

## Study Guide CHEM 1212 Final Exam

1. Strength of intermolecular force found in a liquid and in a solid.
2. Using phase diagram, determine the temperature and pressure that are consistent with the substance being in the gas, solid and liquid phases
3. Acknowledge the colligative properties: melting, boiling, vapor pressure and osmosis pressure.
4. Calculation of molality.
5. Relationship of freezing points with the molarity.
6. Determine the concentration of the ions within an ionic compound if its molarity is given.
7. Applying the "Like dissolve Like" concept.
8. Relationship of freezing points with the molar mass.
9. Calculation of the heat evolved from a chemical reaction if the masses of reactants are known.
10. Differentiate between exo and endothermic chemical reactions.
11. Calculation of the total  $\Delta H^{\circ}_{rxn}$  if  $\Delta H^{\circ}$  of reactants and products are known.
12. Rate of reaction calculation and calculation of rate constant when time and concentrations are given.
13. Relationship of activation energy and rate of reaction.
14. Initial Rate method/calculations.
15. Calculations of equilibrium constant if number of moles or concentrations of the reactants are given.
16. Le Chatelier's Principle and the shift of the chemical equilibrium: left, right or no shift.
17. Calculations of equilibrium constants of gases  $K_p$
18. Standard free energy calculations with given K values.
19. Relationship between  $\Delta H$  and  $\Delta S$  and  $\Delta G$  in case of spontaneous and none spontaneous chemical reactions.
20. Calculations of nonstandard free energy if the pressures of gases are known in a chemical equilibrium reaction.
21. Acknowledge negative  $\Delta S_{sys}$  and  $\Delta G$  (negative, positive and zero) cases.
22. Determination of the pH of the titration of an acid with a base (with a given  $K_a$ ).
23. Determination of the pH of a strong acid and strong base.
24. Determination of the pH of a weak acid and weak base.
25. Determination of the pH of a buffer solution.
26. Calculation of  $K_b$  and  $K_a$  with a given pH.
27. Calculations of the concentrations of  $[OH^-]$  and  $[H^+]$  with given pH.
28. Acknowledge the Buffer formation.
29. Calculation of  $K_{sp}$  if the molar solubility is known.
30. Calculation of molar solubility if  $K_{sp}$  is known.
31. Lowest molar solubility among different compounds.
32. Balancing redox (oxidation/reduction reaction).
33. Writing up redox chemical equation (galvanic cell).
34. Calculation of reduction potentials.

35. Acknowledge the half-reaction that occurs at the anode and cathode for the reaction.
36. Calculation of the standard cell potential for the reaction with a given reduction potentials.
37. Calculation of the nonstandard cell potential for the reaction when the molarities of oxidized and reduced species are given