1. **The sign of ΔH for the process $CO_2(s) = CO_2(g)$ is: ((the symbol "H" means enthalpy))**

A) Positive and $H_{CO2}(s) > H_{CO2}(g)$
B) Positive and $H_{CO2}(g) > H_{CO2}(s)$
C) Negative and $H_{CO2}(s) > H_{CO2}(g)$
D) Negative and $H_{CO2}(g) > H_{CO2}(s)$

2. Which of the ΔH^o_{rxn} of the following equations represents $\Delta H^o_{f,\ K3PO4(s)}$?

A) $3K(s) + PO_2(s) + O_2(g) \rightarrow K_3PO_4(s)$

B) $K_3(s) + P(s) + O_4(g) \rightarrow K_3PO_4(s)$

C) $K_3P(s) + 2O_2(g) \rightarrow K_3PO_4(s)$

D) $3K(s) + P(s) + 2O_2(g) \rightarrow K_3PO_4(s)$

3. A balanced chemical equation with specified value of ΔH and states of substances is called:

A) A thermochemical equation
B) A combustion reaction
C) The first law of thermodynamics
D) Hess's law

4. **Change in internal energy (ΔE^o), in kJ, of the following reaction is:**

$$2NaHCO_3(s) \longrightarrow Na_2CO_3(s) + H_2O(g) + CO_2(g)$$

$$\Delta H^o_{rxn} = 129 \text{ kJ}$$

A) 121.04

B) 134.04

C) 124.04

D) 114.04

5. If 10.0 g of a metal (C_s = 0.896 J/g K) at 298 K is supplied with 313.5 J of heat, its final temperature, in K, will be:

A) 353

B) 333

C) 323

D) 373

$$\boxed{q = C_s \times m \times \Delta T}$$

6. **From table below, ΔH^{o}_{rxn} of the following reaction, in KJ, is:**

$$PCl_3(g) + 3HCl(g) \longrightarrow 3Cl_2(g) + PH_3(g)$$

Compound	$PH_3(g)$	$PCl_3(g)$	$HCl(g)$
ΔH_f/KJ mol $^{-1}$	+ 5.40	- 288.07	- 92.30

A) 570.37 **B) 507.37** **C) 705.37** **D) 750.37**

$$\boxed{\begin{aligned}\Delta H &= H_{\text{final}} - H_{\text{initial}} \\ &= H_{\text{products}} - H_{\text{reactants}}\end{aligned}}$$

7. Knowing that:

$$1/2H_2(g) + 1/2Cl_2(g) \longrightarrow HCl(g) \qquad \Delta H^o_{rxn} = -92.3\ KJ$$

the number of kilojoules (KJ) released if 100 g of HCl(g) is produced, is:

A) 235.17

B) 325.17

C) 523.17

D) 253.17

8. The process of surrounding solute particles by solvent particles is known as:

A) Dilution

B) Formation

C) Solvation

D) Osmosis

9. The solubility of …..?…..in liquid is highly affected by changing pressure

A) Gases

B) Liquids

C) Solids

D) Salts

10. If 0.1 mol of solid glucose ($C_6H_{12}O_6$) is dissolved in the same mass of each of the following solvents:

Solvent	Q	X	Y	Z
K_b/C molal $^{-1}$	0.4	1.53	1.7	0.5

the solvent which its boiling point is elevated more is:

A) Q B) X C) Y D) Z

$$\boxed{\Delta T_b = K_b\, m}$$

11. **The magnitudes of the molal constant of boiling point elevation (K_b) depend on:**

A) **Temperature**

B) **Pressure**

C) **Nature of solute**

D) **Nature of solvent**

12. **The aqueous solution with the highest boiling point is:**

A) 0.1 M HI

B) 0.1 M $(NH_4)_3PO_4$

C) 0.2 M C_2H_5OH

D) 0.1 M NH_4Cl

13. If 1 L carbonated water is bottled under pressure of 2.4 atm of $CO_2(g)$, and Henry's law constant is 3.36×10^{-2} mol/L atm, the number of grams of dissolved $CO_2(g)$ is:

A) 5.35

B) 53.5

C) 35.5

D) 3.55

14. At 30 ^oC, the osmotic pressure, in torr, of 0.108 M aqueous solution of a salt that is assumed to be totally ionized into three ions is:

