Test Bank for Chemistry 9th Edition by Zumdahl

Chapter 5: Gases

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
ANS: A PTS: 1 DIF: Easy REF: 5.1
KEY: Chemistry | general chemistry | phases | gas MSC: Conceptual

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
ANS: D PTS: 1 DIF: Easy REF: 5.1
KEY: Chemistry | general chemistry | phases | gas | gas pressure MSC: Conceptual

3. The SI unit of pressure is the
A) ampere
B) kilojoule
C) newton
D) gram
E) pascal
ANS: E PTS: 1 DIF: Easy REF: 5.1
KEY: Chemistry | general chemistry | phases | gas | gas pressure MSC: Conceptual

4. Which of the following would represent the greatest pressure?
A) 0.680 atm
B) 517 mmHg

C) 11.4 psi

D) 62106 Pa

E) 14.1 in Hg

ANS: C PTS: 1 DIF: Moderate REF: 5.1

KEY: Chemistry | general chemistry | phases | gas | gas pressure MSC: Quantitative

5. A glass column is filled with mercury and inverted in a pool of mercury. The mercury column stabilizes at a height of 729 mm above the pool of mercury. What is the pressure of the atmosphere?

A) 1.04 atm

B) 0.729 atm

C) 0.959 atm D) 456 atm

E) 0.639 atm

ANS: C PTS: 1 DIF: Easy REF: 5.1

KEY: Chemistry | general chemistry | phases | gas | gas pressure MSC: Quantitative

6. The local weather forecaster reports that the current barometric pressure is 30.4 inches of mercury. What is the current pressure in atmospheres?

A) 1.02 atm

B) 10.29 atm

C) 1.00 atm

D) 4.05 atm

E) 910 atm

ANS: A PTS: 1 DIF: Easy REF: 5.1

KEY: Chemistry | general chemistry | phases | gas | gas pressure MSC: Quantitative

7. A physics experiment is conducted at a pressure of 14.4 kPa. What is this pressure in mmHg? A) 18.9 mmHg

B) 1.92 mmHg

C) mmHg

D) 108 mmHg

E) mmHg

ANS: D PTS: 1 DIF: Easy REF: 5.1

KEY: Chemistry | general chemistry | phases | gas | gas pressure MSC: Quantitative

8. The air pressure in the inner tube of a tire on a typical racing bike is held at a pressure of about 112 psi. Convert this pressure to atm.

A) 0.147 atm

B) 7.62 atm

C) 0.112 atm

D) 0.131 atm

E) 112 atm

ANS: B PTS: 1 DIF: Easy REF: 5.1

KEY: Chemistry | general chemistry | phases | gas | gas pressure MSC: Quantitative

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.

ANS: B PTS: 1 DIF: Easy REF: 5.2

KEY: Chemistry | general chemistry | phases | gas | empirical gas laws | Boyle's law MSC: Conceptual

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.

ANS: A PTS: 1 DIF: Easy REF: 5.2

KEY: Chemistry | general chemistry | phases | gas | empirical gas laws | Avogadro's law

MSC: Conceptual

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.

ANS: C PTS: 1 DIF: Easy REF: 5.2

KEY: Chemistry | general chemistry | phases | gas | empirical gas laws | Charles's law MSC: Conceptual

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

ANS: B PTS: 1 DIF: Easy REF: 5.2

KEY: Chemistry | general chemistry | phases | gas | empirical gas laws MSC: Conceptual

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 3.42 L.

A) 312 K

B) 278 K

C) 20.4 K

D) 295 K

E) 552 K

ANS: B PTS: 1 DIF: Easy REF: 5.2

KEY: Chemistry | general chemistry | phases | gas | empirical gas laws | Charles's law MSC: Quantitative

14. You have 41.6 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) 57.2 g

B) 0.650 g

C) 28.6 g

D) 2.60 g

E) none of these

ANS: C PTS: 1 DIF: Moderate REF: 5.2

KEY: Chemistry | general chemistry | phases | gas | empirical gas laws | Avogadro's law

MSC: Quantitative

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 2.33 L. How many moles of the gas are in container 2?

A) 12.0 mol

B) 20.3 mol

C) 0.452 mol

D) 3.74 mol

E) none of these

ANS: A PTS: 1 DIF: Easy REF: 5.2

KEY: Chemistry | general chemistry | phases | gas | empirical gas laws | Avogadro's law

MSC: Quantitative

16. A balloon has a volume of 2.32 liters at 24.0°C. The balloon is heated to 48.0°C. Calculate the new volume of the balloon.

A) 2.32 L

B) 2.51 L

C) 2.15 L

D) 4.64 L

E) 1.16 L

ANS: B PTS: 1 DIF: Easy REF: 5.2

KEY: Chemistry | general chemistry | phases | gas | empirical gas laws | Charles's law

MSC: Quantitative

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

ANS: C PTS: 1 DIF: Moderate REF: 5.3

KEY: Chemistry | general chemistry | phases | gas | empirical gas laws | combined gas law MSC:

Conceptual

18. Body temperature is about 309 K. On a cold day, what volume of air at 276 K must a person with a lung capacity of 2.2 L breathe in to fill the lungs?

