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| 1. Gases generally have   |  |  |  | | --- | --- | --- | |  | a. | low density | |  | b. | high density | |  | c. | closely packed particles | |  | d. | no increase in volume when temperature is increased | |  | e. | no decrease in volume when pressure is increased |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | gas | general chemistry | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 2. Pressure is   |  |  |  | | --- | --- | --- | |  | a. | defined as the mass that an object exerts when at rest | |  | b. | measured in Newtons | |  | c. | defined as the number of moles of substance divided by the mass of the substance | |  | d. | defined as the force per unit area | |  | e. | measured in grams |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | gas | gas pressure | general chemistry | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 3. The SI unit of pressure is the   |  |  |  | | --- | --- | --- | |  | a. | ampere | |  | b. | kilojoule | |  | c. | newton | |  | d. | gram | |  | e. | pascal |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | gas | gas pressure | general chemistry | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 4. Which of the following would represent the *greatest* pressure?   |  |  |  | | --- | --- | --- | |  | a. | 0.501 atm | |  | b. | 437 mmHg | |  | c. | 11.7 psi | |  | d. | 66062 Pa | |  | e. | 18.8 in Hg |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 5.1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | gas | gas pressure | general chemistry | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 2/3/2017 6:24 AM | |

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| 5. A glass column is filled with mercury and inverted in a pool of mercury. The mercury column stabilizes at a height of 754 mm above the pool of mercury. What is the pressure of the atmosphere?   |  |  |  | | --- | --- | --- | |  | a. | 1.01 atm | |  | b. | 0.754 atm | |  | c. | 0.992 atm | |  | d. | 481 atm | |  | e. | 0.661 atm |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | gas | gas pressure | general chemistry | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 2/3/2017 6:26 AM | |

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| 6. The local weather forecaster reports that the current barometric pressure is 29.4 inches of mercury. What is the current pressure in atmospheres?   |  |  |  | | --- | --- | --- | |  | a. | 0.983 atm | |  | b. | 9.96 atm | |  | c. | 1.00 atm | |  | d. | 3.92 atm | |  | e. | 880 atm |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | gas | gas pressure | general chemistry | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 2/3/2017 6:32 AM | |

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| 7. A physics experiment is conducted at a pressure of 15.1 kPa. What is this pressure in mmHg?   |  |  |  | | --- | --- | --- | |  | a. | 19.9 mmHg | |  | b. | 2.01 mmHg | |  | c. | mmHg | |  | d. | 113 mmHg | |  | e. | mmHg |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | gas | gas pressure | general chemistry | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 8. The air pressure in the inner tube of a tire on a typical racing bike is held at a pressure of about 116 psi. Convert this pressure to atm.   |  |  |  | | --- | --- | --- | |  | a. | 0.153 atm | |  | b. | 7.89 atm | |  | c. | 0.116 atm | |  | d. | 0.127 atm | |  | e. | 116 atm |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | gas | gas pressure | general chemistry | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 9. Boyle's law states that:   |  |  |  | | --- | --- | --- | |  | a. | Equal amounts of gases occupy the same volume at constant temperature and pressure. | |  | b. | The volume of a fixed amount of gas is inversely proportional to its pressure at constant temperature. | |  | c. | The volume of a fixed amount of gas is directly proportional to its temperature in Kelvin at constant pressure. | |  | d. | The total pressure of a mixture of gases is the simple sum of the partial pressure of all of the gaseous compounds. | |  | e. | The rates of effusion of gases are inversely proportional to the square roots of their molar masses. |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.2 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Boyle's law | Chemistry | empirical gas laws | gas | general chemistry | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 10. Avogadro's law states that:   |  |  |  | | --- | --- | --- | |  | a. | Equal amounts of gases occupy the same volume at constant temperature and pressure. | |  | b. | The volume of a fixed amount of gas is inversely proportional to its pressure at constant temperature. | |  | c. | The volume of a fixed amount of gas is directly proportional to its temperature in Kelvin at constant pressure. | |  | d. | The total pressure of a mixture of gases is the simple sum of the partial pressure of all of the gaseous compounds. | |  | e. | The rates of effusion of gases are inversely proportional to the square roots of their molar masses. |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.2 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Avogadro's law | Chemistry | empirical gas laws | gas | general chemistry | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 11. Charles's law states that:   |  |  |  | | --- | --- | --- | |  | a. | Equal amounts of gases occupy the same volume at constant temperature and pressure. | |  | b. | The volume of a fixed amount of gas is inversely proportional to its pressure at constant temperature. | |  | c. | The volume of a fixed amount of gas is directly proportional to its temperature in Kelvin at constant pressure. | |  | d. | The total pressure of a mixture of gases is the simple sum of the partial pressure of all of the gaseous compounds. | |  | e. | The rates of effusion of gases are inversely proportional to the square roots of their molar masses. |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.2 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Charles's law | Chemistry | empirical gas laws | gas | general chemistry | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 12. Consider a sample of helium gas in a container fitted with a piston, as pictured below. The piston is frictionless, but has a mass of 10.0 kg. How many of the following processes will cause the piston to move away from the base **and** decrease the pressure of the gas? Assume ideal behavior.   |  |  | | --- | --- | | 10.0 kg | | | ↓ | | |  | | | base ↑ | | | I. | heating the helium | | II. | removing some of the helium from the container | | III. | turning the container on its side | | IV. | decreasing the pressure outside the container |  |  |  |  | | --- | --- | --- | |  | a. | 0 | |  | b. | 1 | |  | c. | 2 | |  | d. | 3 | |  | e. | 4 |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | empirical gas laws | gas | general chemistry | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 2/23/2017 1:38 AM | |

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| 13. A gas sample is held at constant pressure. The gas occupies 3.62 L of volume when the temperature is 21.6°C. Determine the temperature at which the volume of the gas is 3.43 L.   |  |  |  | | --- | --- | --- | |  | a. | 311 K | |  | b. | 279 K | |  | c. | 20.5 K | |  | d. | 295 K | |  | e. | 552 K |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Charles's law | Chemistry | empirical gas laws | gas | general chemistry | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 14. You have 49.8 g of O2 gas in a container with twice the volume as one with CO2 gas. The pressure and temperature of both containers are the same. Calculate the mass of carbon dioxide gas you have in the container.   |  |  |  | | --- | --- | --- | |  | a. | 68.5 g | |  | b. | 0.778 g | |  | c. | 34.2 g | |  | d. | 3.11 g | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 5.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Avogadro's law | Chemistry | empirical gas laws | gas | general chemistry | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 15. Gaseous chlorine is held in two separate containers at identical temperature and pressure. The volume of container 1 is 1.30 L, and it contains 6.70 mol of the gas. The volume of container 2 is 2.02 L. How many moles of the gas are in container 2?   |  |  |  | | --- | --- | --- | |  | a. | 10.4 mol | |  | b. | 17.6 mol | |  | c. | 0.392 mol | |  | d. | 4.31 mol | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Avogadro's law | Chemistry | empirical gas laws | gas | general chemistry | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 16. A balloon has a volume of 1.80 liters at 24.0°C. The balloon is heated to 48.0°C. Calculate the new volume of the balloon.   |  |  |  | | --- | --- | --- | |  | a. | 1.80 L | |  | b. | 1.95 L | |  | c. | 1.67 L | |  | d. | 3.60 L | |  | e. | 0.90 L |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Charles's law | Chemistry | empirical gas laws | gas | general chemistry | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 17. Consider a sample of gas in a container on a comfortable spring day. The Celsius temperature suddenly doubles, and you transfer the gas to a container with twice the volume of the first container. If the original pressure was 12 atm, what is a good estimate for the new pressure?   |  |  |  | | --- | --- | --- | |  | a. | 3 atm | |  | b. | 5.5 atm | |  | c. | 6.4 atm | |  | d. | 12 atm | |  | e. | 15 atm |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 5.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | combined gas law | empirical gas laws | gas | general chemistry | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 18. Body temperature is about 309 K. On a cold day, what volume of air at 277 K must a person with a lung capacity of 2.1 L breathe in to fill the lungs?   |  |  |  | | --- | --- | --- | |  | a. | 2.34 L | |  | b. | 1.88 L | |  | c. | 1.98 L | |  | d. | 3.77 L | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Charles's law | Chemistry | empirical gas laws | gas | general chemistry | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 19. You have a certain mass of helium gas (He) in a rigid steel container. You add the same mass of neon gas (Ne) to this container. Which of the following best describes what happens? Assume the temperature is constant.   |  |  |  | | --- | --- | --- | |  | a. | The pressure in the container doubles. | |  | b. | The pressure in the container increases but does not double. | |  | c. | The pressure in the container more than doubles. | |  | d. | The volume of the container doubles. | |  | e. | The volume of the container more than doubles. |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.2 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Avogadro's law | Chemistry | empirical gas laws | gas | general chemistry | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 20. You are holding two balloons, an orange balloon and a blue balloon. The orange balloon is filled with neon (Ne) gas and the blue balloon is filled with argon (Ar) gas. The orange balloon has twice the volume of the blue balloon. Which of the following best represents the mass ratio of Ne:Ar in the balloons?   |  |  |  | | --- | --- | --- | |  | a. | 1:1 | |  | b. | 1:2 | |  | c. | 2:1 | |  | d. | 1:3 | |  | e. | 3:1 |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 5.2 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Avogadro's law | Chemistry | empirical gas laws | gas | general chemistry | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 21. You are holding four identical balloons each containing 10.0 g of a different gas. The balloon containing which gas is the largest balloon?   |  |  |  | | --- | --- | --- | |  | a. | H2 | |  | b. | He | |  | c. | Ne | |  | d. | O2 | |  | e. | All have the same volume. |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.2 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Avogadro's law | Chemistry | empirical gas laws | gas | general chemistry | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| Consider three 1-L flasks at STP. Flask A contains NH3 gas, flask B contains NO2 gas, and flask C contains N2 gas. |

