Name KEY P (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 ID, the department=CHEM, Course no. = 101, and Section= your lab section. Blacken the corresponding letters and numbers.
7.	If you want your score posted by a portion of your ID# mark A under the option column. They will be posted on the bulletin board where you got your seat assignment.
8.	Use the test for scratch paper.
9.	Mark your answers on the test so that you can check your answers with the key after it is posted.
10.	***** Turning in a blank scantron results in a grade of zero. ******
11.	Turn in both the scantron and the exam, have your ID and your calculator ready to be checked.
12.	Work at a steady pace and you will have ample time to finish.
13.	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 35 questions for 125 points. Good Luck!

P

Possibly Useful Information

1 cal = 4.184 J

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

$M_1V_1 = M_2V_2$

q = mass × sp ht × ΔT

$\left(\frac{w}{w}\right)\% = \frac{\text{mass solute}}{\text{total mass}} \times 100$

d = mass/vol

Volume = ℓ × h × w

$\lambda\nu = c$

$E = h\nu$

$\lambda = \frac{h}{mv}$

TABLE 4-12

Element	Common Reduced Form	Common Oxidized Forms
Li	Li	Li^+
K	K	K^+
Ca	Ca	Ca^{2+}
Na	Na	Na^+
Mg	Mg	Mg^{2+}
Al	Al	Al^{3+}
Mn	Mn	Mn^{2+}
Zn	Zn	Zn^{2+}
Cr	Cr	Cr^{3+}, Cr^{6+}
Fe	Fe	Fe^{2+}, Fe^{3+}
Cd	Cd	Cd^{2+}
Co	Co	Co^{2+}
Ni	Ni	Ni^{2+}
Sn	Sn	Sn^{2+}, Sn^{4+}
Pb	Pb	Pb^{2+}, Pb^{4+}
H (a nonmetal)	H_2	H^+
Sb (a metalloid)	Sb	Sb^{3+}
Cu	Cu	Cu^+, Cu^{2+}
Hg	Hg	Hg_2^{2+}, Hg^{2+}
Ag	Ag	Ag^+
Pt	Pt	Pt^{2+}, Pt^{4+}
Au	Au	Au^+, Au^{3+}

TABLE 4-8

Generally Soluble	Exceptions
Na^+, K^+, NH_4^+ compounds	No common exceptions
fluorides (F^-)	Insoluble: MgF_2, CaF_2, SrF_2, BaF_2, PbF_2
chlorides (Cl^-)	Insoluble: AgCl, Hg_2Cl_2 Soluble in hot water: $PbCl_2$
bromides (Br^-)	Insoluble: AgBr, Hg_2Br_2, $PbBr_2$ Moderately soluble: $HgBr_2$
iodides (I^-)	Insoluble: many heavy-metal iodides
sulfates (SO_4^{2-})	Insoluble: $BaSO_4$, $PbSO_4$, $HgSO_4$ Moderately soluble: $CaSO_4$, $SrSO_4$, Ag_2SO_4
nitrates (NO_3^-), nitrites (NO_2^-)	Moderately soluble: $AgNO_2$
chlorates (ClO_3^-), perchlorates (ClO_4^-)	Moderately soluble: $KClO_4$
acetates (CH_3COO^-)	Moderately soluble: $AgCH_3COO$

Generally Insoluble	Exceptions
sulfides (S^{2-})	Soluble: those of NH_4^+, Na^+, K^+, Mg^{2+}, Ca^{2+}
oxides (O^{2-}), hydroxides (OH^-)	Soluble: Li_2O*, LiOH, Na_2O*, NaOH, K_2O*, KOH, BaO*, $Ba(OH)_2$ Moderately soluble: CaO*, $Ca(OH)_2$, SrO*, $Sr(OH)_2$
carbonates (CO_3^{2-}), phosphates (PO_4^{3-}), arsenates (AsO_4^{3-})	Soluble: those of NH_4^+, Na^+, K^+

**Dissolves with evolution of heat and formation of hydroxides.*

Q.1 The substance methanol, CH_3OH is a ...

