# TEST 2, VERSION A

### CHEM 1110.24492

### Spring 2016, Dr. Potts

Put your **NAME, TEST VERSION,** and **ALL YOUR ANSWERS** on the **SCANTRON** and submit the scantron for grading. Do not wait until the end of the test to transfer your answers.

| | IA | | | | | | | | | | | | IIIA | IVA | VA | VIA | VIIA | VIIIA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 **H** 1.008 | IIA | | | | | | | | | | | | | | | | 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 | IIIB | IVB | VB | VIB | VIIB | VIIIB | | | IB | IIB | 13 **Al** 26.98 | 14 **Si** 28.09 | 15 **P** 30.97 | 16 **S** 32.06 | 17 **Cl** 35.45 | 18 **Ar** 39.95 |
| 4 | 19 **K** 39.10 | 20 **Ca** 40.08 | 21 **Sc** 44.96 | 22 **Ti** 47.90 | 23 **V** 50.94 | 24 **Cr** 52.00 | 25 **Mn** 54.94 | 26 **Fe** 55.85 | 27 **Co** 58.93 | 28 **Ni** 58.71 | 29 **Cu** 63.55 | 30 **Zn** 65.37 | 31 **Ga** 69.72 | 32 **Ge** 72.59 | 33 **As** 74.92 | 34 **Se** 78.96 | 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** 95.94 | 43 **Tc** [98] | 44 **Ru** 101.1 | 45 **Rh** 102.9 | 46 **Pd** 106.4 | 47 **Ag** 107.9 | 48 **Cd** 112.40 | 49 **In** 114.8 | 50 **Sn** 118.7 | 51 **Sb** 121.8 | 52 **Te** 127.60 | 53 **I** 126.90 | 54 **Xe** 131.30 |
| 6 | 55 **Cs** 132.9 | 56 **Ba** 137.3 | 71 **Lu** 175 | 72 **Hf** 178.5 | 73 **Ta** 181 | 74 **W** 183.9 | 75 **Re** 186.2 | 76 **Os** 190.2 | 77 **Ir** 192.2 | 78 **Pt** 195.1 | 79 **Au** 197 | 80 **Hg** 200.59 | 81 **Tl** 204.4 | 82 **Pb** 207.2 | 83 **Bi** 209 | 84 **Po** [209] | 85 **At** [210] | 86 **Rn** [222] |
| 7 | 87 **Fr** [223] | 88 **Ra** [226] | 103 **Lr** [262] | 104 **Rf** [267] | 105 **Db** [268] | 106 **Sg** [271] | 107 **Bh** [272] | 108 **Hs** [270] | 109 **Mt** [276] | 110 **Ds** [281] | 111 **Rg** [280] | 112 **Uub** [285] | 113 **Uut** [284] | 114 **Uuq** [289] | 115 **Uup** [288] | 116 **Uuh** [293] | | 118 **Uuo** [294] |

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| 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 | 64 **Gd** 157.3 | 65 **Tb** 158.9 | 66 **Dy** 162.5 | 67 **Ho** 164.93 | 68 **Er** 167.3 | 69 **Tm** 168.9 | 70 **Yb** 173 |
| 89 **Ac** [227] | 90 **Th** 232 | 91 **Pa** [231] | 92 **U** 238 | 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] |

**Part I (80pts).** 20 multiple-choice questions worth 4 points each. Choose the ***best*** answer from the options given, and ***record your final answer on your scantron***.

1. Which of these pairs consists of *isoelectronic* species?
   A. $Na^+$ and $K^+$
   B. $Mn^{2+}$ and Ar
   C. $K^+$ and $Cl^-$
   D. $Cl^-$ and S
   E. $Zn^{2+}$ and $Cu^{2+}$

2. Which of these choices is the electron configuration of the iron(III) ion?
   A. $[Ar]4s^23d^9$
   B. $[Ar]3d^6$
   C. $[Ar]3d^5$
   D. $[Ar]4s^13d^5$
   E. $[Ar]4s^23d^3$

3. Iron(III) chloride hexahydrate is used as a coagulant for sewage and industrial wastes. What is its formula?
   A. $FeCl_3 \cdot 6H_2O$
   B. $FeCl_3(H_2O)_6$
   C. $Fe_3Cl \cdot 6H_2O$
   D. $Fe_3Cl(H_2O)_6$
   E. $Fe(Cl \cdot 6H_2O)_3$

4. Which is the correct formula for copper(II) phosphate?
   A. $Cu(PO_4)_2$
   B. $Cu(PO_3)_2$
   C. $Cu_2PO_3$
   D. $Cu_2PO_4$
   E. $Cu_3(PO_4)_2$