A) 2.46 L

B) 1.97 L

C) 2.08 L

D) 3.93 L

E) none of these

ANS: B PTS: 1 DIF: Easy REF: 5.2

KEY: Chemistry | general chemistry | phases | gas | empirical gas laws | Charles's law MSC: Quantitative

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.

ANS: B PTS: 1 DIF: Easy REF: 5.2

KEY: Chemistry | general chemistry | phases | gas | empirical gas laws | Avogadro's law

MSC: Conceptual

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

ANS: A PTS: 1 DIF: Moderate REF: 5.2

KEY: Chemistry | general chemistry | phases | gas | empirical gas laws | Avogadro's law

MSC: Conceptual

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) H_2

B) He

C) Ne

D) O_2

E) All have the same volume.

ANS: A PTS: 1 DIF: Easy REF: 5.2

KEY: Chemistry | general chemistry | phases | gas | empirical gas laws | Avogadro's law

MSC: Conceptual

Consider three 1-L flasks at STP. Flask A contains NH_3 gas, flask B contains NO_2 gas, and flask C contains N_2 gas.

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.

ANS: D PTS: 1 DIF: Easy REF: 5.3

KEY: Chemistry | general chemistry | phases | gas | ideal gas law MSC: Conceptual

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.

ANS: C PTS: 1 DIF: Easy REF: 5.8

KEY: Chemistry | general chemistry | phases | gas | ideal gas law MSC: Conceptual

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.
ANS: A PTS: 1 DIF: Easy REF: 5.6

KEY: Chemistry | general chemistry | phases | gas | molecular speed MSC: Conceptual

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.

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
ANS: C PTS: 1 DIF: Easy REF: 5.3
KEY: Chemistry | general chemistry | phases | gas | ideal gas law
MSC: Conceptual

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
ANS: D PTS: 1 DIF: Moderate REF: 5.6
KEY: Chemistry | general chemistry | phases | gas | kinetic-molecular theory MSC: Conceptual

Three 1.00-L flasks at 25°C and 725 torr contain the gases CH_4 (flask A), CO_2 (flask B), and C_2H_6 (flask C).

27. In which flask is there 0.039 mol of gas?
A) Flask A
B) Flask B
C) Flask C
D) all
E) none
ANS: D PTS: 1 DIF: Easy REF: 5.3

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.
ANS: E PTS: 1 DIF: Moderate REF: 5.6

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 0.140 atm, what is the final pressure?
A) 0.0477 atm
B) –0.177 atm
C) 0.411 atm
D) 0.242 atm
E) 0.0811 atm
ANS: E PTS: 1 DIF: Easy REF: 5.3

30. A sample of oxygen gas has a volume of 1.72 L at 27°C and 800.0 torr. How many oxygen molecules does it contain?
A)
B)
C)
D)
E) none of these
ANS: A PTS: 1 DIF: Easy REF: 5.3

31. You fill a balloon with 2.50 moles of gas at 22°C at a pressure of 1.62 atm. What is the volume of the balloon?

A) 15.7 L

B) 98.0 L

C) 37.4 L

D) 2.79 L

E) 22.4 L

ANS: C PTS: 1 DIF: Easy REF: 5.3

KEY: Chemistry | general chemistry | phases | gas | ideal gas law MSC: Quantitative

32. A sample of helium gas occupies 14.7 L at 23°C and 0.956 atm. What volume will it occupy at 40°C and 1.20 atm?

A) 19.5 L

B) 20.4 L

C) 11.1 L

D) 12.4 L

E) 14.9 L

ANS: D PTS: 1 DIF: Easy REF: 5.3

KEY: Chemistry | general chemistry | phases | gas | empirical gas laws | combined gas law

MSC: Quantitative

33. A 3.60-L sample of carbon monoxide is collected at 55°C and 0.869 atm. What volume will the gas occupy at 1.05 atm and 25°C?

A) 1.35 L

B) 3.95 L

C) 2.71 L

D) 3.28 L

E) none of these

ANS: C PTS: 1 DIF: Easy REF: 5.3

KEY: Chemistry | general chemistry | phases | gas | empirical gas laws | combined gas law

MSC: Quantitative

34. Mercury vapor contains Hg atoms. What is the volume of 201 g of mercury vapor at 822 K and 0.512 atm?

A) 132 L
B) L
C) 175 L
D) 34.5 L
E) 17.3 L
ANS: A PTS: 1 DIF: Easy REF: 5.3
KEY: Chemistry | general chemistry | phases | gas | ideal gas law MSC: Quantitative

35. What volume is occupied by 21.0 g of methane (CH4) at 27°C and 1.25 atm? A) 37.2 L B)
25.8 L C)
2.32 L
D) L
E) not enough data to calculate
ANS: B PTS: 1 DIF: Easy REF: 5.3
KEY: Chemistry | general chemistry | phases | gas | ideal gas law MSC: Quantitative