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| 22. Which contains the largest number of molecules?   |  |  |  | | --- | --- | --- | |  | a. | Flask A | |  | b. | Flask B | |  | c. | Flask C | |  | d. | All are the same. | |  | e. | More information is need to answer this. |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 5-1 | | *KEYWORDS:* | Chemistry | gas | general chemistry | ideal gas law | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 23. In which flask are the molecules least polar and therefore most ideal in behavior?   |  |  |  | | --- | --- | --- | |  | a. | Flask A | |  | b. | Flask B | |  | c. | Flask C | |  | d. | All are the same. | |  | e. | More information is needed to answer this. |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.8 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 5-1 | | *KEYWORDS:* | Chemistry | gas | general chemistry | ideal gas law | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 24. In which flask do the molecules have the highest average velocity?   |  |  |  | | --- | --- | --- | |  | a. | Flask A | |  | b. | Flask B | |  | c. | Flask C | |  | d. | All are the same. | |  | e. | More information is needed to answer this. |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.6 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 5-1 | | *KEYWORDS:* | Chemistry | gas | general chemistry | molecular speed | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| You have two samples of the same gas in the same size container, with the same pressure. The gas in the first container has a Kelvin temperature four times that of the gas in the other container. |

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| 25. The ratio of the number of moles of gas in the first container compared to that in the second is   |  |  |  | | --- | --- | --- | |  | a. | 1:1 | |  | b. | 4:1 | |  | c. | 1:4 | |  | d. | 2:1 | |  | e. | 1:2 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 5-2 | | *KEYWORDS:* | Chemistry | gas | general chemistry | ideal gas law | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 26. The ratio of the average velocity of particles in the first container compared to that in the second is   |  |  |  | | --- | --- | --- | |  | a. | 1:1 | |  | b. | 4:1 | |  | c. | 1:4 | |  | d. | 2:1 | |  | e. | 1:2 |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 5.6 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 5-2 | | *KEYWORDS:* | Chemistry | gas | general chemistry | kinetic-molecular theory | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| Three 1.00-L flasks at 25°C and 725 torr contain the gases CH4 (flask A), CO2 (flask B), and C2H6 (flask C). |

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| 27. In which flask is there 0.039 mol of gas?   |  |  |  | | --- | --- | --- | |  | a. | Flask A | |  | b. | Flask B | |  | c. | Flask C | |  | d. | all | |  | e. | none |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 5-3 | | *KEYWORDS:* | Chemistry | gas | general chemistry | ideal gas law | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 28. In which single flask do the molecules have the greatest mass, the greatest average velocity, *and* the highest kinetic energy?   |  |  |  | | --- | --- | --- | |  | a. | Flask A | |  | b. | Flask B | |  | c. | Flask C | |  | d. | All are the same. | |  | e. | No one flask has all these. |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 5.6 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 5-3 | | *KEYWORDS:* | Chemistry | gas | general chemistry | kinetic-molecular theory | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 29. A gas sample is heated from -20.0°C to 57.0°C and the volume is increased from 2.00 L to 4.50 L. If the initial pressure is 0.146 atm, what is the final pressure?   |  |  |  | | --- | --- | --- | |  | a. | 0.0498 atm | |  | b. | –0.185 atm | |  | c. | 0.428 atm | |  | d. | 0.252 atm | |  | e. | 0.0846 atm |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | combined gas law | empirical gas laws | gas | general chemistry | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 30. A sample of oxygen gas has a volume of 5.82 L at 27°C and 800.0 torr. How many oxygen molecules does it contain?   |  |  |  | | --- | --- | --- | |  | a. |  | |  | b. |  | |  | c. |  | |  | d. |  | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | gas | general chemistry | ideal gas law | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 31. You fill a balloon with 2.50 moles of gas at 22°C at a pressure of 1.19 atm. What is the volume of the balloon?   |  |  |  | | --- | --- | --- | |  | a. | 11.5 L | |  | b. | 72.503 L | |  | c. | 50.9 L | |  | d. | 3.79 L | |  | e. | 22.4 L |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | gas | general chemistry | ideal gas law | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 32. A sample of helium gas occupies 16.1 L at 23°C and 0.956 atm. What volume will it occupy at 40°C and 1.20 atm?   |  |  |  | | --- | --- | --- | |  | a. | 21.4 L | |  | b. | 22.3 L | |  | c. | 12.1 L | |  | d. | 13.6 L | |  | e. | 16.3 L |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | combined gas law | empirical gas laws | gas | general chemistry | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 33. A 6.51-L sample of carbon monoxide is collected at 55°C and 0.816 atm. What volume will the gas occupy at 1.05 atm and 25°C?   |  |  |  | | --- | --- | --- | |  | a. | 2.30 L | |  | b. | 7.61 L | |  | c. | 4.60 L | |  | d. | 5.57 L | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | combined gas law | empirical gas laws | gas | general chemistry | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 34. Mercury vapor contains Hg atoms. What is the volume of 201 g of mercury vapor at 822 K and 0.248 atm?   |  |  |  | | --- | --- | --- | |  | a. | 272 L | |  | b. | L | |  | c. | 362 L | |  | d. | 16.7 L | |  | e. | 8.36 L |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | gas | general chemistry | ideal gas law | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 35. What volume is occupied by 17.8 g of methane (CH4) at 27°C and 1.95 atm?   |  |  |  | | --- | --- | --- | |  | a. | 20.2 L | |  | b. | 14.0 L | |  | c. | 1.26 L | |  | d. | L | |  | e. | not enough data to calculate |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | gas | general chemistry | ideal gas law | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 36. An automobile tire is filled with air at a pressure of 31.5 lb/in2 at 25°C. A cold front moves through and the temperature drops to 5°C. Assuming no change in volume, what is the new tire pressure?   |  |  |  | | --- | --- | --- | |  | a. | 6.30 lb/in2 | |  | b. | 29.4 lb/in2 | |  | c. | 33.8 lb/in2 | |  | d. | 158 lb/in2 | |  | e. | 3.97 lb/in2 |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Charles's law | Chemistry | empirical gas laws | gas | general chemistry | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 37. Which conditions of *P*, *T*, and *n*, respectively, are most ideal?   |  |  |  | | --- | --- | --- | |  | a. | high *P*, high *T*, high *n* | |  | b. | low *P*, low *T*, low *n* | |  | c. | high *P*, low *T*, high *n* | |  | d. | low *P*, high *T*, high *n* | |  | e. | low *P*, high *T*, low *n* |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.8 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | gas | general chemistry | ideal gas law | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 38. A 9.56-g piece of solid CO2 (dry ice) is allowed to sublime in a balloon. The final volume of the balloon is 1.00 L at 302 K. What is the pressure of the gas?   |  |  |  | | --- | --- | --- | |  | a. | 5.38 atm | |  | b. | atm | |  | c. | 2.59 atm | |  | d. | 0.186 atm | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | gas | general chemistry | ideal gas law | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 39. A sample of 35.1 g of methane gas has a volume of 4.24 L at a pressure of 2.70 atm. Calculate the temperature.   |  |  |  | | --- | --- | --- | |  | a. | 3.97 K | |  | b. | 63.8 K | |  | c. | 337 K | |  | d. | 38.7 K | |  | e. | 47.7 K |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | gas | general chemistry | ideal gas law | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 40. A 37.8-g sample of Ne gas exerts a certain pressure in a container of fixed volume. What mass of Ar is required to exert half the pressure at the same conditions of volume and temperature?   |  |  |  | | --- | --- | --- | |  | a. | 74.8 g Ar | |  | b. | 0.936 g Ar | |  | c. | 150 g Ar | |  | d. | 755 g Ar | |  | e. | 37.4 g Ar |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 5.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | gas | general chemistry | ideal gas law | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 2/3/2017 6:51 AM | |

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| 41. A sample of gas is in a 50.0-mL container at a pressure of 645 torr and a temperature of 25°C. The entire sample is heated to a temperature of 35°C and transferred to a new container whose volume is 98.6 mL. The pressure of the gas in the second container is about:   |  |  |  | | --- | --- | --- | |  | a. | 458 torr | |  | b. | 316 torr | |  | c. | torr | |  | d. | 65 torr | |  | e. | 338 torr |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | combined gas law | empirical gas laws | gas | general chemistry | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 42. Given a cylinder of fixed volume filled with 1 mol of argon gas, which of the following is correct? (Assume all gases obey the ideal gas law.)   |  |  |  | | --- | --- | --- | |  | a. | If the temperature of the cylinder is changed from 25°C to 50°C, the pressure inside the cylinder will double. | |  | b. | If a second mole of argon is added to the cylinder, the ratio *T*/*P* would remain constant. | |  | c. | A cylinder of identical volume filled with the same *pressure* of helium must contain more atoms of gas because He has a smaller atomic radius than argon. | |  | d. | Two of the above. | |  | e. | None of the above. |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 5.3 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | gas | general chemistry | ideal gas law | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 43. For an ideal gas, which pairs of variables are inversely proportional to each other (if all other factors remain constant)?  1. *P* and *T* 2. *V* and *P* 3. *n* and *P*  4. *V* and *T*   |  |  |  | | --- | --- | --- | |  | a. | 1 and 2 only | |  | b. | 3 and 4 only | |  | c. | 2 only | |  | d. | 1 and 3 only | |  | e. | 1, 3, and 4 only |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | gas | general chemistry | ideal gas law | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 44. For a gas, which two variables are *directly* proportional to each other (if all other conditions remain constant)?  1. *T* and *n* 2. *V* and *n*  3. *P* and *T*   |  |  |  | | --- | --- | --- | |  | a. | 1 only | |  | b. | 2 only | |  | c. | 3 only | |  | d. | 1 and 2 only | |  | e. | 2 and 3 only |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | gas | general chemistry | ideal gas law | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 45. The temperature of a specific amount of gas in a sealed container changes from 40.0°C to 80.0°C. If the volume remains constant, the pressure will change from 715 mmHg to   |  |  |  | | --- | --- | --- | |  | a. | 1430 mmHg | |  | b. | 634 mmHg | |  | c. | 358 mmHg | |  | d. | 806 mmHg | |  | e. | 715 mmHg |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | combined gas law | empirical gas laws | gas | general chemistry | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| Four identical 1.0-L flasks contain the gases He, Cl2, CH4, and NH3, each at 0°C and 1 atm pressure. |

