

Questions

MathonGo

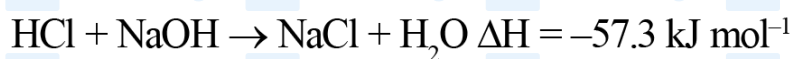
Q1 - 25 July - Shift 1

The enthalpy of combustion of propane, graphite and dihydrogen at 298 K are: $-2220.0 \text{ kJ mol}^{-1}$, $-393.5 \text{ kJ mol}^{-1}$ and $-285.8 \text{ kJ mol}^{-1}$ respectively.

The magnitude enthalpy of formation of propane (C_3H_8) is..... kJ mol^{-1} . (Nearest integer)

*Space for your notes:***Q2 - 25 July - Shift 2**

While performing a thermodynamics experiment, a student made the following observations,



$$\Delta H = -55.3 \text{ kJ mol}^{-1}$$

The enthalpy of ionization of CH_3COOH as calculated by the student is _____ kJ mol^{-1} . (nearest integer)

*Space for your notes:***Q3 - 26 July - Shift 1**

2.4 g coal is burnt in a bomb calorimeter in excess of oxygen at 298 K and 1 atm pressure.

The temperature of the calorimeter rises from 298 K to 300 K. The enthalpy change during the combustion of coal is $-x \text{ kJ mol}^{-1}$. The value of x is _____. (Nearest Integer)

Space for your notes:

(Given : Heat capacity of bomb calorimeter 20.0 kJ K^{-1} . Assume coal to be pure carbon)

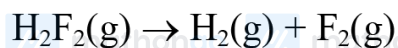
Q4 - 26 July - Shift 2

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For the reaction



$$\Delta U = -59.6 \text{ kJ mol}^{-1} \text{ at } 27^\circ\text{C}.$$

The enthalpy change for the above reaction is (-)

___ kJ mol^{-1} [nearest integer] Given : $R = 8.314$

$\text{JK}^{-1} \text{mol}^{-1}$.

Space for your notes:

Q5 - 27 July - Shift 1

The molar heat capacity for an ideal gas at constant

pressure is $20.785 \text{ J K}^{-1} \text{mol}^{-1}$. The change in

internal energy is 5000 J upon heating it from

300K to 500K . The number of moles of the gas at

constant volume is ___ [Nearest integer]

(Given: $R = 8.314 \text{ J K}^{-1} \text{mol}^{-1}$)

Space for your notes:

Q6 - 27 July - Shift 2

A gas (Molar mass = 280 g mol^{-1}) was burnt in

excess O_2 in a constant volume calorimeter and

during combustion the temperature of calorimeter

increased from 298.0 K to 298.45 K . If the heat

capacity of calorimeter is 2.5 kJ K^{-1} and enthalpy

of combustion of gas is 9 kJ mol^{-1} then amount of

gas burnt is ___ g. (Nearest Integer)

Space for your notes:

Q7 - 28 July - Shift 1

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Which of the following relation is not correct ?

- (A) $\Delta H = \Delta U - P\Delta V$ (B) $\Delta U = q + W$
(C) $\Delta S_{\text{sys}} + \Delta S_{\text{surr}} \geq 0$ (D) $\Delta G = \Delta H - T\Delta S$

Space for your notes:

Q8 - 28 July - Shift 2

Given below are two statements : One is labelled as

Assertion A and the other is labelled as **Reason R**

Assertion A : The reduction of a metal oxide is easier if the metal formed is in liquid state than solid state.

Reason R : The value of ΔG^\ominus becomes more on negative side as entropy is higher in liquid state than solid state.

In the light of the above statements. Choose the most appropriate answer from the options given below

- (A) Both A and R are correct and R is the correct explanation of A
(B) Both A and R are correct but R is NOT the correct explanation of A
(C) A is correct but R is not correct
(D) A is not correct but R is correct

Space for your notes:

Q9 - 28 July - Shift 2

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Among the following the number of state variable is _____.

Internal energy (U)

Volume (V)

Heat (q)

Enthalpy (H)

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Q10 - 29 July - Shift 1

When 600 mL of 0.2 M HNO_3 is mixed with

400 mL of 0.1M NaOH solution in a flask, the rise

in temperature of the flask is _____ $\times 10^{-2} \text{ }^\circ\text{C}$.