36. An automobile tire is filled with air at a pressure of 27.0 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) 5.40 lb/in2

B) 25.2 lb/in2

C) 28.9 lb/in2

D) 135 lb/in2

E) 4.63 lb/in2

ANS: B PTS: 1 DIF: Easy REF: 5.3

KEY: Chemistry | general chemistry | phases | gas | empirical gas laws | Charles's law
MSC: Quantitative

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

ANS: E PTS: 1 DIF: Easy REF: 5.8

KEY: Chemistry | general chemistry | phases | gas | ideal gas law MSC: Conceptual

38. A 7.94-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 301 K. What is the pressure of the gas?

A) 4.46 atm

B) atm

C) 3.11 atm D)

0.224 atm E)

none of these

ANS: A PTS: 1 DIF: Easy REF: 5.3

KEY: Chemistry | general chemistry | phases | gas | ideal gas law MSC: Quantitative

39. A sample of 35.1 g of methane gas has a volume of 3.11 L at a pressure of 2.70 atm. Calculate the temperature.

A) 2.92 K

B) 46.8 K

C) 320 K

D) 32.4 K

E) 35.0 K

ANS: B PTS: 1 DIF: Easy REF: 5.3

KEY: Chemistry | general chemistry | phases | gas | ideal gas law MSC: Quantitative

40. A 41.1-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) 81.4 g Ar

B) 1.02 g Ar

C) 163 g Ar

D) 821 g Ar

E) 40.7 g Ar

ANS: E PTS: 1 DIF: Moderate REF: 5.3

KEY: Chemistry | general chemistry | phases | gas | ideal gas law MSC: Quantitative

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 98.7 mL. The pressure of the gas in the second container is about:

A) 457 torr

B) 316 torr

C) torr D)

65 torr E)

338 torr

ANS: E PTS: 1 DIF: Easy REF: 5.3

KEY: Chemistry | general chemistry | phases | gas | empirical gas laws | combined gas law

MSC: Quantitative

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.

ANS: E PTS: 1 DIF: Moderate REF: 5.3

KEY: Chemistry | general chemistry | phases | gas | ideal gas law MSC: Conceptual

43. For an ideal gas, which pairs of variables are inversely proportional to each other (if all other factors remain constant)?

1. V and T
2. T and n
3. n and V
4. P 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

ANS: C PTS: 1 DIF: Easy REF: 5.3

KEY: Chemistry | general chemistry | phases | gas | ideal gas law MSC: Conceptual

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. V and T

A) 1 only

B) 2 only

C) 3 only

D) 1 and 2 only

E) 2 and 3 only

ANS: E PTS: 1 DIF: Easy REF: 5.3

KEY: Chemistry | general chemistry | phases | gas | ideal gas law MSC: Conceptual

45. The temperature of a specific amount of gas in a sealed container changes from 20.0°C to 40.0°C. If the volume remains constant, the pressure will change from 755 mmHg to A) 1510 mmHg

B) 707 mmHg

C) 378 mmHg

D) 807 mmHg

E) 755 mmHg

ANS: D PTS: 1 DIF: Easy REF: 5.3

KEY: Chemistry | general chemistry | phases | gas | empirical gas laws | combined gas law

MSC: Quantitative

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

46. Which gas has the highest
density? A) He

B) Cl2

C) CH4

D) NH3

E) all gases the same

ANS: B PTS: 1 DIF: Moderate REF: 5.4

KEY: Chemistry | general chemistry | phases | gas | ideal gas law | gas density MSC:
Conceptual

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

ANS: A PTS: 1 DIF: Easy REF: 5.6

KEY: Chemistry | general chemistry | phases | gas | molecular speed MSC:
Conceptual

48. Which gas sample has the greatest number of
molecules? A) He

B) Cl2

C) CH4

D) NH3

E) all gases the same

ANS: E PTS: 1 DIF: Easy REF: 5.3

KEY: Chemistry | general chemistry | phases | gas | ideal gas law MSC:
Conceptual

49. For which gas are the molecules diatomic?

A) He

B) Cl2

C) CH4

D) NH3

E) all gases the same

ANS: B PTS: 1 DIF: Easy REF: 5.3

50. For which gas are the collisions
elastic? A) He
B) Cl2
C) CH4
D) NH3
E) all gases the same
ANS: E PTS: 1 DIF: Easy REF: 5.6
KEY: Chemistry | general chemistry | phases | gas | kinetic-molecular theory MSC:
Conceptual

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
ANS: E PTS: 1 DIF: Easy REF: 5.6
KEY: Chemistry | general chemistry | phases | gas | kinetic-molecular theory MSC:
Conceptual

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
ANS: B PTS: 1 DIF: Moderate REF: 5.4
KEY: Chemistry | general chemistry | phases | gas | ideal gas law | gas density MSC:
Quantitative

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

ANS: C PTS: 1 DIF: Moderate REF: 5.4

KEY: Chemistry | general chemistry | phases | gas | ideal gas law | molar mass MSC: Quantitative

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.

