

Semester Exam Review

Name _____

REMEMBER YOUR UNITS!!

Sections 0 and 1A

1. Explain the location of 3 pieces of safety equipment in the room and explain a situation in which you would use each of them.
 - fire extinguisher - used when there is an object on fire
 - safety shower - used when a person spills chemicals on their bodies
 - fire blanket - used when a person sets themselves on fire

2. What is the formula for density?

$$\text{Density} = \frac{\text{mass}}{\text{volume}}$$

3. What is the density of an object having a mass of 13.0 g and a volume of 48 cm³?

$$D = \frac{13}{48} = 0.27 \text{ g/cm}^3$$

4. What is the volume of an object that has a mass of 20 grams and a density of 2 g/cm³?

$$2 = \frac{20}{v} \Rightarrow v = 10 \text{ cm}^3$$

5. How many millimeters is 34 meters?

- $34 \text{ m} \times 1000 = 34000 \text{ mm}$

6. How many centimeters is 2.3 kilometers?

- $2.3 \text{ km} \times 1000 \text{ to m} = 2300 \text{ m} \times 100 \text{ to cm} = 230000 \text{ cm}$

7. How many kilograms are in 389 grams?

- $389 \text{ grams} \div 1000 = 0.389 \text{ kg}$

8. Explain the difference between a physical change and a chemical change.

- in a physical change, the substance changes appearance but stays the same substance.
- in a chemical change, the substance changes into a new substance by a chemical reaction.

9. Name three examples of physical changes and three examples of chemical changes.

- physical - tearing, dissolving, boiling chemical - color change, temperature change, fizzing

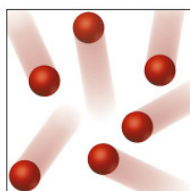
10. In the compound MgCl₂, what is the ratio of magnesium atoms to chloride atoms?

- 1 magnesium to 2 chlorine

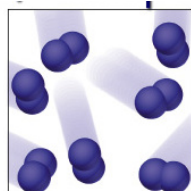
11. In Ca(OH)₂, what kind of atoms are present and how many of each kind are there?

- 1 calcium to 2 oxygen to 2 hydrogen

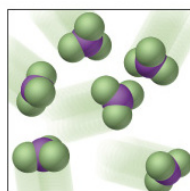
12. Draw a picture of an atom, an element, a molecule, and a compound. Label which is which.



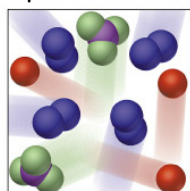
(a) Atoms of an element



(b) Molecules of an element



(c) Molecules of a compound



(d) Mixture of elements and a compound

Section 1B

13. Does the radius of atoms get smaller or larger as you move across the periodic table from left to right? Explain why.

- Smaller, the outermost electrons stay in the same ring, but more protons attract the electron ring closer to the nucleus, making the radius smaller.

14. Do atoms get smaller or larger as you move down the periodic table? Explain why.

- Bigger, each time you go down a row, you add another ring of electrons, making the radius bigger.

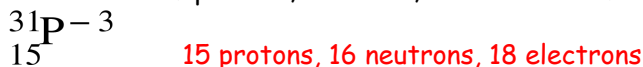
15. ${}_{20}^{40}\text{Ca}^{+2}$ As you go across the periodic table from left to right, does it get easier or harder to remove an electron? Explain why.

- Harder, it takes more energy to remove the electrons because they are closer to the nucleus, which has a stronger pull on the electrons.

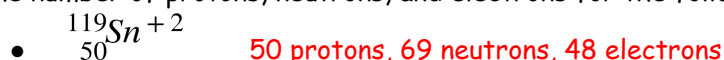
16. As you go down the periodic table, does it get easier or harder to remove an electron? Explain why.

- Easier, it takes less energy to remove the electrons because they are farther from the nucleus, which does not have as strong a pull on the electrons,

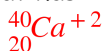
17. Identify the number of protons, neutrons, and electrons for the following atom of Boron:



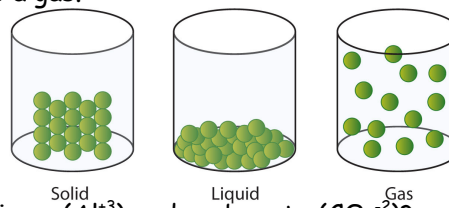
18. Identify the number of protons, neutrons, and electrons for the following atom of Tin?