a) weak acid
b) salt
c) strong base
d) a nonelectrolyte ←
e) strong acid

Q.2 The discovery that small atomic size particles can behave like waves and indeed have a wavelength, was put forth by which of the following scientists working in the development of early atomic theory?

a) Niels Bohr
b) J.J. Thomson
c) Henri Becquerel
d) Ernest Rutherford
e) Louis de Broglie ←

Q.3 The quantum number n represents the

a) The number of electrons in an orbital
b) The magnetic field of the electron
c) The shape of the orbital
d) The orientation of the orbital
e) The energy of the orbital ←

Q.4 What is the general electronic configuration that best describes the noble gases as a group?

a) ns^1np^6 b) $ns2^1np^4$ c) ns^2np^5 d) ns^2np^6 e) ns^2np^3

Q.5 How many electrons are allowed in an p subshell, a d subshell, and an f subshell?

a) 6,8,16
b) 6,10,18
c) 2,6,10
d) 8,10,14
e) 6,10,14 ←

Q.6 What element has the following ground state electronic configuration?

$[Kr]\ 5s^2 4d^{10} 5p^2$ $36 + 2 + 10 + 2 = 50 \therefore Sn$

a) Sn b) Sb c) Te d) Pb e) Zr

Q.7 Identify the last halogen, the 3rd transition metal, the first lanthanide and the 3rd noble gas.

a) F, V, La Kr
b) I, Sc, Ac, He
c) At, V, Ce, Ar ←
d) I, V, La, Ar
e) I, Ti, La, Ar

Q.8 Which of the following statements is false ?

a) A potassium atom has a smaller radius than a rubidium atom. T
b) An argon atom has a smaller radius than a sulfur atom. T
c) A fluorine atom has a smaller ionization potential than an oxygen atom. F ←
d) A cesium atom has a smaller first ionization energy than a sodium atom. T
e) All the above are true.

Q.9 Which of the following types of radiation has the shortest wavelength, the greatest energy, and the highest frequency?

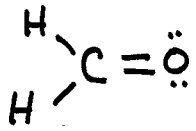
a) Ultraviolet radiation ← UV VIS IR → λ increases
b) Infrared radiation
c) Visible red light
d) Visible blue light
e) None of these since short wavelength means low energy and low frequency.

Q.10 The correct chemical name for the compound $Ca_3(PO_4)_2$ is ...

a) tricalcium phosphite
b) tricalcium diphosphate
c) calcium phosphate ←
d) calcium diphosphate
e) calcium(II) phosphate

Q.11 How many single, double, and triple bonds, respectively are there in the molecule H_2CO ?

a) 0,2,0 b) 1,1,0 c) 2,0,1 (d) 2,1,0 e) 0,0,1



∴ 2,1,0

Q.12 The neutralization of 15.0 mL of 0.24M HCℓ uses 10.0 mL of NaOH. What is the molarity of the NaOH?

a) 0.72M
(b) 0.36M ←
c) 1.44M
d) 0.48M
e) 0.18M

$0.015\,L * 0.24\,\frac{mol}{L} = 3.6\times10^{-3}\,mol\ HCl$

$= 3.6\times10^{-3}\,mol\ NaOH$

$M_{NaOH} = \frac{3.6\times10^{-3}\,mol}{0.010\,L} = 0.36\,M$

Q.13 Which of the following would be expected to have the largest, i.e., the most negative, electron affinity?

a) O b) Na (c) F d) B e) Li

Q.14 $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 5s^2 5p^1$ is the ground state electronic configuration of ...

49 e⁻ ∴ In

a) Tℓ (b) In c) Hg d) Pt e) Bi

Q.15 What nonmetal ion would have the same electronic configuration as Xe?

(a) I^- b) Cs^+ c) Rb^+ d) Br^- e) none of these

Q.16 What is the oxidation number of any group I metal atom at 25°C and 1 atmosphere?

a) +1 b) +2 (c) 0 d) -2 e) -1

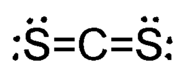
Q.17 The following reaction is classified as...

