General Chemistry 1 *(CHEM 1141)*

Shawnee State University – Fall 2016

September 23, 2016

Exam # 1C

Name _____KEY_____

Please write your full name, and the exam version (1C) that you have on the scantron sheet !

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

Section #:   ☐ 1. (Monday Lab, 11:00 AM – 1:50 PM)   ☐ 2. (Wednesday Lab, 11:00 AM – 1:50 PM)

☐ 3. (Tuesday Lab, 3:30 PM – 6:20 PM)   ☐ 4. (Thursday Lab, 3:30 PM – 6:20 PM)

☐ 5. (Wednesday Lab, 2:00 PM – 4:50 PM)

Multiple Choice: _____	/ 30
Q11: _____	/ 10
Q12: _____	/ 10
Q13: _____	/ 10
Q14: _____	/ 10
Q15: _____	/ 10
Q16: _____	/ 10
Q17: _____	/ 10
BONUS: _____	/ 3
TOTAL: _____	/ 100

Q1. In one of the first lab experiments this semester you determined the mass of your graduated cylinder containing water three times. One CHEM 1141 student obtained the following masses: 34.987 g, 35.001 g, and 34.995 g. This students are certainly _____ .

A) accurate   B) precise   *—close together*   C) accurate and precise

—can't say anything about accuracy! Don't know 'true' value

D) accurate but not precise   E) neither accurate nor precise

Q2. Which of the following represents the **_smallest_** volume of water ?

0.00015L

A) 1.5×10^{-7} kL   B) 15 cm^3 *$\frac{15cm^3}{} \frac{1L}{1000cm^3} = 0.015L$* *0.015L*   C) 1.5×10^{-3} L *0.0015L*

D) 1.5×10^5 µL   E) 1.5×10^9 nL *1.5L* *$\frac{1.5\times10^9 nL}{} \left|\frac{10^{-9}}{n}\right| = 1.5L$*

$\frac{1.5\times10^5 µL}{} \left|\frac{10^{-6}}{µ}\right| = 0.15L$

$\frac{1.5\times10^{-7}KL}{} \left|\frac{10^3}{K}\right| = 1.5\times10^{-4}L$

Q3. Read the volume of water contained in the 100 mL graduated cylinder shown below to the correct number of significant figures.
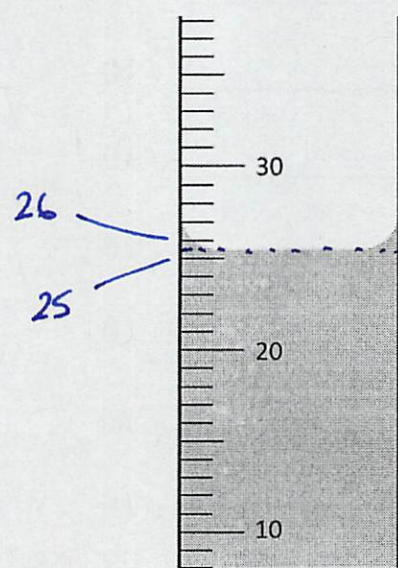
read to $\frac{1}{10}$ division.

26

25

x $\frac{1}{2}$ way between 25+26 divisions ⟹ 25.5mL
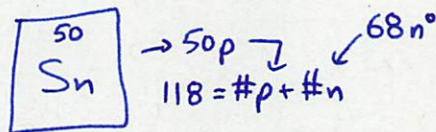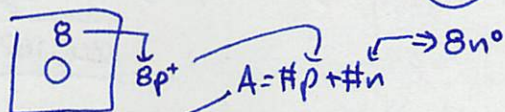
A) 20.5 mL   B) 22.53 mL   C) 25.53 mL   D) 25.5 mL   E) 25 mL

Q4. The density of gold is $19.3 \frac{g}{cm^3}$. This is an example of a(n):

A) chemical property   B) physical property   C) intensive property

D) extensive property   (E) both B and C

[handwritten annotations: box with 8 / O, $8p^+$, $A = \#p + \#n$, $\rightarrow 8n^\circ$; box with 50 / Sn, $\rightarrow 50p$, $118 = \#p + \#n$, $68n^\circ$]