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| 46. Which gas has the highest density?   |  |  |  | | --- | --- | --- | |  | a. | He | |  | b. | Cl2 | |  | c. | CH4 | |  | d. | NH3 | |  | e. | all gases the same |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 5.4 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 5-5 | | *KEYWORDS:* | Chemistry | gas | gas density | general chemistry | ideal gas law | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 47. For which gas do the molecules have the highest average velocity?   |  |  |  | | --- | --- | --- | |  | a. | He | |  | b. | Cl2 | |  | c. | CH4 | |  | d. | NH3 | |  | e. | all gases the same |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.6 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 5-5 | | *KEYWORDS:* | Chemistry | gas | general chemistry | molecular speed | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 48. Which gas sample has the greatest number of molecules?   |  |  |  | | --- | --- | --- | |  | a. | He | |  | b. | Cl2 | |  | c. | CH4 | |  | d. | NH3 | |  | e. | all gases the same |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 5-5 | | *KEYWORDS:* | Chemistry | gas | general chemistry | ideal gas law | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 49. For which gas are the molecules diatomic?   |  |  |  | | --- | --- | --- | |  | a. | He | |  | b. | Cl2 | |  | c. | CH4 | |  | d. | NH3 | |  | e. | all gases the same |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 5-5 | | *KEYWORDS:* | Chemistry | general chemistry | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 50. For which gas are the collisions elastic?   |  |  |  | | --- | --- | --- | |  | a. | He | |  | b. | Cl2 | |  | c. | CH4 | |  | d. | NH3 | |  | e. | all gases the same |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.6 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 5-5 | | *KEYWORDS:* | Chemistry | gas | general chemistry | kinetic-molecular theory | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 51. For which gas do the molecules have the smallest average kinetic energy?   |  |  |  | | --- | --- | --- | |  | a. | He | |  | b. | Cl2 | |  | c. | CH4 | |  | d. | NH3 | |  | e. | all gases the same |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.6 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 5-5 | | *KEYWORDS:* | Chemistry | gas | general chemistry | kinetic-molecular theory | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 52. The mass of 1.12 liters of gas *Y* at STP is found to be 6.23 g. The density of gas *Y* is   |  |  |  | | --- | --- | --- | |  | a. | 10.6 g/L | |  | b. | 5.56 g/L | |  | c. | 15.6 g/L | |  | d. | 0.200 g/L | |  | e. | 0.180 g/L |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 5.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | gas | gas density | general chemistry | ideal gas law | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 53. The mass of 1.12 liters of gas *Y* at STP is found to be 6.23 g. The molar mass of gas *Y* is   |  |  |  | | --- | --- | --- | |  | a. | 56.0 g/mol | |  | b. | 89.0 g/mol | |  | c. | 125 g/mol | |  | d. | 140. g/mol | |  | e. | 157 g/mol |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 5.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | gas | general chemistry | ideal gas law | molar mass | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 54. A plastic bag is weighed and then filled successively with two gases, *X* and *Y*. The following data are gathered:   |  |  | | --- | --- | |  | Temperature: 0.0°C (273 K) | |  | Pressure: 1.00 atmosphere | |  | Mass of empty bag: 20.77 g | |  | Mass of bag filled with gas *X*: 24.97 g | |  | Mass of 1.12 liters of air at conditions given: 1.30 g | |  | Volume of bag: 1.12 liter | |  | Molar volume at STP: 22.4 liters |   The bag is emptied and refilled, successively, with gases *X* and *Y*, this time at 1 atm pressure and a temperature 30°C *higher*. Assume that the volume of the bag is the same as before. Which one of the following statements is *wrong*?   |  |  |  | | --- | --- | --- | |  | a. | The full bag contains fewer molecules of each gas than it did at 0.0°C. | |  | b. | The *ratio* of the density of gas Y to the density of gas X is the same as at 0.0°C. | |  | c. | The molar masses of the two gases are the same as they were at 0.0°C. | |  | d. | The mass of each gas filling the bag is now 303/273 times the mass held at 0.0°C. | |  | e. | The average velocity of the molecules of gas X at 30°C is higher than it was at 0.0°C. |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 5.6 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | gas | general chemistry | ideal gas law | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 55. Argon has a density of 1.78 g/L at STP. How many of the following gases have a density at STP *greater* than that of argon?   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | Cl2 | He | NH3 | NO2 |  |  |  |  | | --- | --- | --- | |  | a. | 0 | |  | b. | 1 | |  | c. | 2 | |  | d. | 3 | |  | e. | 4 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | gas | gas density | general chemistry | ideal gas law | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 56. Which of the following is the best qualitative graph of *P* versus molar mass of a 1-g sample of different gases at constant volume and temperature?   |  |  |  | | --- | --- | --- | |  | a. |  | |  | b. |  | |  | c. |  | |  | d. |  | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Difficult | | *REFERENCES:* | 5.4 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | gas | gas density | general chemistry | ideal gas law | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 57. It is found that 250. mL of a gas at STP has a mass of 0.675 g. What is the molar mass?   |  |  |  | | --- | --- | --- | |  | a. | 60.5 g/mol | |  | b. | 2.70 g/mol | |  | c. | 16.5 g/mol | |  | d. | 11.2 g/mol | |  | e. | 133 g/mol |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | gas | general chemistry | ideal gas law | molar mass | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 58. Given reaction 2NH3(*g*) + 3Cl2(*g*) → N2(*g*) + 6HCl(*g*), you react 5.0 L of NH3 with 5.0 L of Cl2 measured at the same conditions in a closed container. Calculate the ratio of pressures in the container (*P*final/*P*initial).   |  |  |  | | --- | --- | --- | |  | a. | 0.75 | |  | b. | 1.00 | |  | c. | 1.33 | |  | d. | 1.50 | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 5.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | gas | general chemistry | ideal gas law | phases | stoichiometry and gas volumes | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 59. Given reaction N2 + 3H2 → 2NH3, you mix 1 mol each of nitrogen and hydrogen gases under the same conditions in a container fitted with a piston. Calculate the ratio of volumes of the container (*V*final/*V*initial).   |  |  |  | | --- | --- | --- | |  | a. | 0.67 | |  | b. | 1.00 | |  | c. | 1.33 | |  | d. | 1.50 | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 5.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | gas | general chemistry | ideal gas law | phases | stoichiometry and gas volumes | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 60. You carry out the reaction represented by the following balanced equation: N2(*g*) + 3H2(*g*) → 2NH3(*g*) You add an equal number of moles of nitrogen and hydrogen gases in a balloon. The volume of the balloon is 1.00 L before any reaction occurs. Determine the volume of the balloon after the reaction is complete. Assume constant temperature.   |  |  |  | | --- | --- | --- | |  | a. | 0.330 L | |  | b. | 0.670 L | |  | c. | 1.00 L | |  | d. | 1.50 L | |  | e. | 3.00 L |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 5.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | gas | general chemistry | ideal gas law | phases | stoichiometry and gas volumes | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 61. When 0.72 g of a liquid is vaporized at 110°C and 0.967 atm, the gas occupies a volume of 0.559 L. The empirical formula of the gas is CH2. What is the molecular formula of the gas?   |  |  |  | | --- | --- | --- | |  | a. | CH2 | |  | b. | C2H4 | |  | c. | C3H6 | |  | d. | C4H8 | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 5.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | gas | general chemistry | ideal gas law | molar mass | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 62. Gaseous reacts with according to the following equation:  What volume of oxygen gas at STP is needed to react with 6.01 mol of ?   |  |  |  | | --- | --- | --- | |  | a. | 18.0 L | |  | b. | 44.9 L | |  | c. | L | |  | d. | L | |  | e. | Not enough information is given to solve the problem. |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 5.4 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | gas | general chemistry | ideal gas law | phases | stoichiometry and gas volumes | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 63. A 4.01 gram sample of a certain diatomic gas occupies a volume of 3.73-L at 1.00 atm and a temperature of 45°C. Identify this gas.   |  |  |  | | --- | --- | --- | |  | a. | N2 | |  | b. | O2 | |  | c. | F2 | |  | d. | H2 | |  | e. | Cl2 |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 5.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | gas | general chemistry | ideal gas law | molar mass | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 2/6/2017 12:03 AM | |