ANS: D PTS: 1 DIF: Moderate REF: 5.6

KEY: Chemistry | general chemistry | phases | gas | ideal gas law MSC: Conceptual

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

ANS: C PTS: 1 DIF: Easy REF: 5.4

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
ANS: E PTS: 1 DIF: Difficult REF: 5.4

57. It is found that 250. mL of a gas at STP has a mass of 0.700 g. What is the molar mass?
A) 62.7 g/mol
B) 2.80 g/mol
C) 15.9 g/mol
D) 11.2 g/mol
E) 128 g/mol
ANS: A PTS: 1 DIF: Easy REF: 5.4

58. Given reaction $2NH_3(g) + 3Cl_2(g) \rightarrow N_2(g) + 6HCl(g)$, you react 5.0 L of NH_3 with 5.0 L of Cl_2 measured at the same conditions in a closed container. Calculate the ratio of pressures in the container (Pfinal/Pinitial).
A) 0.75
B) 1.00
C) 1.33
D) 1.50
E) none of these
ANS: C PTS: 1 DIF: Moderate REF: 5.4

59. Given reaction $N_2 + 3H_2 \rightleftharpoons 2NH_3$, 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 (Vfinal/Vinitial).

A) 0.67

B) 1.00

C) 1.33

D) 1.50

E) none of these

ANS: A PTS: 1 DIF: Moderate REF: 5.4

KEY: Chemistry | general chemistry | phases | gas | ideal gas law | stoichiometry and gas volumes MSC: Conceptual
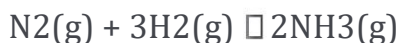
60. You carry out the reaction represented by the following balanced equation:

$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$

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

ANS: B PTS: 1 DIF: Moderate REF: 5.4

KEY: Chemistry | general chemistry | phases | gas | ideal gas law | stoichiometry and gas volumes MSC: Conceptual

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

ANS: C PTS: 1 DIF: Moderate REF: 5.4

KEY: Chemistry | general chemistry | phases | gas | ideal gas law | molar mass MSC: Quantitative

62. Gaseous reacts with according to the following equation:

What volume of oxygen gas at STP is needed to react with 5.75 mol of ?

A) 17.3 L

B) 42.9 L

C) L

D) L

E) Not enough information is given to solve the

problem. ANS: C PTS: 1 DIF: Moderate REF: 5.4

KEY: Chemistry | general chemistry | phases | gas | ideal gas law | stoichiometry and gas volumes MSC: Quantitative

63. A 3.54 gram sample of a certain diatomic gas occupies a volume of 3.30-L at 1.00 atm and a temperature of 45°C. Identify this gas.

A)

B)

C)

D)

E)

ANS: A PTS: 1 DIF: Moderate REF: 5.4

64. Air has an average molar mass of 29.0 g/mol. The density of air at 0.97 atm and 30.0°C is: A)
29.0 g/L B)
39.0 g/mL C)
1.13 g/L D)
1.35 g/mL E)
11.4 g/L
ANS: C PTS: 1 DIF: Moderate REF: 5.4

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
ANS: D PTS: 1 DIF: Moderate REF: 5.4

66. If a 17.90-g sample of a gas occupies 10.0 L at STP, what is the molar mass of the gas at 125°C? A) 5.48 g/mol
B) 40.1 g/mol
C) 18.4 g/mol
D) 58.5 g/mol
E) Not enough information is given.
ANS: B PTS: 1 DIF: Easy REF: 5.4

67. A 3.31-g sample of lead nitrate, , molar mass = 331 g/mol, is heated in an evacuated cylinder with a volume of 2.37 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) 0.260 atm

B) 0.208 atm

C) 0.0519 atm

D) 0.364 atm

E) 34.4 atm

ANS: A PTS: 1 DIF: Moderate REF: 5.4

KEY: Chemistry | general chemistry | phases | gas | ideal gas law | stoichiometry and gas volumes MSC: Quantitative

68. The purity of a sample containing zinc and weighing 0.312 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

ANS: D PTS: 1 DIF: Difficult REF: 5.4

KEY: Chemistry | general chemistry | phases | gas | ideal gas law | stoichiometry and gas volumes MSC: Quantitative

69. What volume of carbon dioxide measured at STP will be formed by the reaction of 1.47 mol of oxygen with 0.900 mol of ethyl alcohol, CH3CH2OH?

A) 40.3 mL

B) 22.0 L

C) 32.9 L

D) 49.4 L

E) 0.980 L

ANS: B PTS: 1 DIF: Difficult REF: 5.4

KEY: Chemistry | general chemistry | phases | gas | ideal gas law | stoichiometry and gas volumes MSC: Quantitative

70. What volume of measured at STP is produced by the combustion of 6.27 g of natural gas according to the following equation?