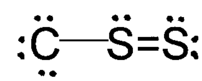
$$AgNO_3\ (aq) + NaC\ell\ (aq) \rightarrow NaNO_3\ (aq) + AgC\ell\ (s)$$

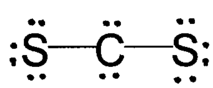
a) redox no
(b) precipitation yes ←
c) single replacement no
d) combustion no
e) more than one of these

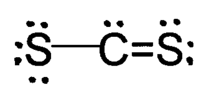
Q.18 Which of the following is (are) acceptable Lewis structures for CS_2?

N = 24
A = 4 + 12 = 16 ←
S = 8 = 4 CB
L = 8 = 4 LP

→ (a)  16e⁻

b)  18e⁻

c)  20e⁻

d)  18e⁻

e) all are acceptable

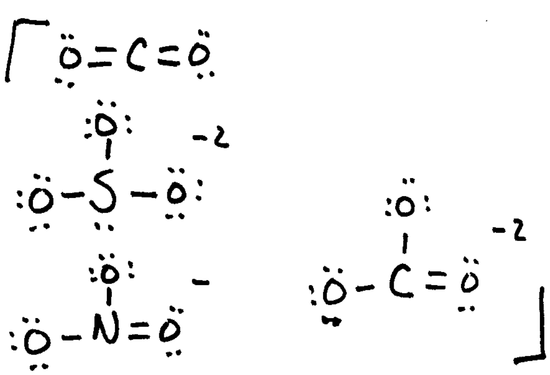
Q.19 What type of orbital (if any) is designated by n = 6, $\ell = 1$ $m_\ell = -1$

a) 5p b) 3d c) 4f (d) 6p ✓ e) no orbital is identified

Q.20 Which of the following has a Lewis structure most like CO_3^{2-}?

a) CO_2
b) SO_3^{2-}
(c) NO_3^- ←

CO_3^{2-} A = 24
CO_2 A = 16
SO_3^{2-} A = 26
NO_3^- A = 24



Q.21 Which of the following is the ground state electron configuration for Rb?

(a) [Ar] ↑↓ ↑↓ ↑↓ ↑↓ ↑↓ ↑↓ ↑↓ ↑↓ ↑↓ ↑ yes ←

b) [Xe] ↑ no

c) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^6 3p^2$ no

d) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 4p^3$ no

e) More than one of these is correct. no

$_{37}Rb$ [Kr] $5s^1$

Q.22 For an electron (mass = 9.109×10^{-31} kg) moving with a velocity of 4.00×10^6 m/s, what is the de Broglie wavelength in meters?

$\lambda = \frac{h}{mv}$

a) 1.37×10^9 m

b) 6.28×10^{-8} m

→ (c) 1.82×10^{-10} m

d) 1.37×10^{-10} m

e) 2.42×10^{-11} m

$$\lambda = \frac{6.626 \times 10^{-34}\ kg\ \frac{m^2}{s^2} \cdot s}{9.109 \times 10^{-31}\ kg * 4.00 \times 10^{6}\ m/s} = 1.818 \times 10^{-10}\ m$$

Q.23 How many d orbitals have n=3?

a) 0 (b) 5 c) 10 d) 7 e) 2

Q.24 In the Lewis structure for the molecule $AsCl_5$, how many lone pairs on the central atom?

a) 11

b) 2

c) 3

d) 1

(e) none ←

N = 48

A = 5 + 35 = 40

S = 10 needed

L = 40 − 10 = 30 = 15 LP { 3 each on each Cl

∴ no LP on As

Q.25 Which of the following has the largest radius?

→ (a) Ca b) Na^+ c) Na d) Ar e) Kr

Q.26 Which of the following is diamagnetic?

a) S b) N c) Fe d) K (e) Zn

$3s^2 3p^4$ $2s^2 2p^3$ $4s^2 3d^6$ $4s^1$ $4s^2 3d^{10}$

Q.27 How many valence electrons are there in the molecular ion, $IC\ell_4^-$?

a) 32 b) 40 c) 35 (d) 36 e) 34

A = 5(7) + 1 = 36

Q.28 Consider the following reaction,

$Cu\ (s) + AgNO_3\ (aq) \rightarrow$ Copper replaces silver

The products of this reaction are ...