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| 64. Air has an average molar mass of 29.0 g/mol. The density of air at 0.99 atm and 30.0°C is:   |  |  |  | | --- | --- | --- | |  | a. | 29.0 g/L | |  | b. | 39.8 g/mL | |  | c. | 1.15 g/L | |  | d. | 1.37 g/mL | |  | e. | 11.7 g/L |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 5.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | gas | gas density | general chemistry | ideal gas law | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 65. Calculate the density of nitrogen at STP.   |  |  |  | | --- | --- | --- | |  | a. | 0.312 g/L | |  | b. | 0.625 g/L | |  | c. | 0.800 g/L | |  | d. | 1.25 g/L | |  | e. | 1.60 g/L |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 5.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | gas | gas density | general chemistry | ideal gas law | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 66. If a 10.03-g sample of a gas occupies 10.0 L at STP, what is the molar mass of the gas at 125°C?   |  |  |  | | --- | --- | --- | |  | a. | 3.07 g/mol | |  | b. | 22.5 g/mol | |  | c. | 10.3 g/mol | |  | d. | 32.8 g/mol | |  | e. | Not enough information is given. |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | gas | general chemistry | ideal gas law | molar mass | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 67. A 3.31-g sample of lead nitrate, , molar mass = 331 g/mol, is heated in an evacuated cylinder with a volume of 2.19 L. The salt decomposes when heated, according to the equation:  Assuming complete decomposition, what is the pressure in the cylinder after decomposition and cooling to a temperature of 300. K? Assume the takes up negligible volume.   |  |  |  | | --- | --- | --- | |  | a. | 0.281 atm | |  | b. | 0.225 atm | |  | c. | 0.0562 atm | |  | d. | 0.393 atm | |  | e. | 37.2 atm |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 5.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | gas | general chemistry | ideal gas law | phases | stoichiometry and gas volumes | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 68. The purity of a sample containing zinc and weighing 0.323 g is determined by measuring the amount of hydrogen formed when the sample reacts with an excess of hydrochloric acid. The determination shows the sample to be 84.0% zinc. What amount of hydrogen (measured at STP) was obtained?   |  |  |  | | --- | --- | --- | |  | a. | L | |  | b. | g | |  | c. | mole | |  | d. | molecules | |  | e. | atoms |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Difficult | | *REFERENCES:* | 5.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | gas | general chemistry | ideal gas law | phases | stoichiometry and gas volumes | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 69. What volume of carbon dioxide measured at STP will be formed by the reaction of 1.31 mol of oxygen with 0.900 mol of ethyl alcohol, CH3CH2OH?   |  |  |  | | --- | --- | --- | |  | a. | 40.3 mL | |  | b. | 19.6 L | |  | c. | 29.3 L | |  | d. | 44.0 L | |  | e. | 0.873 L |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Difficult | | *REFERENCES:* | 5.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | gas | general chemistry | ideal gas law | phases | stoichiometry and gas volumes | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 70. What volume of measured at STP is produced by the combustion of 2.47 g of natural gas according to the following equation?   |  |  |  | | --- | --- | --- | |  | a. | 3.45 L | |  | b. | 6.9 L | |  | c. | 1.72 L | |  | d. | 7.53 L | |  | e. | 1.24 L |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | gas | general chemistry | ideal gas law | phases | stoichiometry and gas volumes | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 2/6/2017 1:23 AM | |

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| 71. At 1000°C and 10. torr, the density of a certain element in the gaseous state is 8.78 × 10-3 g / L. The element is:   |  |  |  | | --- | --- | --- | |  | a. | Mn | |  | b. | He | |  | c. | Ga | |  | d. | Au | |  | e. | Hg |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | gas | gas density | general chemistry | ideal gas law | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 2/27/2017 6:57 AM | |

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| 72. Into a 4.19-liter container at 25°C are placed 1.23 moles of O2 gas and 3.20 moles of solid C (graphite). If the carbon and oxygen react completely to form CO(*g*), what will be the final pressure in the container at 25°C?   |  |  |  | | --- | --- | --- | |  | a. | 14.4 atm | |  | b. | 7.17 atm | |  | c. | 1.20 atm | |  | d. | 18.7 atm | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 5.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | gas | general chemistry | ideal gas law | phases | stoichiometry and gas volumes | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 2/27/2017 7:00 AM | |

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| 73. Calcium hydride combines with water according to the equation:  Beginning with 84.0 g of CaH2 and 42.0 g of H2O, what volume of H2 will be produced at 273 K and a pressure of 1308 torr?   |  |  |  | | --- | --- | --- | |  | a. | 30.3 L | |  | b. | 15.2 L | |  | c. | L | |  | d. | 26.0 L | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 5.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | gas | general chemistry | ideal gas law | phases | stoichiometry and gas volumes | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 74. What volume does 31.5 g of N2 occupy at STP?   |  |  |  | | --- | --- | --- | |  | a. | 50.3 L | |  | b. | 1.4145 L | |  | c. | 25.1 L | |  | d. | 39.4 L | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | gas | general chemistry | ideal gas law | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 2/27/2017 7:03 AM | |

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| 75. A mixture is prepared from 15.0 L of ammonia and 15.0 L chlorine measured at the same conditions; these compounds react according to the following equation:  When the reaction is completed, what is the volume of each gas (NH3, Cl2, N2, and HCl, respectively)? Assume the final volumes are measured under identical conditions.   |  |  |  | | --- | --- | --- | |  | a. | 0.00 L, 5.00 L, 7.50 L, 45.0 L | |  | b. | 5.00 L, 0.00 L, 5.00 L, 30.0 L | |  | c. | 0.00 L, 0.00 L, 7.50 L, 45.0 L | |  | d. | 0.00 L, 0.00 L, 5.00 L, 30.0 L | |  | e. | 0.00 L, 10.0 L, 15.0 L, 90.0 L |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 5.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | gas | general chemistry | ideal gas law | phases | stoichiometry and gas volumes | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 76. An excess of sodium hydroxide is treated with 26.4 L of dry hydrogen chloride gas measured at STP. What is the mass of sodium chloride formed?   |  |  |  | | --- | --- | --- | |  | a. | 1.54 kg | |  | b. | 1.69 g | |  | c. | 0.137 kg | |  | d. | 68.8 g | |  | e. | 13.2 g |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 5.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | gas | general chemistry | ideal gas law | phases | stoichiometry and gas volumes | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 77. A 1.00-g sample of a gaseous compound of boron and hydrogen occupies 0.820 L at 1.00 atm and 3°C. What could be the molecular formula for the compound?   |  |  |  | | --- | --- | --- | |  | a. | BH3 | |  | b. | B2H6 | |  | c. | B4H10 | |  | d. | B3H12 | |  | e. | B5H14 |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 5.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | gas | general chemistry | ideal gas law | molar mass | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 78. A mixture of KCl and KClO3 weighing 1.72 grams was heated; the dry O2 generated occupied 143 mL at STP. What percent of the original mixture was KClO3, which decomposes as follows:   |  |  |  | | --- | --- | --- | |  | a. | 30.3% | |  | b. | 45.4% | |  | c. | 68.2% | |  | d. | 8.31% | |  | e. | 18.4% |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Difficult | | *REFERENCES:* | 5.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | gas | general chemistry | ideal gas law | phases | stoichiometry and gas volumes | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 2/16/2017 5:53 AM | |

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| 79. Given the equation:  A 3.00-g sample of KClO3 is decomposed and the oxygen at 24.0°C and 0.706 atm is collected. What volume of oxygen gas will be collected assuming 100% yield?   |  |  |  | | --- | --- | --- | |  | a. | mL | |  | b. | mL | |  | c. | mL | |  | d. | mL | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 5.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | gas | general chemistry | ideal gas law | phases | stoichiometry and gas volumes | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 80. If M is the molar mass, *R* the gas constant, *T* the temperature, and *P* its pressure, which of the following expressions represents the density of a gas?   |  |  |  | | --- | --- | --- | |  | a. |  | |  | b. |  | |  | c. |  | |  | d. |  | |  | e. |  |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 5.4 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | gas | gas density | general chemistry | ideal gas law | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 81. One way to isolate metals from their ores is to react the metal oxide with carbon as shown in the following reaction:  If 31.87 g of a metal oxide reacted with excess carbon and 4.08 L of CO2 formed at 100°C and 1.50 atm, what is the identity of the metal?   |  |  |  | | --- | --- | --- | |  | a. | Hg | |  | b. | Mg | |  | c. | Cu | |  | d. | Cd | |  | e. | Cr |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Difficult | | *REFERENCES:* | 5.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | gas | general chemistry | ideal gas law | phases | stoichiometry and gas volumes | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 82. The standard temperature for gases is   |  |  |  | | --- | --- | --- | |  | a. | 100°C | |  | b. | 0°C | |  | c. | 32°C | |  | d. | 212°F | |  | e. | 0°F |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | gas | general chemistry | phases | STP | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 83. Standard pressure for gases is   |  |  |  | | --- | --- | --- | |  | a. | 0 atm | |  | b. | 1 atm | |  | c. | 100 atm | |  | d. | dependent upon temperature | |  | e. | none of the above |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | gas | general chemistry | phases | STP | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| Zinc metal is added to hydrochloric acid to generate hydrogen gas, which is collected over a liquid whose vapor pressure is the same as pure water at 20.0°C (18 torr). The volume of the gas mixture is 1.7 L and its total pressure is 0.810 atm. |

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| 84. Determine the partial pressure of the hydrogen gas in this mixture.   |  |  |  | | --- | --- | --- | |  | a. | 562 torr | |  | b. | 580 torr | |  | c. | 598 torr | |  | d. | 616 torr | |  | e. | 634 torr |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.5 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 5-7 | | *KEYWORDS:* | Chemistry | collecting gases over water | gas | gas mixtures | general chemistry | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 85. Determine the number of moles of hydrogen gas present in the sample.   |  |  |  | | --- | --- | --- | |  | a. | 42 mol | |  | b. | 0.82 mol | |  | c. | 1.3 mol | |  | d. | 0.056 mol | |  | e. | 22 mol |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 5-7 | | *KEYWORDS:* | calculations with the ideal gas law | Chemistry | gas | general chemistry | ideal gas law | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 86. A 157-mL sample of gas is collected over water at 22°C and 753 torr. What is the volume of the dry gas at STP? (The vapor pressure of water at 22°C = 20. torr)   |  |  |  | | --- | --- | --- | |  | a. | 137 mL | |  | b. | 177 mL | |  | c. | 143 mL | |  | d. | 123 mL | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.5 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | collecting gases over water | gas | gas mixtures | general chemistry | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 87. A vessel with a volume of 18.9 L contains 2.80 g of nitrogen gas, 0.807 g of hydrogen gas, and 79.9 g of argon gas. At 25°C, what is the pressure in the vessel?   |  |  |  | | --- | --- | --- | |  | a. | 107.0 atm | |  | b. | 0.271 atm | |  | c. | 3.88 atm | |  | d. | 3.23 atm | |  | e. | 61.1 atm |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 5.5 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | Dalton's law of partial pressures | gas | gas mixtures | general chemistry | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 2/20/2017 12:29 AM | |

