

Houston Community College System HCCS  
CHEM 1305 Exam III, Chapters 8-11  
Spring Semester 2017

Time: 2

Student Name: \_\_\_\_\_ Student ID # \_\_\_\_\_

Instructor: Dr. Emad Akeer

**MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.**

**3 Points each**

- 1) Which of the following is equal to 1.00 mole of substance? 1) \_\_\_\_\_  
A)  $6.02 \times 10^{23}$  sodium iodide formula units, NaI  
B)  $6.02 \times 10^{23}$  sodium atoms, Na  
C)  $6.02 \times 10^{23}$  iodine molecules, I<sub>2</sub>  
D) all of the above  
E) none of the above
- 2) What is the molar mass of aspirin, C<sub>9</sub>H<sub>8</sub>O<sub>4</sub>? 2) \_\_\_\_\_  
A) 116.08 g/mol  
B) 29.02 g/mol  
C) 252.25 g/mol  
D) 244.17 g/mol  
E) 180.17 g/mol
- 3) Which of the following gases occupies 22.4 L at STP? 3) \_\_\_\_\_  
A) 1 mol nitrogen, N<sub>2</sub>  
B) 1 mol of oxygen, O<sub>2</sub>  
C) 1 mol hydrogen, H<sub>2</sub>  
D) all of the above  
E) none of the above
- 4) How many moles of chlorine gas react with 1 mol of hydrogen gas according to the balanced chemical equation? 4) \_\_\_\_\_  
$$\text{H}_2(\text{g}) + \text{Cl}_2(\text{g}) \rightarrow 2 \text{HCl}(\text{g})$$
  
A) 3 mol  
B) 1 mol  
C) 4 mol  
D) 2 mol  
E) none of the above
- 5) Which of the following is an observed property of gases? 5) \_\_\_\_\_  
A) gases have a variable shape  
B) gases expand uniformly  
C) gases mix uniformly  
D) gases compress uniformly  
E) all of the above

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- 6) Which of the following does *not* express standard atmospheric pressure? 6) \_\_\_\_\_  
A) 29.9 in. Hg  
B) 760 cm Hg  
C) 14.7 psi  
D) 760 torr  
E) 101 kPa
- 7) If a gas pressure gauge reads 15 mm Hg, what is the pressure in atmospheres? 7) \_\_\_\_\_  
A) 1100 atm      B) 11,000 atm      C) 15 atm      D) 0.20 atm      E) 0.020 atm
- 8) Which of the following increases the pressure of a gas? 8) \_\_\_\_\_  
A) increasing temperature  
B) decreasing the volume  
C) increasing the number of molecules  
D) all of the above  
E) none of the above
- 9) If the temperature of a liquid increases, what happens to its vapor pressure? 9) \_\_\_\_\_  
A) decreases  
B) remains constant  
C) unpredictable  
D) increases  
E) none of the above
- 10) What is the vapor pressure of water at 100 °C? 10) \_\_\_\_\_  
A) 100 mm Hg  
B) 760 mm Hg  
C) 1 mm Hg  
D) 76 mm Hg  
E) none of the above
- 11) Which of the following is true according to the kinetic theory of gases? 11) \_\_\_\_\_  
A) Molecules have elastic collisions.  
B) Molecules move randomly.  
C) Molecules occupy negligible volume.  
D) all of the above  
E) none of the above
- 12) What is the temperature at which an ideal gas occupies zero volume? 12) \_\_\_\_\_  
A) 273 °C  
B) -273 °C  
C) 273 K  
D) -273 K  
E) none of the above
- 13) According to Boyle's law, what happens to a gas as the volume increases? 13) \_\_\_\_\_  
A) The temperature increases.  
B) The temperature decreases.  
C) The pressure decreases.  
D) The pressure increases.  
E) none of the above

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- 14) If a helium balloon is placed in a cold freezer, what happens in the balloon? 14) \_\_\_\_\_  
A) The temperature increases and the volume decreases.  
B) The temperature increases and the volume increases.  
C) The temperature decreases and the volume decreases.  
D) The temperature decreases and the volume increases.  
E) none of the above
- 15) If the partial pressure of oxygen gas in a blood capillary is 105 mm Hg, what is the pressure expressed in centimeters of mercury? 15) \_\_\_\_\_  
A) 0.105 cm Hg  
B) 105,000 cm Hg  
C) 10.5 cm Hg  
D) 1,050 cm Hg  
E) 1.05 cm Hg
- 16) Which of the following is an observed property of liquids? 16) \_\_\_\_\_  
A) Liquids flow readily.  
B) Liquids are more dense than gases.  
C) Liquids do not compress or expand significantly.  
D) Liquids have a variable shape and fixed volume.  
E) all of the above
- 17) If the molecules in a liquid have a strong attraction for each other, which of the following properties has a relatively low value? 17) \_\_\_\_\_  
A) vapor pressure  
B) surface tension  
C) viscosity  
D) boiling point  
E) all of the above
- 18) Consider the following liquids with similar molar masses. Predict which liquid has the strongest intermolecular attraction based on viscosity data. 18) \_\_\_\_\_  
A) propionic acid (viscosity @ 20 °C = 1.10 centipoise)  
B) butyl alcohol (viscosity @ 20 °C = 2.95 centipoise)  
C) ethyl ether (viscosity @ 20 °C = 0.23 centipoise)  
D) propyl chloride (viscosity @ 20 °C = 0.35 centipoise)  
E) ethyl formate (viscosity @ 20 °C = 0.40 centipoise)
- 19) Which of the following is an observed property of solids? 19) \_\_\_\_\_  
A) Solids do not compress or expand significantly.  
B) Solids are usually more dense than liquids.  
C) Solids have a fixed shape and fixed volume.  
D) Solids can be crystalline or noncrystalline.  
E) all of the above
- 20) Which of the following types of crystalline solids have ions arranged in regular geometric patterns? 20) \_\_\_\_\_  
A) molecular  
B) metallic  
C) ionic  
D) all of the above  
E) none of the above