A) 8.76 L

B) 17.5 L

C) 4.38 L

D) 19.1 L

E) 3.14 L

ANS: B PTS: 1 DIF: Easy REF: 5.4

KEY: Chemistry | general chemistry | phases | gas | ideal gas law | stoichiometry and gas volumes MSC: Quantitative

71. At 1000°C and 10. torr, the density of a certain element in the gaseous state is . The element is:

A) F

B) He

C) Na

D) Zn

E) Hg

ANS: C PTS: 1 DIF: Easy REF: 5.4

KEY: Chemistry | general chemistry | phases | gas | ideal gas law | gas density MSC: Quantitative

72. Into a 2.22-liter container at 25°C are placed 1.23 moles of O_2 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) 27.1 atm B)

13.5 atm C)

2.27 atm D)

35.2 atm E)

none of these

ANS: A PTS: 1 DIF: Moderate REF: 5.4

KEY: Chemistry | general chemistry | phases | gas | ideal gas law | stoichiometry and gas volumes MSC: Quantitative

73. Calcium hydride combines with water according to the equation:

Beginning with 84.0 g of CaH_2 and 42.0 g of H_2O, what volume of H_2 will be produced at 273 K and a pressure of 1327 torr?

A) 29.9 L

B) 15.0 L

C) L

D) 25.7 L

E) none of these

ANS: A PTS: 1 DIF: Moderate REF: 5.4

KEY: Chemistry | general chemistry | phases | gas | ideal gas law | stoichiometry and gas volumes MSC: Quantitative

74. What volume does 40.5 g of N_2 occupy at STP?

A) 64.8 L

B) 1.81 L

C) 32.4 L

D) 50.7 L

E) none of these

ANS: C PTS: 1 DIF: Easy REF: 5.4

KEY: Chemistry | general chemistry | phases | gas | ideal gas law MSC: Quantitative

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 (NH_3, Cl_2, N_2, 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
ANS: B PTS: 1 DIF: Moderate REF: 5.4
KEY: Chemistry | general chemistry | phases | gas | ideal gas law | stoichiometry and gas volumes MSC: Quantitative

76. An excess of sodium hydroxide is treated with 26.5 L of dry hydrogen chloride gas measured at STP. What is the mass of sodium chloride formed?
A) 1.55 kg
B) 1.69 g
C) 0.138 kg
D) 69.1 g
E) 13.3 g
ANS: D PTS: 1 DIF: Moderate REF: 5.4
KEY: Chemistry | general chemistry | phases | gas | ideal gas law | stoichiometry and gas volumes MSC: Quantitative

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
ANS: B PTS: 1 DIF: Moderate REF: 5.4
KEY: Chemistry | general chemistry | phases | gas | ideal gas law | molar mass MSC: Quantitative

78. A mixture of KCl and KClO3 weighing 1.34 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) 38.9%
B) 58.4%
C) 87.6%
D) 10.7%
E) 23.7%
ANS: A PTS: 1 DIF: Difficult REF: 5.4
KEY: Chemistry | general chemistry | phases | gas | ideal gas law | stoichiometry and gas volumes MSC: Quantitative

79. Given the equation:

A 3.00-g sample of KClO3 is decomposed and the oxygen at 24.0°C and 0.717 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
ANS: C PTS: 1 DIF: Moderate REF: 5.4
KEY: Chemistry | general chemistry | phases | gas | ideal gas law | stoichiometry and gas volumes MSC: Quantitative

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)
ANS: A PTS: 1 DIF: Moderate REF: 5.4
KEY: Chemistry | general chemistry | phases | gas | ideal gas law | gas density MSC: Conceptual

81. One way to isolate metals from their ores is to react the metal oxide with carbon as shown in the following reaction:

If 34.08 g of a metal oxide reacted with excess carbon and 4.37 L of CO_2 formed at 100°C and 1.50 atm, what is the identity of the metal?
A) Hg
B) Mg
C) Cu
D) Cd
E) Zn
ANS: C PTS: 1 DIF: Difficult REF: 5.4

KEY: Chemistry | general chemistry | phases | gas | ideal gas law | stoichiometry and gas volumes MSC: Quantitative

82. The standard temperature for gases
is A) 100°C
B) 0°C
C) 32°C
D) 212°F
E) 0°F
ANS: B PTS: 1 DIF: Easy REF: 5.4
KEY: Chemistry | general chemistry | phases | gas | STP MSC: Conceptual

83. Standard pressure for gases is
A) 0 atm
B) 1 atm
C) 100 atm
D) dependent upon temperature
E) none of the above
ANS: B PTS: 1 DIF: Easy REF: 5.4
KEY: Chemistry | general chemistry | phases | gas | STP MSC: Conceptual

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.

