

# General Chemistry 1 (CHEM 1141)

Shawnee State University – Autumn 2023

September 21, 2023

## 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)
  - 3. (Tue Lab, 11:00 AM – 1:50 PM)
  - 4. (Thu Lab, 11:00 AM – 1:50 PM)
- } **Fleeman**
- } **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!**

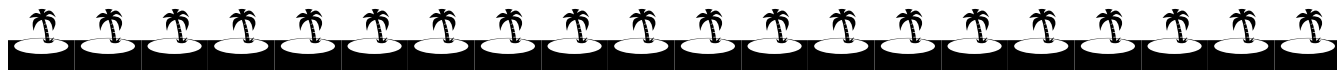


- Q1. The SI prefixes meaning  $\times 10^{-3}$ ,  $\times 10^9$ , and  $\times 10^{-9}$  respectively are:
- A) milli, mega, and pico
  - B) micro, mega, and pico
  - C) milli, giga, and nano
  - D) micro, tera, and nano
- Q2. Tungsten has a density of  $19.0 \text{ g/cm}^3$ . A sample of tungsten with a mass of  $48.5 \text{ g}$  would have a volume of:
- A)  $2.55 \text{ cm}^3$
  - B)  $0.392 \text{ cm}^3$
  - C)  $922 \text{ cm}^3$
  - D)  $29.5 \text{ cm}^3$
- Q3. The quantity  $1.100 \times 10^5 \text{ m}$  contains how many significant figures?
- A) 2
  - B) 3
  - C) 4
  - D) 5
- Q4. An example of a compound, a homogeneous mixture, and an element (respectively) would be:
- A) water, air, & mercury
  - B) saline, salt, & water
  - C) salt, water, & silver
  - D) baking soda, air, & chalk
- Q5. Which scientist is credited with the “modern” invention of atomic theory in 1808?
- A) Dmitri Mendeleev
  - B) Michael Faraday
  - C) Amadeo Avogadro
  - D) John Dalton

- Q6. The gold foil experiment showed that:
- A) neutrons are constituent particles of nuclei and have no electrical charge
  - B) elements cannot be broken down chemically into simpler components
  - C) atoms are mostly empty space, with a solid nuclear core
  - D) electrons behave like both waves and particles
- Q7. A single atom of neon-16 would contain:
- A) 16 p, 10 n, 10 e
  - B) 10 p, 10 e, 16 n
  - C) 16 p, 8 e, 8 n
  - D) 10 p, 6 n, 10 e
- Q8. Based upon its location on the periodic table, which element would be most chemically similar to potassium?
- A) Na
  - B) As
  - C) O
  - D) C
- Q9. Which of the following compounds would have the IUPAC name of titanium(IV) oxide?
- A)  $\text{TiO}_2$
  - B)  $\text{TiO}_4$
  - C)  $\text{Ti}_4\text{O}$
  - D)  $\text{Ti}_2\text{O}$
- Q10. How many atoms are there in a 8.9 g sample of chlorine?
- A)  $6.0 \times 10^{23}$
  - B)  $3.0 \times 10^{23}$
  - C)  $1.5 \times 10^{23}$
  - D)  $0.75 \times 10^{23}$

- Q11. How many moles of  $\text{K}_2\text{SO}_4$  are in 35.0 g of  $\text{K}_2\text{SO}_4$ ?
- A) 2.11 moles
  - B) 0.259 moles
  - C) 610 moles
  - D) 0.201 moles
- Q12. What is the mass percentage of phosphorus in cupric phosphate,  $\text{Cu}_3(\text{PO}_4)_2$ ?
- A) 8.14%
  - B) 65.1 %
  - C) 16.3 %
  - D) 13.3%
- Q13. A common ingredient in slime is borax with the following chemical formula,  $\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$ . Calculate the molar mass of borax.
- A) 219.2 g/mol
  - B) 381.4 g/mol
  - C) 201.2 g/mol
  - D) 221.4 g/mol
- Q14. What is the mass number of an ion with 106 electrons, 157 neutrons, and a 1+ charge?
- A) 106
  - B) 107
  - C) 263
  - D) 264
- Q15. Which of the following is not a physical process?
- A) distillation
  - B) chromatography
  - C) evaporation
  - D) rusting

