AP Chemistry: Intermolecular Forces and Solutions Quiz

Name_____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) In liquids, the attractive intermolecular forces are _____.   1) _____
   A) strong enough to hold molecules relatively close together
   B) strong enough to hold molecules relatively close together but <u>not</u> strong enough to keep
      molecules from moving past each other
   C) not strong enough to keep molecules from moving past each other
   D) strong enough to keep the molecules confined to vibrating about their fixed lattice points
   E) very weak compared with kinetic energies of the molecules
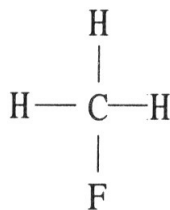
2) The strongest interparticle attractions exist between particles of a _____, and the weakest   2) _____
   interparticle attractions exist between particles of a _____.
   A) liquid, gas
   B) gas, solid
   C) solid, gas
   D) liquid, solid
   E) solid, liquid

3) Which molecule has hydrogen bonding as the predominant intermolecular force?   3) _____
   A) C_4H_{10} B) CH_4 C) CH_3OH D) CO_2 E) C_6H_6
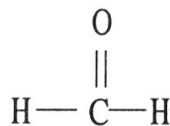
4) Elemental iodine (I_2) is a solid at room temperature. What is the major attractive force that exists   4) _____
   among different I_2 molecules in the solid?
   A) dipole-dipole interactions
   B) London dispersion forces
   C) covalent-ionic interactions
   D) dipole-dipole attractions
   E) ionic-dipole interactions

5) Which one of the following substances will have hydrogen bonding as one of its intermolecular   5) _____
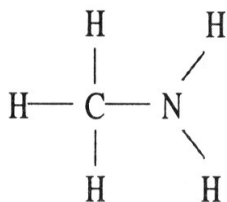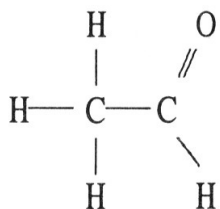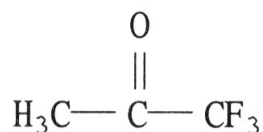   forces?

   A)

   B)

1

C)

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      H        H
      |       /
H —— C —— N
      |       \
      H        H
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D)

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      H        O
      |       //
H —— C —— C
      |       \
      H        H
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E)

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         O
         ||
H₃C —— C —— CF₃
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$$H_3C — C — CF_3$$

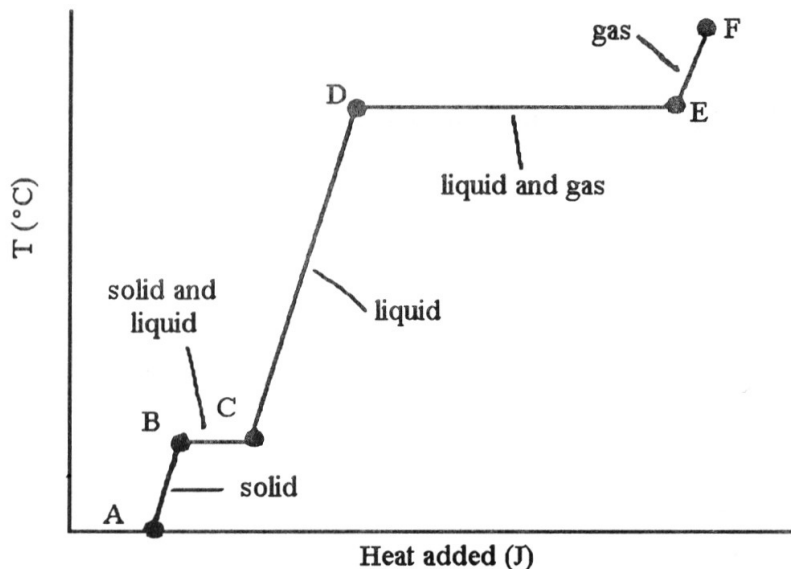6) What types of intermolecular forces exist between CH_3OH and H_2O?   6) _____

    A) dipole-dipole and ion-dipole
    B) dispersion forces, dipole-dipole, and hydrogen bonding
    C) dispersion forces and ion-dipole
    D) dispersion forces, dipole-dipole, and ion-dipole
    E) dispersion forces, hydrogen bonding, dipole-dipole, and ion-dipole

7) Viscosity is _____.   7) _____

    A) the resistance to flow
    B) inversely proportional to molar mass
    C) the "skin" on a liquid surface caused by intermolecular attraction
    D) the same as density
    E) unaffected by temperature

The graph shows temperature T (°C) on the vertical axis versus Heat added (J) on the horizontal axis. Points labeled A, B, C, D, E, F are marked along the heating curve, with regions labeled: solid (A–B), solid and liquid (B–C), liquid (C–D), liquid and gas (D–E), and gas (E–F).

8) The _____ (is)are associated with the heat energy being used up to increase distances between molecules.

8) _____

    A) phase change B →E
    B) phase change D →E
    C) phase change C →E
    D) phase change B →C
    E) phase changes B →C and D →E

9) Of the following, _____ is an exothermic process.

9) _____

    A) freezing
    B) subliming
    C) melting
    D) boiling
    E) All of the above are exothermic.

10) The phrase "like dissolves like" refers to the fact that _____.

10) _____

    A) solvents can only dissolve solutes of similar molar mass
    B) polar solvents dissolve nonpolar solutes and vice versa
    C) polar solvents dissolve polar solutes and nonpolar solvents dissolve nonpolar solutes
    D) gases can only dissolve other gases
    E) condensed phases can only dissolve other condensed phases

11) A solution with a concentration higher than the solubility allows is _____.

11) _____

    A) saturated
    B) supersaturated
    C) not possible
    D) supercritical
    E) unsaturated

12) Which of the following substances is more likely to dissolve in CH_3OH? 12) _____
    A) CH_3CH_2OH
    B) Kr
    C) N_2
    D) CCl_4
    E) H_2

13) Which one of the following substances is more likely to dissolve in CCl_4? 13) _____
    A) NaCl
    B) CBr_4
    C) HBr
    D) CH_3CH_2OH
    E) HCl

14) Which one of the following is least soluble in water? 14) _____
    A) CH_3CH_2OH
    B) CH_3OH
    C) $CH_3CH_2CH_2CH_2OH$
    D) $CH_3CH_2CH_2CH_2CH_2OH$
    E) $CH_3CH_2CH_2OH$

15) Calculate the mole fraction of phosphoric acid (H_3PO_4) in a 38.5% (by mass) aqueous solution. 15) _____
    A) 0.103
    B) 0.115
    C) 0.0516
    D) 0.206
    E) The density of the solution is needed to solve the problem.

16) What is the molal concentration of potassium bromide in a solution prepared by dissolving 2.27 g 16) _____
    of potassium bromide in 897 g of water?
    A) 0.0167   B) 0.0186   C) 0.0213   D) 0.0000207   E) 2.46

17) The concentration of lead nitrate ($Pb(NO_3)_2$) in a 0.926 M solution is _____ molal. The density 17) _____
    of the solution is 1.202 g/mL.
    A) 0.819   B) 0.650   C) 2.13   D) 1.03   E) 0.770

18) What is the mole fraction of NH_3 in a solution prepared by dissolving 16.0 g of NH_3 in 250.0 g of 18) _____
    water? The density of the resulting solution is 0.974 g/mL.
    A) 16.8   B) 0.0635   C) 0.0640   D) 0.922   E) 0.940