

Name Key N (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 you can check them with the key when 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!

N

Possibly Useful Information

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

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

$$M_1V_1 = M_2V_2$$

$$q = \text{mass} \times \text{sp ht} \times \Delta T$$

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

$$d = \text{mass/vol}$$

$$\text{Volume} = \ell \times h \times w$$

$$\lambda\nu = c$$

$$E = h\nu$$

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

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 fluorides (F^-) chlorides (Cl^-) bromides (Br^-) iodides (I^-) sulfates (SO_4^{2-}) nitrates (NO_3^-), nitrites (NO_2^-) chlorates (ClO_3^-), perchlorates (ClO_4^-) acetates (CH_3COO^-)	No common exceptions Insoluble: MgF_2 , CaF_2 , SrF_2 , BaF_2 , PbF_2 Insoluble: AgCl , Hg_2Cl_2 Soluble in hot water: PbCl_2 Insoluble: AgBr , Hg_2Br_2 , PbBr_2 Moderately soluble: HgBr_2 Insoluble: many heavy-metal iodides Insoluble: BaSO_4 , PbSO_4 , HgSO_4 Moderately soluble: CaSO_4 , SrSO_4 , Ag_2SO_4 Moderately soluble: AgNO_2 Moderately soluble: KClO_4 Moderately soluble: AgCH_3COO
Generally Insoluble	Exceptions
sulfides (S^{2-}) oxides (O^{2-}), hydroxides (OH^-) carbonates (CO_3^{2-}), phosphates (PO_4^{3-}), arsenates (AsO_4^{3-})	Soluble: those of NH_4^+ , Na^+ , K^+ , Mg^{2+} , Ca^{2+} Soluble: Li_2O^* , LiOH , Na_2O^* , NaOH , K_2O^* , KOH , BaO^* , $\text{Ba}(\text{OH})_2$ Moderately soluble: CaO^* , $\text{Ca}(\text{OH})_2$, SrO^* , $\text{Sr}(\text{OH})_2$ Soluble: those of NH_4^+ , Na^+ , K^+

*Dissolves with evolution of heat and formation of hydroxides.

Q.1 What is the oxidation number of P in K_3P ?

- a) +3 **b) -3** c) +1 d) -1 e) 0

Q.2 Assigning the oxidation number of -1 to fluorine and -2 to oxygen, the oxidation number of Xenon in the compound, XeO_2F_2 , is...

- a) +2 b) -2 c) +1 **d) +6** e) +4

Q.3 The following reaction is classified as ...

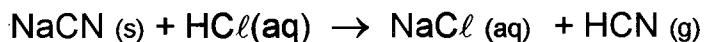


- a) Decomposition
b) Redox ←
c) Neutralization
d) Displacement
e) More than one of these

Q.4 The correct formula for the compound bromous acid is...

- a) $HBrO_4$ b) $HBrO$ **c) $HBrO_2$** d) HBr e) $HBrO_3$

Q.5 In the reaction,



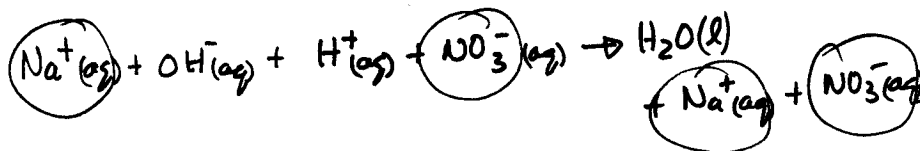
The substance oxidized is ...

- a) $NaCN(s)$
b) $NaCl(aq)$
c) $HCl(aq)$
d) $HCN(g)$
e) This is not a redox reaction. ←

Q.6 For the reaction between aqueous sodium hydroxide and aqueous nitric acid, the "spectator ions" are,

- a) K^+ and OH^-
- b) K^+ and NO_3^-
- c) H^+ and NO_3^-
- d) H^+ and OH^-

☒ e) None of the above ←



Q.7 Which of the following combinations is correct?

- a) NaOH :weak base
- b) H_3PO_4 :strong acid
- c) HNO_3 : weak acid
- d) NH_3 :strong base

☒ e) None of the above ←

Q.8 The substance BaCl_2 is ...

- a) a weak base
- b) a weak acid
- c) a weak electrolyte
- ☒ d) a strong electrolyte
- e) a precipitate

Q.9 Addition of $\text{Na}_2\text{S}(\text{aq})$ and $\text{NaCl}(\text{aq})$ to a solution containing several different cations produces a precipitate. Which of the following conclusions is valid?

- a) K^+ may be present
- ☒ b) Pb^{2+} may be present ←
- c) NH_4^+ may be present
- d) Ca^{2+} may be present
- e) All the above may be present

Q.10 The neutralization of 25.0 mL of 0.24M HCl uses 5.0 mL of NaOH . What is the molarity of the NaOH ?

