001
version

last name

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McCord CH301

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TTh 9:30 am - 11 am

Exam 1

Sep 17, 2018

Monday 7:30 - 9:00 PM

A - Mi in BUR 106

Mo - Z in JES A121A

Remember to refer to the Periodic Table handout that is separate from this exam copy.

NOTE: Please keep this exam copy intact (all pages still stapled - including this cover page). You must turn in ALL the materials that were distributed. This means that you turn in your exam copy (name and signature included), bubble sheet, periodic table handout, and all scratch paper. Please also have your UT ID card ready to show as well.

This print-out should have 20 questions. Multiple-choice questions may continue on the next column or page – find all choices before answering.

Balance a Reaction
001 5.0 points

Consider the following unbalanced reaction:

$$Fe_2O_3 + CO \longrightarrow Fe + CO_2$$

What is the sum of the coefficients in the balanced chemical reaction? Remember to count the 1 if no coefficient is present.

1. 9

2. 6

3. 8

4. 5

5. 4

6. 12

Stoich Application Fuel w Phases
002 5.0 points

A fuel cell car is powered by electrons harvested from the flameless, low-temperature reaction

$$2\,H_2(g) + O_2(g) \rightarrow 2\,H_2O(\ell)$$

What volume of hydrogen is needed to fully react with 18.6 L of oxygen at STP?

1. 2.02 L

2. 97.4 L

3. 9.3 L

4. 38.2 L

5. 37.2 L

6. 18.6 L

Combustion Stoichiometry Calc
003 5.0 points

Use the following balanced chemical equation:

$$C_3H_8(g) + 5O_2(g) \rightarrow 3CO_2(g) + 4H_2O(l)$$

6.45 moles of C_3H_8 and 9.56 moles of O_2 are combusted at 298.15 K and 1 atm. What is the volume of CO_2 formed after the reaction reaches 100% completion? Assume temperature and pressure remain constant.

1. 140 L

2. 473 L

3. 158 L

4. 46.8 L

5. 128 L

6. 234 L

Boyles Law Reasoning
004 5.0 points

From the microscopic perspective, Boyle's Law explains that for a closed gaseous system...

1. An increase in volume at constant temperature results in a higher pressure

2. An increase in volume at constant temperature results in fewer collisions between gas particles and the walls of the container

3. All answer choices are true

4. There can be no change in volume without a change in pressure

5. There is a linear relationship between volume and pressure

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Avogadros Law Concept
005 5.0 points

A balloon is inflated with 0.12 moles of helium to a volume equal to V_i. Which of the

following represents the final volume (V_f) after 0.06 moles of helium are released from the inflated balloon at constant temperature and pressure?

1. $V_f = \frac{1}{2}V_i$

2. $V_f = 3V_i$

3. $V_f = V_i$

4. $V_f = 2V_i$

5. $V_f = \frac{1}{3}V_i$

6. None of these choices are true

Charles Law Calc
006 5.0 points

A gas has a volume of 2.00 liters at a temperature of 127°C. What will be the volume of the gas if the temperature is increased to 254°C at constant pressure?

1. 4.00 L

2. 1.52 L

3. 1.32 L

4. 0.38 L

5. 2.63 L

6. 3.03 L

Combined Gas Law 1
007 5.0 points

A sample of helium (He) occupies 8.0 liters at 1 atm and 20.0°C. What pressure is necessary to change the volume to 1.0 liters at 10.0°C?

1. 0.13 atm

2. 4 atm

3. 7.7 atm

4. 8.3 atm

5. 16 atm

Gas bulb comparison
008 5.0 points

Equal masses of CO_2 and O_2 are placed in separate bulbs with equal volume and temperature. Assuming the gases behave ideally, which statement is true?

1. Both bulbs contain the same number of moles of gas.

2. The bulb containing CO_2 has a greater number density.

3. The pressure in the O_2 bulb is greater than the pressure in the CO_2 bulb.

4. The bulb containing CO_2 has a greater mass density.

5. The pressures in the two bulbs are the same.

Gas Law Application
009 5.0 points

The vital capacity of the lungs is the maximum volume of air that can be exhaled after a full breath. The average human has a vital capacity of 238 in^3 with an internal lung pressure of 1.44 atm and a temperature of 37.0°C. How many moles of ideal gas are in a full exhalation?

1. 0.22 moles

2. 2.51 moles

3. 1.85 moles

4. 0.93 moles

5. 3.70 moles

Ideal Gas Law Composition Stoich
010 5.0 points

How many nitrogen atoms are present in a nitrogen gas sample that occupies 54.6 L at

STP?

1. 3.29×10^{25} N atoms

2. 8.26×10^{-24} N atoms

3. 1.47×10^{24} N atoms

4. 1.35×10^{25} N atoms

5. 2.94×10^{24} N atoms

6. 4.13×10^{-24} N atoms

Sparks Density Modified
011 5.0 points

What is the mass density of HBr gas at 30.5°C and 758 Torr?

