



DO NOT OPEN

UNTIL INSTRUCTED TO DO SO

*CHEM 140 – Dr. McCorkle – Exam #2A **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. Grade corrections for incorrectly marked or incompletely erased answers will not be made.

Periodic Table of the Elements

PERIOD	GROUP 1		GROUP 2		GROUP 3-10										GROUP 11		GROUP 12		GROUP 13		GROUP 14		GROUP 15		GROUP 16		GROUP 17		GROUP 18	
	IA	IIA	IIIB	IIIB	IIIB	IIIB	IIIB	IIIB	IIIB	IIIB	IIIB	IIIB	IIIB	IIIB	IIIB	IIIB	IIIB	IIIB	IIIB	IIIB	IIIB	IIIB	IIIB	IIIB	IIIB	IIIB	IIIB	IIIB	IIIB	
1	1 H 1.01	2 He 4.00																												
2	3 Li 6.94	4 Be 9.01																												
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 Nh (284)	114 Fl (289)	115 Mc (288)	116 Lv (293)	117 Ts (294)	118 Og (294)												

58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu
140.12	140.91	144.24	(145)	150.36	151.96	157.25	158.93	162.50	164.93	167.26	168.93	173.05	174.97
90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr
232.04	231.04	238.03	(237)	(244)	(243)	(247)	(247)	(251)	(252)	(257)	(258)	(259)	(262)

*

**

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

- Which state of matter has indefinite shape and is compressible?
A) liquid
B) solid
C) **gas**
D) plasma
E) none of the above
- Which of the following is a heterogeneous mixture?
A) milk
B) **raisin bran cereal**
C) apple juice
D) air
E) none of the above
- All of the following can be considered physical properties EXCEPT:
A) taste
B) color
C) **flammability**
D) density
E) boiling point
- Which of the following items is a chemical property?
A) the paint color on a new red Corvette
B) the odor of spearmint gum
C) water boils at 100 °C and freezes at 0 °C
D) **copper pots & pans tarnish, turning green**
E) none of the above
- Which type of energy is associated with motion?
A) chemical
B) nuclear
C) potential
D) **kinetic**
E) none of the above
- If a solid piece of shiny sodium metal is exposed to chlorine gas, a large amount of heat is released and the white solid sodium chloride (table salt) forms. Based on this information, which of the following statements is TRUE?
A) This process represents a physical change.
B) Mass is lost during this process.
C) Sodium chloride is an element.
D) **This process was exothermic.**
E) none of the above
- An atom containing 7 protons, 8 neutrons, and 7 electrons
A) **is charge-neutral.**
B) is an ion.
C) is an oxygen atom.
D) cannot exist.
E) none of the above

8. Ions are formed when atoms
- A) gain or lose protons.
 - B) gain or lose electrons.**
 - C) gain or lose neutrons.
 - D) Each of these results in ion formation.
 - E) None of these results in ion formation.
9. The mass number of an atom is equal to the number of the
- A) protons
 - B) neutrons
 - C) electrons
 - D) protons & neutrons**
 - E) protons & electrons
10. What is the symbol for the ion with 19 protons and 18 electrons?
- A) F^+
 - B) F^-
 - C) Ar^+
 - D) K^-
 - E) K^+**
11. Indicate which isotope has 26 p^+ , 32 n^0 , and 26 e^- .
- A) ${}_{26}^{32}Fe$
 - B) ${}_{26}^{58}Fe$**
 - C) ${}_{26}^{32}Ge$
 - D) ${}_{32}^{58}Ge$
 - E) ${}_{26}^{58}S$
12. How many neutrons are in the nucleus of ${}^{198}Pt$?
- A) 78
 - B) 117
 - C) 120**
 - D) 195
 - E) 198
13. Isotopes of an element have the same number of _____ but different numbers of _____.
- A) neutrons, protons
 - B) electrons, protons
 - C) protons, electrons
 - D) neutron, electrons
 - E) protons, neutrons**

Calculations & Short Answers – 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.

14. Rank the following in order of increasing kinetic energy: *liquid, gas, solid*. [3 points]

solid < liquid < gas
Least kinetic energy *Most kinetic energy*

15. Give the corresponding name for the following element symbols (spelling counts!): [2 points each]

a. Pu plutonium

b. Br bromine

c. Ge germanium

16. Give the corresponding symbol for the following element (use proper capitalization!): [2 points each]

a. Cadmium Cd

b. Radon Rn

c. Silver Ag

17. The average temperature on the planet Venus is 462°C.

a. Convert this temperature to Fahrenheit (no decimals). [2 points]

$$T_{\text{°F}} = 1.8 \times T_{\text{°C}} + 32$$

$$T_{\text{°F}} = 1.8 \times 462 + 32$$

$$T_{\text{°F}} = 864 \text{ °F}$$

b. Convert this temperature to Kelvin (no decimals). [2 points]