- a) 0.6M
- b) 0.96M
- ☒ c) 1.2M ←
- d) 2.4M
- e) 5.0M

$$0.0250 \text{ L} \times 0.24 \frac{\text{mol}}{\text{L}} = 6.0 \times 10^{-3} \text{ mol HCl}$$

$$= \text{mol NaOH}$$

$$M_{\text{NaOH}} = \frac{6.0 \times 10^{-3} \text{ mol}}{0.0050 \text{ L}} = 1.2 \text{ M}$$

Q.11 Thorium, Th, is among a group of elements referred to as...

- a) chalcogenides
- ☒ b) actinides ←
- c) halides
- d) thororides
- e) noble metals

Q.12 The ion represented by $^{48}_{22}\text{Ti}^{4+}$ has...

- a) 22 electrons
 - b) 26 protons
 - c) four, 3d electrons
 - ☒ d) no, 4s electrons ←
 - e) 48 neutrons
- 22 p
 26 n
 $18\text{ e}^- \therefore [\text{Ar}]$

Q.13 $1s^2 2s^2 2p^6 3s^2 3p^6 3d^5 4s^1$

is the ground state electronic configuration of ...

- a) scandium
- b) vanadium
- ☒ c) chromium ← $24\text{e}^- \text{ Cr}$
- d) niobium
- e) cobalt

Q.14 EMR of wavelength $4.59 \times 10^{-8}\text{ cm}$ has a frequency of ...

- ☒ a) $6.54 \times 10^{17}\text{ s}^{-1}$
 - b) $6.54 \times 10^{15}\text{ s}^{-1}$
 - c) $1.53 \times 10^{-8}\text{ s}^{-1}$
 - d) 13.8 s^{-1}
 - e) $2.18 \times 10^7\text{ s}^{-1}$
- $$\nu = \frac{3.00 \times 10^8\text{ m}\cdot\text{s}^{-1}}{4.59 \times 10^{-8}\text{ cm} \times \frac{10^{-2}\text{ m}}{1\text{ cm}}}$$

$$\nu = 6.535 \times 10^{17}\text{ s}^{-1}$$

Q.15 What is the orbital designation for the quantum numbers $n=2$, $\ell=1$?

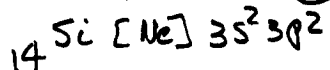
- a) 2s
- ☒ b) 2p ←
- c) 3s
- d) 3p
- e) 2d

Q.16 All of the following terms are quantum numbers except:

- a) Magnetic
- ☒ b) Magic ←
- c) Spin
- d) Principal
- e) Azimuthal

Q.17 How many unpaired electrons are there in the ground state electronic configuration of silicon?

- a) 1 b) 3 **c) 2** d) 0 e) 4



Q.18 How many photons of light of $\nu = 5.50 \times 10^{15} \text{ Hz}$ are needed to provide 2.00 kJ of energy?

- a) 7.28×10^{-18} photons

- b) 5.49×10^{20} photons**

- c) 9.12×10^{-4} photons

- d) 3.30×10^{44} photons

- e) 7.28×10^{-16} photons

$$E = 6.626 \times 10^{-34} \text{ J.s} \times 5.50 \times 10^{15} \text{ s}^{-1}$$

$$E = 3.64 \times 10^{-18} \text{ J/photon}$$

$$\frac{2000 \text{ J}}{3.64 \times 10^{-18} \text{ J/photon}} = 5.49 \times 10^{20} \text{ photons}$$

Q.19 A 6.50 gram sample of an acid HX, requires 137.5 mL of a 0.750 M NaOH solution for complete reaction. What is the molar mass of the acid?

- a) 15.9 g/mol

- b) 36.3 g/mol

- c) 63.0 g/mol**

- d) 103 g/mol

- e) 32.8 g/mol

$$0.1375 \text{ L} \times \frac{0.750 \text{ mol}}{\text{L}} = 0.103 \text{ mol NaOH} \\ = \text{mol HX}$$

$$\text{molar mass HX} = \frac{6.50 \text{ g}}{0.103 \text{ mol}} = 63.0 \text{ g/mol}$$

Q.20 How many electrons can be described by the quantum numbers $n=3$, $\ell=3$, $m_\ell=1$?

- a) 0**

- b) 2

- c) 1

- d) 10

- e) 14

$$n=3$$

$$\ell=0, 1, 2$$

Q.21 An atom of fluorine contains 9 electrons. How many of them are in s orbitals?

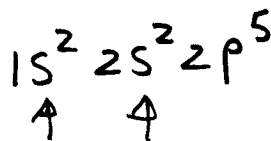
- a) 2

- b) 4**

- c) 6

- d) 8

- e) none



Q.22 Which of the following reactions will proceed as written?

- a) $\text{NaCl(aq)} + \text{KNO}_3(\text{aq}) \rightarrow \text{NaNO}_3(\text{aq}) + \text{KCl(aq)}$ *no*
 b) $\text{Na}_2\text{SO}_4(\text{aq}) + 2\text{KCl(aq)} \rightarrow 2\text{NaCl(aq)} + \text{K}_2\text{SO}_4(\text{aq})$ *no*
 c) $\text{NaCl(aq)} + \text{H}_2\text{O(l)} \rightarrow \text{NaOH(aq)} + \text{HCl(aq)}$ *no*
 → d) $\text{Na}_2\text{CO}_3(\text{s}) + 2\text{HCl(aq)} \rightarrow 2\text{NaCl(aq)} + \text{H}_2\text{O(l)} + \text{CO}_2(\text{g})$ *yes*
 e) None of these will proceed as written.