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
ANS: C PTS: 1 DIF: Easy REF: 5.5
KEY: Chemistry | general chemistry | phases | gas | gas mixtures | collecting gases over water MSC: Quantitative

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

ANS: D PTS: 1 DIF: Easy REF: 5.4

KEY: Chemistry | general chemistry | phases | gas | ideal gas law | calculations with the ideal gas law MSC: Quantitative

86. A 142-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) 122 mL

B) 162 mL

C) 136 mL

D) 111 mL

E) none of these

ANS: E PTS: 1 DIF: Easy REF: 5.5

KEY: Chemistry | general chemistry | phases | gas | gas mixtures | collecting gases over water MSC: Quantitative

87. A vessel with a volume of 26.9 L contains 2.80 g of nitrogen gas, 0.605 g of hydrogen gas, and 79.9 g of argon gas. At 25°C, what is the pressure in the vessel? A) 75.5 atm

B) 0.183 atm

C) 2.55 atm

D) 2.18 atm

E) 58.7 atm

ANS: D PTS: 1 DIF: Moderate REF: 5.5

KEY: Chemistry | general chemistry | phases | gas | gas mixtures | Dalton's law of partial pressures MSC: Quantitative

88. Oxygen gas, generated by the reaction is collected over water at 27°C in a 1.55-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) 0.0608 moles

B) 0.0912 moles

C) 0.0405 moles

D) 0.0434 moles

E) 1.50 moles

ANS: C PTS: 1 DIF: Moderate REF: 5.5

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.

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
ANS: C PTS: 1 DIF: Easy REF: 5.5

90. Calculate the ratio of PHe :
PAr. A) 1/1.22
B) 1.22/1
C) 1/12.2
D) 12.2/1
E) none of these
ANS: D PTS: 1 DIF: Moderate REF: 5.5

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
ANS: C PTS: 1 DIF: Easy REF: 5.5

92. A balloon contains an anesthetic mixture of cyclopropane (cp) and oxygen (O_2) at 171 torr and 570. torr, respectively. What is the ratio of the number of moles of cyclopropane to moles of oxygen?

A) 3.33
B) 0.230
C) 0.300
D) 0.390
E) 0.460
ANS: C PTS: 1 DIF: Moderate REF: 5.2
KEY: Chemistry | general chemistry | phases | gas | gas mixtures | Dalton's law of partial pressures MSC: Quantitative

93. A gaseous mixture containing 1.5 mol Ar and 3.5 mol CO_2 has a total pressure of 7.3 atm. What is the partial pressure of CO_2?
A) 2.2 atm
B) 1.4 atm
C) 17 atm

D) 5.1 atm

E) 7.3 atm

ANS: D PTS: 1 DIF: Easy REF: 5.5

KEY: Chemistry | general chemistry | phases | gas | gas mixtures | Dalton's law of partial pressures MSC: Quantitative

94. The valve between the 2.00-L bulb, in which the gas pressure is 1.80 atm, and the 3.00-L bulb, in which the gas pressure is 3.00 atm, is opened. What is the final pressure in the two bulbs, the temperature remaining constant?

A) 0.720 atm

B) 2.28 atm

C) 2.52 atm

D) 1.80 atm

E) 2.40 atm

ANS: C PTS: 1 DIF: Moderate REF: 5.5

KEY: Chemistry | general chemistry | phases | gas | gas mixtures | Dalton's law of partial pressures MSC: Quantitative

95. The partial pressures of CH4, N2, and O2 in a sample of gas were found to be 135 mmHg, 508 mmHg, and 571 mmHg, respectively. Calculate the mole fraction of nitrogen. A) 20.4

B) 0.470

C) 0.418

D) 0.751

E) 0.359

ANS: C PTS: 1 DIF: Moderate REF: 5.5

KEY: Chemistry | general chemistry | phases | gas | gas mixtures | Dalton's law of partial pressures MSC: Quantitative

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.

ANS: D PTS: 1 DIF: Easy REF: 5.5

KEY: Chemistry | general chemistry | phases | gas | gas mixtures | Dalton's law of partial pressures MSC: Conceptual

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. ANS: A PTS: 1 DIF: Easy REF: 5.6

KEY: Chemistry | general chemistry | phases | gas | kinetic theory of an ideal gas | postulates of kinetic theory MSC: Conceptual

98. Consider the following gas samples:

Sample A Sample B
$S_2(g)$ $O_2(g)$ 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. ANS: D PTS: 1 DIF: Moderate REF: 5.6

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.

ANS: B PTS: 1 DIF: Easy REF: 5.6

KEY: Chemistry | general chemistry | phases | gas | kinetic-molecular theory MSC: Conceptual

100. In the kinetic molecular theory we assume an ideal gas has no

mass. ANS: F PTS: 1 DIF: Easy REF: 5.6

KEY: Chemistry | general chemistry | phases | gas | kinetic-molecular theory MSC: Conceptual

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

ANS: C PTS: 1 DIF: Moderate REF: 5.6

KEY: Chemistry | general chemistry | phases | gas | molecular speed MSC: Conceptual

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.

ANS: D PTS: 1 DIF: Easy REF: 5.6

KEY: Chemistry | general chemistry | phases | gas | kinetic-molecular theory MSC: Conceptual

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.