$Cu(s) + 2\ AgNO_3\ (aq) \rightarrow Cu(NO_3)_2\ (aq) + 2\ Ag\ (s)$

a) $Cu(OH)_2$ (aq) and Ag_3N (s)
(b) Ag (s) and $Cu(NO_3)_2$ (aq) ←
c) Ag (s) + HNO_3 (aq)
d) AgO (s) + Cu_3N_2 (s)
e) No reaction will occur.

Q.29 How many electrons in an atom can have the quantum numbers n=5, $\ell = 2$

a) 14 b) 12 c) 5 d) 6 (e) 10

Q.30 Consider the following reaction,

$C_2H_5OH\ (g) + O_2\ (g) \rightarrow$

The products of this reaction are ...

a) Hydrogen gas and water
b) Solid carbon and hydrogen gas
c) Carbon hydride and ozone
d) Carbon dioxide gas and hydrogen gas
(e) Carbon dioxide gas and water gas ←

Q.31 What is the energy in Joules of 5.48×10^{10} photons of light having a wavelength of 355 nm?

a) 3.03×10^{-19} joules
b) 5.03×10^{-43} joules
c) 1.66×10^{2} joules
→ (d) 3.07×10^{-8} joules
e) 5.60×10^{-19} joules

$$E = \frac{6.626 \times 10^{-34}\ J \cdot s * 3.00 \times 10^{8}\ m \cdot s^{-1}}{355 \times 10^{-9}\ m}$$

$$E = 5.599 \times 10^{-19}\ \frac{J}{photon} * 5.48 \times 10^{10}\ photons$$

$$E = 3.068 \times 10^{-8}\ J$$

Q.32 A 5.20 gram sample of an acid HX, requires 38.0 mL of a 0.650 M NaOH solution for complete reaction. What is the molar mass of the acid?

a) 28.5 g/mol
b) 39.3 g/mol
c) 7.55 g/mol
d) 132 g/mol
→ (e) 211 g/mol

$0.0380\ L * 0.650 \frac{mol}{L} = 2.47 \times 10^{-2}$ mols NaOH
$= 2.47 \times 10^{-2}$ mols HX

molar mass $= \frac{5.20\ g}{2.47 \times 10^{-2}\ mol} = 210.5 \frac{g}{mol} = 211\ g/mol$

Q.33 What is the oxidation number of manganese in MnO_4^-?

a) -3 (b) +7 c) +6 d) +5 e) +3

Q.34 Identify the substance reduced in the following reaction:

+4 red 0 -3 +1

$2\ NO_2\ (g) + 7\ H_2\ (g) \rightarrow 2\ NH_3\ (g) + 4\ H_2O\ (g)$

ox

a) NH_3
b) H_2
(c) NO_2 ←
d) H_2O
e) There is no substance reduced.

Q.35 The net ionic equation for the reaction of aqueous magnesium nitrate and aqueous sodium sulfate, contains ...

a) MgS (s) and $NaNO_2$ (aq)
b) MgS(s) and $NaNO_3$ (aq)
c) $MgSO_4$ (s) and $NaNO_3$ (aq)
d) Mg^{2+} (aq) and NaS (s) and H_2O (ℓ)
(e) No reaction will occur. ←

$Mg^{2+}_{(aq)} + 2\ NO_3^-_{(aq)} + 2\ Na^+_{(aq)} + SO_4^{2-}_{(aq)}$ → no Reaction

End of Test

KEY Ex2 FORM P Magnuson 101 24 Oct 2002

Total points = 125 Each question = 3.572 points

	1	D
	2	E
	3	E
	4	D
	5	E
	6	A
	7	C
	8	C
	9	A
	10	C
	11	D
	12	B
	13	C
	14	B
	15	A
	16	C
	17	B
	18	A
	19	D
	20	C
	21	A
	22	C
	23	B
	24	E
	25	A
	26	E
	27	D
	28	B
	29	E
	30	E
	31	D
	32	E
	33	B
	34	C
	35	E