

**INTRODUCTORY CHEMISTRY, CHEM 111**  
**SPRING 2005, TEST 3**

Name: \_\_\_\_\_

**Multiple Choice:** Read each question carefully. There is only one correct answer to each question. Circle the letter corresponding to the correct answer.

$R = 0.08206 \text{ L atm/mol K}$ ;  $1 \text{ atm} = 760 \text{ mm of Hg} = 14.7 \text{ lb/in}^2$

- Which one of the following elements is most likely to form a sulfide with the formula  $X_2S_3$  and a hydride with the formula  $XH_3$ ?  
a) Li                      b) Ca                      c) Al                      d) C                      e) Cl
- Which of the following ionic compounds would you expect to have the highest melting point?  
a)  $MgBr_2$               b)  $CaBr_2$               c)  $SrBr_2$               d)  $BaBr_2$   
e) all of these compounds have essentially the same melting points
- Predict the chemical formula of the ionic compound formed when Mg reacts with  $P_4$ .  
a)  $MgP$                       b)  $MgP_4$                       c)  $Mg_2P$                       d)  $Mg_3P_2$                       e)  $Mg_2P_5$
- Determine the oxidation number of chlorine in  $KClO_3$ .  
a) -1                      b) +1                      c) +2                      d) +5                      e) none of these
- Determine the oxidation number of carbon in  $CH_3CBr$ .  
a) -1                      b) +1                      c) +2                      d) +5                      e) none of these
- Which of the following best describes the type of bonding in  $InCl_3$ ?  
a) predominately covalent with some ionic character  
b) predominately metallic with some ionic character  
c) predominately covalent with some metallic character  
d) predominately ionic with some covalent character  
e) predominately metallic with some covalent character
- Acetylene burns in oxygen to form  $CO_2$  and  $H_2O$ . What **total** volume of products ( $CO_2$  and  $H_2O$ ) would be produced from the complete combustion of 3.4 liters of acetylene?  
 $2 C_2H_2(g) + 5 O_2(g) \rightarrow 4 CO_2(g) + 2 H_2O(g)$   
a) 3.4 L                      b) 6.8 L                      c) 19.2 L                      d) 27.6 L                      e) none of these
- An automobile tire is inflated at a pressure of  $32 \text{ lb/in}^2$  at  $23^\circ C$ . At what temperature will the pressure reach  $50 \text{ lb/in}^2$ ?  
a)  $36^\circ C$                       b)  $190^\circ C$                       c)  $47^\circ C$                       d)  $123^\circ C$                       e) none of these

9. Three containers of identical volume each contain Ne gas.

A
N = 1.0
T = 25°C

B
N = 1.0
T = 40°C

C
N = 3.0
T = 25°C

In which container is the pressure greatest?

- a) A                      b) B                      c) C                      d) A = B  
e) B = C
10. In which of the above containers will Ne have the greatest average kinetic energy?  
a) A                      b) B                      c) C                      d) A = B  
e) B = C

**Problems: Show all work in a step-by-step fashion. Include all units and maintain significant figures. In discussion questions use correct grammar and complete sentences.**

1. Five (5.0 L) liters of Ar gas was collected at 27°C and 1.0 atm pressure. What will be the pressure of the gas if the volume is compressed to 1.0 L and the temperature is increased to 100°C?

Pressure = \_\_\_\_\_

2. A gas is contained in a cylinder with a movable piston so that the volume can change while maintaining a constant pressure of the gas. If the temperature of the gas is increased while the number of moles and pressure remain constant what happens to the volume of the gas?

Use the Kinetic Molecular Theory to explain what is happening on the molecular level as the gas is heated and the volume changes.

3. Draw the Lewis structure for the ionic compound  $K_3P$ .
  
4. Describe the common factor in covalent, ionic and metallic bonding that causes the atoms or ions to be attracted to one another.

Describe differences in ionic, covalent and metallic bonding in terms of the electrons involved in bonding.

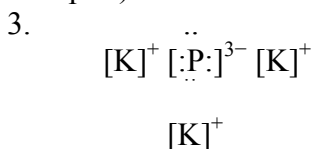
5. Classify each of the following compounds as predominately covalent, ionic or acidic. Provide the name or formula for each of the compounds.

Formula	Classification	Name
a) $MnCl_2$	_____	_____
b) $PBr_3$	_____	_____
c) $Na_3PO_4$	_____	_____
d) _____	_____	lithium sulfate
e) _____	_____	silicon tetrachloride

## Answer Key Test 3 2005

- |      |       |
|------|-------|
| 1. c | 6. a  |
| 2. a | 7. e  |
| 3. d | 8. b  |
| 4. d | 9. c  |
| 5. e | 10. b |

- 6.2 atm
- The volume will increase  
Increasing temperature increases the motion of the gas particles (their average kinetic energy). This will lead to more frequent collisions and the collisions will have more force. This would cause the pressure to increase. Because the problem stated that pressure remains constant the volume must increase to maintain a constant pressure (to decrease the frequency of collisions by moving the walls of the container farther apart).



- Common: electrostatic attraction between opposite charges  
Differences: ionic transfer of electrons, covalent share localized electrons, metallic share delocalized electrons.
- a) On bond type triangle  $\text{MnCl}_2$  is 50% covalent 50% ionic bonding.  
Therefore, either ionic manganese(II) chloride or covalent manganese dichloride  
b) covalent phosphorus tribromide  
c) ionic sodium phosphate  
d)  $\text{Li}_2\text{SO}_4$  ionic  
e)  $\text{SiCl}_4$  covalent