Honors Chemistry

States of matter Pre-quiz

Melting points °C	
Graphite	4200
SiC	2700
$CaCl_2$	1650
LiCl	610
CCl_4	-39
N_2	-210
He	-272

1. Which of the above substances are molecular?

   CCl_4 N_2 He?

2. Which of the above substances is an ionic bulk crystal? $CaCl_2$ LiCl

3. Which of the above substances is a network covalent? SiC

4. Why is helium so much lower the Nitrogen?

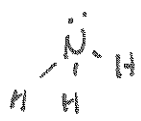
   ↓LDF, less e^-, less polarizable

5. There are three Chlorides in this list:
   a. What is being broken in CCl_4 vs LiCl CCl_4 – LDF LiCl – Ionic
   b. Why is $CaCl_2$ significantly bigger then LiCl?

   +2 −1 → +1 −1 → ↑Charges ↑Coulombic Attraction

6. Which will have the higher melting point, explain? ($AlCl_3$ or KCl)

7. Ammonia (NH_3) at room temperature can be a liquid where as both N_2 and H_2 are both gases independently.
   a. Draw a Lewis structure of NH_3, N_2 and H_2.

   :N≡N: H– H

   b. What about NH_3 makes it a liquid? Explain.

   NH_3 – Large dipole moment → not symmetrical } polar → Hydrogen Bonding

8. A local farmer's dog has died unexpectedly and he thought his dog may have been poisoned. A common poison to dogs is ethylene glycol: $C_2H_6O_2$. Note: Ethylene glycol is commonly used as antifreeze. It has an unusually sweet taste and animals can inadvertently drink.
   a. What is the percent mass of each element for this compound?

   $C_2H_6O_2$ — 2(16) 32 = 62 C: 24/62 ×100 = 38.7% H: 6/62 ×100 = 9.6% O: 32/62 ×100 = 51.6%

   12(2) 24 1(6) 6

   b. A chemists analyzed the animal and found it to have an unusually high concentration of a chemical that is 27.27% C and 73.7% O. What would be the empirical formula of this substance? Should the person dismiss this chemical? — ??

   C: 27.27% $\xrightarrow{100g}$ 27.27g · $\frac{1\ mol}{12\ g}$ = 2.272 mol/2.272 = 1 CO_2

   O: 73.7% → 73.7g · $\frac{1}{16\ g}$ = 4.606 mol/2.272 ≈ 2

   c. The molecular weight of this unknown compound is 88g/mol. What is the unknown substance? Do a quick internet search, is this substance poisonous and could a dog have eaten this accidentally or was it poisoned?

   CO_2 12 32 = 44 $\frac{88}{44}$ = 2 (CO_2)×2 = $C_2O_4^{-2}$