DPP-1 [Basics Of Thermochemistry]

Success is not final, failure is not fatal: It is the courage to continue that counts.

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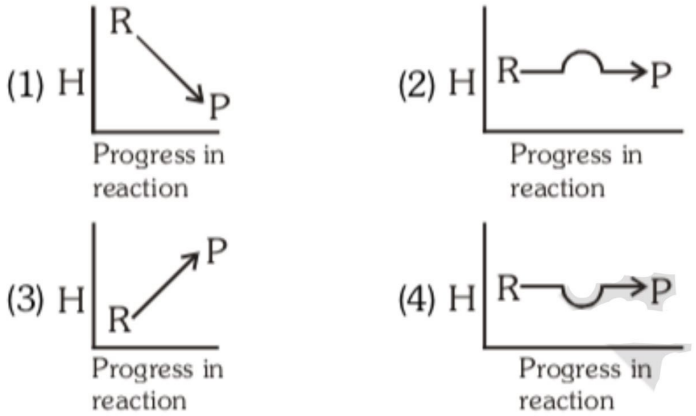
1. **The formation of water from $H_2(g)$ and $O_2(g)$ is an exothermic process because:**
   (1) The chemical energy of $H_2(g)$ and $O_2(g)$ is more than that of water
   (2) The chemical energy of $H_2(g)$ and $O_2(g)$ is less than that of water
   (3) The temperature of $H_2(g)$ and $O_2(g)$ is higher than that of water
   (4) The temperature of $H_2(g)$ and $O_2(g)$ is lower than that of water
2. **Which plot represents an exothermic reaction?**



3. **The enthalpy changes of formation of N_2O and NO are positive because of:**
   (1) The high bond energy of N_2
   (2) The high electron affinity of oxygen atoms
   (3) The high electron affinity of nitrogen atoms
   (4) The tendency of oxygen to form O^{2-}
4. **ΔH for transition of carbon from diamond to graphite is –453.5 cal. This suggests that:**
   (1) Graphite is chemically different from diamond
   (2) Graphite is as stable as diamond
   (3) Graphite is more stable than diamond
   (4) Diamond is more stable than graphite
5. **Which heat of reaction value indicates least stable product?**
   (1) –94 kcal
   (2) –231.6 kcal
   (3) +21.4 kcal
   (4) +64.8 kcal
6. **Exothermic reaction among the following is:**
   (1) Combustion of N_2 to form NO
   (2) Decomposition of water
   (3) Conversion of diamond to graphite
   (4) Dehydrogenation of ethane to ethene

7. **For reaction $3O_2 \rightarrow 2O_3$, $\Delta H = +ve$, we can say that:**
   (1) Ozone is more stable than oxygen
   (2) Ozone is less stable than oxygen
   (3) Oxygen is less stable than ozone
   (4) None of the above
8. **From the reaction P(White) $\rightarrow$ P(Red); $\Delta H = -18.4$ kJ, it follows that:**
   (1) Red P is readily formed from white P
   (2) White P is readily formed from red P
   (3) White P cannot be converted to red P
   (4) White P can be converted to red P and red P is more stable
9. **For the reactions: (i) $H_2 + Cl_2 \rightarrow 2HCl(g) + x$ kJ (ii) $H_2 + Cl_2 \rightarrow 2HCl(l) + y$ kJ** Which one is correct?
   (1) x >y
   (2) x < y
   (3) x = y
   (4) More data required
10. **Two atoms of hydrogen combine to form H_2. The energy of H_2 molecule is:**
    (1) Greater than that of separate atoms
    (2) Equal to that of separate atoms
    (3) Lower than that of separate atoms
    (4) Sometimes lower and sometimes higher

Numerical Questions

1. **1 g of graphite is burnt in a bomb calorimeter (heat capacity = 20.7 kJ K^{-1}). The temperature is raised from 298 K to 299 K. Calculate the enthalpy change for the combustion of graphite at 298 K and 1 atm pressure.**

2. **1.6 g of NH_4NO_3 is decomposed in a bomb calorimeter. The temperature is lowered by 6 K. Heat capacity of the calorimeter system is 1.25 kJ K^{-1}. Calculate the molar heat of decomposition of NH_4NO_3.**

3. **A bomb calorimeter has heat capacity 500 J $°C^{-1}$. A rise of 2°C is observed when 0.1 g of methane is burnt in it. Find the value of ΔE per mole of methane.**

4. **19 g of copper at 87°C is placed in a calorimeter containing 55.55 g water at 18.3°C. The final temperature is 20.4°C. If the specific heat of water is 4.184 J g^{-1} $°C^{-1}$, determine the specific heat of copper.**

5. **A certain amount of gas 'A' in a bomb calorimeter evolves 250 kJ mol^{-1}. For 0.2 mol of it, temperature rises from 298 K to 300 K. Find the heat capacity of the calorimeter.**

6. **The complete combustion of ethanol is represented as: $C_2H_5OH(l) + 3O_2(g) \rightarrow 2CO_2(g) + 3H_2O(l)$. The heat evolved is measured to be 1364.47 kJ mol^{-1}. Find the enthalpy of combustion ΔH (R = 8.314 J K^{-1} mol^{-1}).**