

NAME _____ Section number _____

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Homework 4 and 5

Chemistry 101

December 8, 2005

Clearly print your name in the name section of the Scantron answer sheet.

Clearly place your student ID number in the SUBJECT section of the Scantron sheet.

There is only one most correct response to each of the multiple choice questions. Choose the best answer. Each of the 50 questions is worth 1 points. Since the Scantron sheets will not be returned to you, please work through the entire exam and circle the best answer on this exam. Bring this exam on Friday and then transfer the responses to the Scantron sheet all at one time. This is the best way to reduce errors. Use pencil on the Scantron sheets and make certain to fully erase any changes you make. Use this exam to check your answers on the key that will be posted online.

2.54 cm = 1 in 454 g = 1 lb 946 mL = 1 qt 5280 ft = 1 mile 16 oz = 1 lb 4 qt = 1 gal

heat = (sp. Ht.) X (mass) X (Δ Temp) T (K) = T ($^{\circ}$ C) + 273.15 T ($^{\circ}$ F) = (1.8 X T ($^{\circ}$ C)) + 32

1 cal = 4.184 J

1. Ionic compounds are formed due to which type of attraction?
A) magnetic
B) electrostatic
C) nuclear
D) gravitational
2. Five students obtain the following grades on an exam. What is the average score on this exam for these students? (88, 69, 81, 92, 79)
A) 68
B) 81.80
C) 82
D) 81.8
3. The concentration of 125 mL of an aqueous solution of KNO_2 is 2.30 M. How many grams of KNO_2 were used to prepare this solution?
A) 24.5 g
B) 1.56 g
C) 245 g
D) 0.288 g

4. The formation of molecular compounds involves
- the transfer of electrons.
 - the sharing of electrons.
 - the creation of electrons.
 - the destruction of electrons.
5. Aqueous solutions of iron(II) chloride and sodium hydroxide are poured together and allowed to react. What is the identity of the precipitate, if one is produced?
- Iron(II) hydroxide
 - NaCl
 - FeOH
 - none of the above
6. When beryllium forms its corresponding cation, its electron configuration is which one of the following?
- $2s^2 2p^6$
 - [Ne]
 - [He] $1s^2$
 - $1s^2$
7. Which family in the periodic table has the following general electron configuration, [NG] $ns^2 np^4$, where NG represents a noble gas?
- Group IVA
 - Group VIB
 - Group IIA
 - Group VIA
8. The Lewis structure for N_2O can be represented as $N=N=O$. How many nonbonding electrons must be on these three atoms, respectively?
- 4, 0, 6
 - 6, 2, 4
 - 4, 2, 6
 - 4, 0, 4
9. If a sample of cobalt is composed of 3.231 moles, what is its mass?
- 196 g
 - 190 g
 - 1.95×10^{24} g
 - 0.0548 g
10. In the chemical equation, $Mg_3N_2 + H_2O \rightarrow Mg(OH)_2 + NH_3$, what is the coefficient in front of the water?
- 3
 - 6
 - 2
 - 1

11. Which one of the following single replacement equations will result in “no reaction”?
- A) $\text{Fe(s)} + \text{Zn(NO}_3)_2(\text{aq}) \rightarrow$
 - B) $\text{Zn(s)} + \text{Pb(NO}_3)_2(\text{aq}) \rightarrow$
 - C) $\text{Cr(s)} + \text{Fe(NO}_3)_2(\text{aq}) \rightarrow$
 - D) $\text{K(s)} + \text{Cr(NO}_3)_3(\text{aq}) \rightarrow$
12. Analysis of a 25.0-g sample of water revealed a mass percent for lead of 2.64%. Calculate the number of grams of lead in this sample.
- A) 6.0×10^{-4} g
 - B) 0.026 g
 - C) 2.6 g
 - D) 0.66 g
13. The $[\text{OH}^-]$ of a solution is 4.33×10^{-5} M. What is the pH of this solution?
- A) 18.4
 - B) 9.64
 - C) 4.36
 - D) -4.36
14. A laser beam travels a distance of 52120 m in 0.0002 seconds. Which one of the following is the best expression (scientific notation) for the velocity of the beam?
- A) 3.84×10^{-9} m/sec
 - B) 3.8×10^{-9} m/sec
 - C) 3×10^8 m/sec
 - D) 2.61×10^8 m/sec
15. A sample of propane (25 g) is burned in 86 g of oxygen in a chemical reaction to produce water and carbon dioxide (CO_2). If 78 g of CO_2 is formed, how much water was also produced?
- A) 33 g
 - B) not enough information
 - C) 30 g
 - D) 103 g
16. Naphthalene (C_{10}H_8), better known as mothballs, undergoes a combustion reaction with oxygen to form carbon dioxide and water. What is the coefficient in front of carbon dioxide in the balanced reaction?
- A) 14
 - B) 12
 - C) 8
 - D) 10
17. What is the $[\text{H}_3\text{O}^+]$ if 12.3 g of HCN is dissolved in 125 mL of water and is 2.34% ionized?
- A) 0.0852 M

