General Chemistry 1 *(CHEM 1141)*

Shawnee State University – Fall 2019

September 26, 2019

Exam # 1 B

Name _____

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

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

Section #:

❒ 1. (Monday Lab, 11:10 AM – 1:55 PM)

❒ 2. (Wednesday Lab, 11:10 AM – 1:55 PM)

❒ 3. (Monday Lab, 2:30 PM – 5:20 PM)

❒ 4. (Wednesday Lab, 2:30 PM – 5:20 PM)

❒ 5. (Thursday Lab, 12:30 PM – 3:20 PM)

❒ 6. (Tuesday Lab, 12:30 PM – 3:20 PM)

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 chemical formula for the compound formed from the elements calcium and phosphorus is expected to be:

A) Ca_3P

B) Ca_2P_3

C) CaP_2

D) Ca_3P_2

Q2. Of the following, _____ is the smallest mass:

A) 0.25 kg

B) 2.5×10^{-2} mg

C) 2.5×10^{15} pg

D) 2.5×10^{10} ng

Q3. Atoms X, Y, Z, and R have the following nuclide symbols:

$$^{410}_{186}X \quad ^{410}_{183}Y \quad ^{412}_{186}Z \quad ^{412}_{185}R$$

Which two are isotopes?

A) X & Y

B) X & Z

C) Y & R

D) Z & R

Q4. Calculate the molar mass of $Ca(BO_2)_2 \cdot 6H_2O$

A) 273.87 g/mol

B) 233.80 g/mol

C) 183.79 g/mol

D) 174.89 g/mol

Q5. Potassium dichromate, $K_2Cr_2O_7$, is used in tanning leather, decorating porcelain, and water proofing fabrics. Calculate the number of chromium atoms in 78.82 g of $K_2Cr_2O_7$.

A) 9.490×10^{23} Cr atoms

B) 2.248×10^{24} Cr atoms

C) 1.124×10^{24} Cr atoms

D) 3.227×10^{23} Cr atoms

Q6. Which of the following statements about subatomic particles is FALSE?

A) A neutral atom contains the same number of protons as electrons

B) Protons have about the same mass as electrons

C) Neutrons have no charge

D) Protons and electrons have opposite charges, but are equal in magnitude

Q7. Give a possible molecular formula for the empirical formula of C_2H_5N

A) $C_4H_{10}N$

B) $C_5H_{10}N_2$

C) $C_4H_{10}N_2$

D) $C_6H_{15}N$

Q8. Calculate the mass percent composition of sulfur in $Al_2(SO_4)_3$

A) 28.12%

B) 9.372%

C) 42.73%

D) 21.38%

Q9. Which response contains an element, compound, and homogenous mixture in that order:

A) silicone, water, vegetable soup

B) beryllium, salt, earl grey tea (hot)

C) sulfate, baking powder, sugar

D) rubidium, flour, baking soda

Q10. The element _____ is the most similar to strontium in chemical and physical properties

A) Li

B) At

C) Rb

D) Ba

Q11. Aluminum oxide, Al_2O_3, is used as a filler for paints and varnishes, as well as in the manufacture of electrical insulators. Calculate the number of moles in 47.51 g of Al_2O_3.

A) 2.377 mol

B) 2.146 mol

C) 1.105 mol

D) 0.4660 mol

Q12. Which of the following is an example of an intensive property?

A) temperature

B) volume

C) length

D) mass

Q13. Which of the following contains the **most** atoms?

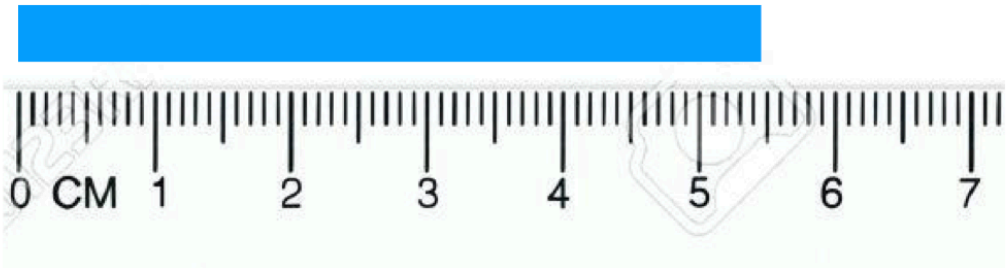
A) 10.0 g Na

B) 10.0 g Li

C) 10.0 g K

D) 10.0 g Rb

Q14. Read the following scale to the correct number of significant figures:



A) 5.4 cm

B) 5.5 cm

C) 5.42 cm

D) 5.420 cm

Q15. A piece of metal ore weighs 9.25 g. When a student places it into a graduated cylinder containing water, the liquid level rises from 21.25 mL to 26.47 mL. What is the density of the ore?

A) 0.340 g/mL

B) 0.564 g/mL

C) 1.77 g/mL

D) 2.94 g/mL

Q16. Which of the following numbers has the **greatest** number of significant figures?

