**Final Exam, 2024**

**Mr. Guch’s Topics In Chemistry**

**Before starting this exam, please fill out the following information:**

**1) Your full name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**2) Today’s date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Honor code: I swear, on my honor and in my faith in God, to take this exam without any information, devices, or assistance used either by myself or with others. Furthermore, I will not tolerate violations of this honor code among my peers, and swear to report any other student who does violate this honor code.**

**Please sign your name to indicate that you will abide by this pledge:**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Handy information for the exam:**

* **Every sheet of paper you require for this exam is included in this packet. You may remove the last two pages from this packet while taking the exam (they are a periodic table and sheet of scratch paper) but you must also staple them on the back of your completed test before turning it back in.**
* **You may not use your iPad until every student has completed the exam. No exceptions. You may, however, study for other exams using paper copies of your preparation materials.**
* **You may use the bathroom once during this exam and may only be gone for a total of three minutes. It is encouraged that you use the bathroom before the exam starts.**

**Please show your work. If you show your work I can give partial credit for answers which are incorrect but show a basic understanding of the material.**

**Mr. Guch, Topics in Chemistry Final Exam 2024**

Answer these questions. Be complete, show your work, and show your work. And show your work. All answers must be legible to be graded. You may not leave the room to use the bathroom unless you ask ahead of time, and you may leave for no more than three minutes. When you’re done, you can study for other classes, but you can’t use any electronic devices until everybody is done. Remember to show your work for partial credit.

1. Let’s say that for some unspecified reason I have 1.99 liters of nitrogen at a pressure of 0.65 atm at a temperature of 32o C. Given this information, how many moles of nitrogen are in this container? (R = 0.08206 L atm/mol K) (5 pt)
2. If I were to compress this nitrogen-filled container from problem 1 until the volume of the gas was 0.25 L, what would the new pressure in this container be? (5 pt)
3. As you know, there’s no such thing as an ideal gas. However, some gases behave more like ideal gases than others. What gas that we’ve mentioned in class this year do you believe would behave a lot like an ideal gas. Give reasons to support your answer! (3 pt)
4. What are the four postulates of the kinetic molecular theory? (8 pt)
5. Why is it important to use Kelvin instead of degrees Celsius when solving problems with gases? (3 pt)
6. What is the main difference in bonding between ionic compounds and covalent compounds? (4 pt)
7. Why are ionic compounds hard and brittle? (4 pt)

8) Why do covalent compounds tend to have very low melting and boiling points? (4 pt)

9) What is the molar mass of lead(IV) hydroxide, the formula of which is Pb(OH)4?(2 pt)

10) Define the following terms: (2 pt each)

* polarity
* law of conservation of mass
* ideal gas
* mole

11) How many moles are there in 40 grams of LiOH? (3 pt)

12) How much does 3.5 moles of H2SO4 weigh? (3 pt)

13) Balance the following equations: (1 pt each)

\_\_\_\_\_ C3H8 + \_\_\_\_\_ O2 → \_\_\_\_\_ CO2 + \_\_\_\_\_ H2O

\_\_\_\_\_ Na3PO4 + \_\_\_\_\_ Pb(OH)2 → \_\_\_\_\_ NaOH + \_\_\_\_\_ Pb3(PO4)2

\_\_\_\_\_ Pb + \_\_\_\_\_ P4 → \_\_\_\_\_ Pb3P2

\_\_\_\_\_ C2H4 + \_\_\_\_\_ Br2 → \_\_\_\_\_ C2Br4 + \_\_\_\_\_ H2

\_\_\_\_\_ S8 + \_\_\_\_\_ NaOH → \_\_\_\_\_\_ Na2S + \_\_\_\_\_ H2O2

14) Why do we measure eggs in “dozens” but atoms in “moles”? (4 pt)

15) Why do we need to balance chemical equations? (3 pt)

16) Explain why ionic compounds conduct electricity when dissolved and covalent compounds do not. (3 pt)

**Matching section:**

Match the following terms with the proper definition. To answer questions, write the letter of the correct definition to the left of each vocabulary word.

