DO NOT OPEN

UNTIL INSTRUCTED TO DO SO

CHEM 110 – Dr. McCorkle – Exam #1

While you wait, please complete the following information:

Name: _____

Student ID: _____

Turn off cellphones and stow them away. No headphones, mp3 players, hats, sunglasses, food, drinks, restroom breaks, graphing calculators, programmable calculators, or sharing calculators. Grade corrections for incorrectly marked or incompletely erased answers will not be made.

Periodic Table of the Elements

GROUP	1 IA	2 IIA	3 IIIB	4 IVB	5 VB	6 VIB	7 VIIB	8 VIIIB	9 VIIIB	10 VIIIB	11 IB	12 IB	13 IIIA	14 IVA	15 VA	16 VIA	17 VIIA	18 VIIIA
PERIOD 1	1 H 1.01																	2 He 4.00
2	3 Li 6.94	4 Be 9.01											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 47.88	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 74.92	34 Se 78.97	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 95.95	43 Tc (98)	44 Ru 101.07	45 Rh 102.91	46 Pd 106.42	47 Ag 107.87	48 Cd 112.41	49 In 114.82	50 Sn 118.71	51 Sb 121.75	52 Te 127.60	53 I 126.90	54 Xe 131.29
6	55 Cs 132.91	56 Ba 137.33	57 La * 138.91	72 Hf 178.49	73 Ta 180.95	74 W 183.85	75 Re 186.21	76 Os 190.23	77 Ir 192.22	78 Pt 195.08	79 Au 196.97	80 Hg 200.59	81 Tl 204.38	82 Pb 207.2	83 Bi 208.98	84 Po (209)	85 At (210)	86 Rn (222)
7	87 Fr (223)	88 Ra (226)	89 Ac ** (227)	104 Rf (267)	105 Db (268)	106 Sg (271)	107 Bh (270)	108 Hs (277)	109 Mt (276)	110 Ds (281)	111 Rg (280)	112 Cn (285)	113 Uut (284)	114 Fl (289)	115 Uup (288)	116 Lv (293)	117 Uus (294)	118 Uuo (294)

Lanthanide Series *

58 Ce 140.12	59 Pr 140.91	60 Nd 144.24	61 Pm (145)	62 Sm 150.36	63 Eu 151.96	64 Gd 157.25	65 Tb 158.93	66 Dy 162.50	67 Ho 164.93	68 Er 167.26	69 Tm 168.93	70 Yb 173.05	71 Lu 174.97

Actinide Series **

90 Th 232.04	91 Pa 231.04	92 U 238.03	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)

**Multiple Choice – Choose the answer that best completes the question. Use an 815-E
Scantron to record your response. [2 points each]**

1. How would you correctly express the measurement 0.0000043 m using scientific notation?
   A) 4.3×10^{-7} m   B) 4.3×10^{-6} m   C) 4.3×10^{6} m
   D) 0.43×10^{-5} m   E) 4.3 m

2. How many significant digits are in 0.00300210 mL?
   A) 5   B) 6   C) 7   D) 8   E) 9

3. Perform the following calculation and give the answer with the correct significant digits:
   $42.0 \times 0.070 \div 2.010 =$
   A) 2   B) 1.4   C) 1.5   D) 1.46   E) 1.463

4. Perform the following calculation and give the answer with the correct significant digits:
   8700 in. + 3849 in. − 473.2 in. =
   A) 121 in.   B) 12000 in.   C) 12100 in.   D) 12180 in.   E) 12176 in.

5. Perform the following calculation and give the answer with the correct significant digits
$$\frac{3.14 \times 10^{-5} \times 0.080}{7.20 \times 10^{3}} =$$
   A) 3×10^{-10} B) 3.5×10^{-10} C) 3.49×10^{-10}
   D) 3.5×10^{-4} E) 3.49×10^{-4}

6. Which of the following equalities is correct?
   A) 10^{-6} µg = 1 g   B) 10^{3} kg = 1 g   C) 10^{-2} g = 1 dg
   D) 10^{12} g = 1 Tg   E) 10^{9} g = 1 Mg

7. The mass of an electron is only 9.1×10^{-31} kg. What is this mass in fg?
   A) 9.1×10^{-13} fg   B) 9.1×10^{-49} fg   C) 9.1×10^{-16} fg
   D) 9.1×10^{-43} fg   E) 9.1×10^{-19} fg

