General Chemistry 1 *(CHEM 1141)*

Shawnee State University – Fall 2024

October 10, 2024

Exam # 1 A

Name _____

Please print your full name, and the exam version (1 A) that you have on the scantron sheet!
(Bubble in the best answer choice for each question on the scantron sheet in pencil!)

Please ☑ check the box next to your correct section number.

Section #:

- ❒ 1. (Mon Lab, 11:10 AM – 1:55 PM)
- ❒ 2. (Wed Lab, 11:10 AM – 1:55 PM)

} **Fleeman**

- ❒ 3. (Tue Lab, 11:00 AM – 1:50 PM)
- ❒ 4. (Thu Lab, 11:00 AM – 1:50 PM)

} **Napper**

Multiple Choice:	_____	**/ 50**
Q21:	_____	**/ 10**
Q22:	_____	**/ 10**
Q23:	_____	**/ 10**
Q24:	_____	**/ 10**
Q25:	_____	**/ 10**
BONUS:	_____	**/ 3**
TOTAL:	_____	**/ 100**

Each problem in this section (multiple choice) is worth 2.5 points!

Q1. The SI prefixes meaning 10^6 and 10^{-6} respectively are:

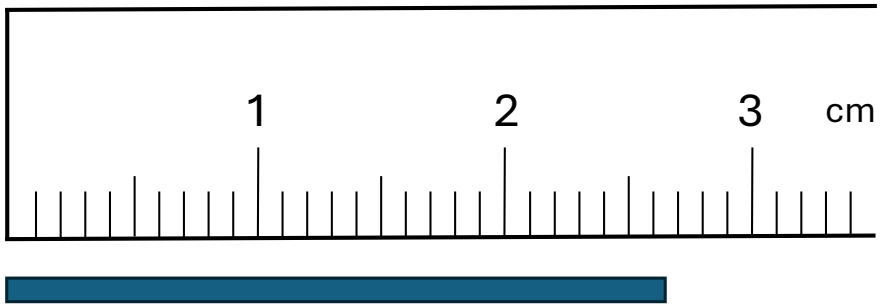
A) M, μ

B) M, m

C) G, μ

D) G, m

Q2. What is the correct reading for the length of the object below:



A) 2.6 cm

B) 2.06 cm

C) 2.64 cm

D) 2.064 cm

Q3. An example of a heterogeneous mixture could be:

A) pizza

B) oxygen

C) water

D) saline

Q4. Which of the following would be an example of a chemical property?

A) water boiling

B) ice melting

C) alcohol evaporating

D) iron rusting

Q5. An example of a semi-metal element is:

A) F

B) Si

C) Mg

D) H

Q6. An example of a naturally occurring diatomic element is:

A) iodine

B) potassium

C) carbon

D) mercury

Q7. An irregularly shaped object with a mass of 29.6 g was placed into a graduated cylinder filled with 17.0 mL of water. The water level rose to 24.6 mL. Determine the density of the object.

A) 0.257 g/mL

B) 0.712 g/mL

C) 1.20 g/mL

D) 3.89 g/mL

Q8. The name given to an ionic compound that retains water molecules in its solid form is:

A) hydrate

B) anhydrous salt

C) soluble salt

D) precipitate

Q9. Using the lowest set of whole number coefficients, balance the following equation and determine the coefficient in front of molecular oxygen.

$$\_\_\_\_\_ C_8H_{18} + \_\_\_\_\_ O_2 \rightarrow \_\_\_\_\_ CO_2 + \_\_\_\_\_ H_2O$$

A) 8

B) 12

C) 16

D) 25

Q10. The number of moles of C_2H_4 in a 12.8 g sample?

A) 28.1 mol

B) 2.19 mol

C) 0.600 mol

D) 0.456 mol

Q11. The number of hydrogen atoms in a 12.8 g sample of C_2H_4?

A) 2.75×10^{23}

B) 1.10×10^{24}

C) 6.02×10^{23}

D) 3.94×10^{24}

Q12. The mass percent of carbon in $C_2H_5NO_2$ is:

A) 81.3%

B) 75.2%

C) 32.0%

D) 16.1%

Q13. The number 0.0005230 has how many significant digits?

A) 3

B) 4

C) 7

D) 8

Q14. Of the following symbol/name combination of the elements, which is incorrect?