17)\_\_\_\_\_\_\_ pressure A) The postulates that describe the characteristics of a gas

18)\_\_\_\_\_\_\_ covalent bond B) Equal to 0.08206 Latm/mol K. Also known as “R”

19)\_\_\_\_\_\_\_ polarity C) 6.02 x 1023 things

20)\_\_\_\_\_\_\_ mole D) The partial separation of charge in a bond or

molecule

21)\_\_\_\_\_\_\_ kinetic molecular theory E) The amount of force that gas molecules exert

on the sides of a container that holds them.

22)\_\_\_\_\_\_\_ ideal gas constant F) Two electrons shared between atoms.

23) Name an ideal gas (1 pt) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

24) A can of soda has a volume of 455 mL. If the temperature of my classroom is 298 K and the water I put it into has a temperature of 285 K, what will the new volume of the can be after dunk it in the water? (5 pt)

25) In class we did a lab similar to the one described in problem 24 above, except that water had been boiling in the can before it was dunked into water. Describe why the volume of the can after it was dunked was about 124 mL, instead of the much larger number you found in the question above. (5 pt)

*Question 25 is the last question on this exam. Please review your work before turning this in.*

This page is scratch paper. Please feel free to remove it from the testing packet as a scratch paper, but please staple it to the back of the test packet before you turn it in.

**Solubility Table:**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **C2H3O2-** | **Br-** | **CO3-2** | **Cl-** | **F-** | **OH-** | **I-** | **NO2-** | **NO3-** | **O-2** | **PO4-3** | **SO3-2** | **SO4-2** | **S-2** |
| **Al+3** | S | S | X | S | I | I | S | I | S | I | I | I | S | D |
| **NH4+** | S | S | S | S | S | S | S | S | S | X | S | S | S | S |
| **Ba+2** | S | S | P | S | I | S | S | S | S | S | I | S | I | D |
| **Ca+2** | S | S | P | S | I | I | S | S | S | P | P | S | P | P |
| **Cu+2** | S | S | X | S | I | S | X | I | S | I | I | I | S | I |
| **H+** | S | S | S | S | S | S | S | S | S | S | S | S | S | S |
| **Fe+2** | X | S | P | S | I | I | S | I | S | I | I | I | S | I |
| **Fe+3** | X | S | X | S | I | I | S | I | S | I | P | I | P | D |
| **Pb+2** | S | S | X | I | I | P | P | I | S | P | I | I | P | I |
| **Li+1** | S | S | S | S | S | S | S | S | S | S | S | S | S | S |
| **Mg+2** | S | S | P | S | I | I | S | S | S | I | P | S | S | D |
| **Mn+2** | S | S | P | S | I | I | S | I | S | I | P | I | S | I |
| **K+1** | S | S | S | S | S | S | S | S | S | S | S | S | S | S |
| **Ag+1** | P | I | I | I | S | X | I | I | S | P | I | I | P | I |
| **Na+1** | S | S | S | S | S | S | S | S | S | D | S | S | S | S |
| **Sr+2** | S | S | P | S | I | S | S | S | S | S | I | S | P | S |
| **Sn+2** | D | S | X | S | I | X | S | I | D | I | I | I | S | I |
| **Sn+4** | S | S | X | S | I | I | D | I | X | I | X | I | S | I |
| **Zn+2** | S | S | P | S | I | P | S | I | S | P | I | I | S | I |

S = soluble in water

P = partially soluble in water

I = insoluble in water

D = compound decomposes in water

X = unknown/compound doesn’t form under standard conditions

**Activity Series:**

Metals (most active to least active):

Li > K > Ca > Na > Mg > Al > Mn > Zn > Fe > Ni > Sn > Pb > Cu > Ag > Pt > Au

Halogens (most active to least active):

F > Cl > Br > I

**Common polyatomic ions:**

ammonium – NH4**+1**

acetate – C2H3O2**-1**

bicarbonate – HCO3**-1**

carbonate – CO3**-2**

cyanide – CN**-1**

hydroxide – OH**-1**

nitrate – NO3**-1**

nitrite – NO2**-1**

sulfate – SO4**-2**

sulfite – SO3**-2**

permanganate – MnO4**-1**

phosphate – PO4**-3**

