PRACTICE FINAL EXAM
80 POINTS

INSTRUCTIONS:
Each question is worth 2 points. Work through all the questions first before transferring your answers to the answer sheet. You may use the periodic table/help sheet. Good luck!

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1. Which of the following colors of light has the highest frequency?
   A. blue
   B. red
   C. violet
   D. yellow
   E. all colors have the same wavelength

2. Which of the following wavelengths of light is the least energetic?
   A. 440 nm
   B. 470 nm
   C. 540 nm
   D. 650 nm
   E. all wavelengths have the same energy

3. How many photons of light are emitted when the electrons in 50 hydrogen atoms drop from energy level 3 to 1?
   A. 1
   B. 50
   C. 100
   D. 150
   E. 200

4. Which of the following energy-level changes for an electron is most energetic?
   A. 3 -> 2
   B. 4 -> 2
   C. 5 -> 2
   D. 6 -> 2
   E. all energy level changes are the same

5. How many energy sublevels exist within the 5th energy level?
   A. 2
   B. 4
   C. 5
   D. 10
   E. 50

6. Which electron sublevel immediately follows the 4p sublevel according to increasing energy?
   A. 3d
   B. 4d
   C. 4s
   D. 5s
   E. 5p
7. Which energy sublevel is being filled by the elements Ga through Kr?
   A. 3d  
   B. 4s  
   C. 4p  
   D. 4d  
   E. 4f  

8. Which of the following is the electron configuration for an atom of cobalt (Co, atomic number 27)?
   A. [Ar]3s²3p⁶  
   B. [Ar] 3s²3p⁷  
   C. [Ar]4s²4p⁷  
   D. [Ar]4s²3d⁷  
   E. [Ar]4s²4d⁷  

9. Predict the number of valence electrons for a Group VIIA/17 element.
   A. 1  
   B. 2  
   C. 3  
   D. 7  
   E. 17  

10. Which of the following is the electron (Lewis) dot formula for an atom of carbon?
    A. C•  
    B. C•  
    C. C•  
    D. C•  
    E. C•  

11. What is the term for the valence electrons in a molecule that are not shared?
    A. bonding electrons  
    B. core electrons  
    C. covalent electrons  
    D. nonbonding electrons  
    E. none of the above  

12. What is the total number of valence electrons in one water molecule?
    A. 2  
    B. 6  
    C. 8  
    D. 18  
    E. none of the above.
13. Draw the electron dot formula for sulfur dioxide, SO$_2$. How many pairs of nonbonding electrons (lone pairs) are in one molecule of sulfur dioxide?
   A. 1
   B. 3
   C. 5
   D. 6
   E. 9

14. Draw the Lewis dot structure for oxygen, O$_2$, and state the type of bond in one molecule.
   A. 1 single bond
   B. 1 double bond
   C. 1 triple bond
   D. 2 single bonds
   E. none of the above

15. Draw the Lewis dot structure for the carbonate ion, CO$_3^{2-}$, and state the type of bonds in one polyatomic ion.
   A. 1 single bond and 2 double bonds
   B. 2 single bonds and 1 double bond
   C. 2 single bonds and 1 triple bond
   D. 3 single bonds
   E. none of the above

16. What is the electron domain geometry for a phosphine, PH$_3$, molecule?
   A. bent
   B. linear
   C. tetrahedral
   D. pyramidal
   E. trigonal planar

17. What is the molecular shape of a carbonate ion, CO$_3^{2-}$?
   A. bent
   B. linear
   C. tetrahedral
   D. pyramidal
   E. trigonal planar

18. What is the molecular shape of the sulfur dioxide, SO$_2$, molecule?
   A. bent
   B. linear
   C. tetrahedral
   D. pyramidal
   E. trigonal planar
19. Which of the following is held together by covalent bonds?
   A. AgClO$_2$
   B. HClO$_2$
   C. NaClO$_2$
   D. Ca(ClO$_2$)$_2$
   E. Zn(ClO$_2$)$_2$

20. Which noble gas is isoelectronic with an calcium ion?
   A. helium
   B. neon
   C. argon
   D. krypton
   E. xenon

21. Which of the following ions has the electron configuration: 1s$^2$2s$^2$2p$^6$3s$^2$3p$^6$?
   A. K$^+$
   B. Cl$^-$
   C. P$^{3-}$
   D. all of the above
   E. none of the above

22. Sodium metal and chlorine vapor react to form sodium chloride. Which of the following statements is true?
   A. The sodium atoms gain electrons and the chlorine atoms lose electrons
   B. The smallest representative particle is called a molecule
   C. The smallest representative particle is called a formula unit
   D. The sodium ion and the chloride ion are isoelectronic with each other
   E. none of the above.

