MC, Chem1B, Spring 17, Test1 Name _____

Read questions carefully to understand what is being asked. If you have doubt, do ask your instructor. Use the reverse side o your answer paper as scratch. Use attached periodic table and important constants chart. On your scantron, please start from same bubble number as the number of the multiple choice question. (Total pts. = 58 + (19 x 3 =) 57= 115)

SHORT ANSWER: Show all your calcualtions using appropriate set up and units.

1) Draw skeletal or condensed structures of (2x5 = 10pts.): 1) _____
(a) Z-2,3-dimethyl-3-hexene

(b) 1,4-Dimethylcyclohexane

2) What is the IUPAC name of the compound $CH_3CH_2CH_2CH_2CH(Br)CH_3$? (4 pts.) 2) _____

3) (A) Write the formula of the two (2) products of the following reaction (4 pts) : 3) _____

n $HO_2C(CH_2)_2CO_2H$ + 2n $HO(CH_2)_4HO$ ----->

(B) Name what kind of reaction is this (2 pts) :

4) Draw the condensed structures of the (A) reactants (2x3 = 6 pts.) and (B) product(s) (2x3=6 pts.) of the reaction between ethanoic acid and 1-propanol. Also (C) name the major product (2 pts.) and (D) the functional group it conatins (2 pts.). (Tot 16 pts.) 4) _____

5) At 318 mmHg of oxygen pressure in the atmosphere, the solubility of oxygen in the blood is 0.88 g per 0.1 L. Calculate the solubility of oxygen in the blood (per L) when the oxygen pressure is 112 mmHg (6 pts.). 5) _____

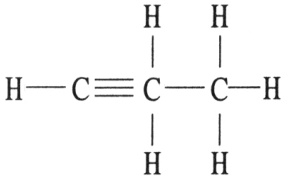
6) An 8.0 g ice cube is placed into 230 g water. Calculate the temperature change in the water upon complete melting of the ice. Given, the heat of fusion of ice is 6.02 kJ/mole and specific heat of water = 4.18 J/(g. °C) (Assume density of ice = density of water and $q = mC\Delta T$. Be sure to include proper sign for the temperature change: positive for increase and negative for decrease) (8 pts.). 6) _____

7) In order to determine the molar mass of an unknown non-electrolyte through FP depression experiment, followiing data were collected: 7) _____

(1) Mass of test tube = 123.2 g
(2) Mass of test tube and cyclohexane = 132.11 g
(3) Mass of test tube, cyclohexane and non-electrolyte = 134.11 g.
(4) FP of pure cyclohexane = 6.4 °C
(5) FP of the non-electrolyte in cyclohexane = 2.9 °C.
If K_{fp} for cyclohexane = -20 °C/m, calculate the molar mass of the non-electrolyte. (8 pts.)

MULTIPLE CHOICE. On scantron start from the same bubble number as the mutiple choice question number. Select the one alternative that best completes the statement or answers the question (3 pts each).

8) The compound below is an _____. 8) _____



A) alkene
B) aromatic compound
C) alkyne
D) olefin
E) alkane

9) Pentane has _____ structural isomers. 9) _____

A) 3 B) 0 C) 1 D) 2 E) 4

10) The addition of HBr to 2-butene produces _____. 10) _____

A) no reaction
B) 2-bromobutane
C) 2,3-dibromobutane
D) 1-bromobutane
E) 1,2-dibromobutane

11) When NaCl dissolves in water, aqueous Na^+ and Cl^- ions result. The force of attraction that exists between Na^+ and H_2O is called a(n) _____ interaction. 11) _____

A) hydrogen bonding
B) dipole-dipole
C) London dispersion force
D) ion-ion
E) ion-dipole

12) The intermolecular force(s) responsible for the fact that CH_4 has the lowest boiling point in the set CH_4, SiH_4, GeH_4, SnH_4 is/are _____. 12) _____

A) mainly hydrogen bonding but also dipole-dipole interactions
B) hydrogen bonding
C) mainly London-dispersion forces but also dipole-dipole interactions
D) dipole-dipole interactions
E) London dispersion forces