- Q16. Which of the following is a diatomic element?
- A) carbon
  - B) iodine
  - C) sulfur
  - D) helium
- Q17. Convert 3600 mL to nL.
- A)  $3.6 \times 10^{-6}$  nL
  - B)  $3.6 \times 10^{-9}$  nL
  - C)  $3.6 \times 10^9$  nL
  - D)  $3.6 \times 10^6$  nL
- Q18. An element has two isotopes with the following abundances and isotopic masses: 59.69% abundance with 79.9813 amu and 40.31% with 80.9163 amu. Calculate the average atomic mass of this element.
- A) 80.44 amu
  - B) 80.36 amu
  - C) 80.20 amu
  - D) 80.07 amu
- Q19. Luke is practicing for a golf tournament. His normal driver distance is 250 yards. He drives three balls, traveling at distances of 190 yards, 195 yards, and 193 yards. Which of the following is true about his driver distances?
- A) accurate but not precise
  - B) precise but not accurate
  - C) both accurate and precise
  - D) neither accurate nor precise
- Q20. Which of the following substances can be classified as an acid?
- A)  $\text{HNO}_3$
  - B)  $\text{KOH}$
  - C)  $\text{Mg}(\text{OH})_2$
  - D)  $\text{Li}_3\text{PO}_4$



**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) Provide IUPAC names for the following substances:

$\text{MgSO}_4$  \_\_\_\_\_

$\text{N}_2\text{F}_6$  \_\_\_\_\_

$\text{CuCl}$  \_\_\_\_\_

$\text{K}_2\text{SO}_4 \cdot 3\text{H}_2\text{O}$  \_\_\_\_\_

$\text{Cl}_4\text{F}_{10}$  \_\_\_\_\_

$\text{Br}_7\text{F}_8$  \_\_\_\_\_

$\text{NaHCO}_3$  \_\_\_\_\_

(b) Write molecular formulas that correspond to the following names:

aluminum hydroxide \_\_\_\_\_

pentachlorine nonafluoride \_\_\_\_\_

sulfuric acid \_\_\_\_\_

Q22. (a) What is the empirical formula of a compound containing 17.41 % carbon (by mass), and 82.59 % fluorine (by mass)? Show all work.

(b) If the molar mass of the compound above is 272.0 g/mol, what must its molecular formula be?

- Q23. (a) While preparing for his chemistry exam, a student drank 1.75 L of coffee. If 12 fluid ounces of coffee contains 85 mg of caffeine, how many pounds of caffeine did he consume? (1 fl oz = 29.57 mL) (1 lb = 453.6 g)

**Use the conversion-factor method when solving this problem!**

- (b) Calculate the number of molecules of caffeine, ( $\text{C}_8\text{H}_{10}\text{N}_4\text{O}_2$ ), he consumed.



Q24. Place the correct number of the element or ion next to the letter that best matches.

(use each number only once)

_____	A.	Lithium ion	1.	Ne
_____	B.	Cupric ion	2.	Sm
_____	C.	Polyatomic ion	3.	Se
_____	D.	Alkaline-earth metal	4.	Mg
_____	E.	Element with 34 protons	5.	Li <sup>+</sup>
_____	F.	Element in Group 1A	6.	Cs
_____	G.	Noble gas	7.	Sr
_____	H.	Period 5 element	8.	Cu <sup>2+</sup>
_____	I.	Inner-transition metal	9.	CN <sup>-</sup>
_____	J.	A metalloid	10.	Si

Q25. Complete the following calculations and record your answers with the correct number of significant figures and units if applicable:

A)  $227.47 - 27.00 =$  \_\_\_\_\_

B)  $\frac{47.25 - 33.2}{2.720 \times 4.624} =$  \_\_\_\_\_

C)  $0.000432 \times 0.0733 =$  \_\_\_\_\_

D)  $\frac{0.0238 \text{ m} \times 5.00 \text{ m}}{3.712 \text{ m} + 4.6 \text{ m}} =$  \_\_\_\_\_

E)  $2700.0 + 47 - 9.02 =$  \_\_\_\_\_



### 3 Point Bonus Question



What mass does a silver nugget with a volume of  $1.5 \text{ in}^3$  have? The density of silver is  $10.5 \text{ g/cm}^3$ . Hint:  $1 \text{ in} = 2.54 \text{ cm}$  (exactly).

## 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

IA	IIA	IIIA										IVA	VA	VIA	VIIA	VIIIA																																																																																																	
1	2	13	14	15	16	17	18	13	14	15	16	17	18	13	14	15	16	17	18																																																																																														
1 H 1.008	2 He 4.003	5 B 10.81	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18	13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.07	17 Cl 35.45	18 Ar 39.95	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	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	55 Cs 132.9	56 Ba* 137.3	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	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]	87 Fr [223]	88 Ra** [226]	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 [262]	104 Rf [261]	105 Db [262]	106 Sg [266]	107 Bh [264]	108 Hs [265]	109 Mt [268]	110 Ds [269]	111 Rg [272]	112 Cn [277]	113 Nh [285]	114 Fl [285]	115 Mc [285]	116 Lv [289]	117 Ts [293]	118 Og [293]