Department of Chemistry
Chem 101- Final Exam

Name: S. No.:

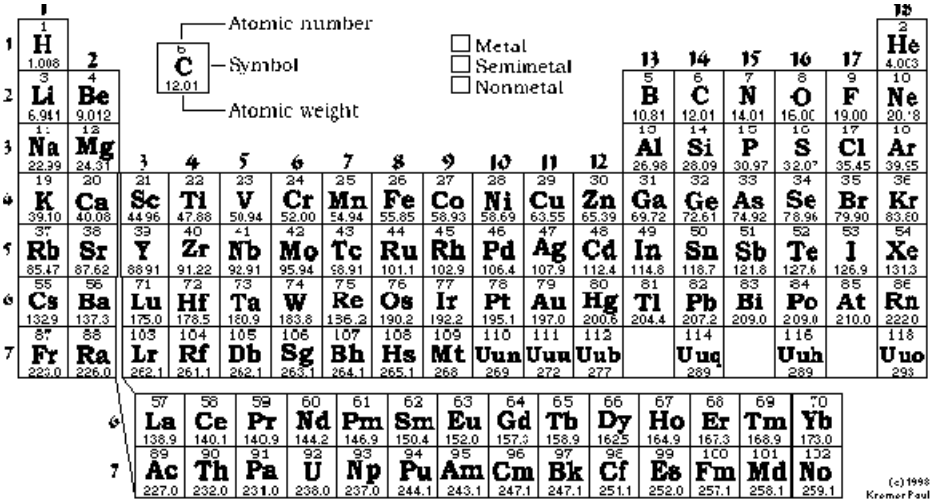
*Answer all questions *Time allowed is two hours only

Answer Sheet

Question No.	Answer	Question No.	Answer	Question No.	Answer	Question No.	Answer
1		**8**		**15**		**22**	
2		**9**		**16**		**23**	
3		**10**		**17**		**24**	
4		**11**		**18**		**25**	
5		**12**		**19**			
6		**13**		**20**			
7		**14**		**21**			
Total Score/50							

Good Luck

Periodic table



1. How many grams of $CaCl_2$ (formula weight = 111.08 g/mol), are needed to prepare 130 mL of 0.450 M $CaCl_2$ solution?

a) 6.49 g b) 111 g c) 19.5 g d) 124 g e) 73.4 g

2. Which of the following would be expected to have the most polar bond?

a) Br-Cl b) Cs-F c) Cs-I d) Al-O e) N-O

3. Which of the atoms below has the most exothermic electron affinity?

a) Si b) Cl c) Sn d) P e) I

4. Consider the following reaction:

$$2Al + 3Cl_2 \; ? \; 2AlCl_3$$

What is the maximum weight of $AlCl_3$ (formula weight = 133.48 g/mol) that could be obtained from a mixture of 0.750 mole of Al and 1.05 mole of Cl_2?

a) 100 g b) 90.4 g c) 106 g d) 93.4 g e) none

5. As the bond order between two atoms increases:

a) bond energy increases and the bond length increases.
b) bond energy decreases and the bond length decreases.
c) bond energy increases and the bond length decreases.
d) Bond energy increases, but the bond length either increase or decrease.
e) bond energy decreases and the bond length increases.

6. The kind of hybrid orbitals used by chlorine to form bonds in ClF_2^- is:

a) sp^3 b) sp^3d^2 c) sp d) sp^2 e) sp^3d

7. In the reaction:

$$NH_4^+ + NH_2OH \; ? \; NH_3 + NH_3OH^+$$

The two Bronsted-Lowery acids are:

a) NH_4^+ and NH_3 b) NH_4^+ and NH_2OH c) NH_3 and NH_2OH
d) NH_3 and NH_3OH^+ e) NH_4^+ and NH_3OH^+

8. What is the hydroxide ion concentration in a solution that has a pH = 4.80?

a) 1.6 $X10^{-5}$ M b) 1.0 x 10^{-7} M c) 6.3 x 10^{-10} M
d) 9.5 x 10^{-12} M e) 3.3 x 10^{-7} M

9. A compound has an empirical formula $C_3H_5O_2$ and a molecular mass of 292. What is the molecular formula of the compound?(Atomic weights: C = 12; H = 1.01; O = 16)

a) $C_{12}H_{20}O_8$ b) $C_{13}H_{24}O_7$ c) $C_{15}H_{25}O_{10}$ d) $C_9H_{15}O_6$ e) $C_{11}H_{16}O_9$