Q.23 Which of the following is the ground state electron configuration for V?

- a) [Ar] $\uparrow\downarrow \uparrow \square \square \square \uparrow\downarrow$ *no*
 b) [Ne] $\uparrow\downarrow \uparrow\downarrow \uparrow \uparrow \uparrow \uparrow \uparrow \uparrow \uparrow\downarrow$ *no*
 c) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^3 4s^2$ ← *23 1st transition series*
 d) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 4p^3$ *no*
 e) More than one of these is correct.

Q.24 In which of the following are the elements arranged in order of increasing first ionization energy?

- a) $\text{O} < \text{F} < \text{Ne}$ ←
 b) $\text{Li} < \text{Na} < \text{K}$
 c) $\text{B} < \text{Be} < \text{Li}$
 d) $\text{C} < \text{P} < \text{Se}$
 e) None of these are correctly arranged in order of increasing first IE.

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

- a) Na^+
 b) Ne
 c) F^-
 d) O^{2-} ←
 e) All have same radius because they are isoelectronic.

Q.26 When $n=2$, which of the following is a possible value for ℓ ?

- a) -2 b) 0 c) +2 d) 4 e) 8

Q.27 When $\ell=4$, what set of orbitals is designated?

- ☒ a) g b) p c) f d) d e) s

Q.28 The quantum number ℓ represents the

- a) The number of valence electrons
b) The number of orbitals
☒ c) The shape of the orbitals
d) The orientation of the orbital
e) The size of the orbital

Q.29 Which of the following has the most metallic character?

- a) calcium b) lithium ☒ c) cesium d) fluorine e) gallium

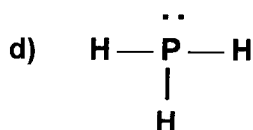
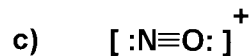
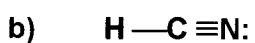
Q.30 Which of the following represents the balanced, net ionic equation for the reaction of barium nitrate with a solution of potassium carbonate?

- ☒ a) $\text{Ba}^{2+}(\text{aq}) + \text{CO}_3^{2-}(\text{aq}) \rightarrow \text{BaCO}_3(\text{s})$
b) $\text{K}^+(\text{aq}) + \text{NO}_3^-(\text{aq}) \rightarrow \text{KNO}_3(\text{s})$
c) $\text{Ba}^{2+}(\text{aq}) + \text{NO}_3^-(\text{aq}) \rightarrow \text{K}_2\text{CO}_3(\text{aq}) + \text{Ba}^{2+}(\text{s})$
d) $\text{Ba}(\text{NO}_3)_2(\text{aq}) + \text{K}^+(\text{aq}) \rightarrow \text{KNO}_3(\text{s}) + \text{Ba}^{2+}(\text{aq})$
e) $\text{Ba}(\text{NO}_3)_2(\text{aq}) + \text{CO}_3^{2-}(\text{aq}) \rightarrow \text{BaCO}_3(\text{s}) + 2\text{N}_2(\text{g}) + 3\text{O}_2(\text{g})$

Q.31 Which of the following contains **no** ionic compounds?

- a) H_2O , MgO , NO_2
☒ b) CO_2 , SO_2 , CS_2
c) CCl_4 , CaCl_2 , Na_2S
d) KBr , SO_2 , CS_2
e) Mg_3N_2 , NCl_3 , HOCl

Q.32 Which of the following is not a correct Lewis structure?



☒ e) all are correct

Q.33 How many covalent bonds are there in the Lewis structure for the nitrite ion, NO_2^- ?

a) four

b) one

c) two

☒ d) three

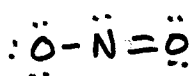
e) none, all bonds are ionic

$$N = 24$$

$$A = 18$$

$$S = 6 = 3 \text{ CB}$$

$$S = 12 = 6 \text{ LP}$$



Q.34 How many valence electrons are there in the molecule, acetonitrile, CH_3CN ?

a) 24

☒ b) 16

c) 32

d) 28

e) 30

$$A = 4 + 3(1) + 4 + 5 = 16$$

Q.35 How many lone pairs are there on the central atom in the molecular ion, NH_4^+ ?

a) one

b) two

c) three

d) four

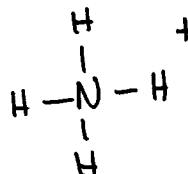
☒ e) none

$$N = 16$$

$$A = 8$$

$$S = 8 = 4 \text{ CB}$$

$$L = 0$$



End of Test

KEY Ex2 FORM **N** Magnuson 101 24 Oct 2002

Total points = 125

Each question = 3.572 points

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