5. Which element has the largest first ionization energy?
   A. Te
   B. Ca
   C. Na
   D. Br
   E. Cl

6. Which of these atoms has the smallest radius?
   A. P
   B. Na
   C. As
   D. Te
   E. Al

7. The formula for sodium sulfide is
   A. SeS
   B. $K_2S$
   C. $NaS_2$
   D. NaS
   E. $Na_2S$

8. The electron configuration of a ground-state copper atom is
   A. $[Ar]4s^24d^4$
   B. $[Ar]4s^23d^9$
   C. $[Ar]3d^9$
   D. $[Ar]4s^24p^63d^3$
   E. $[Ar]4s^13d^{10}$

9. A red glaze on porcelain can be produced by using $MnSO_4$. What is its name?
   A. manganese sulfate
   B. manganese disulfate
   C. manganese(II) sulfate
   D. manganese(IV) sulfate
   E. manganese(I) sulfate

10. What types of elements undergo covalent bonding?
    A. a nonmetal and a metal
    B. two nonmetals
    C. two Group 1A elements
    D. a metal and a noble gas
    E. an actinide

11. Household sugar, sucrose, has the molecular formula $C_{12}H_{22}O_{11}$. What is the % of carbon in sucrose, by mass?
    A. 26.732%
    B. 41.424%
    C. 33.333%
    D. 51.445%
    E. 42.103%

12. Which element has the following ground-state electron configuration? $[Kr]5s^2 4d^{10} 5p^2$
    A. Pb
    B. Ge
    C. Sb
    D. Te
    E. Sn

13. What is the name of $CBr_4$?
    A. tetrabromocarbide
    B. carbon bromide
    C. carbon tetrabromide
    D. bromine tetracarbide
    E. carbon bromine

14. Tetrasulfur dinitride decomposes explosively when heated. What is its formula?
    A. $S_4N_2$
    B. $S_4N$
    C. $4SN_2$
    D. $S_2N_4$
    E. $S_2N$

15. The compound, $P_4S_{10}$, is used in the manufacture of safety matches. What is its name?
    A. phosphorus sulfide
    B. phosphoric sulfide
    C. phosphorus decasulfide
    D. phosphorus sulfide
    E. tetraphosphorus decasulfide

16. The correct name for $Ba(OH)_2$ is
    A. barium hydrate.
    B. beryllium hydroxide.
    C. boron hydroxide.
    D. barium hydroxide.
    E. barium hydrogen oxide.

17. Which of the following is the empirical formula for hexane, $C_6H_{14}$?
    A. $C_3H_7$
    B. $C_{0.43}H$
    C. $CH_{2.3}$
    D. $C_{12}H_{28}$
    E. $C_6H_{14}$

18. How many unpaired electrons does a ground–state atom of sulfur have?
    A. 2
    B. 1
    C. 3
    D. 4
    E. 0

19. Calculate the formula mass of potassium permanganate, $KMnO_4$.
    A. 79.41 amu
    B. 174.04 amu
    C. 158.04 amu
    D. 149.91 amu
    E. 127.41 amu

20. Which is a correct set of quantum numbers for an electron in a 3*d* orbital?

A. $n = 3, l = 2, m_l = 3$
B. $n = 3, l = 2, m_l = -2$
C. $n = 3, l = 0, m_l = -1$
D. $n = 3, l = 1, m_l = +3$
E. $n = 3, l = 3, m_l = +2$

**Part 2 (20 pts).** Calculations: Clearly (**and legibly**) show all work on the blank space on the scantron answer sheet for full credit. Do not wait until the end of the test to transfer your answers.

1. (10 pts) Tin (II) fluoride is added to some toothpaste to aid in the prevention of tooth decay. How many ions of fluoride does 7.10 g $SnF_2$ contain? (MM of $SnF_2$ = 156.71 g /mol)

2. (10 pts) Pheremones are a special type of compound secreted by the females of many insect species to attract the males for mating. One pheromone has the molecular formula $C_{19}H_{38}O$. Normally, the amount of this pheromone secreted by a female insect is about $1.0 \times 10^{-12}$g. How many molecules of $C_{19}H_{38}O$ does this contain? (MM of $C_{19}H_{38}O$= 282.494 g/mol)

3. (5 pts) Essay: In 4 – 6 sentences, explain the difference between core electrons and valence electrons in atoms and describe the effect that core electrons have on valence electrons in relation to the nucleus.

# PUT ALL ANSWERS AND SHOW ALL WORK FOR PART 2 ON THE BLANK SPACE ON THE SCANTRON. DO NOT WAIT UNTIL THE END OF THE TEST TO TRANSFER YOUR ANSWERS.