13) How high a liquid will rise up a narrow tube as a result of capillary action depends on _____. 13) _____

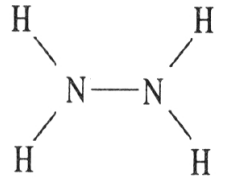
A) only the magnitude of adhesive forces between the liquid and the tube
B) only the magnitude of cohesive forces in the liquid
C) gravity alone
D) the magnitudes of cohesive forces in the liquid and adhesive forces between the liquid and the tube, and gravity
E) the viscosity of the liquid

14) Large intermolecular forces in a substance are manifested by _____. 14) _____

A) high boiling point
B) high critical temperatures and pressures
C) low vapor pressure
D) high heats of fusion and vaporization
E) all of the above

15) Which one of the following substances will <u>not</u> have hydrogen bonding as one of its intermolecular forces? 15) _____

A)



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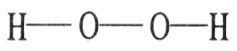
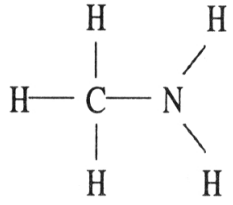
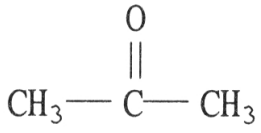


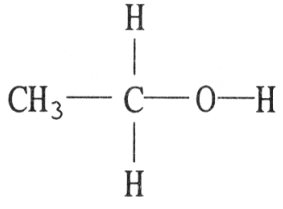
C)

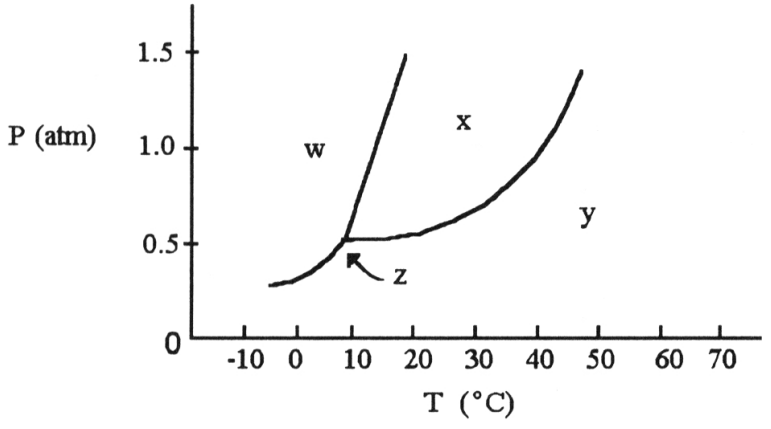


D)



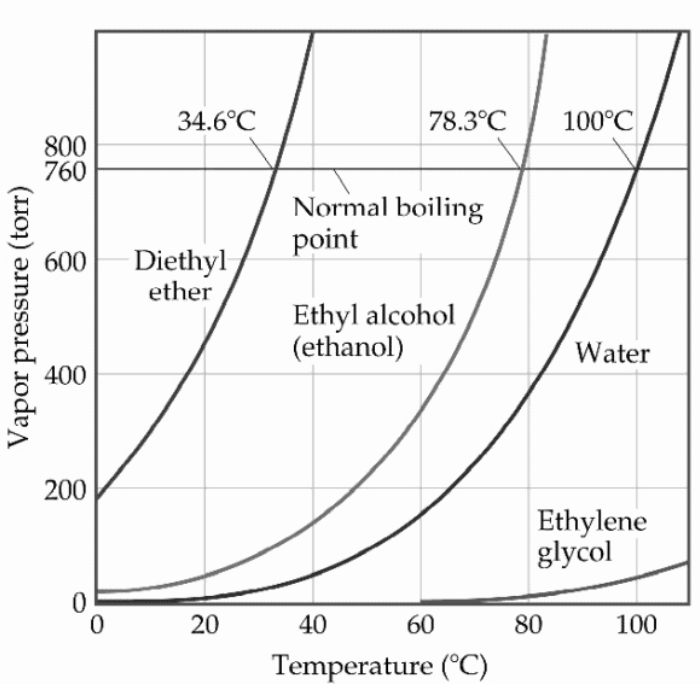
E)





