Name: KEY D (Print last name in CAPS)

SECTION __________ (same as your lab section)

1. Read each question carefully before answering.

2. Mark the choice that best answers the question or completes the statement.

3. Use the scantron provided. Use a no. 2 pencil and clearly mark your choice. If you change an answer, completely erase your previous mark.

4. Answer each question. There is no penalty for guessing. However, multiple answers are graded as incorrect, and blank answers are graded as incorrect.

5. On the scantron, fill in your last name, first name and initial. Blacken the corresponding letters.

6. Fill in your UIN, the department=CHEM, Course no. = 101, and Section= your lab section. Blacken the corresponding letters and numbers.

7. Use the test for scratch paper.

8. Mark your answers on the test so you can check them with the key when it is posted.

9. ***Turning in a blank scantron results in a grade of zero. ***

10. You may be asked to turn in both the scantron and the exam, have your PHOTO ID and your calculator ready to be checked when you do so.

11. Work at a steady pace and you will have ample time to finish.

12. The keys will be posted on my class web page as soon as possible.

There are 25 questions for 150 points. Good Luck!
Possibly Useful Information

\[ N_A = 6.022 \times 10^{23} \quad c \approx 3.00 \times 10^8 \text{ m/s} \quad c = \nu \lambda. \]

\[ E = \hbar \nu = \hbar c / \lambda. \quad h = 6.626 \times 10^{-34} \text{ J} \cdot \text{s} \quad 1 \text{ Å} = 1 \times 10^{-10} \text{ m} \]

\[ 1 \text{ J} = 1 \text{ kg} \cdot \text{m}^2 / \text{s}^2 \quad \lambda = h / mv \]

\[ M = \frac{\text{mol solute}}{\text{L soln}} \quad q = \text{mass} \times \text{sp. ht.} \times (T_f - T_i) \quad M_1V_1 = M_2V_2 \]

\[ \text{w} \% = \frac{\text{mass}}{\text{total mass}} \times 100 \quad \text{density} = \frac{\text{mass}}{\text{volume}} \]

A periodic table is also provided on the last page of this exam.

Q.1 Which element has the smallest radius?
   a) In
   b) Au
   c) Mo
   d) Bi
   e) Bi

Q.2 Which of the following is an actinide?
   a) 22Ti
   b) 92U
   c) 36Kr
   d) 81Tl
   e) 42Mo

Q.3 What is the wavelength of yellow light having a frequency of $5.17 \times 10^{14}$ Hz?
   a) $6.45 \times 10^{-27}$ m
   b) $5.80 \times 10^{-7}$ m
   c) $3.60 \times 10^{-10}$ m
   d) $2.72 \times 10^{-9}$ m
   e) $1.55 \times 10^{-33}$ m
Q.4 Which of the following comparisons according to radius is (are) correct?

1. Na$^+$ > Mg$^{2+}$ ✓
2. In$^{3+}$ > Sr$^{2+}$
3. Cl$^-$ > K$^+$ ✓
4. Cl$^-$ > K$^+$ ✓

a) II and III
b) III and IV
c) II and IV
d) I and III

Q.5 Which of the following substances is insoluble in water?

a) KSCN
b) Na$_3$PO$_4$
c) RbOH
d) BaCO$_3$
e) LiBr

d) BaCO$_3$

Q.6 Which of the following is a strong acid?

a) HF
b) HBrO
c) HI
d) HCN
e) HNO$_2$

c) HI

Q.7 Hydrogen (atomic mass 1.0079 amu) has two naturally occurring isotopes. The masses of $^1$H and $^2$H are 1.007825 and 2.0140 amu respectively. What is the % abundance of $^2$H?

a) 1.0079%
b) 0.079%
c) 2.014%
d) 0.010%
e) 98.985%

d) 0.010%

\[ 1.0079 = \frac{x}{100} (1.007825) + \frac{100-x}{100} (2.014) \]

\[ 100x + 100 \times 1.007825 - 201.4x = 100 \times 1.0079 \]

\[ x = 99.9925\% = ^2H \]

\[ 100 - x = 0.0075\% = ^1H \]
Q.8 Which of the following is the electronic configuration of P in its ground state?

a) $1s^22s^22p^63s^23p^4$

b) $1s^22s^22p^63s^23p^6$

c) $1s^22s^22p^63s^23p^6$

d) $1s^22s^22p^63s^23p^6$

e) $1s^22s^22p^63s^23p^2$

Q.9 Which of the following salts is soluble in water?

a) FeCO$_3$  b) CuS  c) KC$\text{I}$O$_3$  d) Ag$_3$PO$_4$  e) BaSO$_4$

Q.10 Which of the following contains an error?

