

Chemistry 110 Practice Exam 2 (Ch 3-4):

Note:

1. Sit according to the seat number assigned (ask the TA or the instructor).
2. Use a softlead pencil, fill in your name, z-number, department name (CHEM), course name (110), and today's date () in the scantron sheet.
3. Use the following Periodic Table for the problems involving atomic mass and group names in this exam.
4. This is a **closed-book** exam. You **cannot** use your textbook or notes. However, you should use a calculator. A **Cell phone is not allowed during the exam**. The following data will be helpful to you.

Avogadro's number $N_A = 6.022 \times 10^{23} = 1 \text{ mole}$

Soluble Compounds	Exceptions
Compounds containing alkali metals ions and the ammonium ion	
Nitrates, bicarbonates, and chlorates	
Halides	Halides of Ag^+ , Hg_2^{2+} , and Pb^{2+}
Sulfates	Sulfates of Ag^+ , Ca^{2+} , Sr^{2+} , Ba^{2+} , Hg_2^{2+} , and Pb^{2+}
Insoluble Compounds	Exceptions
Carbonates, phosphates, chromates, and sulfides	Compounds containing alkali metals ions and the ammonium ion
Hydroxides	Compounds containing alkali metals ions and the ammonium ion

MAIN-GROUP ELEMENTS		TRANSITION ELEMENTS										MAIN-GROUP ELEMENTS						
IA (1)												IIIA (13)					VIIIA (18)	
1	1 H 1.008																2 He 4.003	
2	3 Li 6.941											5 B 10.81					10 Ne 20.18	
	4 Be 9.012											6 C 12.01					9 F 19.00	
3	11 Na 22.99											7 N 14.01					18 Ar 39.95	
	12 Mg 24.31	III B (3)	IV B (4)	V B (5)	VI B (6)	VII B (7)	VIII B (8) (9) (10)			IB (11)	IIB (12)	13 Al 26.98					17 Cl 35.45	
4	19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.88	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.69	29 Cu 63.55	30 Zn 65.39	31 Ga 69.72	32 Ge 72.61	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 112.4	49 In 114.8	50 Sn 118.7	51 Sb 121.8	52 Te 127.6	53 I 126.9	54 Xe 131.3
6	55 Cs 132.9	56 Ba 137.3	57 La 138.9	72 Hf 178.5	73 Ta 180.9	74 W 183.9	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.1	79 Au 197.0	80 Hg 200.6	81 Tl 204.4	82 Pb 207.2	83 Bi 209.0	84 Po (209)	85 At (210)	86 Rn (222)
7	87 Fr (223)	88 Ra (226)	89 Ac (227)	104 Rf (261)	105 Db (262)	106 Sg (266)	107 Bh (262)	108 Hs (265)	109 Mt (266)	110 (269)	111 (272)	112 (277)						

Choose the most appropriate answer. Each question is worth 3 points

- Select the correct formula for a compound formed from calcium and chlorine.
A. CaCl B. CaCl₂ C. Ca₂Cl D. Ca₂Cl₂ E. CaCl₃
- Select the strongest bond in the following group.
A. C-S B. C-O C. C=C D. C≡N E. C-F
- Electronegativity is a measure of
A. the energy needed to remove an electron from an atom. B. the energy released when an electron is added to an atom.
C. the magnitude of the negative charge on an electron. D. the attraction by an atom for electrons in a chemical bond.
E. the magnitude of the negative charge on a molecule.
- Which of the following elements is the most electronegative?
A. Ag B. Rb C. P D. I E. Cl
- To form an ion, a magnesium atom
A) loses two electrons. B) loses seven electrons. C) gains two electrons.
D) loses one electron. E) gains one electron.
- The compound AlCl₃ is named
A) aluminum chloride. B) aluminum chlorine. C) aluminum (III) chloride.
D) monoaluminum chloride. E) aluminum trichloride.
- What is the correct formula for copper (I) sulfide?
A) Cu₂S₃ B) Cu₂S C) Cu₃S₂ D) CuS₂ E) CuS
- What is the formula of dinitrogen tetroxide?
A) NO B) N₂O₄ C) NO₃ D) NO₄ E) N₄O
- In a molecule with covalent bonding,
A) atoms are held together by sharing electrons.
B) oppositely charged ions are held together by strong electrical attractions.
C) atoms of different metals form bonds.
D) atoms of noble gases are held together by attractions between oppositely charged ions.
E) atoms of metals form bonds to atoms of nonmetals.
- Which of the following compounds contains a polar covalent bond?
A) MgO B) N₂ C) F₂ D) NaCl E) N₂O
- Which of the following compounds contains ionic bonds?
A) CF₄ B) H₂O C) C₂H₄ D) Cl₂ E) MgO
- A nonpolar covalent bond is found in which of these compounds?
A) PH₃ B) O₂ C) HBr D) H₂S E) NaCl
- Which of the following polyatomic ions has a positive charge?
A) hydroxide B) hydrogen carbonate C) ammonium D) nitrate E) sulfate
- The name of the CO₃²⁻ ion is
A) carbonate. B) carbonite. C) carbon trioxide. D) monocarbon trioxide. E) carbide.