ANS: B PTS: 1 DIF: Moderate REF: 5.6

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) 95.91 m/s
B) 14.90 m/s
C) 471.2 m/s
D) 272.0 m/s
E) m/s
ANS: C PTS: 1 DIF: Easy REF: 5.6

KEY: Chemistry | general chemistry | phases | gas | molecular speed MSC: Quantitative

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.
ANS: B PTS: 1 DIF: Easy REF: 5.6

KEY: Chemistry | general chemistry | phases | gas | kinetic-molecular theory MSC: Conceptual

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.
ANS: C PTS: 1 DIF: Moderate REF: 5.6

KEY: Chemistry | general chemistry | phases | gas | molecular speed MSC: Conceptual

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.

ANS: C PTS: 1 DIF: Easy REF: 5.6

KEY: Chemistry | general chemistry | phases | gas | kinetic-molecular theory MSC: Conceptual

108. At the same temperature, lighter molecules have a higher average kinetic energy than heavier molecules.

ANS: F PTS: 1 DIF: Easy REF: 5.6

KEY: Chemistry | general chemistry | phases | gas | kinetic-molecular theory MSC: Conceptual

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

ANS: B PTS: 1 DIF: Easy REF: 5.6

KEY: Chemistry | general chemistry | phases | gas | kinetic-molecular theory MSC: Conceptual

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.

ANS: C PTS: 1 DIF: Easy REF: 5.6

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.

ANS: B PTS: 1 DIF: Easy REF: 5.6

KEY: Chemistry | general chemistry | phases | gas | kinetic-molecular theory MSC: Conceptual

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.

ANS: C PTS: 1 DIF: Easy REF: 5.6

KEY: Chemistry | general chemistry | phases | gas | kinetic-molecular theory MSC: Conceptual

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.

ANS: E PTS: 1 DIF: Easy REF: 5.7

114. Which of the following would have a higher rate of effusion than

C2H2? A) N2

B) O2

C) Cl2

D) CH4

E) CO2

ANS: D PTS: 1 DIF: Easy REF: 5.7

KEY: Chemistry | general chemistry | phases | gas | molecular speed | effusion MSC: Conceptual

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 4 times the rate of N2. The molar mass of gas A is:

A) 1.75 g/mol

B) 112 g/mol C)

7.01 g/mol D)

448 g/mol E)

none of these

ANS: A PTS: 1 DIF: Moderate REF: 5.7

KEY: Chemistry | general chemistry | phases | gas | molecular speed | effusion MSC: Quantitative

116. The rate of effusion of an unknown gas was measured and found to be 11.9 mL/min. Under identical conditions, the rate of effusion of pure oxygen (O2) gas is 14.0 mL/min. Based on this information, the identity of the unknown gas could be: A)

B)

C)

D)

E) none of these

ANS: C PTS: 1 DIF: Moderate REF: 5.7

KEY: Chemistry | general chemistry | phases | gas | molecular speed | effusion MSC: Quantitative

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

ANS: C PTS: 1 DIF: Moderate REF: 5.7

KEY: Chemistry | general chemistry | phases | gas | molecular speed | effusion MSC: Conceptual

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. ANS: B PTS: 1 DIF: Easy REF: 5.7

KEY: Chemistry | general chemistry | phases | gas | molecular speed | diffusion MSC: Conceptual

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 ANS: A

PTS: 1 DIF: Easy REF: 5.7

KEY: Chemistry | general chemistry | phases | gas | molecular speed | effusion MSC: Conceptual

120. The diffusion of a gas is faster than the effusion of a gas.

ANS: F PTS: 1 DIF: Easy REF: 5.7

KEY: Chemistry | general chemistry | phases | gas | molecular speed | diffusion | effusion

MSC: Conceptual

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.
ANS: D PTS: 1 DIF: Easy REF: 5.8

KEY: Chemistry | general chemistry | phases | gas | real gases MSC: Conceptual

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

ANS: B PTS: 1 DIF: Easy REF: 5.8

KEY: Chemistry | general chemistry | phases | gas | real gases MSC: Conceptual

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.

ANS: A PTS: 1 DIF: Moderate REF: 5.8

KEY: Chemistry | general chemistry | phases | gas | real gases MSC: Conceptual

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.

ANS: D PTS: 1 DIF: Moderate REF: 5.8

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.

ANS: E PTS: 1 DIF: Easy REF: 5.8

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

ANS: B PTS: 1 DIF: Easy REF: 5.8

127. Gases behave most ideally at STP.

ANS: F PTS: 1 DIF: Easy REF: 5.8

128. The pressure a gas would exert under ideal conditions is always greater than the observed pressure of a real gas.

ANS: F PTS: 1 DIF: Easy REF: 5.8

129. Of the following real gases, which would be expected to have the lowest van der Waals correction for intermolecular attractions?

