Answer Key: Ch.10 & 11 (2002), Version A

1.
   a. M
   b. CN
   c. I
   d. MN
   e. MP
   f. A
2.
   a. H_2O; dipole-dipole vs. H-bonding
   b. SiO_2; London dispersion (or dipole-dipole) vs. CN
   c. LiCl; ionic vs. London dispersion
   d. Kr; London dispersion forces: MW↑ stronger forces
3. 42.2torr = 0.0555 atm
   D =PM/RT= ((0.970-0.0555)(28.014))/(0.0821·(273+35))
   = (0.914·28.014)/(0.0821·308)= 1.01g/L
4.
   a. $He>CH_4>N_2>O_2>CO_2$
   b. $R_{CH_4}/R_x = \sqrt{(M_x/M_{CH_4})} = t_x/t_{CH_4}$
      $2 = \sqrt{(M_x/16.0426)}$
      $M_x = 64.1704$
      Speed = √(3RT/M) = √((3·8.314·298)/64.1704)= 340.m/s
   c. "a" is a correction for the presence of intermolecular forces (Since particles are attracted to each other, the pressure will be slightly lower than that of an ideal gas). For CO_2, "a" would be larger since there are small dipoles in CO_2 (although overall μ=0)

Answer Key: Ch.10 & 11 (2002), Version B

1.
   a. MN
   b. MN or MP
   c. A
   d. M
   e. CN
   f. I
2.
   a. NH_3; H-bonding vs. dipole-dipole
   b. SiC or LiCl; CN vs. ionic bonding
   c. NaCl; dipole-dipole vs. ionic
   d. H_2Te; dipole-dipole: MW↑ stronger forces

3. PV = nRT
   PV = (m/M)RT
   15.5 torr = 0.0204 atm
   PM/RT = m/v = D = PM/RT=((0.850-0.0204)(32.00))/((0.0821)(18.0+273))
   = (0.830·32.00)/(0.821·291)=1.11g/L

4.
   a. $CO_2 > O_2 > N_2 > CH_4 > He$
   b. $R_{CO_2}/R_x = \sqrt{(M_x/M_{CO_2})} = t_x/t_{CO_2}$
      $5 = \sqrt{(M_x/44.01)}$
      $M_x = 1100.5$
      Speed = $\sqrt{(3RT/M)} = \sqrt{((3 \cdot 8.314 \cdot 298)/1100)} = 78.7$m/s
   c. "b" is a correction for the actual volume of the molecule
      "b" for O_2 would be smaller because the molecule is smaller

Answer Key: Ch.10 & 11 (2002), Version C

1.
   a. Intermolecular Forces
   b. Actual volume of atoms
   c. H_2S has higher *a* because it has dipole-dipole forces; H_2S has higher *b* because it has a larger molecular volume
   d. a – stronger the intermolecular forces, higher the boiling point
   e. SO_2; Polar therefore strongest intermolecular forces, and largest
2.
   a. Ionic - High Melting Point; electrolytes
      i. Ions
      ii. Electrostatic
   b. Covalent Network – High Melting point, do not dissolve
      i. Atoms
      ii. Covalently bonded
   c. Metallic – good conductors, malleable
      i. Atoms
      ii. Metallic bonds
   d. Molecular – low melting point; poor conductor
      i. Molecules
      ii. Van der Waals: dipole-dipole, London Dispersion, H-bonding

Answer Key: Ch.10 & 11 (2003), Version E

1.
   a. Ideal gas has no volume (made of "point" particles)
   b. Ideal gas molecules have no interactions (no forces of attraction/repulsion)
   c. Elastic collisions
2.
   a. Taller and thinner than the 100ºC one
   b. i. 100ºC
   c. i. 100ºC
   d. Higher Temperature means higher average speed, meaning more move to the hole to effuse quickly
3.
   a. Al: Metallic; Ge: Covalent Network; Al has the lower MP
   b. LiOH: ionic; HOH: molecular, polar; HOH has the lower MP
   c. Bromine: molecular, nonpolar; Xenon: atomic; Xenon has the lower MP
4.
   a. London Dispersion Forces
   b. London Dispersion Forces; Dipole-Dipole

5. T = 65ºC = 338K
   P = 1.20 atm

$$\frac{15.0\text{g } C_3H_8}{1} \left| \frac{1\text{ml}}{44.0932\text{g}} \right| \frac{5 \text{ mol } O_2}{1 \text{ mol } C_3H_8} \left| \frac{1 \text{ mol air}}{0.210 \text{ mol } O_2} \right.$$

