CHEM111 Name _____
College of Charleston
Spring 2002
Exam V Score _____ /100

1(30). Circle the letter that represents the best response to each item.

The kinetic–molecular theory of ideal gases assumes that
(A) the collisions of gas molecules are inelastic
(B) all gas molecules travel at the same speed
(C) gas molecules exert no pressure on the walls
(D) the volume of a gas molecule is negligible

Compressing a fixed quantity of gas while keeping its temperature constant produces a higher pressure, because
(A) there are more molecules per unit volume after compression
(B) there are fewer molecules per unit volume after compression
(C) the elasticity of the molecules increases
(D) the molecules move faster
(E) each molecule hits the container wall harder

If oxygen gas and hydrogen gas are kept at the same temperature and pressure, the hydrogen molecules on the average
(A) move faster than the oxygen molecules
(B) move more slowly than the oxygen molecules
(C) move at the same speed as the oxygen molecules
(D) have the greater kinetic energy
(E) have a lower kinetic energy

The empirical gas law relating the pressure and temperature is
(A) Amonton's law (B) Boyle's law (C) Charles's law (D) Dalton's law

The Kelvin temperature of one liter of gas is doubled and its pressure is tripled, volume will then be
(A) 1/6 L (B) 2/3 L (C) 3/2 L (D) 6 L

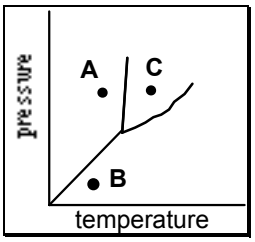
Real gases are most like ideal gases at
(A) high pressure and high temperature
(B) low pressure and low temperature
(C) high pressure and low temperature
(D) low pressure and high temperature

If 0.50 L of a gas at STP (0 °C and 760 torr) has a mass of 1.5 g, what is the approximate molar mass of the gas?
(A) 0.75 $g \cdot mol^{-1}$ (B) 7.5 $g \cdot mol^{-1}$ (C) 11 $g \cdot mol^{-1}$ (D) 34 $g \cdot mol^{-1}$ (E) 67 $g \cdot mol^{-1}$

At 25 °C, a gas diffuses twice as fast as SO_2 (64 g mol^{-1}). The gas could be
(A) He (4 g mol^{-1}) (B) CH_4 (16 g mol^{-1}) (C) O_2 (32 g mol^{-1}) (D) HI (128 g mol^{-1})

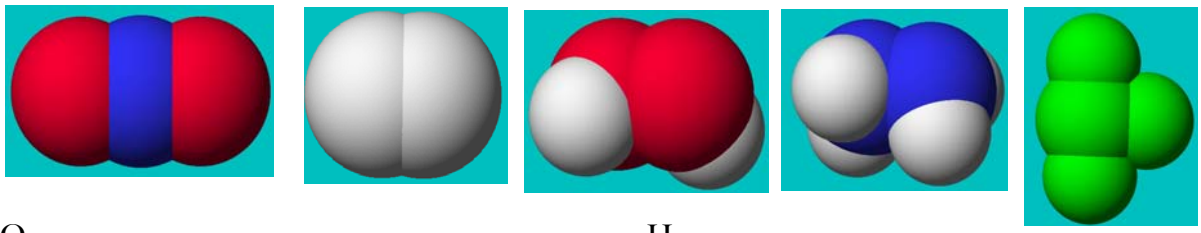
For CO_2, the critical temperature is 31.1 °C and the critical pressure is 73 atm. These data imply that CO_2 can be liquified at
(A) 31.l °C and 72.0 atm
(B) 30.0 °C and 73.0 atm
(C) 32.0 °C and 73.0 atm
(D) 32.0 °C and 74.0 atm

Consider the phase diagram of a pure compound. Which statement applies?



(A) The path **A** to **C** represents sublimation
(B) Following the path **A** to **B** to **C** the compound would first liquefy and then vaporize
(C) If the compound is in state **A**, continued reduction of the pressure (at constant temperature) will cause it to melt
(D) None of these statements is correct

2(15). Circle the type(s) of intermolecular forces present in pure samples of each substance:



NO_2
ion-dipole
dipole-dipole and dipole-induced dipole
hydrogen bonding
London dispersion

H_2
ion-dipole
dipole-dipole and dipole-induced dipole
hydrogen bonding
London dispersion

H_2O_2
ion-dipole
dipole-dipole and dipole-induced dipole
hydrogen bonding
London dispersion

N_2H_4
ion-dipole
dipole-dipole and dipole-induced dipole
hydrogen bonding
London dispersion

ClF_3
ion-dipole
hydrogen bonding

dipole-dipole and dipole-induced dipole
London dispersion

3(15). The chemical reaction for automobile air bags is

$$NaN_3(s) \rightarrow Na(s) + N_2(g)$$

What mass of NaN_3 is required to yield 65 L of N_2 measured at 22 °C and 3.25 atm?

4(20). X-ray studies show that elemental lead crystallizes in a face-centered cubic unit cell with $a = 495.05$ pm.

Sketch the unit cell.

Calculate the value of Z, the unit cell content.

Calculate the (theoretical) density of Pb.

Calculate the radius of a lead atom.

5(20). A handbook list the vapor pressure of methyl alcohol as 2.00 atm at 84.0 °C and 5.00 atm at 112.5 °C.
Use these data to calculate the enthalpy of vaporization for the alcohol.

Calculate the vapor pressure of the alcohol at 100.0 °C.