A) 3.16×10^3

B) 1.63×10^3

C) 6.13×10^3

D) 1.36×10^3

15. The minimum amount of energy required to overcome the energy barrier in a chemical reaction is the:

A) **Activation energy**

B) **Reaction's enthalpy**

C) **Reactant's kinetic energy**

D) **Reactants' heat content**

16. **Increasing temperature increases reaction rate because it:**

A) Increases the activation energy

B) Decreases the activation energy

C) Increases the number of collisions

D) Increases the reaction enthalpy

17. **According to the following reaction:**

$$N_2O_5(g) \longrightarrow NO_2(g) + NO_3(g)$$

if 0.8 mol of N_2O_5 (g) is initially put in 2L-reaction vessel and is found to be 0.0125 mol after 2 min, the rate of disappearance of N_2O_5 (g), in M/min, is:

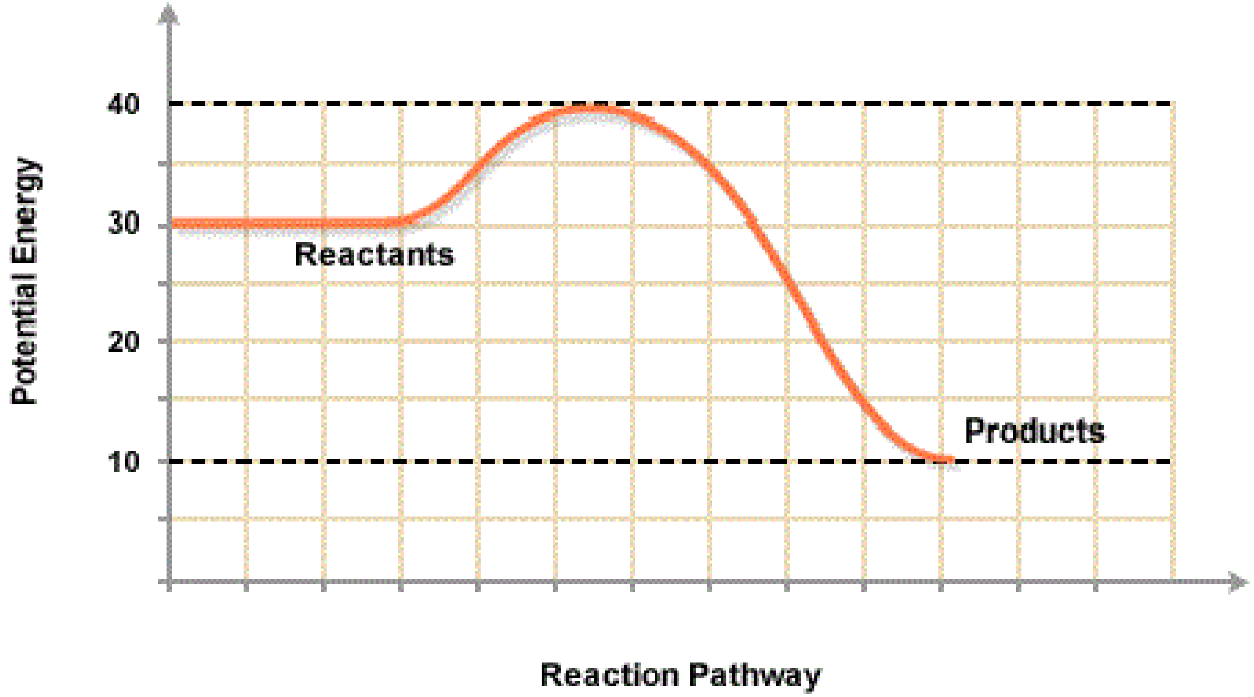
A) 0.9169

B) 0.1969

C) 0.6919

D) 0.9961

18. From the following reaction potential energy (PE) diagram:



which of the following is correct for the forward reaction:

	ΔH/kJ	Activation energy, Ea/kJ	Type of reaction
A)	+ 20	10	exothermic
B)	+ 20	30	endothermic
C)	- 20	10	exothermic
D)	- 20	40	endothermic

19. **In a first order reaction, if the concentration of the reactant changes from 0.1 M to 0.025 M in 40 minutes, the reaction rate, in M/min, when the initial concentration is 0.01 M is:**

A) 6.634 x 10^{-4}
B) 6.346 x 10^{-4}
C) 4.366 x 10^{-4}
D) 3.466 x 10^{-4}

20. **For the reaction:**

$$N_2O_5(g) \longrightarrow 2NO_2(g) + 1/2O_2(g)$$

if the value of the rate of disappearance of N_2O_5 is 6.25×10^{-3} mol L^{-1} s^{-1}, the rate of appearance of NO_2 is:

A) 2.15×10^{-2}

B) 1.25×10^{-2}

C) 2.51×10^{-2}

D) 2.51×10^{-2}


Thank You!