(Enthalpy of neutralisation = 57 kJ mol^{-1} and

Specific heat of water = $4.2 \text{ JK}^{-1} \text{ g}^{-1}$)

(Neglect heat capacity of flask)

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Answer Key

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Q1 (104)

Q2 (2)

Q3 (200)

Q4 (57)

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Q5 (2)

Q6 (35)

Q7 (A)

Q8 (A)

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Q9 (3)

Q10 (54)

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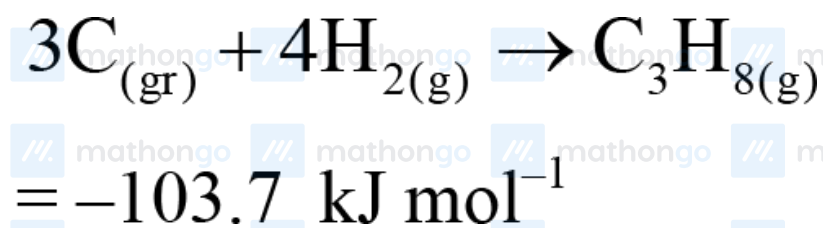
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Q1 (104)



Q2 (2)

$$\Delta H_{\text{ionisation}} \text{ of } \text{CH}_3\text{COOH} = |-57.3 - (-55.3)|$$

$$= 2 \text{ KJ/mol}$$

Q3 (200)



$$Q = C\Delta T = 20 \text{ kJ} \times 2$$

40 kJ heat is released for 2.4 g of C

$$\text{For 1 mole 'C': } Q = \frac{40}{2.4} \times 12$$

$$= \frac{400}{24} \times 12 = 200 \text{ kJ/mole}$$

$$Q = \Delta E = \Delta H = 200 \text{ kJ} (\because \Delta n_g = 0)$$

$$x = 200$$

Q4 (57)

$$\Delta H = \Delta U + \Delta n_g RT$$

$$\Delta H = -59.6 + 1 \times 8.314 \times 300 \times 10^{-3} = -57.10$$

Q5 (2)

$$C_{p,m} = C_{v,m} + R$$

$$\Rightarrow C_{v,m} = 20.785 - 8.314 = 12.471 \text{ J K}^{-1} \text{ mol}^{-1}$$

$$\Delta U = nC_{v,m}\Delta T$$

$$\Rightarrow n = \frac{5000}{12.471 \times 200} = \frac{25}{12.471} \approx 2$$

Q6 (35)

Let x g is burnt

$$\text{moles} = \frac{x}{280}$$

$$\text{heat released by } \frac{x}{280} \text{ mole} = 2.5 \times 0.45 \text{ kJ}$$

$$\text{heat released by 1 mole} = \frac{2.5 \times 0.45 \times 280}{x} \text{ kJ}$$

$$\Delta H = \Delta U + \Delta n g R T$$

$$\Delta H \approx \Delta U$$

$$9 = \frac{2.5 \times 280 \times 0.45}{x}$$

$$x = 35 \text{ g}$$

Q7 (A)

If $U + Pv$ (By definition)

$$\Delta H = \Delta U + \Delta(Pv) \text{ at constant pressure}$$

$$\Delta H = \Delta U + P\Delta V$$

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Q8 (A)

$$\Delta G = \Delta H - T\Delta S$$

\therefore Entropy of liquid is more than solid

\therefore on melting the entropy increases and ΔG

becomes more negative and hence it becomes

easier to reduce metal

Q9 (3)

Internal energy, volume enthalpy are state variable

Q10 (54)

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$$\begin{array}{l} \text{HNO}_3 \qquad \qquad \text{NaOH} \\ 600 \text{ mL} \times 0.2 \text{ M} \qquad 400 \text{ mL} \times 0.1 \text{ M} \\ = 120 \text{ m mol} \qquad \qquad = 40 \text{ m mol} \end{array}$$



$$\text{Bef.} \quad 120 \qquad 40$$

$$\text{Aft.} \quad 80 \qquad 0 \qquad 40 \text{ m mol}$$

$$\Delta_r H = 40 \text{ m mol} \times (57 \times 10^3) \frac{\text{J}}{\text{mol}}$$

$$= 40 \times 10^{-3} \text{ mol} \times 57 \times 10^3 \frac{\text{J}}{\text{mol}}$$

$$= 2280 \text{ J}$$

$$m S \Delta T = 2280$$

$$\Rightarrow 1000 \text{ mL} \times \frac{1 \text{ gm}}{\text{mL}} \times 4.2 \times \Delta T = 2280$$

$$\Delta T = \frac{2280}{4.2} \times 10^{-3}$$

$$= \frac{22800}{42} \times 10^{-3}$$

$$= 542.86 \times 10^{-3}$$

$$\Delta T = 54.286 \times 10^{-2} \text{ K}$$

$$\Delta T = 54.286 \times 10^{-20} \text{ C}$$

$$\text{Ans.} \quad \boxed{54.286}$$

Answer mentioned as 54 (Closest integer)