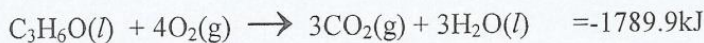


Multiple Choices

- (1) 100 g of metal absorbs 1000 J as its temperature change (from 25 to 45 °C). The specific heat of the metal (in J/g °C) is:

(A) 10 (B) 0.5 (C) 5 (D) 50

- (2) From the following information ΔH_f° (C₃H₆O(l)) is (in kJ/mol):



ΔH_f° (CO₂(g)) = -393.5 kJ/mol and ΔH_f° (H₂O(l)) = -285.8 kJ/mol

(A) +328

(B) -226

(C) +248

(D) -248

$$\Delta H_{rxn} = \sum \Delta H_{products} - \sum \Delta H_{reactants}$$

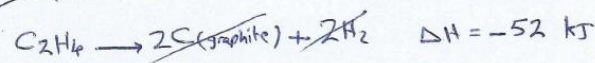
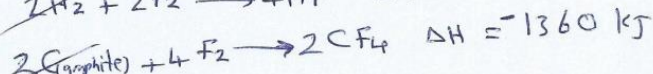
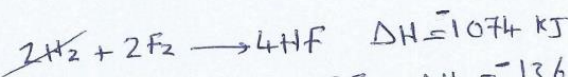
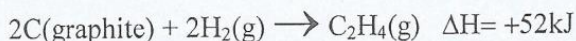
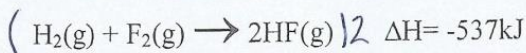
$$-1789.9 = (3 \times -285.8) + (3 \times -393.5) - \Delta H_{\text{C}_3\text{H}_6\text{O}}$$

$$-1789.9 = -857.4 - 1180.5 - \Delta H_{\text{C}_3\text{H}_6\text{O}}$$

$$-1789.9 + 857.4 + 1180.5 = -\Delta H_{\text{C}_3\text{H}_6\text{O}}$$

$$\Delta H_{\text{C}_3\text{H}_6\text{O}} = -248$$

- (3) From the following information:



ΔH (in kJ) of this reaction $\text{C}_2\text{H}_4(g) + 6\text{F}_2(g) \rightarrow 2\text{CF}_4(g) + 4\text{HF}(g)$ is:

(A) -2538

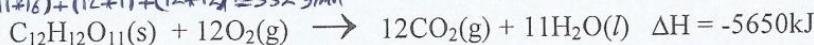
(B) -2486

(C) -2382

(D) -2330

- (4) From the following information:

$$(11 \times 16) + (12 \times 1) + (12 \times 12) = 332 \text{ g/mol}$$



The mass (in g) of C₁₂H₁₂O₁₁(s) needed to obtain $\Delta H = -170.18 \text{ kJ}$ is:

(A) 10

(B) 16

(C) 14

$$1 \text{ mol} \rightarrow -5650 \text{ kJ}$$

$$? \text{ mol} \rightarrow -170.18 \text{ kJ}$$

$$\# \text{ mole} = 0.03 \text{ mol}$$

$$n = \frac{\text{mole}}{\text{mol}} \quad (D) 12 \frac{n \times \text{mol}}{0.03 \times 332} = 9.96 \text{ g}$$

- (5) Given ΔH_f° (NH₃(g)) = -46 kJ/mol. Calculate the change in internal energy, ΔE° (in kJ) of this reaction $\text{N}_2(g) + 3\text{H}_2(g) \rightarrow 2\text{NH}_3(g)$

(A) -51

(B) -41

(C) -87

(D) -97

- (6) 500.0 g of water at 23 °C was cooled down and release 31380 J.

Knowing that the specific heat of water is 4.184 J/g °C, the new temperature of water in °C is:

(A) 10

(B) 5

(C) 6

(D) 8

- (7) The solubility of N₂ gas in water at 25 °C and N₂ partial pressure = 0.76 atm is 5.2 × 10⁻⁴ mol/l. What is the partial pressure of nitrogen (in atm) at which its solubility in water is 1.71 × 10⁻³ mol/l at 25 °C?

A) 2.7

(B) 2.5

C) 2.3

D) 2.1

$$S_g = k P_g$$

$$5.2 \times 10^{-4} = k \cdot 0.76$$

$$k = 6.84 \times 10^{-4} \text{ mol/L atm}$$

$$1.71 \times 10^{-3} = 6.84 \times 10^{-4} \times P_g$$

$$P_g = 2.5 \text{ atm}$$

- 8) Benzene, C_6H_6 , and toluene, C_7H_8 , form ideal solution that has a total vapor pressure of 1.0 atm. What is the mole fraction of benzene in this solution?

