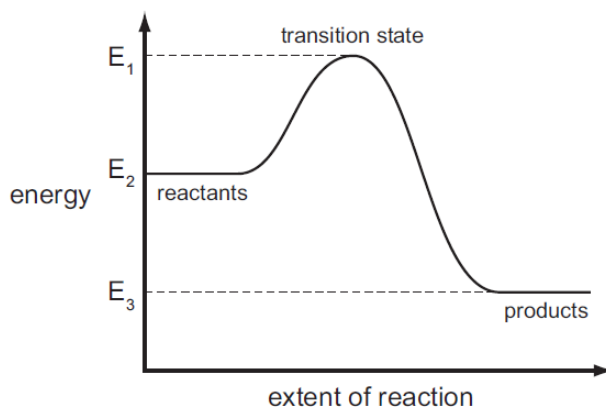


WORKSHEET:

Energy Profile, Activation Energy

- 8 The reaction pathway diagram below illustrates the energies of the reactants, the products and the transition state of a reaction.

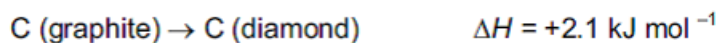


Which expression represents the activation energy of the forward reaction?

- A** $E_1 - E_2$ **B** $E_2 - E_1$ **C** $E_2 - E_3$ **D** $E_3 - E_2$

w/14/qp11

- 32 The conversion of graphite has only a small positive value of ΔH .



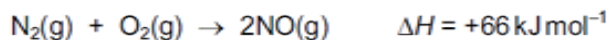
However, the production of synthetic diamonds using this reaction is very difficult.

Which statements help to explain this?

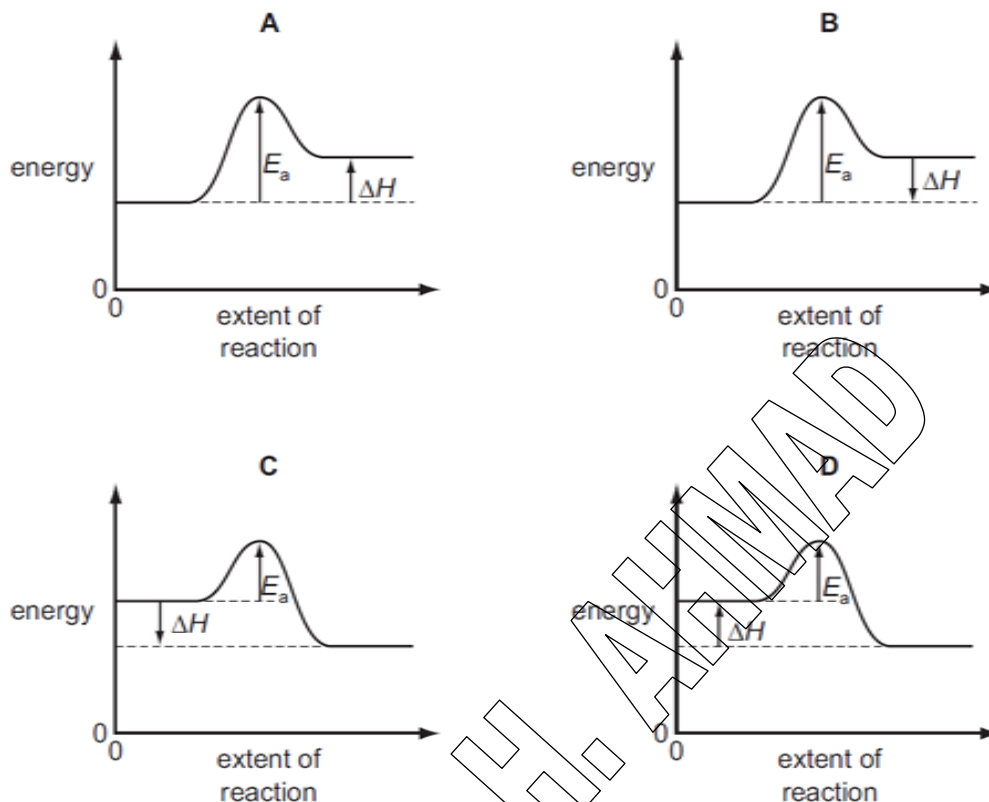
- 1 The activation energy of the reaction is large.
- 2 An equilibrium exists between diamond and graphite.
- 3 Only exothermic reactions can be made to occur readily.

s/04/qp1

10 Nitrogen monoxide is an atmospheric pollutant that is formed inside car engines by an endothermic reaction between nitrogen and oxygen.

