

Question 1 : from (1-10)

Indicate whether the following statements are true (T) or false (F) :

- 1) Crystallization occurs when the solute from a supersaturated solution forms crystal. ( )
- 2) Osmotic pressure can be calculated using a formula that is different from the ideal gas law. ( )
- 3) The boiling point of a solution is higher than the boiling point of the pure solvent. ( )
- 4) In an endothermic reaction, the energy of the final state is greater than the energy of the initial state. ( )
- 5) For an exothermic process, heat is given to the system by the surroundings. ( )
- 6) Enthalpy (H) is an expression related to the change of heat under constant volume (qv). ( )
- 7)  $\Delta E = \Delta H$  when  $\Delta n = 0$ , where  $\Delta n$  represents the change in moles of gas. ( )
- 8) The exponents in a rate law represent the coefficients in the balanced chemical equation. ( )
- 9) Catalysts are consumed during the chemical reaction. ( )
- 10) The value of  $\Delta E$  has no effect on the reaction rate. ( )

Question 2 : from (11-30)

Select the correct answer for each question :

11) How does the solubility of most gases in water change as the temperature increases :

- A- The solubility increases
- B- The solubility initially increases, then decreases
- C- The solubility remains unchanged
- D- The solubility decreases

12) A solution that contains the maximum amount of solute that will dissolve at a specific temperature is \_\_\_\_\_ :

- A- a saturated solution
- B- An unsaturated solution
- C- a supersaturated solution
- D- both A and B are correct

13) Which of the following solvents is most likely to dissolve ionic compounds effectively :

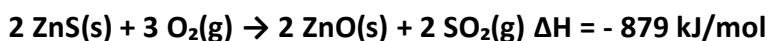
- A- H<sub>2</sub>O
- B- C<sub>6</sub>H<sub>6</sub>
- C- CCl<sub>4</sub>
- D- Cl<sub>2</sub>

14) In which of the following cases is the rate of disappearance of the reactant equal to the rate of formation of the product :

- A-  $5/2 A \rightarrow 5/2 B$
- B-  $2A \rightarrow 4/2 B$
- C-  $1/2 A \rightarrow 3/6 B$
- D- All of the answers are true



15) Calculate the enthalpy change ( $\Delta H$ ) in kJ/mol for the formation of 3 moles of ZnO (s) based on the given reaction :



- A- -1718.5 kJ/mol
- B- +250.5 kJ/mol
- C- +218.5 kJ/mol
- D- -1318.5 kJ/mol

16) Calculate the boiling point of a solution made by dissolving 1 mole of a non-volatile solute in 2 kg of water, if the  $K_b$  for water is 0.52 °C/m and the normal boiling point of water is 100 °C:

- A- 100.26 °C
- B- 150.26 °C
- C- 200.26 °C
- D- 270.26 °C

17) For which reaction order are the units of the rate constant the same as the units of the reaction rate :

- A- Zero order
- B- First order
- C- Second order
- D- None of the above

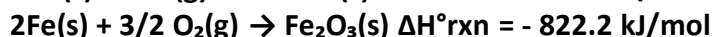
18) A mixture contains 5 grams of solute and 95 grams of solvent. What is the percent by mass of the solute in the mixture :

- A- 5 %                      B- 100 %                      C- 50 %                      D- 95 %

19) Calculate the standard enthalpy change for the reaction :



given that :  $4\text{Al(s)} + 3\text{O}_2\text{(g)} \rightarrow 2\text{Al}_2\text{O}_3\text{(s)} \Delta H^\circ_{\text{rxn}} = -1669.8 \text{ kJ/mol}$



- A- -12.7 kJ/mol                      B- +20.3 kJ/mol                      C- +12.7 kJ/mol                      D- -20.3 kJ/mol

20) Which of the following reactions has the highest reaction rate (according to their activation energy ( $E_a$ ) values) :

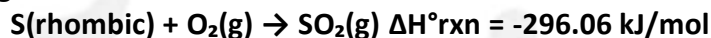
- A-  $E_a = 3$                       B-  $E_a = 5$                       C-  $E_a = 40$                       D-  $E_a = 8$

21) The internal energy  $\Delta E$  of the following reaction at 30 °C is \_\_\_\_\_



- A- -888.740 kJ/mol                      B- -678.740 kJ/mol                      C- -281.740 kJ/mol                      D- -300.740 kJ/mol

22) consider the following reaction :



$\Delta H^\circ_{\text{rxn}}$  for the reversed reaction is \_\_\_\_\_ :

- A- 296.06 kJ/mol                      B- 390.06 kJ/mol                      C- -296.06 kJ/mol                      D- -390.06 kJ/mol

23) Calculate the  $\Delta E$  of a system that releases 52.4 J of heat ( $q$ ) and does 14.2 J of work ( $w$ ) on the surroundings :

- A- -22.6 J                      B- -66.6 J                      C- +22.6 J                      D- +66.6 J

24) Calculate ( $\Delta H^\circ_{\text{rxn}}$ ) for the reaction .



the  $\Delta H_f^\circ$  values are as follows:  $\text{CH}_4 = -74.8 \text{ kJ/mol}$ ,  $\text{CO}_2 = -393.5 \text{ kJ/mol}$ , and  $\text{H}_2\text{O} = -241.8 \text{ kJ/mol}$  :

- A- -900.1 kJ/mol                      B- -802.3 kJ/mol                      C- +802.3 kJ/mol                      D- +900.1 kJ/mol

25) All the properties listed are state functions except for \_\_\_\_\_ :

- A- W                      B- V                      C- P                      D- E

- 26) If the vapor pressure of a pure solvent is 760 mmHg and a non-volatile solute is added, resulting in a vapor pressure of 752 mmHg, what is the mole fraction of the solvent in the solution:
- A- 0.32                      B- 0.99                      C- 0.67                      D- 0.11
- 27) For the reaction ( $4A \rightarrow 5B$ ), if the rate of disappearance of A is  $-\Delta[A]/\Delta t = 0.03 \text{ M/S}$ , what is the rate of formation of B at the same time :
- A- 0.04                      B- 0.2                      C- 0.3                      D- 0.01
- 28) If 5 moles of glucose (a non-electrolyte) are dissolved in 1 kg of water, what would be the decrease in freezing point, given that the  $K_f$  for water is  $1.86 \text{ }^\circ\text{C/m}$  :
- A-  $9.3 \text{ }^\circ\text{C}$                       B-  $1.99 \text{ }^\circ\text{C}$                       C-  $1 \text{ }^\circ\text{C}$                       D-  $3.9 \text{ }^\circ\text{C}$
- 29) What is the molality of a solution prepared by dissolving 0.5 moles of Magnesium chloride ( $\text{MgCl}_2$ ) in 4 kg of ethanol :
- A- 0.125 m                      B- 0.643 m                      C- 0.522 m                      D- 0.435 m
- 30) If the reaction rate is (4M/s) when ( $[A] = 2\text{M}$ ), and remains (4M/s) when ( $[A]=1\text{M}$ ), What is the order of this reaction :
- A- Zero order                      B- First order                      C- Second order                      D- Third order