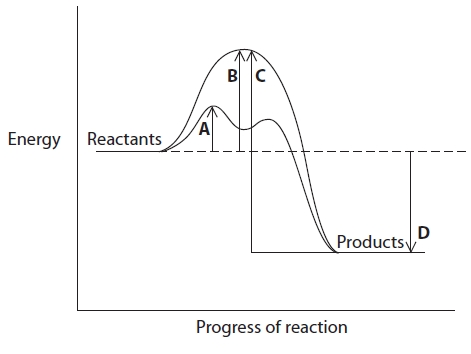
**Questions**

**Q1.**

Which of the arrows, **A**, **B**, **C**, **D**, indicates the activation energy for a **catalysed** reaction on the reaction profile shown?



   **A**

   **B**

   **C**

   **D**

**(Total for question = 1 mark)**

**Q2.**In a chemical reaction, which of the following factors increases the proportion of particles that have sufficient energy to react?

   **A**    A decrease in concentration

   **B**    An increase in concentration

   **C**    A decrease in temperature

   **D**    An increase in temperature

**(Total for Question = 1 mark)**

**Q3.**In the industrial process involving gas phase reactions to produce ammonia, many collisions between molecules are unsuccessful because

   **A**    gas phase reactions are reversible.

   **B**    the collisions are not energetic enough to break the bonds in the molecules.

   **C**    gas phase reactions can only occur when a catalyst is present.

   **D**    gas phase reactions can only occur when UV light is present.

**(Total for Question = 1 mark)**

**Q4.**

In the equilibrium below, what effect would the changes described have on the system?



(a)  Increase in temperature

**(1)**

   **A**     increase rate, decrease yield

   **B**     increase rate, increase yield

   **C**     decrease rate, decrease yield

   **D**     decrease rate, increase yield

(b)  Decrease in pressure

**(1)**

   **A**     increase rate, decrease yield

   **B**     increase rate, increase yield

   **C**     decrease rate, decrease yield

   **D**     decrease rate, increase yield

**(Total for question = 2 marks)**

**Q5.**

Which of the following will **not** affect the rate of the reaction below?

CaCO3(s) + 2HCl(aq) → CaCl2(aq) + H2O(l) + CO2(g)

   **A**    Surface area

   **B**    Concentration

   **C**    Pressure

   **D**    Temperature

**(Total for question = 1 mark)**

**Q6.**

The Maxwell-Boltzmann distribution of molecular energies is useful for explaining why increasing temperature affects the rate of a chemical reaction.

(a) Which of the following statements describes how the shape of the Maxwell-Boltzmann distribution curve changes as temperature increases?

**(1)**

   **A**   The peak decreases in height and moves to the left.

   **B**   The peak increases in height and moves to the left.

   **C**   The peak decreases in height and moves to the right.

   **D**   The peak increases in height and moves to the right.

(b) The **main** reason that reaction rates increase with temperature is that

**(1)**

   **A**   all the molecules move faster.

   **B**   all the molecules collide more frequently.

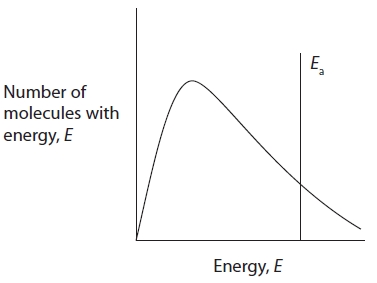
   **C**   more molecules collide with the correct orientation.

   **D**   a larger proportion of molecules have high energies.

**(Total for question = 2 marks)**

**Q7.**

The diagram below shows the Maxwell-Boltzmann distribution of molecular energies for a catalysed reaction.

?

(a)  If the temperature were **lowered**, what would be the effect on the shape of the curve?

**(1)**

   **A**    The peak would shift to the left and be higher.

   **B**    The peak would shift to the left and be lower.

   **C**    The peak would shift to the right and be higher.

   **D**    The peak would shift to the right and be lower.

(b)  Which of the following would shift the activation energy line to the right?

**(1)**

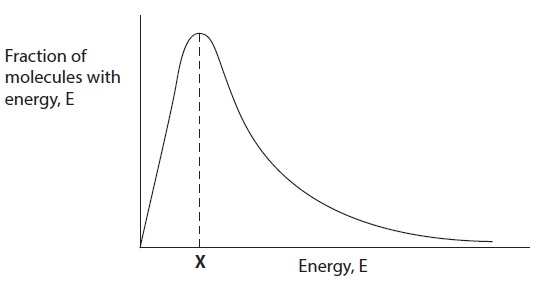
   **A**    An increase in reactant concentration.

   **B**    The removal of the product.

   **C**    The removal of the catalyst.

   **D**    The use of smaller particles with a larger surface area.

**(Total for question = 2 marks)**

**Q8.**

The energy marked **X** in the Maxwell-Boltzmann distribution shows

   **A**    the most common energy of the molecules.

   **B**    the activation energy of the reaction.

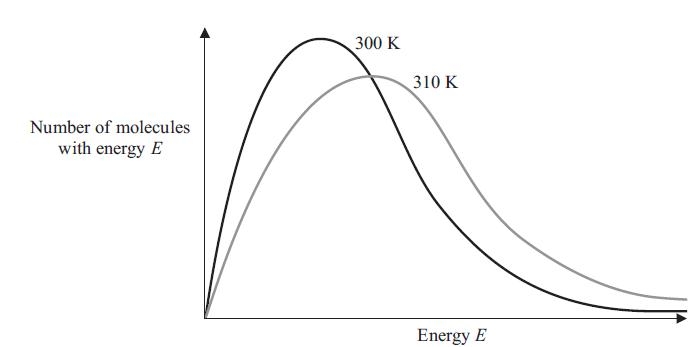
   **C**    the activation energy of a catalysed reaction.