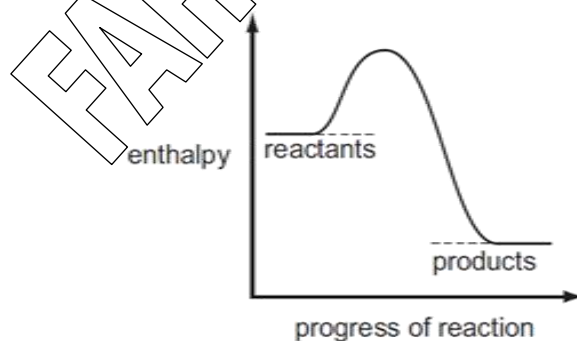


Which labelled diagram correctly represents the energy profile for this reaction?



w/14/qp13

3 A reaction pathway diagram is shown.

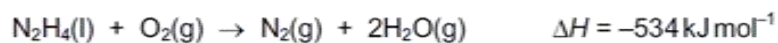


Which enthalpy change could the diagram **not** apply to?

- A enthalpy of atomisation
- B enthalpy of combustion
- C enthalpy of formation
- D enthalpy of neutralisation

s/14/qp13

- 6 Hydrazine, N_2H_4 , is used as a rocket fuel because it reacts with oxygen as shown, producing 'environmentally friendly' gases.



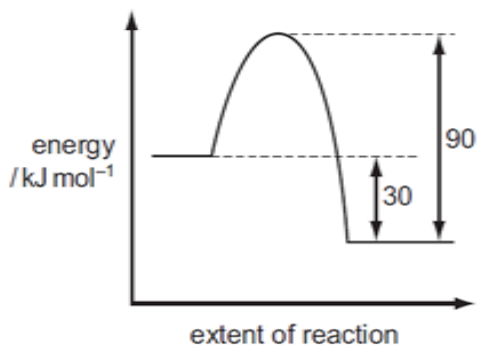
Despite its use as a rocket fuel, hydrazine does not burn spontaneously in oxygen.

Which statement explains why hydrazine does **not** burn spontaneously?

- A Hydrazine is a liquid.
- B The activation energy is too high.
- C The $\text{N}\equiv\text{N}$ bond is very strong.
- D The reaction is exothermic.

s/14/qp13

- 32 The diagram shows the reaction pathway for a reversible reaction.

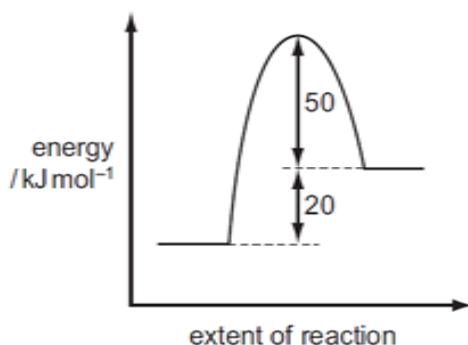


Which statements are correct?

- 1 The enthalpy change for the backward reaction is $+90 \text{ kJ mol}^{-1}$.
- 2 The forward reaction is exothermic.
- 3 The enthalpy change for the forward reaction is -30 kJ mol^{-1} .

s/13/qp12

33 The reaction pathway for a reversible reaction is shown below.

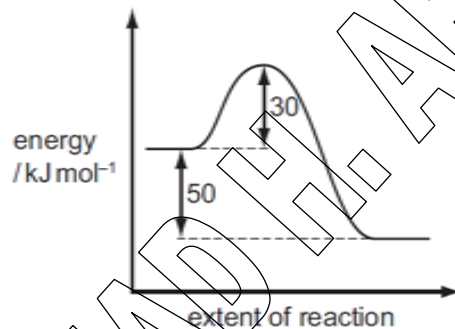


Which statements are correct?

- 1 The enthalpy change for the backward reaction is -20 kJ mol^{-1} .
- 2 The forward reaction is endothermic.
- 3 The activation energy for the forward reaction is $+70 \text{ kJ mol}^{-1}$.

s/13/qp13

7 The reaction pathway for a reversible reaction is shown below.

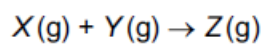


Which statement is correct?