19. What is the correct symbol for an ion that has 20 protons, 20 neutrons, and 18 electrons?



20. Draw atoms in 3 closed beakers. In beaker A, the atoms make up one piece of a solid. In beaker B, the atoms make up a liquid. In beaker C, the atoms make up a gas.



21. What is a polyatomic ion? List 4 examples.

- A polyatomic ion is a compound that has a charge that needs to be balanced by another ion. Examples include NO_3^{-1} , SO_4^{-2} , OH^{-1} and PO_4^{-3}

22. What is the correct formula for a compound between aluminum (Al^{+3}) and carbonate (CO_3^{-2})?



23. If an atom of Argon is neutral, how many protons, neutrons, and electrons does it have?

18 protons, 22 neutrons, 18 electrons

24. Explain the difference between carbon-12 and carbon-14.

- Carbon 12 and carbon 14 are both atoms of carbon with 6 protons. The difference is the number of neutrons. Carbon 12 has 6 neutrons and carbon 14 has 8 neutrons.

25. What is the most important part of an atom, in terms of properties for that element and where it sits on the periodic table?

- protons determine what the element is. electrons determine the properties and where the element is on the periodic table.

26. What name do we use to describe a row on the periodic table?

periods

27. What names do we use to describe a column on the periodic table?

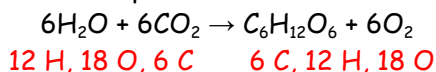
groups

28. List the names of the first two groups and the last two groups of the periodic table. Explain which is which.

- group 1 = alkali metals, group 2 = alkali earth metals, group 17 = halogens, group 18 = noble gases

Section 1C

29. List the type of atoms and the number of each type of atoms on the reactant side of the following equation. Do the same for the product side of the following equation.



30. How many moles of Boron are present in 128.0 g?

$$128 \text{ g B} \left(\frac{1 \text{ mol}}{10.8 \text{ g}} \right) = 11.85 \text{ mol}$$

31. What is the mass of 23.0 mol of Na_2S ?

$$23 \text{ mol Na}_2\text{S} \left(\frac{78.1 \text{ g}}{1 \text{ mol}} \right) = 1796 \text{ g}$$

32. What is the percent mass of oxygen in $\text{Ca}(\text{NO}_3)_2$?

$$\% \text{ O} = \frac{\text{mass oxygen}}{\text{mass of Ca(NO}_3)_2} \times 100 = \frac{96.0}{164.1} \times 100 = 58.5\%$$

33. What is the percent mass of potassium in potassium sulfate ?

$$\% \text{ K} = \frac{\text{mass potassium}}{\text{mass of K}_2\text{SO}_4} \times 100 = \frac{78.2}{174.3} \times 100 = 44.9\%$$

34. How many molecules are in a mole?

$$6.02 \times 10^{23}$$

35. How many molecules are in 4 moles of carbon dioxide?

$$4 \text{ mol} \left(\frac{6.02 \times 10^{23}}{1 \text{ mol}} \right) = 2.408 \times 10^{24} \text{ molecules}$$

36. What is the molar mass of aluminum oxide?

- $\text{Al}_2\text{O}_3 = 2(27) + 3(16) = 102 \text{ g/mol}$

37. How many atoms of carbon are in a piece of coal that weighs 2.15 g?

$$2.15 \text{ g C} \left(\frac{6.02 \times 10^{23}}{12 \text{ g C}} \right) = 1.08 \times 10^{23} \text{ atoms C}$$

38. Name the chemical compounds.

a. NaF sodium fluoride

c. $\text{Fe}(\text{NO}_3)_2$ iron (II) nitrate

b. $\text{Ca}(\text{OH})_2$ calcium hydroxide

d. NH_4Br ammonium bromide

39. Write the chemical formula for the chemical name.

a. Potassium sulfide K_2S

b. Magnesium oxide MgO

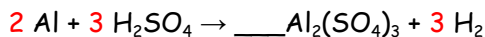
c. Lithium nitrate $LiNO_3$

d. Aluminum sulfate $Al_2(SO_4)_3$

e. iron (III) iodide FeI_3

Section 1D

40. Balance the equation:



41. Balance the following equations. What kind of equation are they (synthesis, decomposition, single replacement, double replacement, or combustion?)