A) F/fluorine

B) Na/sodium

C) Mn/magnesium

D) Fe/iron

Q15. The molar mass of $CoCl_2 \cdot 6H_2O$?

A) 129.8 g/mol

B) 141.9 g/mol

C) 238.0 g/mol

D) 296.9 g/mol

Q16. The limiting reagent in a chemical reaction

A) is in excess

B) is consumed completely

C) has the largest molar mass

D) has the smallest molar mass

Q17. A species has 22 protons, 20 electrons, and 26 neutrons. Determine its nuclide symbol.

A) $^{48}_{22}Ti^{2+}$

B) $^{46}_{26}Ca^{2-}$

C) $^{48}_{22}Ca^{2+}$

D) $^{46}_{20}Ti^{2-}$

Q18. The elements in Group 1A (1), 2A (2), and 8A (18) are called, _____, respectively.

A) alkaline-earth metals, alkali metals, noble gases

B) halogens, alkali metals, noble gases

C) alkali metals, transition metals, halogens

D) alkali metals, alkaline-earth metals, noble gases

Q19. Find the number of protons, neutrons, and electrons in the platinum isotope, Pt-195.

A) 195 protons, 78 neutrons, 195 electrons

B) 78 protons, 78 neutrons, 117 electrons

C) 78 protons 156 neutrons, 117 electrons

D) 78 protons, 117 neutrons, 78 electrons

Q20. Which of the following compounds is most likely to be ionic?

A) $SiCl_4$ B) $AlBr_3$

C) IF_7 D) N_2O_5

Each problem in this section (short answer) is worth 10 points!
All work must be shown to receive credit!
You must use the factor–label (conversion–factor) method for all conversions!
Be sure to include units where applicable!
All numeric answers must be rounded to the correct number of significant figures!

Q21. **(a) Write out the chemical formulas for the following substances:**

(i) sodium carbonate decahydrate _____

(ii) trichlorine pentabromide _____

(iii) aluminum sulfide _____

(iv) iron(II) phosphate _____

(v) cuprous sulfate _____

(b) Name the following substances:

(vi) NH_4NO_3 _____

(vii) N_4S_9 _____

(viii) $H_2SO_4(aq)$ _____

(ix) $Fe(HCO_3)_2$ _____

(x) P_6N_7 _____

Q22. The formation of sulfuric acid, $H_2SO_4(aq)$, can be achieved via:

$$3\ SO_2 + 2\ HNO_3 + 2\ H_2O \rightarrow 3\ H_2SO_4 + 2\ NO$$

(a) If 1.4 mol of HNO_3 react completely, how many moles of H_2SO_4 can be formed?

(b) If 39.2 g of SO_2 react completely, how many grams of H_2SO_4 can be formed?

(c) If 1.8 mol of SO_2 and 1.4 mol of HNO_3 react with an excess of H_2O, what's the theoretical yield of H_2SO_4 (in moles)?

(d) In part (c) above, if 0.750 mol of H_2SO_4 is actually formed, what is the percent yield of the reaction?

Q23. Provide the results of the following calculations with the correct significant figures and units if applicable.

A) 125.465 m − 32.74 m = _____

B) 0.000461 ft × 0.00233 ft = _____

C) $(2.312 - 1.44) / 3.2 \times 10^{-2}$ = _____

D) 122.240 + 1.8 = _____

Q24. A can of Pepsi contains 7.0×10^3 drops of pop. How many cubic meters of pop is this? Use the conversion-factor method when solving this problem.

(1 mL = 20 drops) (1 mL= 1 cm^3)

Treat both of this conversions as exact.

Q25. NutraSweet Natural, an artificial sweetener used in many beverages and foods, is 57.14% C (by mass), 6.16% H (by mass), 9.52% N (by mass), and 27.18% O (by mass).

(a) Calculate the empirical formula of NutraSweet Natural. **Show all work.**

(b) If the molar mass of NutraSweet Natural is 294.3 g/mol, what is its molecular formula? **Show all work.**

3 Point Bonus Question

Thallium sulfate exists as both Tl_2SO_4 and $Tl_2(SO_4)_3$ – where the first form is thallium(I) sulfate and the second is thallium(III) sulfate. If the percent by mass of sulfur in a pure sample of "thallium sulfate" is 13.8%, which form must you have?

