DO NOT OPEN

UNTIL INSTRUCTED TO DO SO

CHEM 100 – Dr. McCorkle – Exam #1 ***KEY***

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.

Periodic Table of the Elements

PERIOD	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
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 write 83,000 ft in proper scientific notation?
   A) 8.3000×10^{4} ft B) 8.30×10^{4} ft C) 0.83×10^{5} ft
   D) 8.3×10^{-4} ft E) **8.3×10^{4} ft**

2. How would you write 7.12×10^{-3} kg as a standard number?
   A) 7120 kg B) 712 kg C) 0.0712 kg
   D) **0.00712 kg** E) 0.07120 kg

3. How many significant digits are in 0.0081020 mL?
   A) 4 B) **5** C) 6 D) 7 E) 8

4. Perform the following calculation and give the answer with the correct significant digits:
   34.6 ÷ 15.80 × 0.020 =
   A) 0.04 B) 0.043 C) **0.044** D) 0.0438 E) 0.04380

5. Perform the following calculation and give the answer with the correct significant digits:
   25.43 s + 105.2 s – 0.017 s =
   A) 130 s B) 131 s C) **130.6 s** D) 130.61 s E) 130.613 s

6. Perform the following calculation and give the answer with the correct significant digits
   $$\frac{0.073 \times 6.21\times10^{-7}}{1.040\times10^{5}} =$$
   A) **4.4×10^{-13}** B) 4.35×10^{-13} C) 4.4×10^{-3}
   D) 4.35×10^{-3} E) 4.4×10^{-12}

7. Which of the following equalities is correct?
   A) 10^{-3} mg = 1 g B) 1 Mg = 10^{-6} g C) 1 g = 10^{-2} cg
   D) 10^{-12} g = 1 ng E) **10^{-1} g = 1 dg**

8. The correct multiplier for femto is:
   A) 10^{12} B) 10^{15} C) 10^{-9} D) 10^{-12} E) **10^{-15}**

9. A watermelon has a mass of 4.2 kg. What is this mass in mg?
   A) **4.2×10^{6} mg** B) 4.2×10^{9} mg C) 4.2×10^{-6} mg
   D) 4.2×10^{-3} mg E) 4.2 mg

10. Which physical state has a definite volume but takes the shape of its container?
A) solid B) **liquid** C) gas

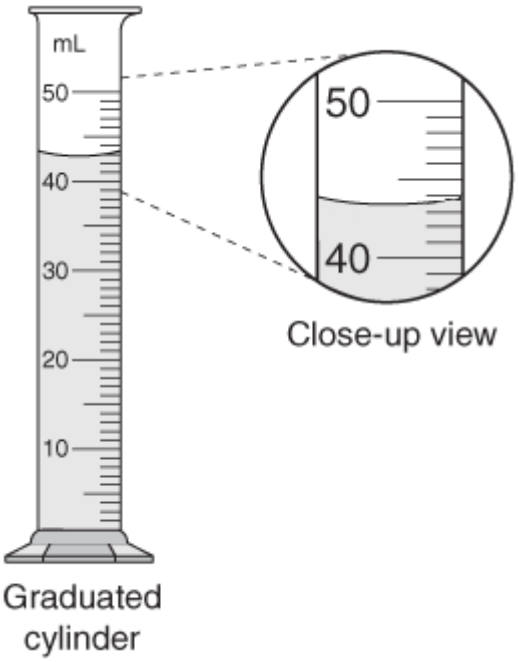
11. Which physical state has the highest kinetic energy?
A) solid B) liquid C) **gas**

12. Which term best describes a glass of wine?
A) element B) compound C) pure substance
D) heterogenous mixture E) **homogeneous mixture**

13. Which of the following is a chemical change?
A) aluminum foil is cut in to squares B) scrap gold is melted down
C) chopping down a tree D) **an egg is hardboiled**
E) a piece of glass glows red in a fire

14. What is the proper term for solid turning directly to gas?
A) vaporization B) condensation C) **sublimation** D) melting E) deposition

15. What measurement is indicated on the graduated cylinder at right?
A) 43 mL B) 44 mL
C) 40.3 mL D) **43.5 mL**
E) 43.50 mL



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.

