**نموذج اجابة امتحان التخلفات للفصل الدراسى الأول 2016 -2017**

## Chemistry

**Question (2)** **(22 Marks)**

(a) Define each of the following:

(i) The first law of thermodynamics.

(ii) Bond enthalpy.

(iii) Molar heat capacity.

(iv) Thermochemical equation.

**Answer**

(i) *In any process the total change in energy of the system ΔE is equal to the sum of the heat q and the work w transferred between the system and the surroundings $\Delta E = q + w$.*

(ii) *The bond enthalpy is defined as ΔH when one mole of bonds is broken in the gaseous state*

(iii) *The amount of heat required to raise the temperature of one mole of substance one degree centigrade.*

(iv) *Thermochemical equation is defined as a balanced chemical equation, together with its value of ΔH*

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(b) Calculate the amount of heat q for the following processes:

(i) An endothermic process in which the system receives 12J of work from its surrounding and the change of internal energy is 77J .

(ii) Converting 55 g of ethanol $C_2H_5OH$ from liquid to vapor at its boiling point if the heat of vaporization is 38.5 KJ/mole.

(iii) Increasing the temperature of 100 g of copper from 10℃ to 100℃ the specific heat of copper is 0.389 J/g ℃.

**Answer**

**Answer:**

(i) $\Delta E = q + w$

$77 = q + 12 \quad \rightarrow q = 65\ J$

(ii) number of moles of 55 gm of $C_2H_5OH = \frac{55}{46} = 1.19$

1 mole $\rightarrow$ 38.5

1.19 $\rightarrow$ ?? $\therefore$ q=46.032 KJ

(iii) $q = s \times m . \Delta T = 0.389 \times 100 \times 90 = 3501\ J$

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(c) Standard heat of formation $\Delta H_f^0$ of $C_2H_{4\,(g)}$, $CO_{2\,(g)}$ and $H_2O_{(\ell)}$ are, $52.3\,KJ/mole$, $-393.5\,KJ/mole$ and $-285.8\,KJ/mole$ respectively. Determine the heat of combustion of one mole of $C_2H_{4\,(g)}$

$$C_2H_{4\,(g)} + 3\,O_{2\,(g)} \rightarrow 2CO_{2(g)} + 2H_2O_{(L)}.$$

**Answer**

$$\Delta H^o{}_r = \sum \Delta H^o_{f\,products} - \sum \Delta H^o_{f\;\;rectants}$$

$$= (2\Delta H^o_f\;\; CO_{2(g)} + 2\Delta H^o_f\;\; H_2O_{(\ell)}) - (\Delta H^o_f\;\; C_2H_{4(g)} + 3\Delta H^o_f\;\; O_{2(g)})$$
$$= \{2\times -393.5 + 2(-285.8)\} - \{52.3 + (3)\times(0)\} = -1410.9\ KJ/mol$$

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(e) If $\Delta E = -1254.3\ kJ$, at 25°C. Calculate $\Delta H$ for the reaction

$$C_2H_{2(g)} + 2.50\ O_{2(g)} \rightarrow 2CO_{2(g)} + H_2O_{(g)}$$

**Answer**

$$\Delta H = \Delta E + \Delta\, nRT$$
$$\Delta H = -1254.3 + (-0.5)(8.31\times 10^{-3} \times 298)$$
$$\Delta H = \ -1255.5\ KJ/mol$$

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