   **D**    the number of molecules with energy greater than the activation energy.

**(Total for Question = 1 mark)**

**Q9.**

The diagram below shows the Maxwell-Boltzmann distribution of molecular energies for a gaseous system at two temperatures.



      (a) The energy plotted on the horizontal axis is **mainly**

**(1)**

   **A**      activation.

   **B**      kinetic.

   **C**      rotation.

   **D**      vibration.

      (b) The rate of a chemical reaction increases with temperature **mainly** because

**(1)**

   **A**      the activation energy increases.

   **B**      the activation energy decreases.

   **C**      more collisions occur with energy greater than the activation energy.

   **D**      the molecules collide more frequently.

      (c) The total area under each curve

**(1)**

   **A**      decreases with increasing temperature.

   **B**      increases with increasing temperature.

   **C**      increases or decreases with increasing temperature, depending on the size of the molecules.

   **D**      does not change with temperature.

**(Total for question = 3 marks)**

**Q10.**

In the reaction between Ag+(aq) ions and Fe2+(aq) ions, what would be the effect of  
 increasing the concentration of Ag+(aq) ions?



   **A**     Rate of reaction increases, yield of Fe3+(aq) stays the same.

   **B**     Rate of reaction increases, yield of Fe3+(aq) decreases.

   **C**     Rate of reaction decreases, yield of Fe3+(aq) stays the same.

   **D**     Rate of reaction increases, yield of Fe3+(aq) increases.

**(Total for question = 1 mark)**

**Q11.**

When steam is passed over heated magnesium, which of the following occurs?

   **A**    Mg + H2O → MgO + H2

   **B**    Mg + H2O → MgOH + ½H2

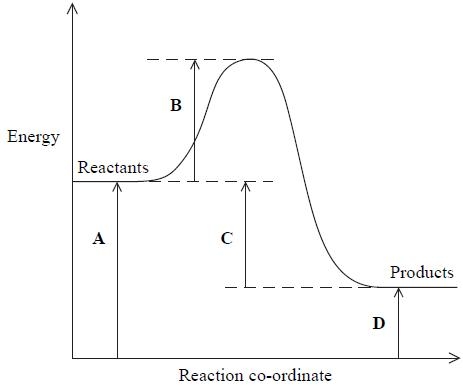
   **C**    Mg + 2H2O → Mg(OH)2 + H2

   **D**    There is no reaction with the magnesium.

**(Total for question = 1 mark)**

**Q12.**

In the reaction profile below, which energy change would alter if a catalyst was added to  
 the reaction?



   **A**

   **B**

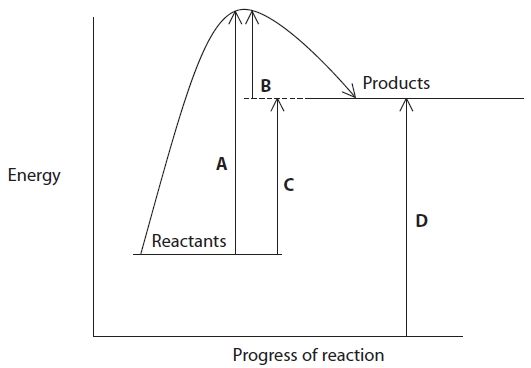
   **C**

   **D**

**(Total for question = 1 mark)**

**Q13.**

The reaction profile for an endothermic reaction is shown below.



(a)  Which arrow represents the activation energy for the **forward** reaction?

**(1)**

   **A**

   **B**

   **C**

   **D**

(b)  Which arrow represents the activation energy for the **backward** reaction?

**(1)**

   **A**

   **B**

   **C**

   **D**

**(Total for question = 2 marks)**

**Mark Scheme**

**Q1.**



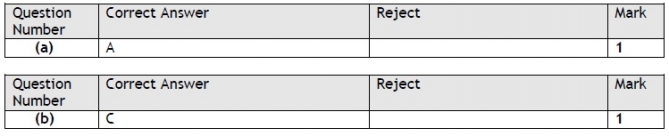
**Q2.**



**Q3.**



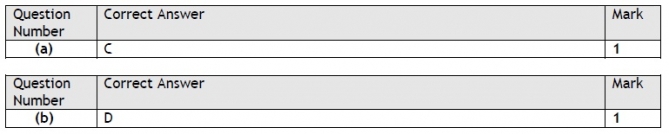
**Q4.**



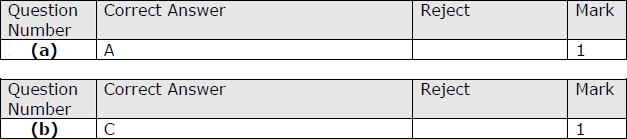
**Q5.**



**Q6.**



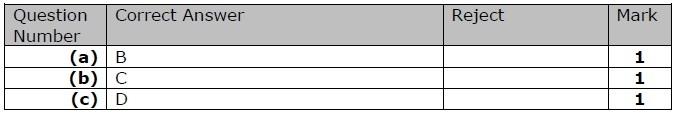
**Q7.**



**Q8.**



**Q9.**



**Q10.**



**Q11.**



**Q12.**



**Q13.**