$$T_{\text{K}} = T_{\text{°C}} + 273.15$$

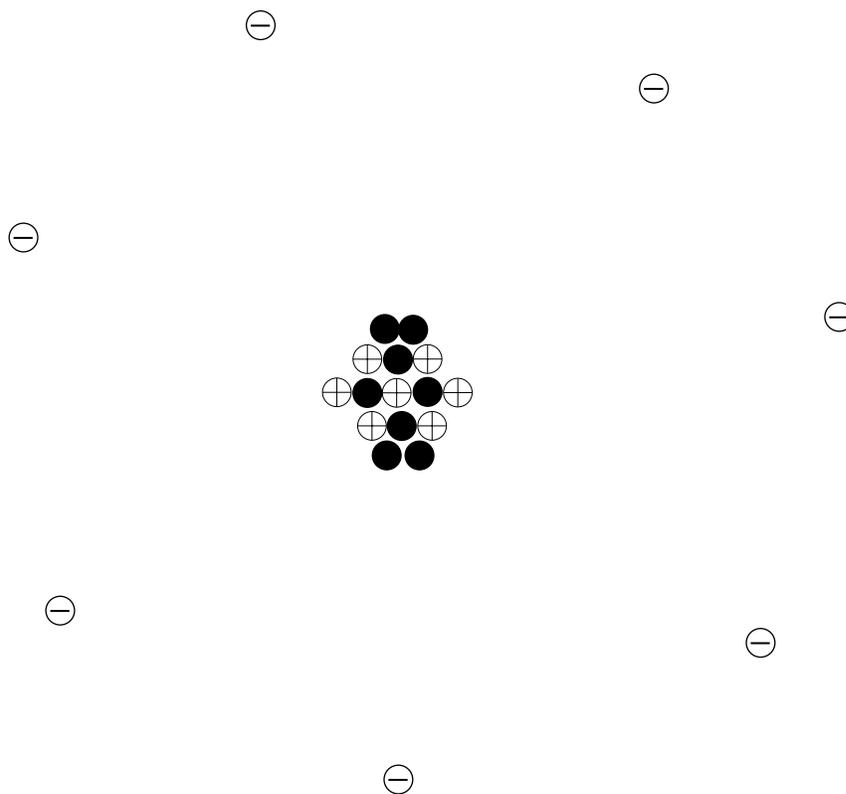
$$T_{\text{K}} = 462 + 273.15$$

$$T_{\text{K}} = 735 \text{ K}$$

19. Name the following elements (spelling counts!): [2 points each]

- Halogen in period 5 iodine
- Metalloid in period 3 silicon
- Alkaline earth metal in period 6 barium

20. Draw the atomic structure of a nitrogen-15 isotope where \oplus is a proton, \bullet is a neutron, and \ominus is an electron. Be sure to include the proper number of each subatomic particle and place them in the correct relative locations. [6 points]



23. Europium has two stable isotopes, Eu-151 and Eu-153. If their exact masses are 150.9196 amu and 152.9209 amu, respectively, what is the percent natural abundance of Eu-153 to two decimal places? (The average atomic mass of europium is 151.96 amu.) [5 points]

average atomic mass = $\Sigma(\text{relative abundance} \times \text{mass of isotope})$

$$151.96 \text{ amu} = (X) \cdot 150.9196 \text{ amu} + (1-X) \cdot 152.9209 \text{ amu}$$

$$151.96 = 150.9196X + 152.9209 - 152.9209X$$

$$-0.9609 = -2.0013X$$

$$X = 0.4801$$

$$\text{Eu-153} = 1 - X = 1 - 0.4801 = 0.5199 = 51.99\%$$

Extra Credit: During WWII, Nobel Laureates Werner Heisenberg and Otto Hahn were among the brilliant scientists working on Germany's nuclear weapons program. However, in order to produce plutonium for their atomic bombs they needed access to large amounts of a vital component they hoped to acquire from the Vemork power station in Telemark, Norway. What was this component? [2 points]

Heavy water

**Formulas & Constants
(you may or may not need)**

$$1 \text{ inch} = 2.54 \text{ cm (exact)}$$

$$1 \text{ lb} = 453.6 \text{ g}; 1 \text{ lb} = 16 \text{ oz}$$

$$T_K = T_{\text{C}} + 273.15$$

$$1 \text{ cal} = 4.184 \text{ J}$$

$$1 \text{ mile} = 5280 \text{ ft} \approx 1.609 \text{ km}$$

$$1 \text{ gal} = 4 \text{ qt} = 8 \text{ pt} \approx 3.785 \text{ L}$$

$$T_{\text{F}} = 1.8 \times T_{\text{C}} + 32$$

$$1 \text{ Cal} = 1000 \text{ cal}$$

$$1 \text{ kg} \approx 2.205 \text{ lb}$$

$$1 \text{ L} = 1000 \text{ cm}^3$$

$$T_{\text{C}} = (T_{\text{F}} - 32)/1.8$$

Scratch Page
(to be handed in)