A) 0.5070

B) 0.201

C) 418000

D) 1.06×10^{24}

Q17. Rutherford's gold foil experiment showed:

A) The mass to charge ratio of an electron could be determined

B) The existence of isotopes from multiple peaks in a mass-spectrum

C) The atom contains a tiny nucleus with >99% of the total mass

D) Metals can be made into extremely thin sheets limited by the dimensions of the electron cloud

Q18. Using the significant-figure/decimal-place rules, evaluate the following expression:

$$\frac{(10.3458\ \text{g} - 9.4238\ \text{g})}{(4.3\ \text{mL} + 3.43\ \text{mL})} =$$

A) 0.1 g/mL

B) 0.12 g/mL

C) 0.120 g/mL

D) 0.1197 g/mL

Q19. Element X consists of two isotopes: X-23, with an abundance of 32.00% and a mass of 23.00 u; and X-25, with an abundance of 68.00% and a mass of 25.00 u. Calculate its atomic mass from this information.

A) 23.32 u

B) 23.68 u

C) 24.00 u

D) 24.36 u

Q20. Identify the element that is in the 4th period & group 6A of the periodic table.

A) selenium

B) tellurium

C) lead

D) chromium

Each problem in this section (short answer) is worth 10 points !

All work must be show in order 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. Place the correct number of the element or ion next to the letter that best matches. *(use each number only once)*

__ A.	an alkali metal	1.	gold
__ B.	an element likely to form a 2– ion	2.	uranium
__ C.	a metalloid	3.	Kr
__ D.	a diatomic element	4.	sulfur
__ E.	a polyatomic ion with a charge of 2–	5.	magnesium
__ F.	an element in period 4	6.	ammonium
__ G.	a polyatomic ion with a charge of 1+	7.	chlorine
__ H.	an element with 12 protons	8.	silicon
__ I.	a transition metal element	9.	cesium
__ J.	an inner-transition metal element	10.	sulfite

Q22. A compound is analyzed and found to contain (by mass):
69.94 % iron and 30.06 % oxygen

(i) Calculate the empirical formula for this compound.

(ii) What is the name of this compound?

Q23. Complete the following table:

Isotope Symbol (${}^{A}_{Z}X^{\pm}$)	$^{212}_{82}Pb^{4+}$			
Ion Name			**bromide**	
Atomic Number				**23**
Mass Number		**56**	**81**	**51**
Number of Protons		**26**	**35**	
Number of Neutrons				
Number of Electrons		**23**		**18**
Net charge	**4+**		**1−**	

Q24. **Name the following substances:**

a) $CaSO_4 \cdot 5H_2O$ _____

b) P_4O_{10} _____

c) Li_2CO_3 _____

d) SF_6 _____

e) $Cr_3(PO_4)_2$ _____

Write formulas for the following named substances:

f) ammonium sulfide _____

g) iron(III) carbonate _____

h) trisulfur heptabromide _____

i) potassium sulfite _____

j) xenon tetroxide _____

Q25. Gold has a density of 19.3 g/cm^3. The largest nugget of gold ever found had a mass of 159 lbs. What would its volume be in in^3?

Note: 1.00 lb = 454 g, and 1 in = 2.54 cm (exact)

3 Point Bonus Question

Write chemical formulas for the following three acids:

1) sulfuric acid: ___________________________

2) hydrochloric acid: ______________________

3) nitric acid: ____________________________

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 (1A, 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:

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

Periodic Table of the Elements

IA	IIA											IIIA	IVA	VA	VIA	VIIA	VIIIA
1												*13*	*14*	*15*	*16*	*17*	*18*
1 **H** 1.008	2											5 **B** 10.81	6 **C** 12.01	7 **N** 14.01	8 **O** 16.00	9 **F** 19.00	2 **He** 4.003
3 **Li** 6.941	4 **Be** 9.012											13 **Al** 26.98	14 **Si** 28.09	15 **P** 30.97	16 **S** 32.07	17 **Cl** 35.45	10 **Ne** 20.18
11 **Na** 22.99	12 **Mg** 24.31	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	31 **Ga** 69.72	32 **Ge** 72.61	33 **As** 74.92160	34 **Se** 78.96	35 **Br** 79.90	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	49 **In** 114.8	50 **Sn** 118.7	51 **Sb** 121.8	52 **Te** 127.60	53 **I** 126.9	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	81 **Tl** 204.4	82 **Pb** 207.2	83 **Bi** 209.0	84 **Po** [210]	85 **At** [210]	54 **Xe** 131.3
55 **Cs** 132.9	56 **Ba*** 137.3	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	113	114	115	116	117	86 **Rn** [222]
87 **Fr** [223]	88 **Ra**** [226]	103 **Lr** [262]	104 **Rf** [261]	105 **Db** [262]	106 **Sg** [266]	107 **Bh** [264]	108 **Hs** [265]	109 **Mt** [268]	110 [269]	111 [272]	112 [277]		[285]		[289]		118 [293]

*	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
**	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]