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 Δn 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 ΔE 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_2O **B- C_6H_6** **C- CCl_4** **D- Cl_2**

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 → 5/2 B **B- 2A → 4/2 B** **C- 1/2 A → 3/6 B** **D- All of the answers are true**

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

$$2\ ZnS(s) + 3\ O_2(g) \rightarrow 2\ ZnO(s) + 2\ SO_2(g)\ \Delta H = -879\ kJ/mol$$

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 Kb 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 :

$$2Al(s) + Fe_2O_3(s) \rightarrow 2Fe(s) + Al_2O_3(s)$$

given that : $4Al(s) + 3O_2(g) \rightarrow 2Al_2O_3(s)$ $\Delta H°rxn = -1669.8$ kJ/mol

$2Fe(s) + 3/2\ O_2(g) \rightarrow Fe_2O_3(s)$ $\Delta H°rxn = -822.2$ 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 (Ea) values) :

A- Ea = 3 **B- Ea = 5** **C- Ea = 40** **D- Ea = 8**

21) The internal energy ΔE of the following reaction at 30 °C is____

$$CO(g) + (1/2)\ O_2(g) \rightarrow CO_2(g)\ \Delta H = -283\ kJ/mol$$

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 :

$$S(rhombic) + O_2(g) \rightarrow SO_2(g)\ \Delta H°rxn = -296.06\ kJ/mol$$

ΔH°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 ΔE 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 (ΔH°rxn) for the reaction .

$$CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(l)$$

the ΔHf° values are as follows: CH_4 = -74.8 kJ/mol, CO_2 = -393.5 kJ/mol, and H_2O = -241.8 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**

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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 → 5B), if the rate of disappearance of A is -Δ[A]/Δt = 0.03 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 Kf for water is 1.86 °C/m :

A- 9.3 °C **B- 1.99 °C** **C- 1 °C** **D- 3.9 °C**

29) What is the molality of a solution prepared by dissolving 0.5 moles of Magnesium chloride ($MgCl_2$) 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] = 2M), and remains (4M/s) when ([A]=1M), What is the order of this reaction :

A- Zero order **B- First order** **C- Second order** **D- Third order**