a) carbonic acid  H$_2$CO$_3$ ✓

b) sulfurous acid  H$_2$SO$_3$ ✓

c) bromic acid  HBrO$_3$ ✓

d) hypochlorous acid  HClO$_2$ ✗

e) nitric acid  HNO$_3$ ✓

Q.11 Which element has the largest atomic radius?

a) Cs

b) Ba

c) Tl

d) Bi

e) Pb

Q.12 Which of the following is an alkali metal?

a) Sr  b) Cs  c) He  d) Fe  e) H

Q.13 Which of the following is a strong electrolyte?

a) HNO$_2$

b) HNO$_3$ ✓

c) NH$_3$

d) N$_2$

e) CH$_3$COOH
Q.14 Which element has the smallest radius?
   a) I
   b) Br
   c) F
   d) At
   e) Cl

Q.15 The number of electrons present in p orbitals in the outermost shell of the Group 7A elements is ...
   a) two
   b) four
   c) one
   d) three
   e) five

Q.16 What is the oxidation number of sulfur in Li₂SO₄?
   a) +5
   b) +4
   c) +3
   d) +2
   e) +6

Q.17 Which of the following reactions is a decomposition reaction?
   a) 2 KClO₃ → 2 KCl + 3 O₂
   b) Fe₂O₃ + 3 CO → 2Fe + 3 CO₂
   c) C₃H₈ + 5 O₂ → 4 H₂O + 3 CO₂
   d) 2 AgNO₃ + Zn → 2 Ag + Zn(NO₃)₂
   e) 2 H₂ + O₂ → 2 H₂O

Q.18 Which of the following statements is false?
   a) Two electrons in the same atom may have quantum numbers, n, ℓ, m₂, mₛ of 2, 1, -1, ½ and 2, -1, -1, ½.
   b) Two electrons in the same atom may not have quantum numbers of 2, 1, -1, -1/2, and 2, 1, -1, -1/2.
   c) If an electron has n=1, it must be in an s orbital.
   d) If an electron has quantum number n=2 it may be in a p sublevel.
   e) If an electron has ℓ=1, it must be in a p sublevel.
Q.19 Which element is not correctly classified?

(a) Se metalloid ✗
(b) S nonmetal ✓
(c) Ge metalloid ✓
(d) Li metal ✓
(e) In metal ✓

Q.20 In determining the results of his "oil drop" experiment in 1909, Robert Millikan was able to determine ...

(a) the charge on the nucleus
(b) that electrically neutral particles (neutrons) are present in the nuclei of atoms
(c) the charge on the electron.
(d) the extremely dense nature of the nuclei of atoms
(e) that the masses of neutrons and protons are nearly identical

Q.21 What is the reducing agent in the following reaction?

$$6 \text{KOH (aq)} + 3 \text{Cl}_2 (g) \rightarrow \text{K}_2\text{Cr}_2\text{O}_7 (aq) + 5 \text{KCl (aq)} + 3 \text{H}_2\text{O (l)}$$

(a) KCl
(b) KCrO$_3$
(c) H$_2$O
(d) Cl$_2$
(e) KOH

Q.22 No two electrons in the same atom can have the same set of four quantum numbers is a statement of ...

(a) the Aufbau Principle
(b) the Pauli Exclusion Principle
(c) The Heisenberg Uncertainty Principle
(d) Dalton's Theory
(e) Hund's Rule
Q.23 What is the electron configuration of oxygen?

\[
\begin{array}{cccc}
1s & 2s & 2p_x & 2p_y & 2p_z \\
\hline
\uparrow \downarrow & \uparrow \downarrow & \uparrow & \uparrow & \uparrow \\
\uparrow \downarrow & \uparrow \downarrow & \uparrow \downarrow & \uparrow \downarrow & \uparrow \downarrow \\
\uparrow \downarrow & \uparrow \downarrow & \uparrow \downarrow & \uparrow & \uparrow \\
\uparrow \downarrow & \uparrow \downarrow & \uparrow \downarrow & \uparrow \downarrow & \uparrow \downarrow \\
\end{array}
\]

Q.24 Which of the following has the lowest first ionization energy?

a) S
b) F
c) B
d) O
e) S

Q.25 The chemical behavior of a group of elements is determined by the ____ of the atoms in the group.

a) atomic weights
b) mass numbers
c) atomic numbers
d) Avogadro’s number
e) atomic mass units

End of Test
Magnuson 101 exam 2 KEY D 12:40 class
There are 25 questions for 150 points
Each question is 6 points.

Q1   D
Q2   B
Q3   B
Q4   D
Q5   D
Q6   C
Q7   B
Q8   D
Q9   C
Q10  D
Q11  A
Q12  B
Q13  B
Q14  C
Q15  E
Q16  E
Q17  A
Q18  A
Q19  A
Q20  C
Q21  D
Q22  B
Q23  C
Q24  A
Q25  C