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| 88. Oxygen gas, generated by the reaction is collected over water at 27°C in a 2.87-L vessel at a total pressure of 1.00 atm. (The vapor pressure of H2O at 27°C is 26.0 torr.) How many moles of KClO3 were consumed in the reaction?   |  |  |  | | --- | --- | --- | |  | a. | 0.112 moles | |  | b. | 0.168 moles | |  | c. | 0.075486 moles | |  | d. | 0.0803 moles | |  | e. | 2.77 moles |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 5.5 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | collecting gases over water | gas | gas mixtures | general chemistry | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| You have a 400-mL container containing 55.0% He and 45.0% Ar by mass at 25°C and 1.5 atm total pressure. You heat the container to 100°C. |

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| 89. Calculate the total pressure.   |  |  |  | | --- | --- | --- | |  | a. | 1.20 atm | |  | b. | 1.50 atm | |  | c. | 1.88 atm | |  | d. | 2.01 atm | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.5 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 5-4 | | *KEYWORDS:* | Chemistry | Dalton's law of partial pressures | gas | gas mixtures | general chemistry | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 90. Calculate the ratio of *P*He : *P*Ar.   |  |  |  | | --- | --- | --- | |  | a. | 1/1.22 | |  | b. | 1.22/1 | |  | c. | 1/12.2 | |  | d. | 12.2/1 | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 5.5 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Ref 5-4 | | *KEYWORDS:* | Chemistry | Dalton's law of partial pressures | gas | gas mixtures | general chemistry | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 91. The valve between a 5-L tank containing a gas at 9 atm and a 10-L tank containing a gas at 6 atm is opened. Calculate the final pressure in the tanks.   |  |  |  | | --- | --- | --- | |  | a. | 3 atm | |  | b. | 4 atm | |  | c. | 7 atm | |  | d. | 15 atm | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.5 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | Dalton's law of partial pressures | gas | gas mixtures | general chemistry | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 92. A balloon contains an anesthetic mixture of cyclopropane (cp) and oxygen (O2) at 202 torr and 570. torr, respectively. What is the ratio of the number of moles of cyclopropane to moles of oxygen?   |  |  |  | | --- | --- | --- | |  | a. | 2.82 | |  | b. | 0.284 | |  | c. | 0.354 | |  | d. | 0.444 | |  | e. | 0.514 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 5.2 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | Dalton's law of partial pressures | gas | gas mixtures | general chemistry | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 2/6/2017 2:14 AM | |

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| 93. A gaseous mixture containing 1.5 mol Ar and 3.5 mol CO2 has a total pressure of 8.6 atm. What is the partial pressure of CO2?   |  |  |  | | --- | --- | --- | |  | a. | 2.5 atm | |  | b. | 1.6 atm | |  | c. | 20 atm | |  | d. | 6 atm | |  | e. | 8.6 atm |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.5 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | Dalton's law of partial pressures | gas | gas mixtures | general chemistry | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 2/6/2017 2:19 AM | |

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| 94. The valve between the 2.00-L bulb, in which the gas pressure is 1.90 atm, and the 3.00-L bulb, in which the gas pressure is 3.20 atm, is opened. What is the final pressure in the two bulbs, the temperature remaining constant?   |  |  |  | | --- | --- | --- | |  | a. | 0.765 atm | |  | b. | 2.42 atm | |  | c. | 2.68 atm | |  | d. | 1.92 atm | |  | e. | 2.55 atm |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 5.5 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | Dalton's law of partial pressures | gas | gas mixtures | general chemistry | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 2/6/2017 4:00 AM | |

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| 95. The partial pressures of CH4, N2, and O2 in a sample of gas were found to be 187 mmHg, 487 mmHg, and 555 mmHg, respectively. Calculate the mole fraction of nitrogen.   |  |  |  | | --- | --- | --- | |  | a. | 19.8 | |  | b. | 0.451 | |  | c. | 0.396 | |  | d. | 0.73788 | |  | e. | 0.358 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 5.5 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | Dalton's law of partial pressures | gas | gas mixtures | general chemistry | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 2/6/2017 4:09 AM | |

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| 96. Dalton's law of partial pressures states that:   |  |  |  | | --- | --- | --- | |  | a. | Equal amounts of gases occupy the same volume at constant temperature and pressure. | |  | b. | The volume of a fixed amount of gas is inversely proportional to its pressure at constant temperature. | |  | c. | The volume of a fixed amount of gas is directly proportional to its temperature in Kelvin at constant pressure. | |  | d. | The total pressure of a mixture of gases is the sum of the partial pressure of all of the gaseous compounds. | |  | e. | The rates of effusion of gases are inversely proportional to the square roots of their molar masses. |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.5 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | Dalton's law of partial pressures | gas | gas mixtures | general chemistry | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 97. Which of the following is *not* a postulate of the kinetic molecular theory?   |  |  |  | | --- | --- | --- | |  | a. | Gas particles have most of their mass concentrated in the nucleus of the atom. | |  | b. | The moving particles undergo perfectly elastic collisions with the walls of the container. | |  | c. | The forces of attraction and repulsion between the particles are insignificant. | |  | d. | The average kinetic energy of the particles is directly proportional to the absolute temperature. | |  | e. | All of the above are postulates of the kinetic molecular theory. |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.6 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | gas | general chemistry | kinetic theory of an ideal gas | phases | postulates of kinetic theory | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 98. Consider the following gas samples:   |  |  |  |  | | --- | --- | --- | --- | |  | **Sample A** | **Sample B** | | |  | S2(g) | O2(g) | | |  | *n* = 1 mol | *n* = 2 mol |  | |  | *T* = 800 K | *T* = 400 K |  | |  | *P* = 0.20 atm | *P* = 0.40 atm |  |   Which of the following statements is *false*?   |  |  |  | | --- | --- | --- | |  | a. | The volume of sample A is twice the volume of sample B. | |  | b. | The average kinetic energy of the molecules in sample A is twice the average kinetic energy of the molecules in sample B. | |  | c. | The fraction of molecules in sample A, having a kinetic energy greater than some high fixed value, is larger than the fraction of molecules in sample B, having kinetic energies greater than that same high fixed value. | |  | d. | The mean square velocity of molecules in sample A is twice as large as the mean square velocity of molecules in sample B. | |  | e. | Assuming identical intermolecular forces in the two samples, sample A should be more nearly ideal than sample B. |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 5.6 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | gas | general chemistry | kinetic-molecular theory | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 2/20/2017 12:26 AM | |

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| 99. What would happen to the average kinetic energy of the molecules of a gas sample if the temperature of the sample increased from 20°C to 40°C?   |  |  |  | | --- | --- | --- | |  | a. | It would double. | |  | b. | It would increase. | |  | c. | It would decrease. | |  | d. | It would become half its value. | |  | e. | Two of these. |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.6 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | gas | general chemistry | kinetic-molecular theory | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 100. In the kinetic molecular theory we assume an ideal gas has no mass.   |  |  |  | | --- | --- | --- | |  | a. | True | |  | b. | False |  |  |  | | --- | --- | | *ANSWER:* | False | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.6 | | *QUESTION TYPE:* | True / False | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | gas | general chemistry | kinetic-molecular theory | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 101. At 200 K, the molecules or atoms of an unknown gas, X, have an average velocity equal to that of Ar atoms at 400 K. What is X? (Assume ideal behavior.)   |  |  |  | | --- | --- | --- | |  | a. | He | |  | b. | CO | |  | c. | HF | |  | d. | HBr | |  | e. | F2 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 5.6 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | gas | general chemistry | molecular speed | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 102. Which of the following is *not* an assumption of the kinetic molecular theory for a gas?   |  |  |  | | --- | --- | --- | |  | a. | Gases are made up of tiny particles in constant chaotic motion. | |  | b. | Gas particles are very small compared to the average distance between the particles. | |  | c. | Gas particles collide with the walls of their container in elastic collisions. | |  | d. | The average velocity of the gas particles is directly proportional to the absolute temperature. | |  | e. | All of the above are assumptions of the kinetic molecular theory. |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.6 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | gas | general chemistry | kinetic-molecular theory | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 103. Use the kinetic molecular theory of gases to predict what would happen to a closed sample of a gas whose temperature increased while its volume decreased.   |  |  |  | | --- | --- | --- | |  | a. | Its pressure would decrease. | |  | b. | Its pressure would increase. | |  | c. | Its pressure would hold constant. | |  | d. | The number of moles of the gas would decrease. | |  | e. | The average kinetic energy of the molecules of the gas would decrease. |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 5.6 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | gas | general chemistry | kinetic-molecular theory | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 104. Calculate the root mean square velocity for the O2 molecules in a sample of O2 gas at 11.8°C. (*R* = 8.3145 J/K mol)   |  |  |  | | --- | --- | --- | |  | a. | 95.94 m/s | |  | b. | 14.89 m/s | |  | c. | 471.1 m/s | |  | d. | 272.1 m/s | |  | e. | m/s |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.6 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | gas | general chemistry | molecular speed | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 2/6/2017 4:23 AM | |

