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McCord CH301
50070

Exam 1

Fall 2017

Remember to refer to the Periodic Table handout that is separate from this exam copy. There are many conversion factors and physical constants available there.

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 17 questions. Multiple-choice questions may continue on the next column or page – find all choices before answering.

001 6.0 points

A gas sample has an initial pressure equal to P_i at equilibrium. Which of the following represents the final pressure (P_f) of the gas sample when the number of moles is doubled at constant volume and temperature?

1. None of the above

2. $P_f = P_i$

3. $P_f = 2P_i$

4. $P_f = 0.5P_i$

5. $P_f = 4P_i$

6. $P_f = 0.25P_i$

002 6.0 points

Consider the following UNBALANCED reaction:

$$?HNO_3 + ?H_2S \rightarrow ?H_2O + ?NO_2 + ?S$$

What is the sum of the coefficients in the balanced reaction?

1. 6

2. 7

3. 12

4. 10

5. 15

6. 8

7. 4

003 6.0 points

Consider the combustion of propane (C_3H_8) run at constant temperature and pressure:

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

If 7.60 L propane is reacted with 45.6 L oxygen, what is the final volume of all gases?

1. 7.60 L

2. 122 L

3. 53.2 L

4. 45.6 L

5. 60.8 L

004 6.0 points

A gas sample is stored in a closed, rigid container at 50°C. How will the pressure change if you increase the temperature to 100°C?

1. The pressure will increase by a small amount

2. There will be no change in pressure

3. The pressure will double

4. The pressure will decrease by a small amount

5. The pressure will halve

005 4.0 points

If the Kelvin temperature of an ideal gas is doubled while maintaining a constant pressure,

1. the volume doubles.

2. the pressure doubles.

3. the volume increases by a factor of 4.

4. the volume is halved.

006 6.0 points

A closed tube used to transport methane has a volume of 110 L at 280°C and 965 torr. How many moles of gas are in the tube?

1. 8.34

2. 23.1

3. 4680

4. 11700

5. 4.17

6. 3510

7. 2340

8. 3.08

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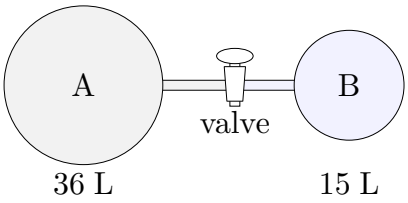
007 6.0 points

Consider the diagram shown below of two glass bulbs connected through a valve. The volume for each gas (A and B) is shown under the bulbs and the gases also happen to be at the same temperature (337K) and pressure (580 torr).



After the valve is opened, the two gases mix completely. What is the partial pressure of gas A in this new (opened valve) state?

1. 241.7 torr

2. 170.6 torr

3. 580 torr

4. 1392 torr

5. 409.4 torr

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008 6.0 points

Calculate the volume of NO gas produced from the following balanced chemical reaction when 66.6 grams NO_2 is reacted to completion with excess H_2O at STP.

$$3NO_2(g) + H_2O(l) \rightarrow 2HNO_3(aq) + NO(g)$$

1. 49.7 L

2. 130 L

3. 4.8 L

4. 66.6 L

5. 10.8 L

6. 16.6 L

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009 6.0 points

The rate of effusion for carbon monoxide (CO) is ____ times the rate of effusion for xenon (Xe) gas .

1. 1.59

2. 3.06

3. 1.16

4. 2.17

5. 4.69

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010 6.0 points

Consider three closed 10L containers at room temperature. Container 1 contains neon gas. Container 2 contains argon gas. Container 3 contains hydrogen gas. Each container has a constant pressure equal to 1.2 atm. Which of the following properties, if any, are the same between the containers?

I. Average velocity of gas particles

II. Number density

III. Kinetic energy

IV. Mass density

1. I and IV only

2. IV only

3. II and IV only

4. II and III only

5. III only

6. I, II, III and IV

7. I and III only

8. None of the above

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011 6.0 points

A 3.43 gram gas sample has a volume of 3.25 L, a pressure of 0.61 atm, and a temperature of 310 K. Which of the following gases is it?

1. O_2

2. SF_6

3. CO_2

4. SO_2

5. NH_3

6. Ne

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012 6.0 points

Consider a Maxwell-Boltzmann distribution plotting three different gases at the same temperature. Which of the following conclusions can be made from the graph?

1. The gas with the highest molecular weight has the highest average kinetic energy

2. The gas with the lowest molecular weight has the highest root mean square velocity and the most narrow distribution

3. The root mean squared velocity of a gas is directly proportional to the square root of the molecular weight of its gas

4. The velocity of the gas particles is independent of the molecular weight

5. The root mean squared velocity of a gas is proportional to the inverse square root of its molecular weight

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013 6.0 points

The compressibility factor (Z) for a gas at 400 atm is greater than one. How can you make an accurate gas law calculation for this gas at 400 atm?

1. You must correct for attractive forces because $PV > nRT$

2. This gas can be modeled ideally at this pressure because $PV < nRT$

3. This gas can be modeled ideally at this pressure because $PV = nRT$

4. You must correct for attractive forces because $PV < nRT$

5. You must correct for repulsive forces because $PV > nRT$

6. This gas can be modeled ideally at this pressure because $PV > nRT$

7. You must correct for repulsive forces because $PV < nRT$

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014 6.0 points

Based on the hard sphere model of gases, which of the following gases is best modeled by ideal behavior?

1. Ne

2. Ar

3. Xe

4. He

5. Kr

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015 6.0 points

A container with a mixture of helium and neon has a total pressure of 2.40 atm. If the partial pressure of helium is 1.60 atm, what is the mole fraction of the neon gas?

1. 1.50

2. 0.333

3. 19

4. 18

5. 0.667

6. 3.00

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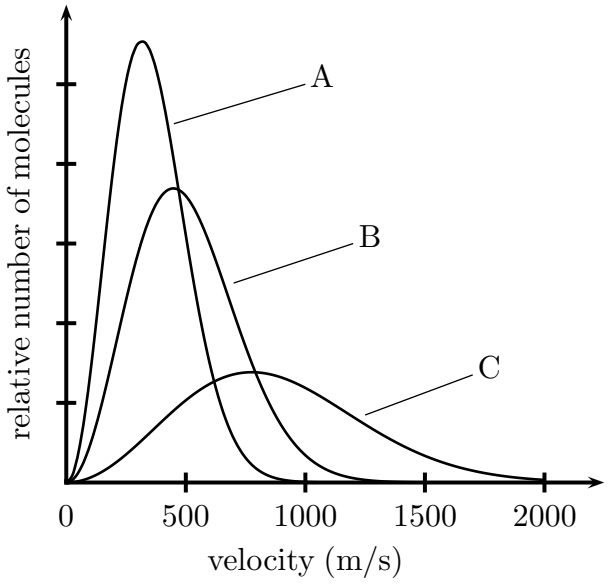
016 6.0 points

The graph shows the approximate Maxwell-Boltzmann distribution plots for O_2, HCl, and Kr at the same temperature.



What is the identity of the gas labeled A?

1. Kr

2. O_2

3. HCl

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017 6.0 points

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

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

2. The b term correlates with the size of particles in a gaseous system

3. A gas with a low molecular weight will have a high a value

4. $(P + \frac{an^2}{V^2})$ represents the measured pressure

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