

US 110 Exam 1. Jordan, Fall 2005

Name Key

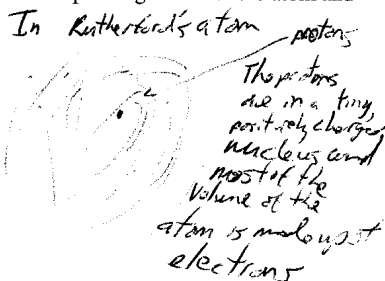
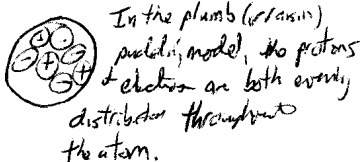
By submitting this exam, I affirm that I have neither given nor received unauthorized aid on this assignment.

You must show all work for credit. Express each answer to the correct number of significant figures.

Useful information: $1\text{ m} = 1.094\text{ yd}$, 2.2 lbs , $1\text{ mL} = 1\text{ cm}^3$, $1\text{ L} = 1.056\text{ qt}$, $1\text{ in} = 2.54\text{ cm}$, $1\text{ kg} =$

$$^{\circ}\text{C} = \frac{5}{9} (^{\circ}\text{F} - 32) \quad ^{\circ}\text{F} = \frac{9}{5} (^{\circ}\text{C}) + 32$$

(1)(4 points) Describe the difference between the plum or raisin pudding model of the atom and Rutherford's model of the atom.



(2)(2 points) Fill in the following table

| isotope | protons | neutrons | electrons |
|------------------------|---------|----------|-----------|
| $^{32}_{14}\text{Si}$ | 14 | 18 | 14 |
| $^{210}_{82}\text{Pb}$ | 82 | 128 | 82 |

(3)(3.5 points) List the 7 base SI units and the property each one measures

- meters length
- kilograms mass
- second time
- Kelvin temperature
- candela luminous intensity
- mole amount of something
- Ampere current

(7)(5 points) List 4 points of Dalton's Atomic theory including the one that was later found to be incorrect (and circle the one that was incorrect).

On p40 of the text book

(8)(5 points) The density of mercury is 13.59 g/mL. What volume of mercury has a mass of ¹²⁵~~100~~ kg? Would this fit into a 2 L pop bottle?

$$\cancel{100} \text{ } 125 \text{ kg} = 125,000 \text{ g}$$
$$125,000 \text{ g} \times \frac{1 \text{ mL}}{13.59 \text{ g}} = \boxed{9.20 \times 10^3 \text{ mL}}$$

no, it is over 9 L.

(9)(4 points) Whose experiment determined the mass of the electron? How did he do it?

Robert Millikan. He suspended charged oil drops between 2 charged plates. The charge on the oil drops was always an integer multiple of the charge on the electron.

(10)(4 points) Classify the following as either element, compound, heterogeneous mixture, or homogeneous mixture.

(a) table salt *compound*

(b) water *compound*

(c) sucrose *compound*

(d) Windex® window cleaner *homogeneous solution*

(11)(4 points) On another planet, calcium has only two naturally occurring isotopes. Given the information below what is the average molecular weight that should go on the periodic table for the planet (this will not be the actual mass on OUR the periodic table).

^{40}Ca mass = 39.963 amu, abundance = 71.58%

^{46}Ca mass = 45.954 amu, abundance = 28.42%

$$0.7158(39.963 \text{amu}) + 0.2842(45.954 \text{amu}) = \boxed{41.67 \text{amu}}$$

(12)(4 points) Perform the following calculations to the correct number of significant figures.

$$\text{(a) } \frac{263.5973 + 2.37}{62.375 - 0.055} = \frac{265.97}{62.320} = \boxed{4.2678}$$

$$\text{(b) } 763.63 + 0.007 + 0.05 = \boxed{763.69}$$

(13) Fill in the following table (4 points)

| | Formula | Name |
|---|-----------------------------------|--------------------|
| a | H ₂ SO ₄ | Sulfuric acid |
| b | CaCl ₂ | calcium chloride |
| c | SO ₃ | sulfur trioxide |
| d | Fe(NO ₃) ₃ | iron (III) nitrate |

(14) Extra Credit(4 pts): A certain copper mine processes an ore that is almost pure Cu₂O. After opening up a new vein, the operators found that the normal processing wasn't working with the ore. The analysis of the copper compound in the ore found that it was 20.1% oxygen and 79.9%Cu. Why isn't the process working? This question is an example of what law?

~~SOLUTION~~

$$\text{Cu}_2\text{O} \text{ FW} = 143.1 \frac{\text{g}}{\text{mol}}$$

$$\% \text{O} = \frac{16.0 \text{ g/mol}}{143.1 \frac{\text{g}}{\text{mol}}} = 11.2\% \text{ O}$$

$$\% \text{Cu} = \frac{127.1 \text{ g/mol}}{143.1 \frac{\text{g}}{\text{mol}}} = 88.8\% \text{ Cu}$$

i.e. the ore isn't Cu₂O

If I have 100g of the unknown ore

$$20.1 \text{ g is O} \div 16.0 \frac{\text{g}}{\text{mol}} = 1.26 \text{ moles O}$$

$$79.9 \text{ g is Cu} \div 63.55 \frac{\text{g}}{\text{mol}} = 1.26 \text{ moles Cu}$$

CuO different oxide than
why the process doesn't work

Law of Multiple Proportions

(4)(8 points) Conversions

(a) Convert 37 in to m

$$\frac{37 \text{ in} \times 2.54 \text{ cm}}{1 \text{ in}} = 93.98 \text{ cm}$$
$$93.98 \text{ cm} \times \frac{1 \text{ m}}{100 \text{ cm}} = \boxed{0.94 \text{ m}}$$

(b) What is -40°C in $^\circ\text{F}$?

$$\frac{9}{5}(-40^\circ\text{C}) + 32 = \boxed{-40^\circ\text{F}}$$

(c) Convert 26.5 cm to nm

$$\frac{26.5 \text{ cm}}{1} \times \frac{1 \text{ m}}{100 \text{ cm}} = 0.265 \text{ m}$$

(d) ~~4.04 m³~~ to quarts

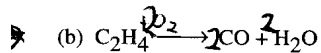
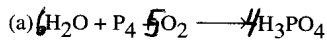
$$0.265 \text{ m} \times \frac{1 \text{ nm}}{10^{-9} \text{ m}} = 2.65 \times 10^8 \text{ nm}$$

$$4.04 \times 10^3 \text{ mL}$$

$$4.04 \times 10^3 \text{ mL} = 4.04 \text{ L}$$

$$4.04 \text{ L} \times \frac{1.056 \text{ qt}}{1 \text{ L}} = \boxed{4.27 \text{ qt}}$$

(5)(4 points) Balance the following equations



(6)(2 points) Complete the equation by switching the cations and anions of the reagents, then balance the equation (metathesis reaction)