Exam checklist:

(Check the boxes to certify the following:)

- ❒ My full name is written legibly on the front page
- ❒ My correct lab section has been indicated on the front page
- ❒ My full name is written legibly on the scantron sheet
- ❒ My exam version (A, B, C, or D) is written on the scantron sheet
- ❒ I have shown work for all problems (where appropriate), paying attention to
    - Significant figures / decimal places
    - Units
- ❒ I have used the conversion-factor method for all conversions
- ❒ If I have torn off the back page (periodic table), I will not turn it in with my exam!

Thank you from the Chemistry Professors and Good Luck!

Useful information:

$N_A = 6.022 \times 10^{23}\ \text{mol}^{-1}$

Periodic Table of the Elements

IUPAC	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Old	*IA*	*IIA*											*IIIA*	*IVA*	*VA*	*VIA*	*VIIA*	*VIIIA*
1	1 **H** 1.008																	2 **He** 4.003
2	3 **Li** 6.941	4 **Be** 9.012											5 **B** 10.81	6 **C** 12.01	7 **N** 14.01	8 **O** 16.00	9 **F** 19.00	10 **Ne** 20.18
3	11 **Na** 22.99	12 **Mg** 24.31											13 **Al** 26.98	14 **Si** 28.09	15 **P** 30.97	16 **S** 32.07	17 **Cl** 35.45	18 **Ar** 39.95
4	19 **K** 39.10	20 **Ca** 40.08	21 **Sc** 44.96	22 **Ti** 47.87	23 **V** 50.94	24 **Cr** 52.00	25 **Mn** 54.94	26 **Fe** 55.85	27 **Co** 58.93	28 **Ni** 58.69	29 **Cu** 63.55	30 **Zn** 65.39	31 **Ga** 69.72	32 **Ge** 72.61	33 **As** 74.92160	34 **Se** 78.96	35 **Br** 79.90	36 **Kr** 83.80
5	37 **Rb** 85.47	38 **Sr** 87.62	39 **Y** 88.91	40 **Zr** 91.22	41 **Nb** 92.91	42 **Mo** 95.94	43 **Tc** [98]	44 **Ru** 101.1	45 **Rh** 102.9	46 **Pd** 106.4	47 **Ag** 107.9	48 **Cd** 112.4	49 **In** 114.8	50 **Sn** 118.7	51 **Sb** 121.8	52 **Te** 127.60	53 **I** 126.9	54 **Xe** 131.3
6	55 **Cs** 132.9	56 **Ba*** 137.3	51–71	72 **Hf** 178.5	73 **Ta** 180.9	74 **W** 183.8	75 **Re** 186.2	76 **Os** 190.2	77 **Ir** 192.2	78 **Pt** 195.1	79 **Au** 197.0	80 **Hg** 200.6	81 **Tl** 204.4	82 **Pb** 207.2	83 **Bi** 209.0	84 **Po** [210]	85 **At** [210]	86 **Rn** [222]
7	87 **Fr** [223]	88 **Ra**** [226]	89–103	104 **Rf** [267]	105 **Db** [268]	106 **Sg** [269]	107 **Bh** [270]	108 **Hs** [277]	109 **Mt** [278]	110 **Ds** [281]	111 **Rg** [282]	112 **Cn** [285]	113 **Nh** [285]	114 **Fl** [289]	115 **Mc** [290]	116 **Lv** [293]	117 **Ts** [294]	118 **Og** [294]

6	57 **La** 138.9	58 **Ce** 140.1	59 **Pr** 140.9	60 **Nd** 144.2	61 **Pm** [145]	62 **Sm** 150.4	63 **Eu** 152.0	64 **Gd** 157.3	65 **Tb** 158.9	66 **Dy** 162.50	67 **Ho** 164.9	68 **Er** 167.3	69 **Tm** 168.9	70 **Yb** 173.0	71 **Lu** 175.0
7	89 **Ac** [227]	90 **Th** 232.0	91 **Pa** 231.0	92 **U** 238.0	93 **Np** [237]	94 **Pu** [244]	95 **Am** [243]	96 **Cm** [247]	97 **Bk** [247]	98 **Cf** [251]	99 **Es** [252]	100 **Fm** [257]	101 **Md** [258]	102 **No** [259]	103 **Lr** [266]