Q5. A commonly offering isotope of tin is tin–118, while most oxygen occurs in nature as oxygen–16. A formula unit of tin(IV) oxide formed from these isotopes would contain how many neutrons ?   *[handwritten: $Sn^{4+} \ O^{2-} = SnO_2$]*
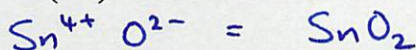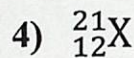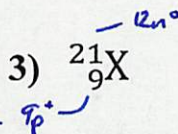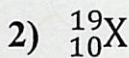
A) 66   (B) 84   C) 76   D) 134   E) 150

[handwritten: $1 \times Sn, \ 2 \times O \Rightarrow 1 \times 68n^\circ + 2 \times 8n^\circ = 84n^\circ$]

Q6. How many significant figures are in the measurement 3.300×10^4 kg contain.

A) 1   B) 2   C) 3   (D) 4   E) 5

[handwritten: same $\#p^+$, diff't $\#n^\circ$]

Q7. Which of the following symbols represent isotopes of the same element ?

1) $^{19}_{9}X$ 2) $^{19}_{10}X$ 3) $^{21}_{9}X$ 4) $^{21}_{12}X$

[handwritten: $10n^\circ$, $9p^+$ near 1; $12n^\circ$ near 3; $9p^+$ near 3]
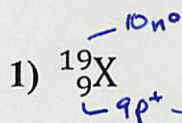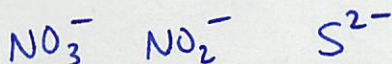
A) 1 and 2   (B) 1 and 3   C) 1 and 4   D) 3 and 4   E) 1, 2, and 3

Q8. The Rutherford gold–foil scattering experiment provided evidence for:

A) the existence of isotopes   B) the electron cloud about the atom

(C) the nuclear model of the atom   D) the law of multiple proportions

E) the mass to charge ratio of the electron

[handwritten: NO_3^- NO_2^- S^{2-}]

Q9. The formulas for nitrate, nitrite, and sulfide ions are represented, respectively, as:

A) $NO_4^-, NO_3^-, SO_4^{2-}$ B) NO_3^-, N^{3-}, S^{2-} C) $NO_2^-, NO_3^-, SO_3^{2-}$

D) $N^{3-}, NO^{2-}, SO_3^{2-}$ (E) NO_3^-, NO_2^-, S^{2-}

Q10. A prospector found a grey colored metal nugget and wants to see if it is valuable. Your suggestion is to determine the density by obtaining the mass and volume of the nugget. The mass of the nugget was obtained by difference as follows:

$$\text{weigh pan} + \text{nugget} = 25.915 \text{ g}$$
$$\text{empty weigh pan} = 1.753 \text{ g}$$

(handwritten:)
$$> \text{mass} = \dfrac{25.915g}{\ominus \ 1.753g}$$
$$\underline{24.162g} \ (3dp.)$$

Since this nugget is an irregularly shaped object, the volume of the nugget was determined by placing it in a graduated cylinder containing water as follows:

$$\text{graduated cylinder} + \text{water} + \text{nugget} = 18.45 \text{ mL}$$
$$\text{graduated cylinder} + \text{water} = 9.50 \text{ mL}$$

(handwritten:)
$$> \text{Vol} = \dfrac{18.45mL}{-\ 9.50mL}$$
$$\underline{8.95mL}$$

The density *(and identity)* of the nugget is:

(handwritten:)
$$d = \dfrac{m}{V} = \dfrac{24.162g}{8.95mL} = 2.70 \text{ g/mL } (3sf)$$

A) 2.70 $\frac{g}{mL}$ *(aluminum)*   B) 7.87 $\frac{g}{mL}$ *(iron)*   C) 11.4 $\frac{g}{mL}$ *(lead)*

D) 10.5 $\frac{g}{mL}$ *(silver)*   E) 7.13 $\frac{g}{mL}$ *(zinc)*

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 !

