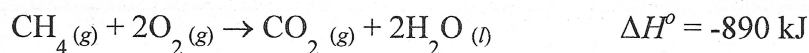


1. How much heat is released when 8.0 g of methane gas is burned, according to the following equation:

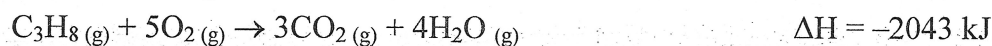


- A) 1050 kJ B) 445 kJ C) 256 kJ D) 625 kJ
-

2. The internal energy ΔE (ΔU) of the system is a **positive** value if the system:

- A) Absorbs heat and work done on it.
B) Absorbs heat and does work.
C) Release heat and does work.
D) Release heat and work done on it.
-

3. Given the following reactions:



Find ΔH_{rxn} (in **kJ**) for: $3\text{C}(\text{gr}) + 4\text{H}_2(\text{g}) \rightarrow \text{C}_3\text{H}_8(\text{g})$

- A) -99 B) -132 C) -118 D) -107
-

4. The amount of heat (in **J**) required to increase the temperature of 350.0 g of copper from 25°C to 85°C is: (the specific heat of copper is 0.385 J/g °C)

- A) 6485 B) 8085 C) 7676 D) 6806
-

5. A gas absorbs 1900 J as heat and its change in the internal energy is 1100 J. The amount of work (in **J**) in this process, is:

- A) -3000 B) +3000 C) -800 D) +800
-

6. What is the vant Hoff factor of a solution, contained 10.0 g of CaCl_2 (an electrolyte) in 100.0 g of water, and the solution freeze at - 4.1 °C? (K_f of water = 1.86 °C/m).

- A) 2.44 B) 2.85 C) 2.68 D) 2.59
-

7. If 20.0 g of non-electrolyte substance ($M_{\text{wt}} = 6.8 \times 10^4 \text{ g/mol}$) dissolved in water to make 200 mL of solution. What is the osmotic pressure (in **torr**) at 30 °C?

- A) 15.0 B) 9.0 C) 28.0 D) 31.0
-

8. What is the vapor pressure (in **torr**) of a solution prepared from 200.0 g of " $\text{CO}(\text{NH}_2)_2$ " and 350.0 g of water at 32.0 °C.

(The vapor pressure of pure water at 32.0 °C is 35.7 torr)

- A) 28.6 B) 30.5 C) 29.4 D) 27.3

9. The solubility of nitrogen gas "N₂" in water at 20 °C and 520 torr is 5.0×10^{-4} mol/L. The Henry's law constant (in mol/L.atm) at 20 °C, is:

- A) 7.3×10^{-4} B) 6.7×10^{-4} C) 6.9×10^{-4} D) 7.1×10^{-4}

10. What is the freezing point of an aqueous solution, containing a nonvolatile nonelectrolyte solute. The solution has a boiling point of 103.8 °C? (K_f of water = 1.86 °C/m and K_b of water = 0.52 °C/m)

- A) -7.7 °C B) -13.6 °C C) -11.2 °C D) -9.8 °C

11. The rate law of a reaction is: $\text{rate} = k[A]^{1/2}[B]$. The unit of k (rate constant) is:

- A) $M^{-1/2} \cdot s^{-1}$ B) $M^{3/2} \cdot s$ C) $M^{-3/2} \cdot s^{-1}$ D) $M^{1/2} \cdot s$

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

- A) 112 B) 118 C) 122 D) 115

13. For the reaction: $3A \longrightarrow 2B$

The average rate of appearance of B may be expressed as:

- A) $-\frac{3}{2} \Delta A / \Delta t$ B) $-\frac{2}{3} \Delta A / \Delta t$ C) $+\frac{2}{3} \Delta A / \Delta t$ D) $+\frac{3}{2} \Delta A / \Delta t$

14. The rate constant for first order reaction at 700 K is 6.2×10^{-4} and at 760 K is 2.4×10^{-2} . The activation energy (in **kJ/mol**) for this reaction is:

- A) 269.5 B) 465.8 C) 325.6 D) 312.7

15. For the following reaction:



The table shows the initial rates of the reaction that measured for three experiments:

Exp.	[NO] ₀ mol/L	[Cl ₂] ₀ mol/L	Initial rate (mol L ⁻¹ hr ⁻¹)
1	0.50	0.50	1.19
2	1.0	0.50	4.76
3	1.0	1	9.52

The rate law for the reaction is:

- A) $\text{rate} = k [\text{Cl}_2]^2$ B) $\text{rate} = k [\text{NO}]^2 [\text{Cl}_2]$
 C) $\text{rate} = k [\text{NO}] [\text{Cl}_2]^2$ D) $\text{rate} = k$