Please read all the questions VERY carefully before answering. If you do not understand any question, please ask. Use the reverse side of the question paper as scratch. Use the periodic table and constant chart in the last page. No outside paper is allowed. Total points = 43+(24x3=)72=115

SHORT ANSWER. Please write the set-up equation and insert the raw data with units in the equation before doing your calculations. Write the word or phrase that best completes each statement or answers the question.

1) One kilogram of water is cooled from 50°C to ice at 0°C. Calculate the amount of heat   1) _____
released. Given specific heat of water is 4.18 j. g^{-1} K^{-1} and heat of fusion of ice = 6.01 kJ. mol^{-1}. (8 pts.)

2) How many grams of Calcium hydroxide is needed to completely react with 30.0 mL of   2) _____
0.52 M HCl? (6 pts.)

3) Write the formula of the conjugate base next to the following species (2 pts/each, 6 pts   3) _____
total):

(a) H_3PO_4

(b) NH_4^+

(c) OH^-

4) If 12.5 mL of a 0.100 M sodium hydroxide solution is needed to completely neutralize a sample of acetic acid, then calculate the grams of the acetic acid in the sample ($C_2H_4O_2$) (5 pts.)

4) _____

5) Calculate the mass in grams of $K_2Cr_2O_7$ is needed to make 250.0 mL of a 0.5 M $K_2Cr_2O_7$ solution (6 pts.)

5) _____

6) Calculate the pH of a solution made by dissolving 1.00 gram of NaOH in 300.00 mL water. (8 pts.)

6) _____

7) Calculate the pH of a solution if 1.35 moles of HI is in 530.00 mL of water. (4 pts.)

7) _____

MULTIPLE CHOICE. On scantron, fill up the circles of the same number as that of the question number. Choose the one alternative that best completes the statement or answers the question. (3 poins each)

8) The tendency of a liquid to minimize its surface area is called: 8) _____
    A) surface tension.
    B) capillary action.
    C) viscosity.
    D) vaporization.
    E) none of the above

9) Evaporation is: 9) _____
    A) an endothermic process.
    B) the opposite process as condensation.
    C) a cooling process for humans when they sweat.
    D) increased by increasing temperature.
    E) all of the above

10) The opposite process of freezing is: 10) _____
    A) evaporation.
    B) sublimation.
    C) condensation.
    D) boiling.
    E) none of the above

11) The rate of vaporization of a liquid can be increased by   11) _____
    1. increasing the surface area
    2. increasing the temperature
    3. increasing the strength of the intermolecular forces
    A) 1 only
    B) 2 only
    C) 3 only
    D) 1 and 2 only
    E) 2 and 3 only

12) How many kilojoules of heat are needed to completely vaporize 42.8 grams of $C_4H_{10}O$ at its boiling point?   12) _____
Given ΔH_{vap} = 26.5kJ/mol
    A) 15.3
    B) 16.3
    C) 9.49
    D) 74.12
    E) none of the above

13) When you make ice cubes: 13) _____
    A) it is an exothermic process.
    B) the process is referred to scientifically as sublimation.
    C) it is an endothermic process.
    D) the heat of vaporization must be removed.
    E) none of the above

14) Which sequence correctly shows the increasing density of the three phases of water?   14) _____
    A) liquid < gas < solid
    B) gas < solid < liquid
    C) gas < liquid < solid
    D) solid < liquid < gas
    E) none of the above

15) Which of the following substances is NOT a solution?   15) _____
    A) soda
    B) homogenized milk
    C) bronze
    D) sea water
    E) All of the above are solutions.

16) The oxygen in the air we breath is classified as: 16) _____
    A) the solvent in a simple mixture.
    B) the solvent in a homogeneous gas mixture.
    C) the solute in a heterogeneous gas-liquid mixture.
    D) the solute in a homogeneous gas mixture.
    E) none of the above

17) If the solubility of sodium chloride is 36 grams per 100 grams of water, which of the following   17) _____
solutions would be considered unsaturated?
    A) 3.25 moles of NaCL dissolved in 500 ml of water
    B) 1.85 moles of NaCl dissolved in 300 ml of water
    C) 5.8 moles of NaCl dissolved in 1 L of water
    D) none of the above

18) A solution is saturated in both nitrogen gas (N_2) and sodium iodide (NaI) at 50°C. When the   18) _____
solution is cooled to 25°C, which of the following is most likely to occur?
    A) Some nitrogen gas bubbles out of solution.
    B) Some sodium iodide will precipitate out of solution.
    C) Both A) and B) will happen.
    D) Nothing will happen.
    E) not enough information

19) How many moles of NaF are in 34.2 grams of a 45.5% by mass NaF solution?   19) _____
    A) 0.371
    B) 75.2
    C) 0.814
    D) 15.6
    E) none of the above

20) A 90.0 g sample of NaOH is dissolved in water and the solution is diluted to give a final volume of 3.00 liters. The molarity of the final solution is _____. 20) _____
   A) 0.500 M
   B) 2.25 M
   C) 0.750 M
   D) 1.00 M
   E) none of the above

21) Which solution below contains the highest total quantity of dissolved sodium ions? 21) _____
   A) 75.0 mL of 3.0 M Na_2SO_4
   B) 50.0 mL of 8.0 M NaOH
   C) 50.0 mL of 2.0 M Na_3PO_4
   D) 100. mL of 4.0 M NaCl
   E) none of the above

22) How many grams of barium sulfate are produced if 25.34 mL of 0.113 M $BaCl_2$ completely react given the reaction: 22) _____

   $BaCl_2(aq) + Na_2SO_4(aq) \rightarrow BaSO_4(s) + 2NaCl\ (aq)$

   A) 26.3
   B) 5.90
   C) 0.668
   D) 1039
   E) none of the above

23) Which of the following is NOT a property of bases? 23) _____
   A) Bases turn litmus paper blue.
   B) Bases dissolve many metals.
   C) Bases have a bitter taste.
   D) Bases have a slippery feel.
   E) All of the above are properties of bases.

24) The Bronsted-Lowry definition of an acid is: 24) _____
   A) produces H^+ in solution.
   B) a proton acceptor.
   C) produces OH^- in solution.
   D) a proton donor.
   E) none of the above

25) A substance that acts as an acid *or* a base is called 25) _____
   A) hydrophillic.
   B) a salt.
   C) amphoteric.
   D) isoprotic.
   E) none of the above

26) What is the concentration of the hydroxide ions in an acidic solution? 26) _____

    A) 1.0×10^{-7} M

    B) $< 1.0 \times 10^{-7}$ M

    C) $> 1.0 \times 10^{-7}$ M

    D) 0.0 M

    E) 1.0×10^{-14} M

27) What is the $[H^+]$ in a solution that has a pH of 3.35? 27) _____

    A) 4.5×10^{-4} M

    B) 3.35×10^{-14} M

    C) 2.2×10^{3} M

    D) $1 \times 10^{3.35}$ M

    E) none of the above

TRUE/FALSE. On scantron, choose "A" for a true answer and "B" for wrong answer. (3 points each)

28) Gases typically have high densities in comparison to solids. 28) _____

29) The minor component in a solution is called the solvent. 29) _____

30) A saturated solution holds the maximum amount of solute under the solution conditions. 30) _____

31) An Arrhenius base is a proton acceptor. 31) _____