Q11. Provide the correct name for each of the following compounds:

A) Li_2SO_4 _____ lithium sulfate _____

B) $CuNO_2$ _____ copper (I) nitrite _____

C) Br_3O_9 _____ tribromine nonoxide _____

D) $Na_3PO_4 \cdot 4\,H_2O$ _____ sodium phosphate tetrahydrate _____

E) CF_4 _____ carbon tetrafluoride _____

F) NH_4NO_3 _____ ammonium nitrate _____

G) H_3PO_4 (dissolved in water) _____ phosphoric acid _____

Q12. Complete the following table:

Isotope Symbol ($^A_Z X^\pm$)	$^{58}_{26}Fe^{3+}$	$^{35}_{17}Cl^{3-}$
Ion Name	iron(III)	chloride
Atomic Number (Z)	26	17
Mass Number (A)	58	35
Number of Protons	26	17
Number of Electrons	23	20
Number of Neutrons	32	18

3+ ion ⇒ lost 3e⁻ from atom

— 3 more than #p⁺ ⇒ 3- charge

Q13. A barrel of oil as measured on the oil market is equal to 1.333 U.S. barrels. A U.S. barrel is equal to 31.5 gallons. If oil is on the market at $ 94.0 per barrel, what is the price in dollars per gallon ?

$$\frac{\$94.0}{barrel} \xrightarrow{?} \frac{\$}{gal}$$

$$\frac{\$ 94.0}{barrel} \times \frac{1\ barrel}{1.333\ us\ barrels} \times \frac{1\ us\ barrel}{31.5\ gal} = \frac{\$2.24}{gal} \quad (3s.f.)$$

Q14. Provide the correct chemical formula for each of the following compounds:

A) iron(III) sulfide $\qquad Fe_2S_3$

E) dibromine heptachloride $\qquad Br_2Cl_7$

C) sodium phosphide $\qquad Na_3P$

D) magnesium bicarbonate $\qquad Mg(HCO_3)_2$

E) potassium chromate $\qquad K_2CrO_4$

Q15. Fill in the blanks:

A) The name of the group IIA elements on the periodic table: Alkaline Earth Metals

B) The name of an element in the fifth period on the periodic table: Silver , ...

C) The name of the group VIIIA elements on the periodic table: Noble/Inert Gases

D) The name of a metalloid on the periodic table: Silicon , ...

E) The name of a transition metal on the periodic table: Iron , ...

Q16. Complete the following calculations and round your answers to the correct number of significant figures:

A) $\overset{3dp}{365.079} - \overset{2dp}{43.20}$ = $\underline{\quad 321.88 \qquad (2dp.) \quad}$

B) $\dfrac{\overset{4dp}{7.2849} + \overset{3dp}{5.030}}{\underset{1dp}{89.7} - \underset{2dp}{2.04}}$ = $\dfrac{\overset{-3dp\ (5s.f)}{12.3149}}{\underset{1dp\ (3s.f.)}{87.66}}$ = $0.140 \ (3s.f.)$

C) $\overset{3dp}{6.307} + \overset{4dp}{9.0745} + \overset{2dp}{12.83}$ = $\underline{\quad 28.21 \ (2d.p.) \quad}$

D) $\dfrac{\overset{5sf}{8.0015 \text{ km}} \times \overset{4sf}{4.806 \text{ km}}}{\underset{3sf}{3.08 \text{ km}}}$ = $12.5 \text{ Km} \ (3s.f.) \qquad \underline{\underline{unit!!}}$

E) $\underset{5s.f.}{0.0073590} \times \underset{4s.f.}{0.08070}$ = 5.939×10^{-4} or $0.0005939 \ (4s.f.)$

Q17. Mercury has a density of $13.56 \ \frac{g}{mL}$. What volume in milliliters *(mL)* does 248.0 g of mercury occupy ? Convert this volume into cubic inches (in³) given that $1 \text{ in} = 2.54 \text{ cm}$.

$d = m/v \Rightarrow V = m/d = \dfrac{\overset{(4s.f.)}{248.0g}}{\underset{(4s.f.)}{13.56 g/mL}} = 18.29 \text{ mL} \ (4s.f.)$

$18.29 \text{ mL} = 18.29 \text{ cm}^3 = 18.29 \text{ cm}^3 \times \left(\dfrac{1 \text{ in}}{2.54 \text{ cm}}\right)^3 = 1.116 \text{ in}^3 \ (4s.f.)$

$\qquad\qquad\qquad\qquad\qquad (4s.f.) \qquad (exact)$

ბბბ

3 Point Bonus Question

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Name all seven elements that form diatomic molecules in their natural state.

Hydrogen, nitrogen, oxygen, fluorine, chlorine, bromine, iodine.