

Name KEY L (Print last name in CAPS)SECTION SS2- 561 (same as your lab section)

1.	Fill in your name, ID, the department=CHEM, Course no. = 101, and Section= your lab section. Blacken the corresponding letters and numbers.
2.	Read each question carefully before answering.
3.	Mark the choice that best answers the question or completes the statement.
4.	Use the scantron provided. Use a no. 2 pencil and clearly mark your choice. If you change an answer, completely erase your previous mark.
5.	Answer each question. There is no penalty for guessing. However, multiple answers are graded as incorrect, and blank answers are graded as incorrect.
6.	On the scantron, fill in your last name, first name and initial. Blacken the corresponding letters.
7.	Use the test for scratch paper.
8.	Mark your answers on the test so you can check them with the key.
9.	***Turning in a blank scantron results in a grade of zero.***
10.	You may be asked to turn in <u>both</u> 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. You may check your grade at the class web site. Your password is the middle 5 numbers of your student ID followed by the first letter of your last name in CAPS. Be patient and give the webmaster time to enter all of this information.

There are 30 questions for 150 points. Good Luck!

L

Possibly Useful Information

$$M = \frac{\text{mol solute}}{\text{L soln}}$$

$$M_1V_1 = M_2V_2$$

$$\text{density} = \frac{\text{mass}}{\text{volume}}$$

$$\lambda\nu = c$$

$$\frac{w}{w}\% = \frac{\text{mass}}{\text{total mass}} \times 100$$

$$E = mc^2$$

$$E = h\nu$$

$$\lambda = h/mv$$

$$1 \text{ \AA} = 1 \times 10^{-10} \text{ m}$$

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

Q.1 An element with outermost electron configuration $ns^2 np^3$ would be in Group...

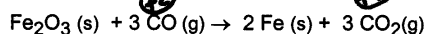
- a. VIIIA
- b. VIIA
- c. VA**
- d. IIIA
- e. IIA

Q.2 Which one of the following is not isoelectronic with neon?

- a. O^{2-}
- b. Cl^- ← 18 e^-**
- c. Al^{3+}
- d. Mg^{2+}
- e. Na^+

In the following reaction CO is ...

Q.3



- a. the reducing agent and is reduced.
- b. neither an oxidizing agent nor a reducing agent.
- c. the oxidizing agent and is reduced.
- d. the oxidizing agent and is oxidized.
- e. the reducing agent and is oxidized.**

Q.4 An electron of mass $9.11 \times 10^{-28} \text{ g}$ is traveling at $2.50 \times 10^6 \text{ m/s}$. Calculate its de Broglie wavelength(in \AA).

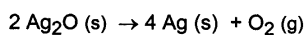
- a. 2.91 \AA**
 - b. 345 \AA
 - c. 0.029 \AA
 - d. 0.14 \AA
 - e. $2.90 \times 10^{-3} \text{ \AA}$
- $$\lambda = \frac{h}{mv} = \frac{6.626 \times 10^{-34} \text{ kg m}^2 \cdot \text{s}^{-2} \cdot \text{s}}{9.11 \times 10^{-28} \text{ g} \times \frac{\text{kg}}{1000\text{g}} \times 2.50 \times 10^6 \text{ m} \cdot \text{s}^{-1}}$$
- $$\lambda = 2.909 \times 10^{-10} \text{ m} = 2.91 \text{ \AA}$$

Q.5 Which statement is false?

- a. The third energy level has d orbitals.
 - b. The 4s orbitals are lower in energy than the 3d orbitals.
 - c. A set of p orbitals in a given energy level are equal in energy.
 - d.** An f set of orbitals is filled with 10 electrons.
 - e. The 5d and 4f orbitals are very close in energy.
-

Q.6 Classify the reaction by giving all of these reaction type(s) that apply.

- I. redox ✓
- II. combination
- III. decomposition ✓
- IV. single displacement
- V. double displacement



- a. I only
 - b. I and IV
 - c. III only
 - d. I, IV, and V
 - e.** I and III
-

Q.7 Which of the following contains no ionic compounds?

- a. HCN, NO₂, Ca(NO₃)₂
 - b. PCl₅, LiBr, Zn(OH)₂
 - c. KOH, CCl₄, SF₄
 - d. NaH, CaF₂, NaNH₂
 - e.** CH₂O, H₂S, NH₃
-

Q.8 Diamagnetism is characteristic of systems containing...

