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 softhead pencil, fill in you 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 $N_A = 6.022 \times 10^{23} = 1$ mole

<table>
<thead>
<tr>
<th>Soluble Compounds</th>
<th>Exceptions</th>
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<tbody>
<tr>
<td>Compounds containing alkali metals ions and the ammonium ion</td>
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<tr>
<td>Nitrates, bicarbonates, and chlorates</td>
<td>Halides of Ag$^+$, Hg$^{2+}$, and Pb$^{2+}$</td>
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<tr>
<td>Halides</td>
<td>Sulfates of Ag$^+$, Ca$^{2+}$, Sr$^{2+}$, Ba$^{2+}$, Hg$^{2+}$, and Pb$^{2+}$</td>
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<td>Sulfates</td>
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<table>
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<tr>
<th>Insoluble Compounds</th>
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<tbody>
<tr>
<td>Carbonates, phosphates, chromates, and sulfides</td>
<td>Compounds containing alkali metals ions and the ammonium ion</td>
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<tr>
<td>Hydroxides</td>
<td>Compounds containing alkali metals ions and the ammonium ion</td>
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</table>
Choose the most appropriate answer. Each question is worth 3 points

1. Select the correct formula for a compound formed from calcium and chlorine.
   A. CaCl   B. CaCl₂   C. Ca₂Cl   D. Ca₂Cl₂   E. CaCl₃

2. Select the strongest bond in the following group.
   A. C-S   B. C-O   C. C≡C   D. C≡N   E. C-F

3. 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.

4. Which of the following elements is the most electronegative?
   A. Ag   B. Rb   C. P   D. I   E. Cl

5) 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.

6) The compound AlCl₃ is named
   A) aluminum chloride.    B) aluminum chlorine.    C) aluminum (III) chloride.
   D) monoaluminum chloride. E) aluminum trichloride.

7) What is the correct formula for copper (I) sulfide?
   A) Cu₂S₃   B) Cu₂S   C) Cu₂S₂   D) CuS₂   E) CuS

8) What is the formula of dinitrogen tetroxide?
   A) NO   B) N₂O₄   C) NO₃   D) NO₄   E) N₂O

9) 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.

10) Which of the following compounds contains a polar covalent bond?
    A) MgO   B) N₂   C) F₂   D) NaCl   E) N₂O

11) Which of the following compounds contains ionic bonds?
    A) CF₄   B) H₂O   C) C₂H₄   D) Cl₂   E) MgO

12) A nonpolar covalent bond is found in which of these compounds?
    A) PH₃   B) O₂   C) HBr   D) H₂S   E) NaCl

13) Which of the following polyatomic ions has a positive charge?
    A) hydroxide   B) hydrogen carbonate   C) ammonium   D) nitrate   E) sulfate

14) The name of the CO₃²⁻ ion is
15) What is the formula for magnesium nitrate?
A) MgNO₃    B) Mg₂NO₃    C) Mg(NO₃)₂    D) Mg(NO₃)₃    E) Mg₂(NO₃)₂

16) The molecular shape of PH₃, 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 AX₄ 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 (NH₃) is
A)    B)    C)    D)    E)

19) Water, H₂O, 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 N₂O 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 ×10²³ 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 Na₃PO₄ and Fe(NO₃)₃ are mixed?
A) NaNO₃    B) NaFe    C) FePO₄    D) PO₄NO₃    E) Fe₃PO₄

24) Select the classification for the following reaction: H₂(g) + Cl₂(g) → 2HCl(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 ×10²⁴ oxygen atoms weigh
A. 2.4 ×10²⁴ 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 H₂O?
A. 3.01 x 10^{23} B. 6.02 x 10^{23} C. 3.61 x 10^{24} D. 1.20 x 10^{24} E. 2.41 x 10^{24}

28. The molar mass of C₂H₄ is
A. 6.02 x 10^{23} g/mol B. 28 g/mol C. 24 g/mol D. 32 g/mol E. 18 g/mol

29) Aluminum oxide, Al₂O₃, 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 Al₂O₃.
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 (H₃PO₄), iron(II) phosphate (Fe₃(PO₄)₂) and hydrogen (H₂) when the following equation is balanced?
Fe + H₃PO₄ → Fe₃(PO₄)₂ + H₂
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 BaCl₂ (aq) + CuSO₄ (aq) → CuCl₂ (aq) + BaSO₄ (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 CO₂ are produced when 24 grams of carbon react completely with O₂ in the reaction
C + O₂ → CO₂
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, O₂, how many moles of aluminum oxide are produced?
4Al + 3 O₂ → 2 Al₂O₃
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 CH₄ + 2O₂ → CO₂ + 2H₂O, 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%

- end -

(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)