- 15) What is the formula for magnesium nitrate?
 A) MgNO_3 B) Mg_2NO_3 C) $\text{Mg}(\text{NO}_3)_3$ D) $\text{Mg}(\text{NO}_3)_2$ E) $\text{Mg}_2(\text{NO}_3)_2$
- 16) The molecular shape of PH_3 , is
 A) trigonal planar B) pyramidal C) tetrahedral D) bent with 120 degree bond angle
 E) bent with 109 degree bond angle
- 17) A molecule with the general formula AX_4 will have a _____ molecular shape.
 A. bent B. trigonal planar C. trigonal pyramidal D. square planar E. tetrahedral
- 18) The Lewis electron-dot structure of ammonia (NH_3) is
 A) $\begin{array}{c} \text{H} \\ | \\ \text{H}-\text{N}-\text{H} \\ \bullet \end{array}$ B) $\begin{array}{c} \text{H} \\ | \\ \text{H}-\text{N}-\text{H} \end{array}$ C) $\begin{array}{c} \text{H} \\ | \\ \text{H}-\text{N}=\text{H} \end{array}$
 D) $\begin{array}{c} \text{H} \\ | \\ \text{H}-\text{N}=\text{H} \\ \bullet\bullet \end{array}$ E) $\begin{array}{c} \text{H} \\ | \\ \text{H}-\text{N}-\text{H} \\ \bullet\bullet \end{array}$
- 19) Water, H_2O , has the following molecular shape:
 A) trigonal. B) pyramidal. C) bent with a bond angle close to 109 degrees.
 D) bent with a bond angle close to 120 degrees. E) tetrahedral.
- 20) The name of the covalent compound N_2O is
 A) nitrogen oxide B) dinitrogen oxide C) dinitrogen monoxide
 D) dinitrogen tetroxide E) oxygen dinitride
- 21) 1 mole is
 A) equal to the number of atoms in 1 gram of sodium.
 B) a different name for amu. C) a collective quantity that contains 6.02×10^{23} units.
 D) a collective quantity that contains a dozen units. E) equal to 1 gram.
- 22) The number of valence electrons in a carbon atom is
 A) 6 B) 5 C) 4 D) 8 E) 3
- 23) What is the precipitate that forms when solutions of Na_3PO_4 and $\text{Fe}(\text{NO}_2)_3$ are mixed?
 A) NaNO_3 B) NaFe C) FePO_4 D) PO_4NO_3 E) Fe_3PO_4
- 24) Select the classification for the following reaction: $\text{H}_2(\text{g}) + \text{Cl}_2(\text{g}) \rightarrow 2\text{HCl}(\text{g})$
 A. combination B. decomposition C. displacement D. acid-base E. None of these choices is correct.
- 25) 0.800 mole of sodium weighs
 A. 23.0 g. B. 0.700 g. C. 16.1 amu. D. 16.1 grams. E. 18.4 g.
- 26) 2.4×10^{24} oxygen atoms weigh
 A. 2.4×10^{24} g. B. 32 g. C. 32 amu. D. 64 g. E. 32 amu.

27. How many hydrogen atoms are there in 3.00 mole of H_2O ?
 A. 3.01×10^{23} B. 6.02×10^{23} C. 3.61×10^{24} D. 1.20×10^{24} E. 2.41×10^{24}
28. The molar mass of C_2H_4 is
 A. 6.02×10^{23} g/mol B. 28 g/mol C. 24 g/mol D. 32 g/mol E. 18 g/mol
- 29) Aluminum oxide, Al_2O_3 , is used as a filler for paints and varnishes as well as in the manufacture of electrical insulators. Calculate the number of moles in 47.51 g of Al_2O_3 .
 A. 2.377 mol B. 2.146 mol C. 1.105 mol D. 0.4660 mol E. 0.4207 mol
- 30) What are the coefficients of iron (Fe), phosphoric acid (H_3PO_4), iron(II) phosphate ($\text{Fe}_3(\text{PO}_4)_2$) and hydrogen (H_2) when the following equation is balanced?

$$\text{Fe} + \text{H}_3\text{PO}_4 \rightarrow \text{Fe}_3(\text{PO}_4)_2 + \text{H}_2$$

 A. 2, 3, 1, 3 B. 3, 2, 1, 2 C. 3, 2, 1, 3 D. 2, 1, 2, 1 E. 2, 3, 2, 1
- 31) The reaction $\text{BaCl}_2(\text{aq}) + \text{CuSO}_4(\text{aq}) \rightarrow \text{CuCl}_2(\text{aq}) + \text{BaSO}_4(\text{s})$ is a
 A. combination reaction B. decomposition reaction C. single replacement reaction
 D. double replacement reaction E. combustion reaction
- 32) How many grams of CO_2 are produced when 24 grams of carbon react completely with O_2 in the reaction

$$\text{C} + \text{O}_2 \rightarrow \text{CO}_2$$

 A. 88 g B. 44 g C. 33 g D. 11 g E. 22 g
- 33). When 3 moles of aluminum are allowed to react with an excess of oxygen, O_2 , how many moles of aluminum oxide are produced?

$$4\text{Al} + 3\text{O}_2 \rightarrow 2\text{Al}_2\text{O}_3$$

 A. 1 mole B. 1.5 moles C. 2 moles D. 2.5 moles E. 3 moles
- 34) When 16 g of methane is burned according to the equation $\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$, you experimentally measure you have produced 32 g of water. What is the percent yield for this reaction?
 A. 79% B. 85% C. 95% D. 62% E. 89%

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(Sign and write down your seat number in the back of the scantron. Show your student ID when hand in the scantron. Keep this copy for your record)