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AP Chemistry – May The Force Be With You – 25

Name _____Per ___

1. Hydrazine (NH_2NH_2), hydrogen peroxide and water all have exceptionally high surface tensions in comparison with other substances of comparable molecular masses. (a) Draw the Lewis structures for these three compounds. (b) What structural property do these substances have in common? (c) How does this account for the high surface tensions?

2. Name the phase transition in each of the following situations, and indicate whether it is exothermic or endothermic. Explain.
(a) Bromine vapor turns to bromine liquid as it is cooled.

(b) Crystals of iodine disappear from an evaporating dish as they stand in a fume hood.

(c) Rubbing alcohol in an open container slowly disappears.

(d) Molten lava from a volcano turns into solid rock.

3. The compound CCl_2F_2 is a chlorofluorocarbon or CFC. Its heat of vaporization is 289 J/g. What mass of this substance must evaporate in order to freeze 100.0 g of water initially at $18^{\circ C}$? The heat of fusion of water is 334 J/g and the specific heat of water is 4.184 J/gK.

4. The critical temperatures (K) and critical pressures (atm) of a series of halogenated methanes are as follows:

Compound	CCl_3F	CCl_2F_2	$CClF_3$	CF_4
Critical Temperature	471	385	302	227
Critical Pressure	43.5	40.6	38.2	37.0

(a) What in general can you say about the variation of intermolecular forces in this series?

(b) What specific kinds of intermolecular forces are most likely to account for the variation in critical parameters in this series?

5. PCl_3 and $AsCl_3$ are similar substances, with similar geometries and bonding modes.
(a) Which of these two substances would you expect to be the more volatile at room temperature? Explain.

(b) Which substance would have the higher boiling point? Explain.

(c) In which substance would the average kinetic energies of the molecules be greater at 40^oC, a temperature well below either substance's boiling point? Explain.

(d) In which substance would you expect the intermolecular forces to be greater? Explain.