- C) 24.3 M
- D) 8.52 M

18. The concentration of H_3O^+ in an aqueous solution is 1.71×10^{-6} M. What is the OH^- concentration?

- A) 1.71×10^8 M
- B) 5.85×10^{-9} M
- C) 5.85×10^{-8} M
- D) 1.71×10^{-8} M

19. According to Arrhenius, bases produce

- A) peroxide ions in water.
- B) salts in water.
- C) hydrogen ions in water.
- D) hydroxide ions in water.

20. A sample of table salt has a mass of 14.3 mg. If the density of salt is 2.16 g/mL, what volume does the sample occupy?

- A) 151 mL
- B) 6.62 mL
- C) 30.9 mL
- D) 6.62×10^{-3} mL

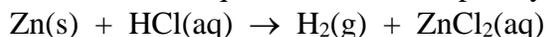
21. The general public routinely consumes antacids in order to offset the ill effects of an upset stomach caused by an increase in stomach acid. The common name for one antacid is milk of magnesia. The chemical name for milk of magnesia is magnesium hydroxide, for which the chemical formula is

- A) $\text{Mg}(\text{OH})_2$.
- B) MnOH .
- C) MgOH .
- D) $\text{Mn}(\text{OH})_2$.

22. Group VIIA are a family of elements best known as

- A) halogens.
- B) nonmetals.
- C) noble gases.
- D) diatomics.

23. What mass of zinc is required to react completely with 12.2 mL of 3.4 M HCl?



- A) 1.4 g
- B) 1400 g
- C) 9.1 g
- D) 2.7 g

24. The pictures that are drawn to depict atomic orbitals represent

- A) the unique symmetry of the atom.

- B) the exact locations of the electrons.
C) the 90% probability of finding the electron in this space.
D) the abstract nature of the atom.
25. Which one of the following series correctly orders the elements in order of increasing ionization energy?
A) K, Sr, Rb, Ba
B) Ca, K, Mg, Na
C) Sb, Te, As, Se
D) P, S, Se, Ar
26. According to Brønsted-Lowry, an acid is a
A) hydroxide acceptor.
B) proton donor.
C) proton acceptor.
D) hydroxide donor.
27. Which one of the following does not naturally exist as a diatomic molecule?
A) hydrogen
B) nitrogen
C) fluorine
D) helium
28. The volume of space occupied by the electrons, in comparison to the nucleus, is
A) many times larger.
B) slightly larger.
C) about the same.
D) slightly smaller.
29. For an electron to occupy an excited state ($n > 1$),
A) the electron must absorb energy.
B) the magnetic component of radiation “attracts” the electron away from the nucleus.
C) the positive charge of the nucleus must “push” it up.
D) the electron must release energy.
30. How much energy must be absorbed by a 15-g sample of iron if it undergoes a 15-degree increase in temperature? (spht = 0.444 J/g°C)
A) - 6.7 J
B) - 13 J
C) - 100 cal
D) - 1.0x10² J
31. A sample of N₂O₅ is known to contain 4.3x10²⁴ atoms of nitrogen. How many oxygen atoms are in this sample?

