Name: _____ Class: _____ Date: _____ ID: A

States of Matter- Free Response

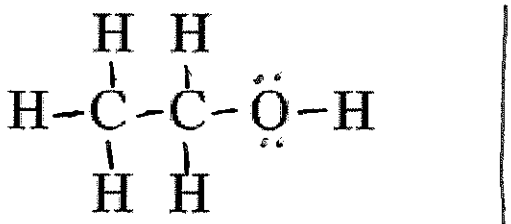
Google for answers ☺

Short Answer

1.

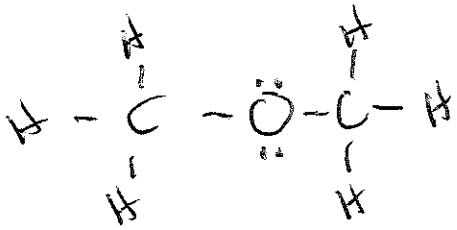
Compound	Empirical formula	Solubility in water	Boiling point (C)
1	C_2H_6O	Slightly Soluble	-24
2	C_2H_6O	Soluble	78

Compounds 1 and 2 in the data table above have the same empirical formula, but they have different physical properties.
(a) The skeletal structure for one of the two compounds is shown below in Box X.
(i) Complete the Lewis electron-dot diagram of the molecule below. Include any lone (nonbonding) pairs of electrons.



X

Same formula different structure



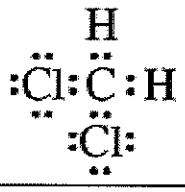
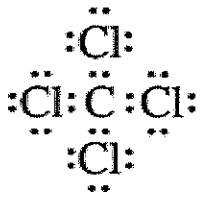
(ii) Above, draw the complete Lewis electron-dot diagram for the other compound (2), which is a structural isomer of the compound represented in Box X. Include any lone (nonbonding) pairs of electrons.

(b) On the basis of the complete Lewis electron-dot diagrams you drew in part (a) and the information in the data table above, identify which compound, 1 or 2, has the structure represented in Box X. Justify your answer in terms of the intermolecular forces present in each compound.

Box X (top) is #2 because it can hydrogen bond causing it to be more soluble in water and have a higher melting/Boiling points

SMP -8

Name: _____ **ID: A**

Name	Lewis Structure	Boiling point (C)	Vapor pressure (mmHg)
DiChloralmethane		39.6	353
Carbon Tetra Chloride		76.7	89

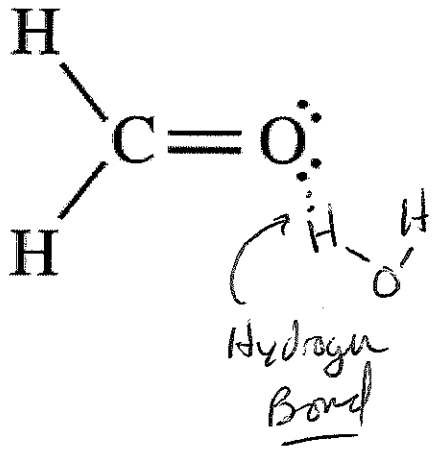
(c) Dichloromethane has a greater solubility in water than carbon tetrachloride has. Account for this observation in terms of the intermolecular forces between each of the solutes and water.

- Contains a dipole moment, that attracts to dipole moment of water

(d) In terms of intermolecular forces, explain why dichloromethane has a higher vapor pressure than carbon tetrachloride. CH_2Cl_2 - Less LDF/small dipole = less IMF = more VP

CCl_4 - increased LDF causes CCl_4 to have a lower VP, more IMF = less VP

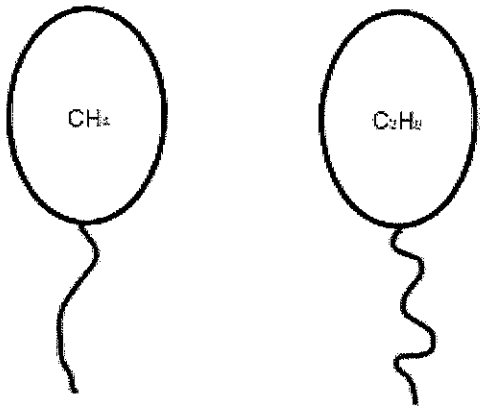
(e) The complete Lewis electron-dot diagram of methanal (formaldehyde) is shown in the box below. Molecules of methanal can form hydrogen bonds with water. In the box below, draw a water molecule in a correct orientation to illustrate a hydrogen bond between a molecule of water and the molecule of methanal. Use a dashed line to represent the hydrogen bond.



SmR-9

Name: _____ ID: A

Both balloons are subject to a 25C and 1.25 ATM pressure.



2.

A. Which balloon has the most particles? – Same – Ideal gases Identity doesn't matter
B. Which balloon has the greatest molecular velocity? CH_4
C. Which balloon, if compressed would condense to a liquid first? Why? C_3H_8, more LDF
~~D. One of these ballons sinks and one floats in air. Which one floats?~~
D) ~~E.~~ 24 hours after the contents were added to the balloon, one balloon is significately smaller, which balloon is this and why?
E) ~~F.~~ If the contents of the balloons where ignighted, Which balloon would create the largest production of gaseous products? Why?

C) C_3H_8, more LDF or more IMF means greater attraction so they stick together the most.

D) skip

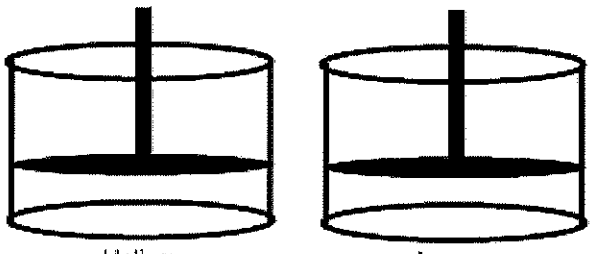
D) CH_4 – Higher molecular velocity, hits walls faster so hits tiny holes causing it to escape.

E) C_3H_8 – more due to more atoms of C & H.

SMR-10

Name: _____ **ID: A**

Two pistons, each at the same volume (2.4L) and the same temperature (273K).



4/4 = 1 mol

/40 = 0.5 moles

3. A. Which of the two has the highest average kinetic energy? - Same

B. Which of the two contains the largest number of particles? - Argon - Smallest
↳ He 1 mole vs. 0.5

C. Which container has the largest pressure? He, more particles, smaller area.

D. What is the pressure in the Helium piston?

E. If both pistions where compressed equally until 1 substance liquified, which piston would this be? Why?

F. If both of these pistons had the external pressure released therefore allowing the pressure inside of them to expand the piston until it reached a pressure equal to that of the atmousphere (1atm) how big would each cylinder expand to?

d) $PV = nRT$

$P = \frac{nRT}{V}$ $\frac{1 \cdot .0821 \cdot 273}{2.4L} = 9.33atm$

e) Argon, more IMF (LDF)

F) @STP - He = 22.4L (1 mole)

Ar = 11.2 (½ mole)

SMR-11