16) The normal boiling point of the substance with the phase diagram shown above is _____°C. 16) _____

A) 10 B) 20 C) 30 D) 40 E) 50



17) Based on the figure above, the boiling point of diethyl ether under an external pressure of 1.32 atm is _____°C. 17) _____

A) 40 B) 10 C) 0 D) 20 E) 30

18) On a phase diagram, the critical temperature is _____. 18) _____

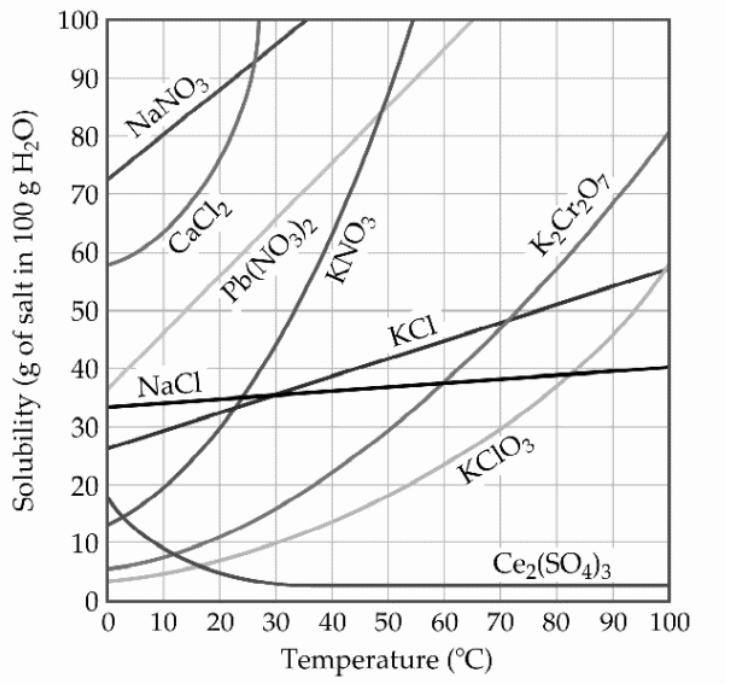
A) the temperature below which a gas cannot be liquefied
B) the temperature above which a gas cannot be liquefied
C) the temperature required to melt a solid
D) the temperature required to cause sublimation of a solid
E) the temperature at which all three states are in equilibrium

19) The process of solute particles being surrounded by solvent particles is known as _____. 19) _____

A) agglutination
B) solvation
C) agglomeration
D) salutation
E) dehydration

20) A solution is prepared by dissolving 15.0 g of NH_3 in 250.0 g of water. The density of the resulting solution is 0.974 g/mL. The mole fraction of NH_3 in the solution is _____. 20) _____

A) 0.0597 B) 0.940 C) 0.0640 D) 0.922 E) 16.8



21) A sample of potassium chlorate (15.0 g) is dissolved in 201 g of water at 70°C, with precautions taken to avoid evaporation of any water. The solution is cooled to 30.0°C and no precipitate is observed. This solution is _____. 21) _____

A) hydrated
B) unsaturated
C) saturated
D) miscible
E) supersaturated

TRUE/FALSE. In your scantron, fill up bubble A for true and bubble B for false answers (3 pts./question).

22) The principal source of the difference in the normal boiling points of ICl (97°C; molecular mass 162 amu) and Br_2 (59°C; molecular mass 160 amu) is both dipole-dipole interactions and London dispersion forces. 22) _____

23) The bond angles in a tetrahedral molecule are 90°. 23) _____

24) Under ordinary conditions, a substance will sublime rather than melt if its triple point occurs at a pressure above atmospheric pressure. 24) _____

25) After swimming in the ocean for several hours, swimmers noticed that their fingers appeared to be very wrinkled. This is an indication that seawater is supertonic relative to the fluid in cells. 25) _____

26) A solution with a solute concentration greater than the solubility is called a supercritical solution. 26) _____