- a. only d electrons
 - b. only s electrons as valence electrons
 - c. one or more unpaired electrons
 - d. only p electrons
 - e.** no unpaired electrons
-

Q.9 Which one of the following elements is paramagnetic in the ground state?

- a. Mg
 - b. Hg
 - c. Kr
 - d.** Se
 - e. He
-

Q.10 Arrange the following in order of **decreasing** atomic radii.

Pb, P, Cl, F, Si

- a. $\text{Pb} > \text{Si} > \text{P} > \text{Cl} > \text{F}$
- b. $\text{Pb} > \text{Cl} > \text{P} > \text{Si} > \text{F}$
- c. $\text{Pb} > \text{Si} > \text{P} > \text{F} > \text{Cl}$
- d. $\text{Pb} > \text{Cl} > \text{F} > \text{Si} > \text{P}$
- e. $\text{Cl} > \text{F} > \text{Pb} > \text{Si} > \text{P}$

Q.11 Which of these elements has the greatest attraction for electrons in a covalent bond?

- a. Se
- b. Kr
- c. As
- d. Br
- e. Ge

EN \rightarrow increase for rep. element
 $\text{Ge} < \text{As} < \text{Se} < \text{Br}$

Q.12 Which of the following reactions is not a decomposition reaction?

- a. $2 \text{HgO} (\text{s}) \rightarrow 2 \text{Hg} (\text{l}) + \text{O}_2 (\text{g})$
- b. $2 \text{H}_2\text{O}_2 (\text{aq}) \rightarrow 2 \text{H}_2\text{O} (\text{l}) + \text{O}_2 (\text{g})$
- c. $\text{Mg}(\text{OH})_2 (\text{s}) \rightarrow \text{MgO} (\text{s}) + \text{H}_2\text{O} (\text{g})$
- d. $\text{NH}_4\text{NO}_3 (\text{s}) \rightarrow \text{N}_2\text{O} (\text{g}) + 2 \text{H}_2\text{O} (\text{g})$
- e. $\text{H}_2 (\text{g}) + \text{Cl}_2 (\text{g}) \rightarrow 2 \text{HCl} (\text{g})$

Q.13 A tanning booth uses ultraviolet light at a wavelength of $1000. \text{\AA}$. What is the frequency of this light?

- a. $1.5 \times 10^{26} \text{ s}^{-1}$
- b. $2.48 \times 10^{13} \text{ s}^{-1}$
- c. $6.63 \times 10^{16} \text{ s}^{-1}$
- d. $3.3 \times 10^{16} \text{ s}^{-1}$
- e. $3.0 \times 10^{15} \text{ s}^{-1}$

$$\nu = \frac{c}{\lambda} = \frac{3.00 \times 10^8 \text{ m.s}^{-1}}{1000 \times 10^{-10} \text{ m}}$$
$$\nu = 3.00 \times 10^{15} \text{ s}^{-1}$$

Q.14 The amount of energy absorbed in a process in which an electron is added to a gaseous atom is defined as ...

- a. first ionization energy
- b. shielding effect
- c. standard reduction potential
- d. electronegativity
- e. electron affinity

Q.15	The total number of electrons in s orbitals in a germanium atom (Z=32) is...				
a.	20	1s			
<input checked="" type="radio"/> b.	8	2s			
c.	18	3s			
d.	6	4s			
e.	15				
Q.16	Which element has the largest atomic radius?				
a.	Na				
b.	Li				
<input checked="" type="radio"/> c.	Rb				
d.	F				
e.	I				
Q.17	Which element has the following electron configuration?				
	1s	2s	2p	3s	3p
	$\uparrow\downarrow$	$\uparrow\downarrow$	$\uparrow\downarrow\uparrow\downarrow\uparrow\downarrow$	$\uparrow\downarrow$	$\uparrow\uparrow\uparrow$
a.	Mg				
b.	Cl				
<input checked="" type="radio"/> c.	P				
d.	Br				
e.	Na				
Q.18	If an element has the following electron configuration, what is the symbol for the element?				
	$1s^2 2s^2 2p^6 3s^2 3p^5$				
<input checked="" type="radio"/> a.	Cl				
b.	Si				
c.	P				
d.	Al				
e.	S				
Q.19	The general shape of the region in space occupied by electrons is described by which quantum number?				
a.	m_s				
b.	ψ				
<input checked="" type="radio"/> c.	ℓ				
d.	n				
e.	m_ℓ				

Q.20 Which two subatomic particles have approximately the same mass?