$P^\circ_{\text{Benzene}} = 1.326 \text{ atm}$ and $P^\circ_{\text{Toluene}} = 0.532 \text{ atm}$

(A) 0.59

(B) 0.56

$$P_T = X_1 P_1^\circ + X_2 P_2^\circ \quad X_1 = 1 - X_2$$

$$1 = X_1 (1.326) + (1 - X_1) 0.532 \quad X_2 = 1 - X_1$$

$$1 = 1.326 X_1 + 0.532 - 0.532 X_1$$

$$0.468 = 0.794 X_1 \quad X_1 = 0.589$$

- (9) The molar mass of a chemical that is non-volatile and non-electrolyte is $6.8 \times 10^4 \text{ g/mole}$. What is the osmotic pressure (in mmHg) at 27°C of 200 ml aqueous solution containing 8.0 g of this chemical?

(A) 9.0

(B) 11.0

(C) 13.0

(D) 14.0

$$\pi = MRT$$

$$R = 0.082 \text{ Latm/mol K}$$

$$M = \frac{n}{V} = \frac{8}{6.8 \times 10^4 \times 0.2} = 5.88 \times 10^{-4} \text{ M}$$

$$n = \frac{8}{6.8 \times 10^4} = 1.176 \times 10^{-4} \text{ mol}$$

$$\pi = 5.88 \times 10^{-4} \times 0.082 \times 300 = 0.01447 \text{ atm}$$

$$1 \text{ atm} = 760 \text{ mmHg}$$

- (10) 0.05 molal of CaCl_2 aqueous solution freeze at -0.27°C .

What is the Vant's Hoff factor (i) of CaCl_2 ? ($K_f \text{ water} = 1.86^\circ\text{C/m}$)

(A) 3.0

(B) 2.7

(C) 2.9

(D) 2.8

$$T_f = 0 \text{ for pure water}$$

$$\Delta T_f = i K_f m$$

$$0 - (-0.27) = i \times 1.86 \times 0.05$$

- (11) The unit of the rate constant for zero order reaction is: $R = k \text{ M s}^{-1} \text{ mol L}^{-1} \text{ s}^{-1}$

(A) mol l^{-1}

(B) s^{-1}

(C) $\text{l mol}^{-1} \text{ s}^{-1}$

(D) $\text{mol l}^{-1} \text{ s}^{-1}$

- (12) A first order reaction has a rate constant of $7.5 \times 10^{-3} \text{ s}^{-1}$. The time (in seconds) needed for the reaction to be 60% complete is:

(A) 116.17

(B) 118.17

(C) 122.17

(D) 112.17

$$\frac{A_t}{A_0} = \frac{60}{100} = 0.6 \quad \text{1st order} \quad \ln \frac{A_t}{A_0} = -kt$$

$$\ln 0.4 = -7.5 \times 10^{-3} t$$

$$t = 122.17 \text{ s}$$

- (13) For this reaction: $A + 3B \rightarrow 2D$, The rate of D appearance is:

(A) Faster than A disappearance
(C) Slower than A disappearance

(B) Faster than B disappearance
(D) Equal to A disappearance

$$R_A = \frac{R_B}{3} = \frac{R_D}{2}$$

- (14) From this information:

Exp.	$[\text{NO}]_0 \text{ (M)}$	$[\text{H}_2]_0 \text{ (M)}$	Initial rate (M/s)
1	0.273	0.763	2.83
2	0.273	1.526	2.83
3	0.819	0.763	22.47

The rate law for this reaction $2\text{NO} + \text{H}_2 \rightarrow \text{N}_2\text{O} + \text{H}_2\text{O}$ is:

(A) $\text{Rate} = k[\text{NO}]^2 [\text{H}_2]$ (B) $\text{Rate} = k[\text{NO}] [\text{H}_2]^2$ (C) $\text{Rate} = k[\text{NO}]^2 [\text{H}_2]^2$ (D) $\text{Rate} = k[\text{NO}]^2$

$$R = k[\text{NO}]^x [\text{H}_2]^y \quad y = 0 \quad x = 2$$

- (15) $A \rightarrow B$ is a first order reaction. Which of the following statements is true?

(A) $t_{1/2}$ increases as $[\text{A}]_0$ increases.
(C) $t_{1/2}$ decreases as (the rate constant) increases.

(B) $t_{1/2}$ decreases as $[\text{A}]_0$ increases.
(D) $t_{1/2}$ increases as (the rate constant) increases.

$$\text{1st order}$$

$$t_{0.5} = \frac{\ln 2}{k}$$

$$t_{0.5} \propto 1/k$$

THE END