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| 105. Which of the following is true about the kinetic molecular theory?   |  |  |  | | --- | --- | --- | |  | a. | The volume of a gas particle is considered to be small – about 0.10 mL. | |  | b. | Pressure is due to the collisions of the gas particles with the walls of the container. | |  | c. | Gas particles repel each other, but do not attract one another. | |  | d. | Adding an ideal gas to a closed container will cause an increase in temperature. | |  | e. | At least two of the above statements are correct. |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.6 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | gas | general chemistry | kinetic-molecular theory | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 106. Consider the following containers, one with helium at 27°C and the other with argon at 27°C.   |  |  | | --- | --- | |  | Which of the following statements are true? |  |  |  |  | | --- | --- | --- | |  | a. | The speed of each atom of helium is 926 m/s. | |  | b. | The rms speed of the He and the Ar atoms are the same. | |  | c. | The average kinetic energy of the two samples are equal. | |  | d. | All of the above are true. | |  | e. | None of the above are true. |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 5.6 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | gas | general chemistry | molecular speed | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 107. Which of the following statements is true concerning ideal gases?   |  |  |  | | --- | --- | --- | |  | a. | The temperature of the gas sample is directly related to the average velocity of the gas particles. | |  | b. | At STP, 1.0 L of Ar(*g*) contains about twice the number of atoms as 1.0 L of Ne(*g*) since the molar mass of Ar is about twice that of Ne. | |  | c. | A gas exerts pressure as a result of the collisions of the gas molecules with the walls of the container. | |  | d. | The gas particles in a sample exert attraction for one another. | |  | e. | All of the above are false. |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.6 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | gas | general chemistry | kinetic-molecular theory | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 108. At the same temperature, lighter molecules have a higher average kinetic energy than heavier molecules.   |  |  |  | | --- | --- | --- | |  | a. | True | |  | b. | False |  |  |  | | --- | --- | | *ANSWER:* | False | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.6 | | *QUESTION TYPE:* | True / False | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | gas | general chemistry | kinetic-molecular theory | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 109. According to the postulates of the kinetic theory of gases, the average speed of the molecules of a given gas is proportional to the   |  |  |  | | --- | --- | --- | |  | a. | absolute temperature squared | |  | b. | square root of the absolute temperature | |  | c. | absolute temperature | |  | d. | Celsius temperature squared | |  | e. | reciprocal of the absolute temperature |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.6 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | gas | general chemistry | kinetic-molecular theory | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 110. Which statement is *inconsistent* with the kinetic theory of an ideal gas?   |  |  |  | | --- | --- | --- | |  | a. | The forces of repulsion between gas molecules are very weak or negligible. | |  | b. | Most of the volume occupied by a gas is empty space. | |  | c. | When two gas molecules collide, they both gain kinetic energy. | |  | d. | The average kinetic energy of a gas is proportional to the absolute temperature. | |  | e. | Gas molecules move in a straight line between collisions. |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.6 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | gas | general chemistry | kinetic-molecular theory | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 111. Which of the following is included as a postulate in the kinetic molecular theory of an ideal gas?   |  |  |  | | --- | --- | --- | |  | a. | The distance between gas molecules is small compared with the size of the molecule. | |  | b. | All collisions between molecules are elastic. | |  | c. | In an average collision between molecules, both molecules have the same kinetic energy. | |  | d. | All molecules move randomly in zigzag directions. | |  | e. | All the molecules have the same velocity. |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.6 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | gas | general chemistry | kinetic-molecular theory | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 112. All the following are postulates of the kinetic-molecular theory of gases *except:*   |  |  |  | | --- | --- | --- | |  | a. | The collisions between molecules are elastic. | |  | b. | The gas molecules are in constant motion. | |  | c. | At a constant temperature, each molecule has the same kinetic energy. | |  | d. | The volumes of the molecules are negligible compared with the volume of the container. | |  | e. | The gas molecules are in rapid motion. |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.6 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | gas | general chemistry | kinetic-molecular theory | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 113. Graham's law states that:   |  |  |  | | --- | --- | --- | |  | a. | Equal amounts of gases occupy the same volume at constant temperature and pressure. | |  | b. | The volume of a fixed amount of gas is inversely proportional to its pressure at constant temperature. | |  | c. | The volume of a fixed amount of gas is directly proportional to its temperature in Kelvin at constant pressure. | |  | d. | The total pressure of a mixture of gases is the simple sum of the partial pressure of all of the gaseous compounds. | |  | e. | The rates of effusion of gases are inversely proportional to the square roots of their molar masses. |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.7 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | effusion | gas | general chemistry | molecular speed | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 114. Which of the following would have a higher rate of effusion than C2H2?   |  |  |  | | --- | --- | --- | |  | a. | N2 | |  | b. | O2 | |  | c. | Cl2 | |  | d. | CH4 | |  | e. | CO2 |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.7 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | effusion | gas | general chemistry | molecular speed | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 115. A sample of N2 gas is contaminated with a gas (A) of unknown molar mass. The partial pressure of each gas is known to be 200. torr at 25°C. The gases are allowed to effuse through a pinhole, and it is found that gas A escapes at 3 times the rate of N2. The molar mass of gas A is:   |  |  |  | | --- | --- | --- | |  | a. | 3.11 g/mol | |  | b. | 84 g/mol | |  | c. | 9.34 g/mol | |  | d. | 252 g/mol | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 5.7 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | effusion | gas | general chemistry | molecular speed | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 116. The rate of effusion of an unknown gas was measured and found to be 14.3 mL/min. Under identical conditions, the rate of effusion of pure oxygen (O2) gas is 16.8 mL/min. Based on this information, the identity of the unknown gas could be:   |  |  |  | | --- | --- | --- | |  | a. | N2 | |  | b. | NO | |  | c. | CO2 | |  | d. | C2H6 | |  | e. | none of these |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 5.7 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | effusion | gas | general chemistry | molecular speed | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/23/2017 7:06 AM | |

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| 117. Calculate the ratio of the effusion rates of N2 and N2O.   |  |  |  | | --- | --- | --- | |  | a. | 0.637 | |  | b. | 1.57 | |  | c. | 1.25 | |  | d. | 0.798 | |  | e. | 1.61 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 5.7 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | effusion | gas | general chemistry | molecular speed | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 118. Hydrogen and chlorine gases react to form HCl. You and a friend are on opposite sides of a long hallway, you with H2 and your friend with Cl2. You both want to form HCl in the middle of the room. Which of the following is true?   |  |  |  | | --- | --- | --- | |  | a. | You should release the H2 first. | |  | b. | Your friend should release the Cl2 first. | |  | c. | You both should release the gases at the same time. | |  | d. | You need to know the length of the room to answer this question. | |  | e. | You need to know the temperature to answer this question. |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.7 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | diffusion | gas | general chemistry | molecular speed | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 119. Order the following in increasing rate of effusion:                F2, Cl2, NO, NO2, CH4   |  |  |  | | --- | --- | --- | |  | a. | Cl2 < NO2 < F2 < NO < CH4 | |  | b. | Cl2 < F2 < NO2 < CH4 < NO | |  | c. | CH4 < NO2 < NO < F2 < Cl2 | |  | d. | CH4 < NO < F2 < NO2 < Cl2 | |  | e. | F2 < NO < Cl2 < NO2 < CH4 |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.7 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | effusion | gas | general chemistry | molecular speed | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 120. The diffusion of a gas is faster than the effusion of a gas.   |  |  |  | | --- | --- | --- | |  | a. | True | |  | b. | False |  |  |  | | --- | --- | | *ANSWER:* | False | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.7 | | *QUESTION TYPE:* | True / False | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | diffusion | effusion | gas | general chemistry | molecular speed | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 121. Complete the following: Because real gas particles have attraction for one another:   |  |  |  | | --- | --- | --- | |  | a. | Real gases act most ideally at STP. | |  | b. | We assume gas particles have negligible (zero) volume. | |  | c. | One mole of an ideal gas at STP has a volume of 22.4 L. | |  | d. | Real gases act more ideally at higher temperatures and lower pressures. | |  | e. | At least two of the above statements (A-D) correctly complete the statement. |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.8 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | gas | general chemistry | phases | real gases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 122. The van der Waals equation, *nRT* = [*P* + a(*n*/*V)*2] (*V* – *nb*), incorporates corrections to the ideal gas law in order to account for the properties of real gases. One of the corrections accounts for   |  |  |  | | --- | --- | --- | |  | a. | the possibility of chemical reaction between molecules | |  | b. | the finite volume of molecules | |  | c. | the quantum behavior of molecules | |  | d. | the fact that average kinetic energy is inversely proportional to temperature | |  | e. | the possibility of phase changes when the temperature is decreased or the pressure is increased |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.8 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | gas | general chemistry | phases | real gases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 123. Which of the following properties of a real gas is related to the *b* coefficient in the van der Waals equation?   |  |  |  | | --- | --- | --- | |  | a. | Real gases consist of molecules or atoms that have volume. | |  | b. | The average speed of the molecules of a real gas increases with temperature. | |  | c. | There are attractive forces between atoms or molecules of a real gas. | |  | d. | The rate of effusion of a gas is inversely proportional to the square root of the molecular weight of the gas. | |  | e. | None of these. |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 5.8 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | gas | general chemistry | phases | real gases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 124. Which of the following effects will make *PV*/*nRT* less than one for a real gas?   |  |  |  | | --- | --- | --- | |  | a. | The gas molecules are large enough to occupy a substantial amount of space. | |  | b. | A large number of molecules have speeds greater than the average speed. | |  | c. | The gas molecules have a very low molar mass. | |  | d. | The gas molecules attract one another. | |  | e. | None of these. |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 5.8 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | gas | general chemistry | phases | real gases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 125. Which of the following statements is *least* likely to be true of a sample of nitrogen gas?   |  |  |  | | --- | --- | --- | |  | a. | Molecules of gaseous nitrogen are in constant random motion. | |  | b. | The pressure exerted by gaseous nitrogen is due to collisions of the molecules with the walls of the container. | |  | c. | The average kinetic energy of the gaseous nitrogen is proportional to the absolute temperature of the gas. | |  | d. | Collisions between the gaseous molecules are elastic. | |  | e. | The volume of the sample would be zero at –273°C. |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.8 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | gas | general chemistry | phases | real gases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 126. Real gases are those that   |  |  |  | | --- | --- | --- | |  | a. | only behave ideally at high pressures or low temperatures | |  | b. | deviate from ideal behavior | |  | c. | are only available naturally in the earth's atmosphere | |  | d. | are called real gases because their behavior can easily be modeled | |  | e. | have an even number of protons |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.8 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | gas | general chemistry | phases | real gases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 127. Gases behave most ideally at STP.   |  |  |  | | --- | --- | --- | |  | a. | True | |  | b. | False |  |  |  | | --- | --- | | *ANSWER:* | False | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.8 | | *QUESTION TYPE:* | True / False | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | gas | general chemistry | phases | real gases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 128. The pressure a gas would exert under ideal conditions is always greater than the observed pressure of a real gas.   |  |  |  | | --- | --- | --- | |  | a. | True | |  | b. | False |  |  |  | | --- | --- | | *ANSWER:* | False | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.8 | | *QUESTION TYPE:* | True / False | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | gas | general chemistry | phases | real gases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:34 PM | | *DATE MODIFIED:* | 3/4/2016 4:34 PM | |