- a. protons and electrons
- b. electrons and nuclei
- c. neutrons and electrons
- d. protons and alpha particles
- ☒ e. protons and neutrons

Q.21 What is the acidic anhydride of H_2CO_3 ?

- a. H_2
- ☒ b. CO_2
- c. H_2O
- d. CO_3^-
- e. CO

Q.22 Which element has the smallest radius?

- ☒ a. F
- b. I
- c. At
- d. Br
- e. Cl

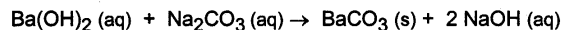
all Gr VIIA

Q.23 Which of the following represents the net ionic equation for all strong acid/strong base reactions that produce a soluble salt and water?

- a. $2\text{H}^+(\text{aq}) + 2\text{e}^- \rightarrow \text{H}_2(\text{g})$
- b. $\text{H}_2\text{O}(\ell) + \text{OH}^-(\text{aq}) \rightarrow \text{O}_2(\text{g}) + 3/2\text{H}_2(\text{g})$
- c. $2\text{H}^+(\text{aq}) + \text{H}_2\text{O}(\ell) \rightarrow 4\text{OH}^-(\text{aq})$
- ☒ d. $\text{H}^+(\text{aq}) + \text{OH}^-(\text{aq}) \rightarrow \text{H}_2\text{O}(\ell)$
- e. $2\text{H}^+(\text{aq}) + \text{O}^{2-}(\text{aq}) \rightarrow 2\text{H}_2\text{O}(\ell)$

Q.24 Classify the reaction by giving all of these reaction type(s) that apply.

- I. redox
- II. combination
- III. decomposition
- IV. single displacement
- V. double displacement ✓



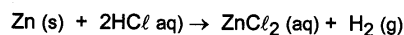
- a. only I
- b. only IV
- ☒ c. only V
- d. II and III
- e. only II

Write net ionic equation for the complete neutralization of HBr by $\text{Ca}(\text{OH})_2$. Use H^+ rather than H_3O^+ . Using the smallest integer coefficients, what is the sum of the balancing coefficients? Do not forget coefficients of one.

- a. 5
b. 3
c. 4
d. 6
e. 7
- $2\text{HBr}(\text{aq}) + \text{Ca}(\text{OH})_2(\text{aq}) \rightarrow \text{CaBr}_2(\text{aq}) + 2\text{H}_2\text{O}(\text{l})$
 $2\text{H}^+ + 2\text{OH}^- \rightarrow 2\text{H}_2\text{O}(\text{l})$
 $\text{H}^+ + \text{OH}^- \rightarrow \text{H}_2\text{O}(\text{l}) \therefore 1+1+1$

Q.26 Classify the reaction by giving all the reaction types that apply.

- I. redox ✓
II. combination
III. decomposition
IV. single displacement ✓
V. double displacement



- a. only I
b. only III
c. only V
d. only II
e. I and IV

Q.27 Which of the following is a strong acid?

- a. HNO_2
b. H_2SO_3
c. HClO
d. HClO_3
e. HF

Q.28 Determine the oxidation number of the underlined element in $\text{Na}\underline{\text{Mn}}\text{O}_4$.

- a. +5
b. +1
c. +7
d. +3
e. +6
- $+1 + \underset{\uparrow}{+7} - 8 = 0$

- Q.29 Which statement regarding the "gold foil" experiment is false?
- a. It suggested the nuclear model of the atom.
 - ☒ b. The alpha particles were repelled by the electrons.
 - c. It was performed by Rutherford and his research group in the early 20th century.
 - d. It suggested that atoms are mostly empty space.
 - e. Most of the alpha particles passed through the foil undeflected.

- Q.30 Which of the following has the lowest first ionization energy?

- a. O
- b. B
- c. S
- d. F
- ☒ e. Sr ← metal

End of Test

Key L Exam 2

Magnuson 22 Oct 2003

30 questions each 5 points for a total of 150 points

Q1	C
Q2	B
Q3	E
Q4	A
Q5	D
Q6	E
Q7	E
Q8	E
Q9	D
Q10	A
Q11	D
Q12	E
Q13	E
Q14	E
Q15	B
Q16	C
Q17	C
Q18	A
Q19	C
Q20	E
Q21	B
Q22	A
Q23	D
Q24	C
Q25	B
Q26	E
Q27	D
Q28	C
Q29	B
Q30	E