- A) 1.7×10^{24} atoms
- B) 7.1 atoms
- C) 1.1×10^{25} atoms
- D) 4.3×10^{24} atoms

32. When the oxide ion is formed, its electron configuration is the same as which one of the following?

- A) He
- B) C
- C) Ar
- D) Ne

33. Given, $\text{CN}^-(\text{aq}) + \text{H}_2\text{O}(\ell) \rightarrow \text{HCN}(\text{aq}) + \text{OH}^-(\text{aq})$, water is acting as an

- A) Brønsted-Lowry acid.
- B) Arrhenius base.
- C) Brønsted-Lowry base.
- D) Arrhenius acid.

34. Which one of the following best describes the pH of a NaCN solution?

- A) depends on $[\text{CN}^-]$
- B) $\text{pH} < 7$
- C) $\text{pH} > 7$
- D) $\text{pH} = 7$

35. A sample of Cr_2O_3 has a mass of 0.33 g. How many chromium atoms are in this sample?

- A) 1.3×10^{21} atoms
- B) 3.9×10^{21} atoms
- C) 2.6×10^{21} atoms
- D) 9.1×10^{25} atoms

36. How many atoms are in one molecule of capsaicin, $\text{C}_{18}\text{H}_{27}\text{NO}_3$?

- A) 49
- B) 48
- C) Not enough info
- D) 4

37. How many d orbitals can exist in a single subshell?

- A) 5
- B) 7
- C) 3
- D) 1

38. A major league pitcher can throw a fastball at 43 m/sec. How fast is his fastball in miles per hour?
- A) 62 mph
 - B) 89 mph
 - C) 96 mph
 - D) 75 mph
39. Determine the charge on the iron ion in the compound Fe_2O_3 .
- A) +2
 - B) -2
 - C) +3
 - D) -3
40. For the $n = 3$ shell, what is the maximum number of orbitals available for electron occupation?
- A) 3
 - B) 5
 - C) 9
 - D) 18
41. Naphthalene (C_{10}H_8), better known as mothballs, undergoes a combustion reaction with oxygen to form carbon dioxide and water. What is the coefficient in front of carbon dioxide in the balanced reaction?
- A) 10
 - B) 14
 - C) 8
 - D) 12
42. Which one of the following correctly represents the electron configuration for iron?
- A) $[\text{Kr}] 4s^1 3d^7$
 - B) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^6$
 - C) $[\text{Ar}] 4s^2 3d^6$
 - D) $[\text{Kr}] 5s^2 4d^6$
43. Which one of the following common laboratory compounds is named *incorrectly*?
- A) sodium carbonate, NaHCO_3
 - B) perchloric acid, HClO_4
 - C) lead(II) nitrate, $\text{Pb}(\text{NO}_3)_2$
 - D) potassium carbonate, K_2CO_3
44. For the $n = 2$ electronic shell, what is the maximum number of orbitals that can be occupied by electrons?
- A) 3
 - B) 4
 - C) 2
 - D) 1

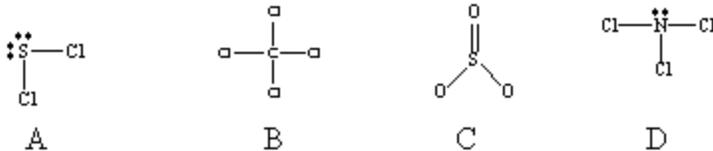
45. Which one of the following units represents molality?

- A) g solute/kg solvent
- B) g/L
- C) mol/L
- D) mol/mL

46. In the ammonia molecule, NH_3 , how many nonbonding pairs of electrons are on the nitrogen atom?

- A) 4
- B) 3
- C) 1
- D) 2

47. Given the following structures, which of them possesses a molecular dipole?



- A) A and D
- B) A only
- C) C only
- D) B and C

48. A 15.0-mL solution of 12 M HCl is diluted with 200 mL of water. What is the new concentration of the acid solution?

- A) 0.90 M
- B) 16 M
- C) 1.11 M
- D) 9.0 M

49. What type of bond exists between two atoms if they share four electrons?

- A) single bond
- B) triple bond
- C) quaternary bond
- D) double bond

50. With its one pair of nonbonding electrons on the nitrogen atom, what is the molecular geometry of ONCl?

- A) trigonal planar
- B) bent
- C) trigonal pyramidal
- D) linear