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**4 Points each**

21) The formula for mustard gas used in chemical warfare is  $C_4H_8SCl_2$  (159.09 g/mol). What is the percentage of carbon in the compound? 21) \_\_\_\_\_  
A) 5.08%                      B) 7.55%                      C) 44.57%                      D) 20.16%                      E) 30.20%

22) If 0.500 mol of copper combines with 0.250 mol of sulfur, what is the empirical formula of the copper sulfide product? 22) \_\_\_\_\_  
A)  $Cu_5S_5$   
B)  $CuS_2$   
C)  $Cu_2S$   
D)  $CuS$   
E) none of the above

23) The taste of sour milk is lactic acid. What is the molecular formula for lactic acid if the percent composition is 40.00% C, 6.71% H, 53.29% O, and the approximate molar mass is 90 g/mol? 23) \_\_\_\_\_  
A)  $C_6HO_8$                       B)  $CHO_2$                       C)  $CHO$                       D)  $CH_2O$                       E)  $C_3H_6O_3$

24) How many moles of water react with 0.500 mol of calcium metal? 24) \_\_\_\_\_  
$$\underline{\hspace{1cm}}Ca(s) + \underline{\hspace{1cm}}H_2O(l) \rightarrow \underline{\hspace{1cm}}Ca(OH)_2(aq) + \underline{\hspace{1cm}}H_2(g)$$
  
A) 2.00 mol  
B) 0.250 mol  
C) 1.00 mol  
D) 0.500 mol  
E) none of the above

25) What is the mass of aluminum metal that reacts to give 11.1 g of manganese metal? 25) \_\_\_\_\_  
$$\underline{\hspace{1cm}}MnO_2(l) + \underline{\hspace{1cm}}Al(l) \xrightarrow{\Delta} \underline{\hspace{1cm}}Mn(l) + \underline{\hspace{1cm}}Al_2O_3(s)$$
  
A) 4.09 g                      B) 8.18 g                      C) 5.45 g                      D) 7.27 g                      E) 3.64 g

26) What is the volume of oxygen gas at STP from the decomposition of 10.8 g of mercuric oxide (216.59 g/mol)? 26) \_\_\_\_\_  
$$\underline{\hspace{1cm}}HgO(s) \xrightarrow{\Delta} \underline{\hspace{1cm}}Hg(l) + \underline{\hspace{1cm}}O_2(g)$$
  
A) 1.12 L                      B) 209 L                      C) 2.23 L                      D) 52.2 L                      E) 0.558 L

27) A sample of propane gas occupies  $625\text{ cm}^3$  at  $20.0\text{ }^\circ\text{C}$  and 750 torr. What is the final volume in cubic centimeters at  $-80.0\text{ }^\circ\text{C}$  and 750 torr? 27) \_\_\_\_\_  
A)  $2500\text{ cm}^3$                       B)  $156\text{ cm}^3$                       C)  $519\text{ cm}^3$                       D)  $949\text{ cm}^3$                       E)  $412\text{ cm}^3$

28) A sample of xenon gas at 786 mm Hg is cooled from  $100.0\text{ }^\circ\text{C}$  to  $50.0\text{ }^\circ\text{C}$ . If the volume remains constant, what is the final pressure? 28) \_\_\_\_\_  
A) 908 mm Hg  
B) 1570 mm Hg  
C) 393 mm Hg  
D) 153 mm Hg  
E) 681 mm Hg

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- 29) How many moles of methane occupy a volume of 2.00 L at 50.0 °C and 0.500 atm? ( $R = 0.0821 \text{ atm} \cdot \text{L/mol} \cdot \text{K}$ ) 29) \_\_\_\_\_
- A) 4.11 mol
  - B) 0.244 mol
  - C) 0.0377 mol
  - D) 0.151 mol
  - E) 26.5 mol

- 30) Calculate the number of calories required to raise 10.0 g of water from 25.0 °C to 75.0 °C. The specific heat of water is  $1.00 \text{ cal}/(\text{g} \times ^\circ\text{C})$ . 30) \_\_\_\_\_
- A)  $5.00 \times 10^2 \text{ cal}$
  - B) 10.0 cal
  - C) 50.0 cal
  - D)  $7.50 \times 10^2 \text{ cal}$
  - E)  $2.50 \times 10^2 \text{ cal}$

## Answer Key

Testname: CHEM 1305 TEST I

- 1) D
- 2) E
- 3) D
- 4) B
- 5) E
- 6) B
- 7) E
- 8) D
- 9) D
- 10) B
- 11) D
- 12) B
- 13) C
- 14) C
- 15) C
- 16) E
- 17) A
- 18) B
- 19) E
- 20) C
- 21) E
- 22) C
- 23) E
- 24) C
- 25) D
- 26) E
- 27) E
- 28) E
- 29) C
- 30) A