   = 8.10 mol air

   PV=nRT
   (1.20)(V)=(8.10)(0.0821)(338)
   V=187L air

Answer Key: Ch.10 & 11 (2003), Version F

1.
   a. The volume of a sample of gas is directly related to its temperature
   b. The volume of a sample of gas is indirectly related to its pressure
   c. The volume of a sample of gas is directly related to the number of moles
2.
   a. Thinner and Taller than the 100ºC graph
   b. iii. The have the same kinetic energy
   c. ii. MM_2, which equals $2(MM_1)$
   d. Because temperature measures the average kinetic energy, and since they are both at the same temperature, they have the same kinetic energy
3.
   a. S_8: molecular polar; O_2: molecular nonpolar; O_2 has the lower MP
   b. NaI: ionic; ICl: molecular polar; ICl has the lower MP
   c. Hg: metallic; Ne: atomic; Ne has the lower MP
4.
   a. Covalent bonds
   b. Dipole-Dipole
      London Dispersion Force
      Hydrogen Bonding
5. T = 75ºC = 348K
   P = 0.80 atm

$$\frac{65.0\text{g } C_4H_{10}}{1} \left| \frac{1\text{ml}}{58.1190\text{g}} \right| \frac{13 \text{ mol } O_2}{2 \text{ mol } C_4H_{10}} \left| \frac{1 \text{ mol air}}{0.210 \text{ mol } O_2} \right.$$

   = 34.6 mol air

   PV=nRT
   (0.80)(V)=(34.6)(0.0821)(348)
   V=1200L

Answer Key: Ch.10 & 11 (2003), Version G

1. Relationship #1: P on y-axis and T on x-axis OR V on y-axis and T on x-axis
   Relationship #2: V on y-axis and n on x-axis OR 1/P on y-axis and V on x-axis
2.
   a. Real gases have volumes
   b. Real gases have intermolecular forces
   c. Real gases have inelastic collisions
3.

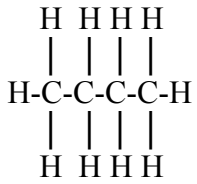
a. H_2; smallest molecular volumes; weakest intermolecular forces
b. H_2: London Dispersion
   HF: London Dispersion
   Dipole-dipole
   H-Bonding
   HCl: London Dispersion
   Dipole-dipole
c. H_2: Weakest Intermolecular Forces

Answer Key: Ch.10 & 11 (2004), Version I

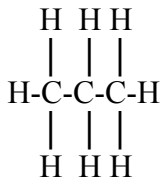
1.

a. Argon

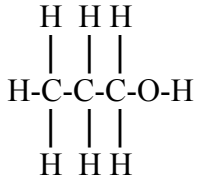
Butane



Propane



1-propanol



b. Argon: London Dispersion Forces
   Butane: London Dispersion Forces
   Propane: London Dispersion Forces
   1-propanol: London Dispersion Forces, dipole-dipole, H-bonding
c. 1 = Argon, 3 = Butane, 2 = Propane, 4 = 1-propanol

2.

a. A decrease in volume means more collision with the wall, causing an increase in pressure.
b. Number of moles is not constant

3.

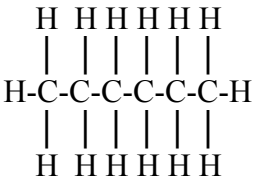
a. CO; polar, so strongest intermolecular forces; heavier than H_2 (same as N_2)
b. H_2; Since there is a same temperature, it will have the same average kinetic energy, meaning the smallest mass will have the greatest velocity.

c. All of them will have the same average kinetic energy because they have the same temperature

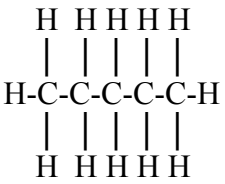
Answer Key: Ch.10 & 11 (2004), Version J

1.

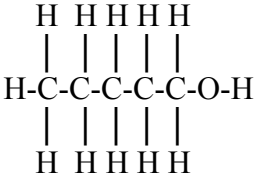
a. Hexane



Pentane



1-pentanol



Krypton

b. Hexane: London Dispersion Forces
Pentane: London Dispersion Forces
1-pentanol: London Dispersion Forces, dipole-dipole, H-bonding
Krypton: London Dispersion Forces

c. 3 = Hexane, 1 = Krypton, 2 = Pentane, 4 = 1-pentanol

2.

a. As volume decreases, there will be more collisions, so the pressure will be higher. Thus, as the volume decreases, the collision become stronger

b. The number of moles is not constant

3.

a. PH_3; polar and the 2nd heaviest

b. All of them have the same temperature, so they will have the same kinetic energy

c. Ne will have the greatest average velocity, because it is the lightest

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