1. 3.24 g/L

2. 32.2 g/L

3. 2.46×10^3 g/L

4. 0.309 g/L

5. Cannot be determined from this data.

ChemPrin3e T04 25
012 5.0 points

If 250 mL of a gas at STP weighs 2 g, what is the molar mass of the gas?

1. $44.8\ \text{g} \cdot \text{mol}^{-1}$

2. $179\ \text{g} \cdot \text{mol}^{-1}$

3. $28.0\ \text{g} \cdot \text{mol}^{-1}$

4. $56.0\ \text{g} \cdot \text{mol}^{-1}$

5. $8.00\ \text{g} \cdot \text{mol}^{-1}$

Gas Mixture Percent by Mass
013 5.0 points

A mixture of oxygen and helium is 87.4% by mass oxygen with a total pressure of 675 Torr. What is the partial pressure of oxygen in this mixture?

1. 314 Torr

2. 333 Torr

3. 590 Torr

4. 688 Torr

5. 299 Torr

Gas Law Stoich III
014 5.0 points

Consider the following balanced chemical reaction:

$$CH_3OCH_3(g) \rightarrow CH_4(g) + H_2(g) + CO(g)$$

118.9 g CH_3OCH_3 fully decomposes to give a pressure of 987 Torr. What is the partial pressure of hydrogen in the final reaction system?

1. 329 Torr

2. 388 Torr

3. 987 Torr

4. 658 Torr

5. 493 Torr

KMT Conceptual III
015 5.0 points

Which of the following is not an assumption made by kinetic molecular theory?

1. An ideal gas does not exhibit attractive or repulsive forces

2. The volume of the gas particles is negligible compared to the size of the container

3. Gas particles are constantly moving in random directions

4. The kinetic energy of a gas is solely dependent on the temperature

5. An ideal gas steadily loses energy due to elastic collisions with the walls of the container

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KMT Calculation Modified
016 5.0 points

If the average speed of a CO_2 molecule is 411 $m \cdot s^{-1}$ at 25°C, what is the average speed of a molecule of CH_4 at the same temperature?

1. 247 $m \cdot s^{-1}$

2. 681 $m \cdot s^{-1}$

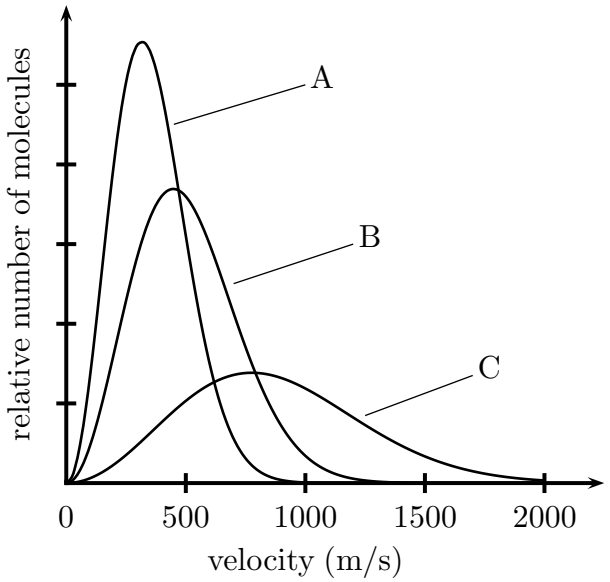
3. 1130 $m \cdot s^{-1}$

4. 410 $m \cdot s^{-1}$

5. 1000 $m \cdot s^{-1}$

Maxwell Distribution Graph
017 5.0 points

The graph shows the approximate Maxwell-Boltzmann distribution plots for three different gases at the same temperature.



Which of the following statements is true?

1. Gas C has the greatest kinetic energy

2. Gas C has the lowest molar mass

3. Gas B is heavier than Gas A

4. Gas A has the greatest kinetic energy

5. The v_{rms} for Gas C is 1500 m/s

Non Ideal Conditions Conceptual
018 5.0 points

A real gas is expected to behave most ideally at which of the following conditions?

1. 580 K, 0.1 atm

2. 28 K, 0.1 atm

3. 28 K, 1 atm

4. 580 K, 10 atm

5. 28 K, 10 atm

Non Ideal Gases Conceptual 18
019 5.0 points

Consider the van der Waals equation for a non-ideal gas. Which of the following statements is true?

1. $(P + \frac{an^2}{V^2})$ is equal to the measured pressure

2. A large b value correlates with a low molecular weight

3. Attractive forces between particles cause the measured pressure to be lower than the ideal pressure

4. This equation can only be used to model ideal gases

5. $(V - nb)$ is equal to the volume of the container holding the gas

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Non Ideal Conceptual
020 5.0 points

A non-ideal gas is quantified at constant temperature and pressure. The compressibility factor (Z) is equal to 0.85. Which of the

following statements best explains this gas?

1. The gas has a negligible a term in the van der Waal's equation

2. The gas exhibits attractive forces, resulting in a measured pressure that is lower than the ideal pressure

3. The gas exhibits attractive forces, resulting in an ideal pressure that is lower than the measured pressure

4. The non-ideal gas has dominate repulsive forces, resulting in an ideal pressure that is lower than the measured pressure