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| 129. Of the following real gases, which would be expected to have the lowest van der Waals correction for intermolecular attractions?   |  |  |  | | --- | --- | --- | |  | a. | H2 | |  | b. | Cl2 | |  | c. | NH3 | |  | d. | N2 | |  | e. | not enough information to determine |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.9 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | gas | general chemistry | phases | real gases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:35 PM | | *DATE MODIFIED:* | 3/4/2016 4:35 PM | |

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| 130. What is the name for the lowest layer of the atmosphere, which is most influenced by human activities?   |  |  |  | | --- | --- | --- | |  | a. | stratosphere | |  | b. | mesosphere | |  | c. | terrasphere | |  | d. | troposphere | |  | e. | ionosphere |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.1 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | gas | general chemistry | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:35 PM | | *DATE MODIFIED:* | 3/4/2016 4:35 PM | |

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| 131. Which of the following pollutant gases is not produced directly in a combustion engine?   |  |  |  | | --- | --- | --- | |  | a. | CO | |  | b. | CO2 | |  | c. | O3 | |  | d. | NO | |  | e. | NO2 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | gas | general chemistry | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:35 PM | | *DATE MODIFIED:* | 3/4/2016 4:35 PM | |

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| 132. Combustion of coal releases sulfur dioxide into the atmosphere. The following process converts this gas into sulfuric acid, a component of acid rain.  If each tonne of coal produces L of sulfur dioxide (measured at STP), what mass of sulfuric acid can result from combustion of each tonne of coal? (1 tonne = 1000 kg)   |  |  |  | | --- | --- | --- | |  | a. | kg H2SO4 | |  | b. | kg H2SO4 | |  | c. | kg H2SO4 | |  | d. | kg H2SO4 | |  | e. | kg H2SO4 |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 5.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | True | | *KEYWORDS:* | Chemistry | gas | general chemistry | ideal gas law | phases | stoichiometry and gas volumes | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:35 PM | | *DATE MODIFIED:* | 3/4/2016 4:35 PM | |

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| 133. A room is 16 ft × 12 ft × 12 ft. Would air enter or leave the room if the temperature changed from 27°C to –3°C while the pressure remained constant? Determine the volume of the air that moved in or out of the room.   |  |  | | --- | --- | | *ANSWER:* | Air enters the room. 210 ft3 of air moves.  See Sec. 5.2 of Zumdahl, *Chemistry*. Volume of room = 16ft\*12ft\*12ft = 2304 ft3 Room gas volume at lower temp (V2) = V1(T2/T1) = 2304(270/300) = 2097 ft3 2304-2097 = 210 ft must enter room to compensate. | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 5.2 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Charles's law | Chemistry | empirical gas laws | gas | general chemistry | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:35 PM | | *DATE MODIFIED:* | 3/4/2016 4:35 PM | |

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| 134. Toy balloons are filled with hydrogen gas, at standard temperature, from a 10.0-liter cylinder. The initial pressure of the gas in the cylinder is exactly 100 atm. Assuming each balloon is filled to a volume of 1.0 liter at standard pressure, how many balloons could be filled?   |  |  | | --- | --- | | *ANSWER:* | 9990 balloons  See Sec. 5.4 of Zumdahl, *Chemistry*. The cylinder volume at standard pressure (V2) = V1\*(P1/P2) = 10.0L\*(100 atm/1 atm) = 10000L gas at standard pressure. 10.0L must remain in cylinder at 1 atm. 10000 – 10.0 = 9990 L = 9990 1-L balloons | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 5.4 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | gas | general chemistry | ideal gas law | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:35 PM | | *DATE MODIFIED:* | 3/4/2016 4:35 PM | |

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| 135. Calculate the density of F2 gas at 26°C and 755 torr.   |  |  | | --- | --- | | *ANSWER:* | 1.54 g/L  See Sec. 5.4 of Zumdahl, *Chemistry*. MM = *dRT/P* 38.0 = *d*\*(0.08206)\*(273+26)/(755/760) | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.4 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | gas | gas density | general chemistry | ideal gas law | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:35 PM | | *DATE MODIFIED:* | 3/4/2016 4:35 PM | |

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| 136. If equal masses of hydrogen gas and helium gas are placed in the same container, determine the ratio of partial pressure of hydrogen : partial pressure of helium.   |  |  | | --- | --- | | *ANSWER:* | 2  See Sec. 5.5 of Zumdahl, *Chemistry*. Ratio of partial pressures will be same as ratio of mole fractions. mole fraction H2 : mole fraction He = *X*H2/2.016 : *X*He/4.003, which reduces to 2:1 | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 5.5 | | *QUESTION TYPE:* | Subjective Short Answer | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | Dalton's law of partial pressures | gas | gas mixtures | general chemistry | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:35 PM | | *DATE MODIFIED:* | 3/4/2016 4:35 PM | |

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| 137. A manometer is attached to a sample of gas that occupies a volume of 2.34 liters.  The mercury level in arm of the manometer attached to the gas sample is 24.3 torr lower than that of the arm open to the atmosphere.  Atmospheric pressure is measured to be 1.23 atm.  What is the pressure of the sample of gas?   |  |  |  | | --- | --- | --- | |  | a. | 23.1 torr | |  | b. | 25.5 torr | |  | c. | 911 torr | |  | d. | 935 torr | |  | e. | 959 torr |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 5.1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | gas | gas pressure | general chemistry | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:35 PM | | *DATE MODIFIED:* | 3/4/2016 4:35 PM | |

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| 138. A sample of a gas occupies a volume of 2.62 liters at 25 °C and 1.00 atm.  What will be the volume at 50.0 °C and 2.00 atm?   |  |  |  | | --- | --- | --- | |  | a. | 1.42 liters | |  | b. | 2.62 liters | |  | c. | 4.83 liters | |  | d. | 5.68 liters | |  | e. | 10.5 liters |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | combined gas law | gas | general chemistry | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:35 PM | | *DATE MODIFIED:* | 3/4/2016 4:35 PM | |

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| 139. A chemical reaction produced 10.1 cm3 of nitrogen gas at 23 °C and 746 mmHg.  What is  the volume of this gas if the temperature and pressure are changed to 0 °C and 760 mmHg?   |  |  |  | | --- | --- | --- | |  | a. | 9.14 cm3 | |  | b. | 9.49 cm3 | |  | c. | 10.8 cm3 | |  | d. | 11.2 cm3 | |  | e. | 10.1 cm3 |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | combined gas law | gas | general chemistry | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:35 PM | | *DATE MODIFIED:* | 3/4/2016 4:35 PM | |

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| 140. A sample of gas occupies 20.0 liters at 32 °C when the pressure is 0.750 atm.  What temperature in °C is required to increase the volume to 25.0 liters at a pressure of 0.680 atm?   |  |  |  | | --- | --- | --- | |  | a. | -3.90 °C | |  | b. | 309 °C | |  | c. | 72.7 °C | |  | d. | 346 °C | |  | e. | 36.1 °C |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | combined gas law | gas | general chemistry | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:35 PM | | *DATE MODIFIED:* | 3/4/2016 4:35 PM | |

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| 141. What will be the pressure of a sample of 48.0 grams of oxygen gas in a glass container of volume 5.2 L at 25 °C?   |  |  |  | | --- | --- | --- | |  | a. | 0.591 atm | |  | b. | 1.18 atm | |  | c. | 7.05 atm | |  | d. | 14.1 atm | |  | e. | 226 atm |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | empirical gas laws | gas | general chemistry | ideal gas law | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:35 PM | | *DATE MODIFIED:* | 3/4/2016 4:35 PM | |

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| 142. A sample of nitrous oxide, N2O, occupies 16,500 mL at STP.  What is the mass of the sample?   |  |  |  | | --- | --- | --- | |  | a. | 18.9 | |  | b. | 22.1 | |  | c. | 22.8 | |  | d. | 32.4 | |  | e. | 46.0 |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Easy | | *REFERENCES:* | 5.3 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | empirical gas laws | gas | general chemistry | ideal gas law | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:35 PM | | *DATE MODIFIED:* | 3/4/2016 4:35 PM | |

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| 143. A sample of an unknown gas takes 434 s to diffuse through a porous plug at a given temperature. At the same temperature, N2(g) takes 175 s to diffuse through the same plug. What is the molar mass of the unknown gas?   |  |  |  | | --- | --- | --- | |  | a. | 172 g/mol | |  | b. | 69.1 g/mol | |  | c. | 44.0 g/mol | |  | d. | 11.3 g/mol | |  | e. | 21.1 g/mol |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 5.7 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | diffusion | gas | general chemistry | molecular speed | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:35 PM | | *DATE MODIFIED:* | 3/4/2016 4:35 PM | |

