Chemistry

Name_____ Date _____ Period _____

## Gas Exam Review

1. How do gases compare with liquids and solids in terms of the distance between their molecules?

2. What is kinetic energy? Write the equation that represents the kinetic energy of a gas particle in motion. Label the variables in the equation.

3. How do mass and temperature affect the kinetic energy of gas particles?

4. What is the equation for calculating pressure?

5. How does changing force and surface area affect pressure?

6. Why do gas particles exert pressure?

7. What is gas diffusion? Provide an example.

8. What is atmospheric pressure at sea level? Provide your answer in each of the following units.

atm:

torr:

mm Hg:

Pa:

psi:

9. What happens to atmospheric pressure at higher altitudes? At lower altitudes?

10. What is the meaning and values represented by STP?

11. What is a barometer? How does it work?

12. Why is it dangerous to throw an aerosol can into a fire? (Hint: Think Charles' Law!)

13. What is absolute zero? Provide this value in Kelvin and °C.

14. Convert each of the following values:

a. 1.59 atm to mm Hg

b. 325 Pa to psi

c. 25.0 torr to atm

d. -50°C to Kelvin

15. Determine whether each of the following variables are directly proportional or inversely proportional, assuming the other two variables of the gas are constant.

a. volume and temperature

b. volume and moles

c. pressure and volume

d. pressure and moles

e. pressure and temperature

16. The pressure exerted on a 240. mL sample of hydrogen gas at constant temperature is increased from 0.428 atm to 0.724 atm. What will the final volume of the sample be?

17. A sample of air has a volume of 140 mL at 67 °C. At what temperature will its volume be 50. mL, assuming constant pressure?

18. Three of the primary components of air are $CO_2$, $N_2$ and $O_2$. In a sample containing a mixture of only these gases at sea level, the partial pressure of $CO_2$ is 0.285 torr and the partial pressure of $N_2$ is 593.525 torr. What is the partial pressure of $O_2$?

19. If a 44.9 L balloon at 127 °C is cooled to standard temperature, what will be the new volume?

20. Which equation represents the ideal gas law? State the required units of each measurement.

21. How many grams of oxygen gas, $O_2$, are contained in a 26.0 L container at 27 °C at 126 atm?

22. What is the standard molar volume of a gas?

23. What volume would 28.02 g of nitrogen gas, $N_2$, occupy at STP?

24. Write two equations that can be used to calculate the density of a gas.

25. What is the value of the gas constant, R? Don't forget your units!

26. Calculate the volume of 4 g of $O_2$ at 57 °C and 0.88 atm.

27. Find the mass of 125 mL of $SO_2$ at 0.822 atm and -53 °C.

28. Find the molar mass of 1.05 g of a gas that occupies 2.35 L at 37.0 °C and 0.840 atm.

29. The density of a gas is 3.2 g/L at -18 °C and 2.17 atm. What is the molar mass of this gas?

30. Carbon monoxide gas reacts with oxygen gas to produce carbon dioxide gas. If 1.00 L of carbon monoxide reacts,

a. Write a balanced chemical equation.

b. How many L of oxygen are required?

c. How many L of carbon dioxide are produced?

31. Acetylene gas, $C_2H_2$, undergoes combustion to produce carbon dioxide gas and water vapor. If 75.0 L of $CO_2$ are produced,

a. Write a balanced chemical equation.

b. How many liters of $C_2H_2$ are required?

c. What volume of water vapor is produced?

d. What volume of $O_2$ is required?

32. If 5.6 L of $H_2$ at STP reacts with $Cu_2O$ according to the following equation:

$$Cu_2O_{(s)} + H_{2(g)} \rightarrow Cu_{(s)} + H_2O_{(g)}$$

a. Balance the equation.

b. How many moles of $H_2$ react?

c. How many moles of Cu are produced?

d. How many L of Cu are produced?

33. What volume of oxygen gas, in liters, can be collected at 0.987 atm and 25.0 °C when 30.6 g of $KClO_3$ decompose by heating, according to the following equation?

$$KClO_{3(s)} \rightarrow KClO_{(s)} + O_{2(g)}$$

# Answers

(1) The gas molecules are much farther apart. The majority of gas volume is empty space.

(2) KE is energy dve to movement

$KE = \frac{1}{2}mv^2$ (m: mass; v: velocity (speed w/ direction))

(3) ↑ mass = ↑ KE
↑ temp = ↑ KE

(4) Pressure = $\frac{Force}{Area}$

(5) ↑ force = ↑ pressure (directly proportional)
↑ area = ↓ pressure (indirectly proportional)

(6) They collide with the walls of their container, exerting a force = PRESSURE

(7) Diffusion of gas molecules from an area of high concentration to low concentration is dve to their random movement ex) odor of perfume spreading through the room

(8) 1 atm; 760 torr; 760 mm Hg; 101,325 Pa; 14.7 psi

(9) Patm decreases at higher altitudes
patm increases at lower altitudes

(10) Standard Temperature & Pressure: 0°C, 1 atm

(11) An instrument that measures Patm 


(12) The KE of the molecules will increase rapidly dve to ↑ temperature ∴ the pressure and volume will increase, bursting the can!

(13) The lowest possible temperature (molecules will have no pressure & no KE. = 0K, -273°C)

(14) a) 1210 atm b) 0.0472 psi c) 0.0329 atm d) 223 K

(15) a, b, d, e: directly proportional c: indirectly proportional

(16) 142 mL

(17) 120 K or -150° C

(18) 166.190 torr

(19) 30.6 L

(20) PV = nRT
P (atm), V (L), n (moles)
$R = 0.0821 \frac{atm \cdot L}{mol \cdot K}$, T (Kelvin)

(21) $4.3 \times 10^3$ g $O_2$

(22) 1 mol of any gas @ STP = 22.4 L

(23) 22.4 L

(24) $D = \frac{mass}{volume}$, $D = \frac{M \cdot P}{R \cdot T}$ (M: molar mass; P: pressure (atm); R: 0.0821; T: temp (K))

(25) $0.0821 \frac{atm \cdot L}{mol \cdot K}$

(26) 4 L $O_2$

(27) 0.36 g $SO_2$

(28) 13.5 g/mol

(29) 31 g/mol

(30) a) $2CO_{(g)} + O_{2(g)} \rightarrow 2CO_{2(g)}$
b) 0.5 L $O_2$
c) 1.0 L $CO_2$

(31) a) $2C_2H_{2(g)} + 5O_{2(g)} \rightarrow 4CO_{2(g)} + 2H_2O_{(g)}$
b) 37.5 L $C_2H_2$
c) 37.5 L $H_2O$
d) 93.8 L $O_2$

(32) a) $Cu_2O_{(s)} + H_{2(g)} \rightarrow 2Cu_{(s)} + H_2O_{(g)}$
b) 0.25 mol $H_2$
c) 0.50 mol Cu
d) 11 L Cu

(33) 6.19 L