23. The phosphide ion, P$^{3-}$, is classified as which of the following?
   A. monatomic cation
   B. monatomic anion
   C. polyatomic cation
   D. polyatomic anion
   E. none of the above.

24. What is the name for SO$_3^{2-}$?
   A. sulfide ion
   B. sulfite ion
   C. sulfate ion
   D. sulfur trioxide ion
   E. none of the above
25. What is the chemical formula for the binary compound composed of Fe$^{2+}$ and F$^-$ ions?
   A. FeF
   B. FeF$_3$
   C. Fe$_2$F$_2$
   D. FeF$_2$
   E. none of the above

26. What is the chemical formula for the compound composed of Ca$^{2+}$ and PO$_4^{3-}$?
   A. CaPO$_4$
   B. Ca$_3$PO$_4$
   C. Ca$_3$(PO$_4$)$_2$
   D. Ca$_2$(PO$_4$)$_3$
   E. (CaPO$_4$)$_3$

27. What is the ionic charge for the nickel ion in Ni(NO$_3$)$_2$?
   A. 0
   B. 1+
   C. 2+
   D. 3+
   E. 4+

28. What is the chemical formula for chromium (III) oxide?
   A. CrO
   B. Cr$_2$O
   C. Cr$_2$O$_3$
   D. Cr$_3$O$_2$
   E. CrO$_2$

29. What is the name of Ag$_2$S?
   A. silver sulfide
   B. silver sulfite
   C. silver (I) sulfide
   D. silver (I) sulfite
   E. silver (I) sulfate

30. What is the name for N$_2$O$_4$?
   A. nitrogen tetraoxide
   B. nitrogen pentaoxide
   C. dinitrogen tetraoxide
   D. dinitrogen pentaoxide
   E. dinitrogen oxide
31. What is the term for a type of reaction in which two or more substances are produced from a single compound?
   A. combination
   B. decomposition
   C. double replacement
   D. neutralization
   E. single replacement

32. Which of the following is not evidence for a chemical reaction?
   A. a change in physical state
   B. a change in odor
   C. a change in color
   D. a change in solubility
   E. a change in energy

33. Which of the following elements occurs naturally as diatomic molecules?
   A. chlorine gas
   B. fluorine gas
   C. hydrogen gas
   D. nitrogen gas
   E. all of the above

34. Which of the following is a general guideline for balancing an equation?
   A. write correct formulas for reactants and products
   B. begin balancing with the most complex formula
   C. balance polyatomic ions as a single unit
   D. check each reactant and product to verify the coefficients
   E. all of the above

35. What is the coefficient of oxygen gas after balancing the following equation?
   \[ \text{___LiNO}_3(s) \rightleftharpoons \text{___LiNO}_2(s) + \text{___O}_2(g) \]
   A. 1
   B. 2
   C. 3
   D. 4
   E. none of the above

36. What are the products of the following reaction?
   \[ \text{Cu(s) + AgNO}_3(aq) \rightleftharpoons \]
   A. Ag(s) + CuNO_3(aq)
   B. Ag(s) + Cu(NO_3)_2 (aq)
   C. AgO(s) + CuN_3(aq)
   D. Ag(s) + Cu(NO_2)_3(aq)
   E. no reaction
37. What is the term for the amount of substance that contains $6.022 \times 10^{23}$ particles?
   A. Avogadro’s number
   B. atomic number
   C. mass number
   D. mole number
   E. atomic mass

38. How many sodium sulfate formula units are in 0.333 mol of Na$_2$SO$_4$?
   A. $2.00 \times 10^{21}$ formula units
   B. $2.00 \times 10^{23}$ formula units
   C. $2.00 \times 10^{24}$ formula units
   D. $5.53 \times 10^{21}$ formula units
   E. $5.53 \times 10^{25}$ formula units

39. What is the molar mass of ammonium dichromate, (NH$_4$)$_2$Cr$_2$O$_7$?
   A. 238.09 g/mol
   B. 252.10 g/mol
   C. 260.18 g/mol
   D. 372.18 g/mol
   E. 386.19 g/mol

40. How many bromine molecules, Br$_2$, have a mass equal to 31.8 g?
   A. $1.20 \times 10^{23}$ molecules
   B. $1.51 \times 10^{24}$ molecules
   C. $1.91 \times 10^{25}$ molecules
   D. $2.40 \times 10^{23}$ molecules
   E. $3.03 \times 10^{24}$ molecules