8. Which physical state assumes the volume and shape of its container?
   A) solid   B) liquid   C) gas

9. Which of the following is a physical change?
   A) salt dissolves in water   B) silver tarnishes & turns green   C) a log burns
   D) Alka-Seltzer fizzes in water   E) dynamite explodes

10. Which term best describes a bowl of granola?
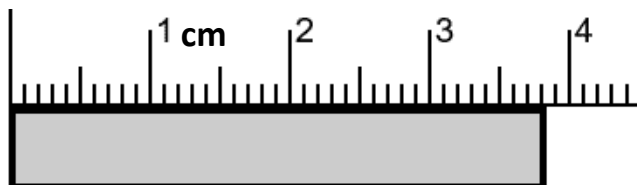
    A) element   B) compound   C) pure substance

    D) heterogenous mixture   E) homogeneous mixture

11. Which of the following is a chemical property?

    A) magnetic   B) conducts electricity   C) tastes sweet

    D) fizzes in water   E) dissolves in water

12. What measurement is indicated on the metric ruler at right?

    A) 3.8 cm   B) 3.80 cm

    C) 3.08 cm   D) 3.800 cm

    E) 4.20 cm

13. Indicate which isotope has 26 p^+, 32 n^0, and 26 e^-.

    A) $^{32}_{26}Fe$ B) $^{58}_{26}Fe$ C) $^{32}_{26}Ge$ D) $^{58}_{32}Ge$ E) $^{58}_{26}S$

14. How many neutrons are in the nucleus of ^{198}Pt?

    A) 78   B) 117   C) 120   D) 195   E) 198

15. What is the symbol for the ion with 19 protons and 18 electrons?

    A) F^+ B) F^- C) Ar^+ D) K^- E) K^+

Calculations – Write your initials in the upper-right corner of every page that contains work. For full credit show all work and write neatly; give answers with correct significant figures and units. Place a box around your final answer.

16. The average temperature on the planet Venus is 462°C.
    a.   Convert this temperature to Fahrenheit. [2 points]

    b.   Convert this temperature to Kelvin. [2 points]

17. Large Peruvian sea scallops are on sale at Sprouts for $9.99 per pound. What is the cost of 2.50 kg of scallops in dollars? [3 points]

18. The standard acceleration due to gravity is 98.07 dm/s^2. Convert this to fm/ms^2. [4 points]

19. Dentists often administer "laughing gas" or nitrous oxide to patients. A dentist has 5.0×10^3 gal of nitrous oxide on hand. If the flow rate of the gas is 45 L/min and the average procedure takes 25 minutes, how many procedures can the dentist complete <u>before he runs out</u> of laughing gas? [4 points]

20. Silicon has three naturally occurring isotopes (Si-28, Si-29, and Si-30). The atomic mass and natural abundance of Si-28 are 27.9769 amu and 92.2 %, respectively. The atomic mass and natural abundance of Si-29 are 28.9765 amu and 4.67 %, respectively. What is the atomic mass of Si-30 to <u>two decimal places</u>? [4 points]

21. What is the mass of 1.55×10^{24} atoms of cadmium in ng? [4 points]

22. A sphere of pure osmium has a volume of 8.2×10^{12} μm^3. If the density of osmium is 22.59 g/cm^3, how many atoms of osmium (symbol Os) are in the sphere? [5 points]

23. In lecture we discussed several important experiments that have helped us understand the structure of the atom.

   - J.J. Thomson's experiment that <u>proved the existence of electrons and determined their charge-to-mass ratio</u>.
   - Ernest Rutherford's experiment that <u>discovered the existence of a small, positively charged nucleus</u>.

Briefly explain ONE of these experiments, including what they did and how they used their results to reach the underlined conclusion. [4 points]

Extra Credit: What is the name of the physics laboratory at Cambridge University that is home to 29 Nobel laureates? [2 points]

Formulas & Constants
(you may or may not need)

1 inch = 2.54 cm (exact)   1 mile = 5280 ft ≈ 1.609 km   1 kg ≈ 2.205 lb

1 lb = 453.6 g; 1 lb = 16 oz   1 gal = 4 qt = 8 pt ≈ 3.785 L   1 L = 1000 cm^3

$T_K = T_{°C} + 273.15$ $T_{°F} = 1.8 \times T_{°C} + 32$ $T_{°C} = (T_{°F} - 32)/1.8$

1 cal = 4.184 J   1 Cal = 1000 cal $q = m \times C \times \Delta T$

Avogadro's # = 6.022×10^{23}

Scratch Page
(to be handed in)