a. $\underline{\quad} Na_2S + 2 HCl \rightarrow 2 NaCl + \underline{\quad} H_2S$ type: double replacement

b. $3 Pb + 2 H_3PO_4 \rightarrow 3 H_2 + \underline{\quad} Pb_3(PO_4)_2$ type: single replacement

c. $\underline{\quad} Zn + \underline{\quad} I_2 \rightarrow \underline{\quad} ZnI_2$ type: synthesis

d. $2 C_4H_{10} + 13 O_2 \rightarrow 8 CO_2 + 10 H_2O$ type: combustion

e. $2 NaI + \underline{\quad} Br_2 \rightarrow 2 NaBr + \underline{\quad} I_2$ type: single replacement

f. $2 H_2O \rightarrow 2 H_2 + \underline{\quad} O_2$ type: decomposition

42. Predict the products of the following reactions. Name the types of reactions they are.

a. $\underline{\quad} HCl + \underline{\quad} AgNO_3 \rightarrow \underline{\quad} AgCl + \underline{\quad} HNO_3$ type: double replacement

b. $\underline{\quad} Pb(NO_3)_2 + \underline{\quad} BaCl_2 \rightarrow \underline{\quad} Ba(NO_3)_2 + \underline{\quad} PbCl_2$ type: double replacement

c. $2 Na + \underline{\quad} Cl_2 \rightarrow \underline{\quad} NaCl$ type: synthesis

d. $2 Al_2O_3 \rightarrow \underline{\quad} 4 Al + \underline{\quad} 3 O_2$ type: decomposition

Sections 2A and 2B

43. Explain the cause of pressure.

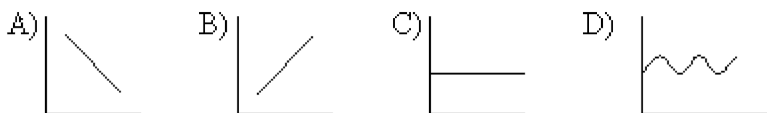
- particles of gas hitting the walls of the container, causing a push.

44. As pressure goes up, volume goes **down**. As pressure goes down, volume goes **up**

45. As pressure goes up, temperature goes **up**. As pressure goes down, temperature goes **down**.

46. As volume goes up, temperature goes **up**. As volume goes down, temperature goes **down**.

Use the following diagram to answer questions 47 and 48.



47. Which of the above lines best represents the relationship between pressure (y-axis) and volume (x-axis)?

A

48. Which of the above lines from the last question best represents the relationship between pressure (y-axis) and temperature (x-axis)?

B

49. Explain what will happen if you take an inflated balloon from a hot room into a cold room.

- The balloon will shrink. The gas particles will move slower, and will not hit as often, and the balloon will shrink in size

50. Explain what will happen if you take an inflated balloon from a cold room into a hot room.

- The balloon will expand. The gas particles will move faster, and will hit as often, and the balloon will expand as the particles push the walls of the balloon out.

51. Convert -52°C to Kelvin

$$-52 + 273 = 221 \text{ K}$$

52. Convert 124 kelvin to Celsius.

$$124 - 273 = -149^{\circ}\text{C}$$

53. Convert 75°F to Kelvin.

$$^{\circ}\text{C} = \frac{5}{9}(75 - 32) = 24^{\circ}\text{C} + 273 = 297 \text{ K}$$

54. What is temperature a measurement of?

- The movement of the molecules in the substance.

55. Convert 15.8 psi into atm.

$$15.8 \text{ psi} \left(\frac{1 \text{ atm}}{14.7 \text{ psi}} \right) = 1.07 \text{ atm}$$

56. Convert 1.97 atm into mmHg.

$$1.97 \text{ atm} \left(\frac{760 \text{ mmHg}}{1 \text{ atm}} \right) = 1497 \text{ mmHg}$$

57. Calculate the temperature of 45 g of Cl_2 in a 2 L flask at 35 atm.

$$P = 35 \text{ atm}$$

$$V = 2 \text{ L}$$

$$n = 45 \text{ g } \text{Cl}_2 \left(\frac{1 \text{ mol}}{71 \text{ g}} \right) = 0.634 \text{ mol}$$

$$R = 0.0821$$

$$T = ?$$

$$PV = nRT$$

$$35(2) = 0.634(0.0821)T$$

$$T = 1344 \text{ K}$$

58. A sample of CH_4 gas occupies 500 mL at a pressure of 1.25 atmospheres. If the gas is compressed to 245 mL (keeping temperature constant), what will be the final pressure?