A) H_2

B) Cl_2

C) NH_3

D) O_2

E) not enough information to determine

ANS: A PTS: 1 DIF: Easy REF: 5.9

KEY: Chemistry | general chemistry | phases | gas | real gases MSC: Conceptual

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

ANS: D PTS: 1 DIF: Easy REF: 5.1

KEY: Chemistry | general chemistry | phases | gas MSC: Conceptual

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

ANS: C PTS: 1 DIF: Easy REF: 5.1

KEY: Chemistry | general chemistry | phases | gas MSC: Conceptual

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

ANS: D PTS: 1 DIF: Moderate REF: 5.4

KEY: Chemistry | general chemistry | phases | gas | ideal gas law | stoichiometry and gas volumes MSC: Quantitative

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.

ANS:
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.

PTS: 1 DIF: Moderate REF: 5.2
KEY: Chemistry | general chemistry | phases | gas | empirical gas laws | Charles's law MSC: Conceptual

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?

ANS:
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 PTS: 1 DIF: Moderate REF: 5.4

KEY: Chemistry | general chemistry | phases | gas | ideal gas law MSC: Conceptual

135. Calculate the density of F2 gas at 26°C and 755 torr.
ANS:
1.54 g/L

See Sec. 5.4 of Zumdahl, Chemistry.
MM = dRT/P

$38.0 = d*(0.08206)*(273+26)/(755/760)$

PTS: 1 DIF: Easy REF: 5.4
KEY: Chemistry | general chemistry | phases | gas | ideal gas law | gas density MSC: Quantitative

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.

ANS: 2

See Sec. 5.5 of Zumdahl, Chemistry.
Ratio of partial pressures will be same as ratio of mole fractions.
mole fraction H_2 : mole fraction He = $X_{H2}/2.016$: $X_{He}/4.003$, which reduces to 2:1

PTS: 1 DIF: Moderate REF: 5.5
KEY: Chemistry | general chemistry | phases | gas | gas mixtures | Dalton's law of partial pressures MSC: Quantitative

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
ANS: E PTS: 1 DIF: Moderate REF: 5.1
KEY: Chemistry | general chemistry | phases | gas | gas pressure MSC: Quantitative

138. A sample of a gas occupies a volume of 2.62 liters at 25 ◻ and 1.00 atm. What will be the volume at 50.0 ◻ and 2.00 atm?
A) 1.42 liters
B) 2.62 liters
C) 4.83 liters
D) 5.68 liters
E) 10.5 liters

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

ANS: A PTS: 1 DIF: Easy REF: 5.3

KEY: Chemistry | general chemistry | phases | gas | combined gas law MSC: Quantitative

140. A sample of gas occupies 20.0 liters at 32 ◻ when the pressure is 0.750 atm. What temperature in ◻ is required to increase the volume to 25.0 liters at a pressure of 0.680 atm?

A) -3.90 ◻

B) 309 ◻

C) 72.7 ◻

D) 346 ◻

E) 36.1 ◻

ANS: C PTS: 1 DIF: Easy REF: 5.3

KEY: Chemistry | general chemistry | phases | gas | combined gas law MSC: Quantitative

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

ANS: C PTS: 1 DIF: Easy REF: 5.3

KEY: Chemistry | general chemistry | phases | gas | empirical gas laws | ideal gas law MSC: Quantitative

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

ANS: D PTS: 1 DIF: Easy REF: 5.3

KEY: Chemistry | general chemistry | phases | gas | empirical gas laws | ideal gas law MSC: Quantitative

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

ANS: A PTS: 1 DIF: Moderate REF: 5.7

KEY: Chemistry | general chemistry | phases | gas | molecular speed | diffusion MSC: Quantitative

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

ANS: A PTS: 1 DIF: Moderate REF: 5.4

KEY: Chemistry | general chemistry | phases | gas | ideal gas law | gas density MSC: Quantitative

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.

ANS: D PTS: 1 DIF: Moderate REF: 5.4

KEY: Chemistry | general chemistry | phases | gas | ideal gas law | gas density MSC: Conceptual

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

ANS: D PTS: 1 DIF: Moderate REF: 5.4

KEY: Chemistry | general chemistry | phases | gas | ideal gas law | stoichiometry and gas volumes MSC: Quantitative

147. Consider the reaction between ethane (C_2H_6) and oxygen gas (O_2) 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 CO_2

B) 3.00 L CO_2

C) 4.00 L CO_2

D) 6.00 L CO_2

E) 8.00 L CO_2

ANS: C PTS: 1 DIF: Moderate REF: 5.4

KEY: Chemistry | general chemistry | phases | gas | ideal gas law | stoichiometry and gas volumes MSC: Quantitative

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

ANS: A PTS: 1 DIF: Moderate REF: 5.7

149. A gas is found to diffuse at half the rate of methane (CH_4). Which of the following could be this gas?

A) O_2
B) N_2
C) CO_2
D) SO_2
E) C_2H_6

ANS: D PTS: 1 DIF: Moderate REF: 5.7

150. Calculate the ratio of the rate of effusion of CO_2 to He.

A) 0.090/1
B) 0.30/1
C) 3.3/1
D) 11/1
E) 12/1

ANS: B PTS: 1 DIF: Moderate REF: 5.7