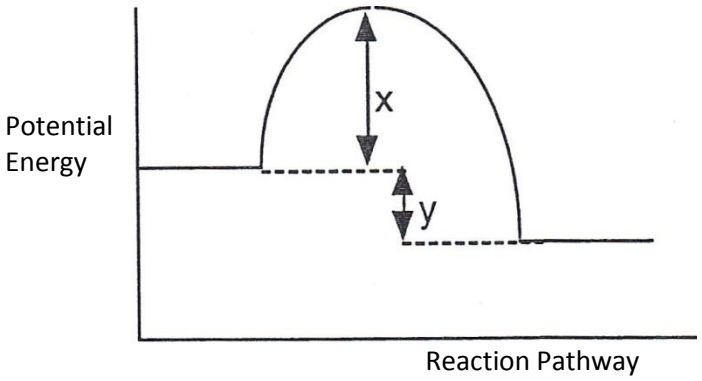
b) Gold and platinum both catalyse the reaction. For the forward reaction E_A using gold is 105 kJ, while E_A using platinum is 58 kJ.

i) Using different dotted lines add this information to the graph.

ii) Which is the better catalyst for the reaction? Explain your choice.

c) The gold and platinum catalysts are used in the solid state. Are the catalysts heterogeneous or homogeneous catalysts? Explain your choice.

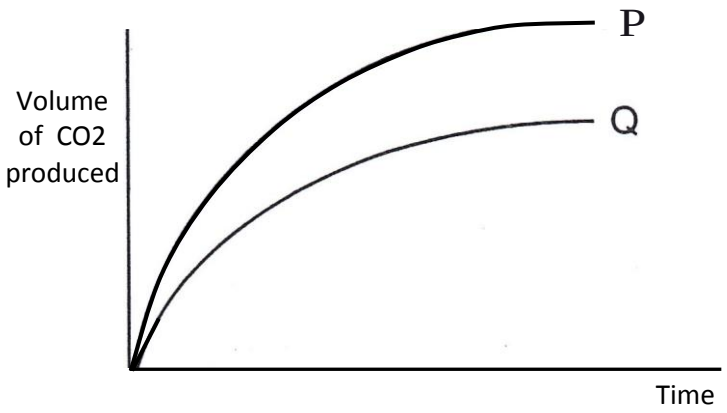
14.



The activation energy for the reverse reaction can be represented by

A. x B. y C. x + y D. x - y

15. When copper carbonate is reacted with excess acid, carbon dioxide is produced. The curves shown were obtained under different conditions.



The change from P to Q could be brought about by

A. increasing the concentration of the acid
B. decreasing the mass of copper carbonate
C. decreasing the particle size of the copper carbonate
D. adding a catalyst

16. The continuous use of large extractor fans greatly reduces the possibility of explosion in a flour mill. This is mainly because

A. a build up in the concentration of oxygen is prevented
B. local temperature rises are prevented by the movement of air
C. particles of flour suspended in the air are removed
D the slow accumulation of carbon monoxide is prevented