

Practice Exam 1

For review on June 30, 2015

PART A (MULTIPLE CHOICE) Circle the correct response to each question:

1. The mass of an object was determined four times using four different balances: 7.613 g, 7.618 g, 7.615 g and 7.618 g. The accepted mass of the object was 7.433 g. Which statement best describes the results of the experiment?

- (A) poor precision and poor accuracy
- (B) poor precision and good accuracy
- (C) good precision and good accuracy
- (D) good precision and poor accuracy

2. In what respect does an atom of magnesium, Mg, differ from a magnesium ion, Mg^{2+} ?

- (A) The ion has an inert gas configuration, the atom does not
- (B) The positive charge on the nucleus of the ion is two units greater than the nuclear charge on the atom
- (C) The ion has two more protons than the atom
- (D) The ion has two more planetary electrons than the atom

3. An atom of strontium-90, ${}^{90}_{38}Sr$, contains

- (A) 38 electrons, 38 protons, 52 neutrons
- (B) 38 electrons, 38 protons, 90 neutrons
- (C) 52 electrons, 52 protons, 38 neutrons
- (D) 52 electrons, 38 protons, 38 neutrons

4. Element X occurs naturally to the extent of 20.0% ${}^{12}X$ and 80.0% ${}^{13}X$. The atomic mass of X is nearest

- (A) 12.2
- (B) 12.5
- (C) 12.8
- (D) 13.0

5. What is the mass percent of oxygen in $Fe_2(SO_4)_3$?

- (A) 15.40%
- (B) 18.76%
- (C) 30.80%
- (D) 48.01%

6. Oxalic acid is 26.67% carbon, 2.22% hydrogen and 71.11% oxygen and its molecular mass is 90 g/mole. What is the molecular formula for oxalic acid?

- (A) HCO_2
- (B) $H_2C_2O_4$
- (C) $H_{10}C_4O_2$
- (D) $H_6C_3O_3$

7. Avogadro's number equals the number of
- (A) atoms in one mole of atom
 - (B) marbles in one mole of marbles
 - (C) molecules in one mole of O₂
 - (D) All of the above
8. What mass of carbon is present in 0.500 mol of sucrose (C₁₂H₂₂O₁₁) if the molar mass of sucrose is 342 g/mole?
- (A) 60.0 g
 - (B) 72.0 g
 - (C) 90.0 g
 - (D) 120 g
9. A 3.41×10^{-6} g sample of a compound is known to contain 4.67×10^{16} molecules. This compound is:
- (A) CO₂
 - (B) CH₄
 - (C) NH₃
 - (D) H₂O
10. What is the mass of SbF₃ needed to produce 1.00 g of Freon-12, CCl₂F₂, if the reaction is represented by this equation: $3 \text{ CCl}_4 + 2 \text{ SbF}_3 \rightarrow 3 \text{ CCl}_2\text{F}_2 + 2 \text{ SbCl}_3$
- (A) 0.667 g
 - (B) 0.986 g
 - (C) 1.48 g
 - (D) 2.22 g

PART B (SHORT ANSWERS) Please show all of your calculations in the places provided.

1. (a) (5 pts) Complete the table below with appropriate unit conversions and express each new value in the correct number of significant figures:

74 nm	mm
lb	0.0055 kg
0.75 qt	mL
175 cm	ft
mL	2.37 dL

(b) (5 pts) Blood flows through the aorta at a rate of 50 cm/s. What is this flow rate in feet per hour?

2. (a) (5 pts) Complete the table with the missing ions, formula or name:

Cation	Anion	Ionic Formula	Name
Na ⁺	Te ²⁻		
		CaSO ₄	
			Ammonium carbonate
		Fe ₂ O ₃	
			Potassium acetate

(b) (5 pts) An unknown piece of metal has a mass of 89.3 g. If it is submerged in a graduated cylinder of liquid originally at a level of 325.2 mL, the level rises to 442.5 mL. What is the density of this unknown metal?

3. (a) (5 pts) Complete the following table for neutral atoms:

Element	Atomic Symbol	Atomic Number	Atomic mass	# protons	# neutrons	# electrons
				84	134	
		55			82	
Tin-126						50
		86	222			
	${}^{148}_{64}\text{Gd}$		148			

(b) (5 pts) The element rubidium has two naturally occurring isotopes with the following masses and natural abundances:

Isotope	Mass (amu)	Abundance (%)
Rb-85	84.9118	72.15
Rb-87	86.9092	27.85

Calculate the atomic mass for rubidium.

4. (a) (5 pts) Methylphenidate hydrochloride is the chemical name for the compound known as Ritalin, which is a mild central nervous system stimulant used to treat ADHD and narcolepsy. %C = 62.35%, %H = 7.42%, Cl = 13.16%, %N = 5.20%
What is the empirical formula for Ritalin?

(b) (5 pts) Provide names for the formulae of covalent molecules listed:

(i) SeF_6

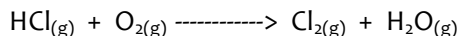
(ii) N_2O_4

(iii) P_2O_5

(iv) AsCl_3

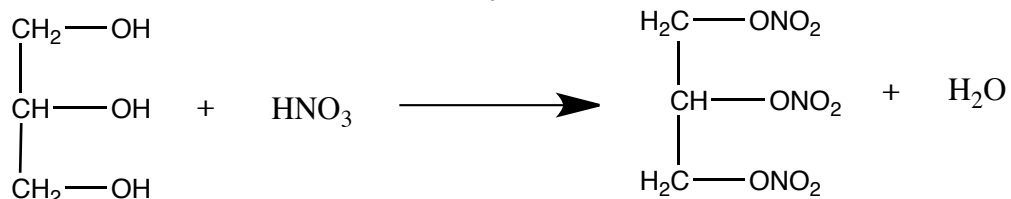
(v) CF_4

5. a. (5 pts) The Deacon process is one way to recover chlorine, Cl₂, in industrial plants when other reactions produce hydrochloric acid, HCl, using oxygen as an oxidizing reagent:



Balance the equation and calculate the number of kilograms of water that would be produced from 26 kg of HCl in the Deacon process.

(b)(5 pts) Glycerol is one of the byproducts of soap manufacture. It was discovered in 1847 the glycerol reacts with nitric acid (HNO₃) to produce nitroglycerin:



Balance the equation and determine how many grams of glycerol would be needed to produce 37 g of nitroglycerin.

Conversion Factors

1.0 kilogram	2.2 pounds	1000 grams
1.0 kilometers	0.6214 miles	1000 meters
1 meter	39.37 inches	1000 millimeters
1 liter	1.057 quarts	0.264 gallons
1 cm ³	1 milliliter	0.0338 fluid ounces
°C = (°F - 32) x 5/9	°F = (°C x 1.8) + 32°	K = °C + 273

Equations

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