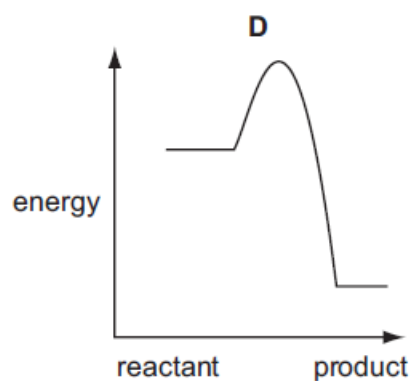
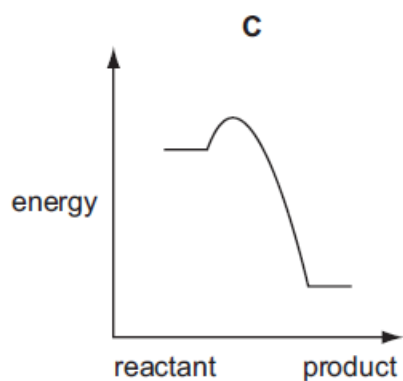
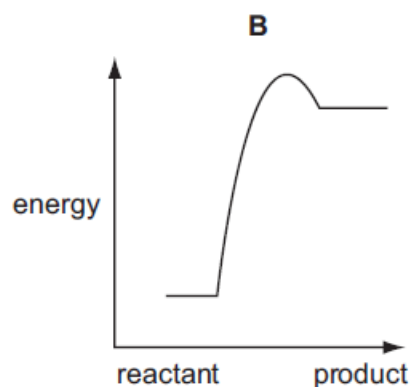
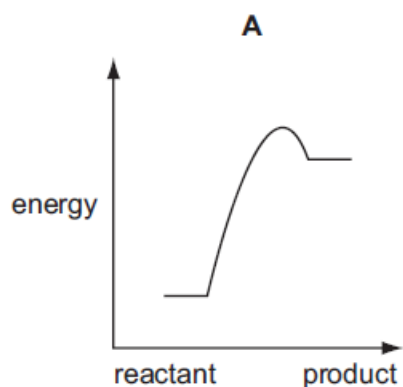
- A The activation energy of the reverse reaction is $+80 \text{ kJ mol}^{-1}$.
- B The enthalpy change for the forward reaction is $+30 \text{ kJ mol}^{-1}$.
- C The enthalpy change for the forward reaction is $+50 \text{ kJ mol}^{-1}$.
- D The enthalpy change for the reverse reaction is $+30 \text{ kJ mol}^{-1}$.

s/13/qp11

10 Four reactions of the type shown are studied at the same temperature.

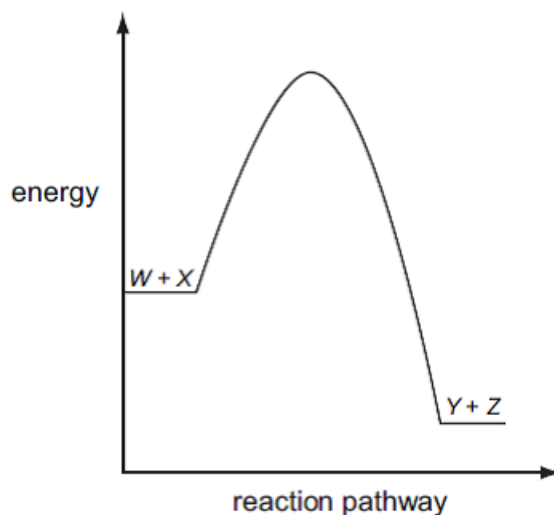
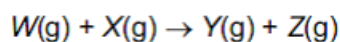


Which is the correct reaction pathway diagram for the reaction that would proceed **most** rapidly and with the **highest** yield?



w/09/qp11

9 The diagram represents the reaction pathway for the following reaction.

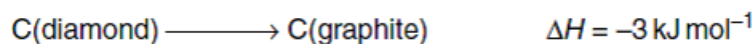


What statement can be made about the reverse reaction, $Y(g) + Z(g) \rightarrow W(g) + X(g)$?

- A It will have a larger activation energy and a positive ΔH .
- B It will have a larger activation energy and a negative ΔH .
- C It will have a smaller activation energy and a positive ΔH .
- D It will have a smaller activation energy and a negative ΔH .

w/08/qp1

12 Why does the exothermic reaction

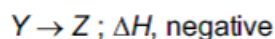
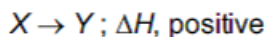


not occur spontaneously?

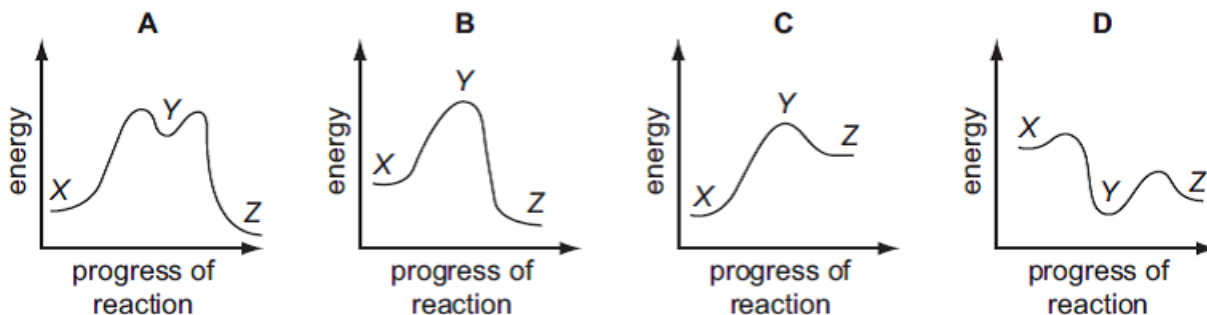
- A A tetrahedral configuration is always more stable than a planar one.
- B Diamond has only strong covalent bonds whereas graphite has both covalent bonds and van der Waals' forces.
- C The change from diamond to graphite has a high activation energy.
- D The density of graphite is less than that of diamond.

w/03/qp1

- 9 In the conversion of compound X into compound Z, it was found that the reaction proceeded by way of compound Y, which could be isolated. The following steps were involved.