$$P_1 = 1.25 \text{ atm}$$

$$V_1 = 500 \text{ mL}$$

$$P_2 = ?$$

$$V_2 = 245 \text{ mL}$$

$$P_1 V_1 = P_2 V_2$$

$$1.25(500) = P_2(245)$$

$$P_2 = 2.55 \text{ atm}$$

59. How many grams of helium will the gas inside a balloon weigh if the balloon holds 185 L of helium gas at STP?

$$P = 1 \text{ atm}$$

$$V = 185 \text{ L}$$

$$n = ?$$

$$R = 0.0821$$

$$T = 273 \text{ K}$$

$$PV = nRT$$

$$(1) 185 = n(0.0821) 273$$

$$n = 8.25 \text{ moles He} \left(\frac{4 \text{ g He}}{1 \text{ mole}} \right) = 33.0 \text{ g He}$$

60. How many moles of hydrogen gas would be contained in a 4.75 L container at 120° C and 90 atm of pressure?

$$P = 90 \text{ atm}$$

$$V = 4.75 \text{ L}$$

$$n = ?$$

$$R = 0.0821$$

$$T = 120 \text{ } ^\circ\text{C} + 273 = 393 \text{ K}$$

$$PV = nRT$$

$$90(4.75) = n(0.0821)393$$

$$n = 13.3 \text{ mol}$$

61. A gas at a temperature of -33° C occupies 0.8 liters. What will be the final volume of the gas if its temperature is raised to 40° C (pressure is held constant)?

$$V_1 = 0.8 \text{ L}$$

$$T_1 = -33 \text{ } ^\circ\text{C} + 273 = 240 \text{ K}$$

$$V_2 = ?$$

$$T_2 = 40 \text{ } ^\circ\text{C} + 273 = 313 \text{ K}$$

$$\frac{V_1}{T_1} = \frac{V_2}{T_2}$$

$$\frac{0.8}{240} = \frac{V_2}{313}$$

$$V_2 = 1.04 \text{ L}$$

Section 2C

62. List the four most abundant gases in the atmosphere, in order from most to least.

nitrogen, oxygen, argon, carbon dioxide

63. What is the greenhouse effect?

- The greenhouse effect happens when IR and visible light reflect off the surface of the Earth. While some of the light goes back into space, some doesn't have enough energy after the reflection and are absorbed in the atmosphere by the greenhouse gases.

64. Explain the problem that would be caused by the presence of too many greenhouse gases in the atmosphere.

- Too much heat could be absorbed by the atmosphere, effectively heating up the Earth, causing melting ice caps, rising seas and changing of growing seasons.

65. Name three gases that contribute to the greenhouse effect and circle the one with the greatest effect.

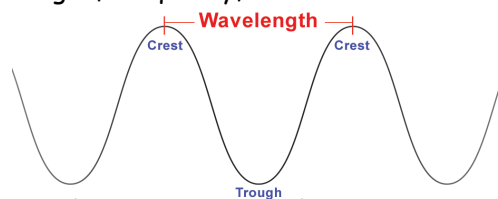
- carbon dioxide (greatest effect), methane (CH₄) and water vapor.

66. List the parts of the electromagnetic spectrum, in order from least energy to greatest energy.

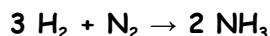
- radio waves, microwaves, infrared (IR), visible light, ultraviolet (UV), x-rays and gamma rays.

67. What is wavelength? Explain the relationship between wavelength, frequency, and amount of energy.

- distance between repeating parts of a wave, as shown in the picture. The longer the wavelength, the lower the frequency and the lower the energy.



68. As the following reaction takes place, will the volume increase, decrease, or stay the same?

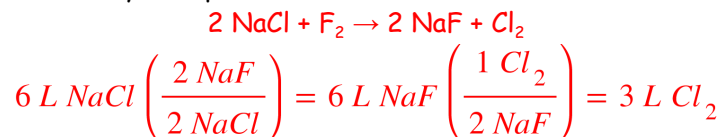


- decrease in volume, because 2 moles of NH₃ take up less room than 4 moles (3+1) moles of reactant

69. If you need to make 8 moles of NH_3 , how much hydrogen should you use?

$$8 \text{ mol } NH_3 \left(\frac{3 H_2}{2 NH_3} \right) = 12 \text{ mol } H_2$$

70. If you mix 6 liters of sodium chloride with fluorine, how much sodium fluoride will you expect to make? How much chlorine will you expect to make?



71. Determine the freezing point and boiling point of the substance to the right based on its heating curve.

- freezing point = $20^\circ C$
- boiling point = $50^\circ C$