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| 144. What is the density of oxygen gas, in g per liter, at 25 °C and 0.850 atm?   |  |  |  | | --- | --- | --- | |  | a. | 1.11 | |  | b. | 0.901 | |  | c. | 0.556 | |  | d. | 1.33 | |  | e. | 0.750 |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 5.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | gas | gas density | general chemistry | ideal gas law | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:35 PM | | *DATE MODIFIED:* | 3/4/2016 4:35 PM | |

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| 145. Which of the following statements is false?   |  |  |  | | --- | --- | --- | |  | a. | The density of a gas is directly proportional to the external pressure. | |  | b. | The density of helium gas is double that of hydrogen gas. | |  | c. | The density of a gas is indirectly proportional to the temperature in Kelvin. | |  | d. | All gases have the same density at STP. | |  | e. | The density of a gas is independent of the volume. |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 5.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | gas | gas density | general chemistry | ideal gas law | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:35 PM | | *DATE MODIFIED:* | 3/4/2016 4:35 PM | |

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| 146. Consider the reaction between Mg(s) and HCl(aq) to produce aqueous magnesium chloride and hydrogen gas.  How many liters of hydrogen gas at STP will be produced when 12.15 g of magnesium reacts with an excess of hydrochloric acid?   |  |  |  | | --- | --- | --- | |  | a. | 1.00 L | |  | b. | 2.00 L | |  | c. | 5.60 L | |  | d. | 11.2 L | |  | e. | 22.4 L |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 5.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | gas | general chemistry | ideal gas law | phases | stoichiometry and gas volumes | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:35 PM | | *DATE MODIFIED:* | 3/4/2016 4:35 PM | |

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| 147. Consider the reaction between ethane (C2H6) and oxygen gas (O2) to produce carbon dioxide and water, as shown.   What volume of carbon dioxide will be produced at STP from the reaction of 4.00 L of ethane with 7.00 L of oxygen?   |  |  |  | | --- | --- | --- | |  | a. | 2.00 L CO2 | |  | b. | 3.00 L CO2 | |  | c. | 4.00 L CO2 | |  | d. | 6.00 L CO2 | |  | e. | 8.00 L CO2 |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 5.4 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | gas | general chemistry | ideal gas law | phases | stoichiometry and gas volumes | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:35 PM | | *DATE MODIFIED:* | 3/4/2016 4:35 PM | |

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| 148. At a given temperature and pressure, a sample of Gas A is observed to diffuse twice as fast as a sample of a different gas, B.  Based on this:   |  |  |  | | --- | --- | --- | |  | a. | The molar mass of A is one fourth that of B | |  | b. | The molar mass of A is one half that of B | |  | c. | The molar mass of A is 0.707 times that of B | |  | d. | The molar mass of A is 1.414 times that of B | |  | e. | The molar mass of A is four times that of B |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 5.7 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | diffusion | gas | general chemistry | molecular speed | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:35 PM | | *DATE MODIFIED:* | 3/4/2016 4:35 PM | |

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| 149. A gas is found to diffuse at half the rate of methane (CH4).  Which of the following could be this gas?   |  |  |  | | --- | --- | --- | |  | a. | O2 | |  | b. | N2 | |  | c. | CO2 | |  | d. | SO2 | |  | e. | C2H6 |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 5.7 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | diffusion | gas | general chemistry | molecular speed | phases | | *OTHER:* | Conceptual | | *DATE CREATED:* | 3/4/2016 4:35 PM | | *DATE MODIFIED:* | 3/4/2016 4:35 PM | |

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| 150. Calculate the ratio of the rate of effusion of CO2 to He.   |  |  |  | | --- | --- | --- | |  | a. | 0.090/1 | |  | b. | 0.30/1 | |  | c. | 3.3/1 | |  | d. | 11/1 | |  | e. | 12/1 |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *DIFFICULTY:* | Moderate | | *REFERENCES:* | 5.7 | | *QUESTION TYPE:* | Multi-Mode (Multiple choice) | | *HAS VARIABLES:* | False | | *KEYWORDS:* | Chemistry | effusion | gas | general chemistry | molecular speed | phases | | *OTHER:* | Quantitative | | *DATE CREATED:* | 3/4/2016 4:35 PM | | *DATE MODIFIED:* | 3/4/2016 4:35 PM | |

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| Consider the following plot that shows the fraction of a sample of gas molecules that have a given speed at the same temperature. The gases plotted are H2, N2, H2O, O2, He.  ​ |

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| 151. Which of the plots, A-E, corresponds to the gas N2?   |  |  | | --- | --- | | *ANSWER:* | B | | *POINTS:* | 1 | | *QUESTION TYPE:* | Objective Short Answer | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Rate of Diffusion Plot | | *DATE CREATED:* | 3/3/2017 1:00 AM | | *DATE MODIFIED:* | 3/3/2017 1:03 AM | |

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| 152. Which of the following **gases** in each pair of compounds, Pairs I-III, would show the **greater** deviation from ideal behavior when both gases are under the same set of conditions?  ​  **Pair I**: argon or xenon       **Pair II**: water vapor or neon    **Pair III**: hydrogen fluoride and fluorine  ​  **Pair I              Pair II                    Pair III**  ​   |  |  |  | | --- | --- | --- | |  | a. | argon              water vapor           hydrogen fluoride | |  | b. | xenon              neon                      hydrogen fluoride | |  | c. | argon               neon                     fluorine | |  | d. | xenon               water vapor          fluorine | |  | e. | xenon               water vapor          hydrogen  fluoride |  |  |  | | --- | --- | | *ANSWER:* | e | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Rate of Diffusion Plot | | *DATE CREATED:* | 3/3/2017 12:50 AM | | *DATE MODIFIED:* | 3/5/2017 11:52 PM | |

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| 153. Shown below are the vapor pressures of water (PH2O) at different temperatures:  ​   |  |  | | --- | --- | | **T(oC)** | **PH2O (torr)** | | 16 | 13.6 | | 26 | 25.2 | | 35 | 42.2 | | 40 | 55.3 |   ​  A small piece of zinc metal reacts with dilute hydrochloric acid to form hydrogen gas, which is collected over water at 16oC. The total pressure of the gases collected over the water is 752 torr and the volume of hydrogen gas collected is 1495 mL. What is the mass of the dry hydrogen gas collected to 4 significant figures?   |  |  |  | | --- | --- | --- | |  | a. | 0.1235 g | |  | b. | 0.1175 g | |  | c. | 0.1114 g | |  | d. | 0.06174 g | |  | e. | 0.1076 g |  |  |  | | --- | --- | | *ANSWER:* | a | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *DATE CREATED:* | 3/3/2017 1:15 AM | | *DATE MODIFIED:* | 3/3/2017 1:43 AM | |

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| 154. An engineer designs a rigid steel tank that will be used for fuel delivery. This tank is fitted with a  safety valve that opens only if the internal pressure of the tank exceeds 1.00 x 103 torr. The safety valve of the steel tank is tested by filling the steel tank with methane gas at 23oC and 0.991 atm and then placing the tank in boiling water at 100oC.  ​  Using this information, which of the following statements, I-IV, is/are **true**?  ​    I. The steel tank will open after being placed in the boiling water.    II. The steel tank will not open after being placed in the boiling water.    III. The pressure of the methane gas after the steel tank was placed in the boiling water is 949 torr.    IV. The pressure of the methane gas after the steel tank was placed in the boiling water is 1.25 atm.  ​   |  |  |  | | --- | --- | --- | |  | a. | I, III and IV only | |  | b. | I and IV only | |  | c. | II - IV only | |  | d. | II and IV only | |  | e. | I and III only |  |  |  | | --- | --- | | *ANSWER:* | c | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *DATE CREATED:* | 3/3/2017 1:44 AM | | *DATE MODIFIED:* | 3/5/2017 11:54 PM | |

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| Three five liter flasks, labeled A, B and C are fixed with pressure gauges and small valves. Each    flask contains 4 g of gas and is at a temperature of 273K. Flask A contains hydrogen gas; Flask B contains methane (CH4) gas and Flask C contains helium gas. Use this information to answer the next **two** (2) questions: |

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| 155. Which of the following correctly ranks the contents of that flask **in terms of gas** **pressure** before the valves connecting each flask are opened?   |  |  |  | | --- | --- | --- | |  | a. | Flask A > Flask B > Flask C | |  | b. | Flask A > Flask C > Flask B | |  | c. | Flask C > Flask B > Flask A | |  | d. | Flask B > Flask C > Flask A | |  | e. | Flask B > Flask A > Flask C |  |  |  | | --- | --- | | *ANSWER:* | b | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Gas Pressure and Diffusion Rate | | *DATE CREATED:* | 3/3/2017 1:50 AM | | *DATE MODIFIED:* | 3/3/2017 2:07 AM | |

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| 156. Which of the following correctly ranks the **diffusion rate of the gas** in each flask after the valves connecting each flask are opened?   Note : rateA  = Diffusion rate  of gas in flask A              rateB  = Diffusion rate  of gas in flask B              rateC  = Diffusion rate  of gas in flask C   |  |  |  | | --- | --- | --- | |  | a. | rateA > rateB > rateC | |  | b. | rateC > rateB > rateA | |  | c. | rateB > rateC > rateA | |  | d. | rateA > rateC > rateB | |  | e. | rateB > rateA > rateC |  |  |  | | --- | --- | | *ANSWER:* | d | | *POINTS:* | 1 | | *QUESTION TYPE:* | Multiple Choice | | *HAS VARIABLES:* | False | | *PREFACE NAME:* | Gas Pressure and Diffusion Rate | | *DATE CREATED:* | 3/3/2017 2:03 AM | | *DATE MODIFIED:* | 3/3/2017 2:08 AM | |