Which reaction profile fits these data?



s/11/qp12

- 37 Nitrogen and oxygen react in a hot car engine to form nitrogen monoxide which is a serious pollutant in our cities and in the countryside. However, nitrogen and oxygen do not react at room temperature.

Which statements help to explain why nitrogen and oxygen do not react at room temperature?

- 1 The reaction is endothermic.
- 2 A high activation energy is required.
- 3 Nitrogen has a high bond energy.

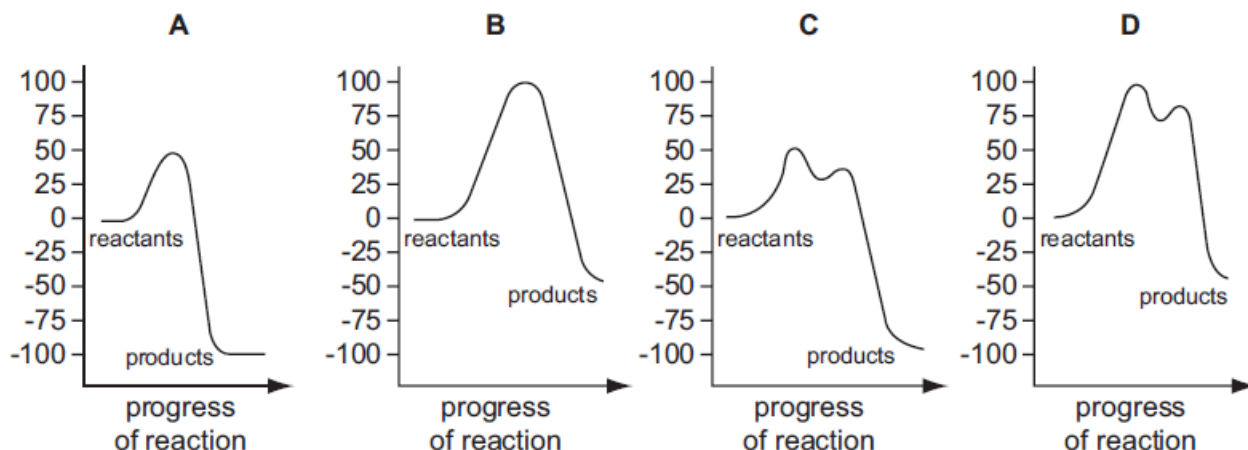
s/07/qp1

7 An exothermic chemical reaction proceeds by two stages.



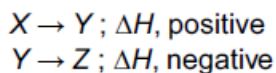
The activation energy of stage 1 is 50 kJ mol^{-1} . The overall enthalpy change of reaction is -100 kJ mol^{-1} .

Which diagram represents the reaction pathway for this reaction?

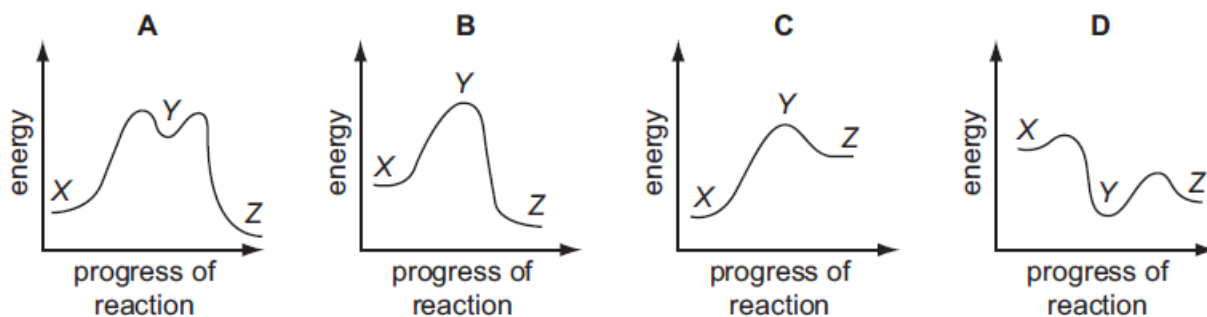


s/07/qp1

8 In the conversion of compound X into compound Z, it was found that the reaction proceeded by way of compound Y, which could be isolated. The following steps were involved.



Which reaction profile fits these data?



s/06/qp1