15. For the following pairs, circle the one that is larger in value. If both values are equal, then circle BOTH responses. [1 point each, no partial credit]

a. 3.8 miles ***or*** 3.8 kilometers

b. 27 in. ***or*** 27 cm

c. 450 nutritional calories ***or*** 450 kcal

d. 75 lb. ***or*** 75 kg

16. This weekend the high temperature in Oceanside is supposed to be 93 °F. (Yikes!)

a. What is this temperature in Celsius? [2 points]

$T_C = (T_F - 32)/1.8 = (93 - 32)/1.8 = 34\ °C$

b. What is this temperature in Kelvin? [2 points]

$T_K = T_C + 273.15 = 34 + 273.15 = 307\ K$

17. In England, a person is weighed in stones. If one stone has a mass of 14.0 lb, what is the mass in kilograms of a person who weighs 12.0 stones? [3 points]

$$12.0\ stones \times \frac{14.0\ lb}{1\ stone} \times \frac{453.6\ g}{1\ lb} \times \frac{1\ kg}{10^3\ g} = 76.2\ kg$$

OR

$$12.0\ stones \times \frac{14.0\ lb}{1\ stone} \times \frac{1\ kg}{2.205\ lb} = 76.2\ kg$$

18. A 1.0 lb. bag of trail mix contains 23.6% peanuts. How many grams of peanuts are in the bag? [3 points]

$$1.0\ lb. \times \frac{23.6\ lb\ peants}{100\ lb\ bag} \times \frac{453.6\ g}{1\ lb} = 1.1 \times 10^2\ g$$

19. Chalcopyrite is an ore that contains copper, iron, and sulfur. A particular sample has a volume of 20.8 L and a density of 4.1 g/mL. What is its mass in micrograms? [4 points]

$$20.8\ L \times \frac{1\ mL}{10^{-3}\ mL} \times \frac{4.1\ g}{1\ mL} \times \frac{1\ \mu g}{10^{-6}\ g} = 8.5 \times 10^{10}\ \mu g$$

20. During a late night study session you binge on 5 shame-filled bags of Doritos, each containing 150 Cal. If walking burns 210 Cal/hour, how many minutes will you have to walk to burn off the Doritos? [4 points]

$$5\ bags \times \frac{150\ Cal}{1\ bag} \times \frac{1\ hr}{210\ Cal} \times \frac{60\ min}{1\ hr} = 210\ min$$

21. A parked car with a set of sweet magnesium wheels sits in the sun all day as the temperature rises from 22 °C to 35 °C. If one wheel has a mass of 6.8 kg and the specific heat of magnesium is 1.02 J/g·°C, how much heat in <u>kilojoules</u> did the one wheel absorb? [4 points]

$$mass = 6.8\ kg \times \frac{10^3\ g}{1\ kg} = 6.8 \times 10^3\ g$$

$$heat = mass \times SH \times \Delta T$$

$$heat = (6.8 \times 10^3\ g) \times \left(\frac{1.02\ J}{g \cdot ℃}\right) \times (35℃ - 22℃)$$

$$heat = (6.8 \times 10^3\ g) \times \left(\frac{1.02\ J}{g \cdot ℃}\right) \times (13℃)$$

$$heat = 9.0 \times 10^4\ J \times \frac{1\ kJ}{10^3\ J} = 9.0 \times 10^1\ kJ$$

22. A doctor has ordered 500. mg of ampicillin every 6.0 hours to a patient over 7.0 days. The pharmacy has 250.-mg capsules in stock. How many capsules will you need on hand for the entire run? [4 points]

$$7.0\ days \times \frac{24\ hr}{1\ day} \times \frac{500.\ mg}{6.0\ hr} \times \frac{1\ capsule}{250.\ mg} = 56\ capsules$$

23. ***Challenge Question:*** An aluminum panel on the wing of a Boeing 777 sits parked outside on a hot tarmac where it absorbs 4.5×10^3 kJ of heat, increasing its temperature from 22 °F to 38 °F. If the specific heat of aluminum is 0.215 cal/g·K, what is the mass of the panel in lbs.? [5 points]

$T_C = (T_F - 32)/1.8 = (22 - 32)/1.8 = -5.\underline{5}6$ °C + 273.15 = 267.$\underline{5}$9 K

$T_C = (T_F - 32)/1.8 = (38 - 32)/1.8 = 3.\underline{3}3$ °C + 273.15 = 276.$\underline{4}$8 K

$$heat = 4.5 \times 10^3\ kJ \times \frac{10^3\ J}{1\ kJ} \times \frac{1\ cal}{4.184\ J} = 1.\underline{0}8 \times 10^6\ cal$$

$$heat = mass \times SH \times \Delta T$$

$$mass = \frac{heat}{SH \times \Delta T} = \frac{1.\underline{0}8 \times 10^6\ cal}{\left(\frac{0.215\ cal}{g \cdot K}\right) \times (276.\underline{4}8\ K - 267.\underline{5}9\ K)} = \frac{1.\underline{0}8 \times 10^6\ cal}{\left(\frac{0.215\ cal}{g \cdot K}\right) \times (8.\underline{8}9\ K)}$$

$$mass = 5.\underline{6}5 \times 10^5\ g \times \frac{1\ lb}{453.6\ g} = 1.2 \times 10^3\ lb$$

Extra Credit: How does a scientific theory differ from a law? [2 points]

A law states what happens, while a theory tries to explain how it happens.

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 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	heat = m x SH x ΔT

Scratch Page
(to be handed in)