10. Which of the following salts would form a basic solution in water:

a) NaCl b) KNO_3 c) $NaC_2H_3O_2$ d) NH_4Cl e) none

11. Which of the following pairs of solution will give a precipitate when mixed?

a) $KNO_3(aq)$ and $BaCl_2(aq)$ b) $Na_2SO_4(aq)$ and $Pb(NO_3)_2(aq)$
c) $Na(CH_3COO)(aq)$ and $CaCl_2(aq)$ d) $NaNO_3(aq)$ and NaCl(aq)
e) None of the above

12. Balance the following oxidation-reduction reaction that occurs in acidic solution:

$$a\mathrm{I}^-_{(aq)} + b\mathrm{ClO}^-_{(aq)} \; ? \quad c\mathrm{I}_3^-{}_{(aq)} + d\mathrm{Cl}^-_{(aq)}$$

Then the ratio a/b =

a) 1 b) 2 c) 3 d) 4 e) 5

13. Which of the following when dissolves in water, forms a basic solution?

a) CO_2 b) SO_2 c) K_2O d) SO_3 e) NO_2

14. A sample of orange juice was found to have a pH of 3.80. What is the H^+ concentration (M) in the juice?

a) 1.58×10^{-4} b) 0.038 c) 2.23×10^{-3} d) 1.39×10^{-4} e) 8.92×10^{-5}

15. A 0.10 M solution of a weak monoprotic acid was found to have a pH = 5.37. What is K_a for the acid?

a) 7.54×10^{-7} b) 3.65×10^{-6} c) 4.98×10^{-5} d) 1.82×10^{-10} e) 1.14×10^{-9}

16. A student prepared a 0.025 M HCN solution ($K_a = 4.9 \times 10^{-10}$). Calculate the percent ionization for HCN?

a) 3.74% b) 1.32 % c) 0.57% d) 0.014 % e) 0.94%

17. What is the pH of a buffer prepared by mixing 0.20 M of $HC_2H_3O_2$ ($K_a = 1.8 \times 10^{-5}$) and 0.40 M of $NaC_2H_3O_2$.

a) 4.21 b) 2.05 c) 3.11 d) 5.04 e) 5.45

18. Calculate the pH of a 0.10 M solution of KNO_2? (K_a for HNO_2 is 4.5×10^{-4}).

a) 8.18 b) 6.11 c) 4.12 d) 9.11 e) 7.45

19. What is the oxidation number of sulfur in $Na_2S_4O_6$?

a) 3/2 b) 2 c) 5/2 d) 6 e) 5

20. Use VSEPR theory to predict the molecular shape of ICl_3?

a) Planar triangular b) linear c) T-shaped
d) bent e) trigonal pyramidal

21. If 48.7 grams of magnesium chloride (formula mass = 95.3 g/mole) is dissolved in 4.35 L of water, what is the resulting molarity of the magnesium chloride solution?

a) 0.234 b) 0.322 c) 0.117 d) 0.352 e) 0.911

22. The balanced net ionic equation for the neutralization reaction between magnesium hydroxide, $Mg(OH)_2$, and hydrochloric acid, HCl is:

a) $Mg(OH)_2 + 2HCl \rightarrow MgCl_2 + 2H_2O$ b) $Mg^{2+} + 2OH^- + 2H^+ + 2Cl^- \rightarrow Mg^{2+} + 2Cl^- + 2H_2O$
c) $2OH^- + 2H^+ \rightarrow 2H_2O$ d) $Mg(OH)_2 \rightarrow Mg^{2+} + 2OH^-$
e) No net ionic equation

23. In iron, which of the following electrons, characterized by the four quantum numbers, has the lowest energy?

a) $n = 4$, $l = 0$, $m_l = 0$, $m_s = +1/2$ b) $n = 3$, $l = 2$, $m_l = 1$, $m_s = -1/2$
c) $n = 3$, $l = 2$, $m_l = 0$, $m_s = +1/2$ d) $n = 3$, $l = 1$, $m_l = 0$, $m_s = +1/2$
e) b, c and d

24. The electron configuration for the Mg atom is:

a) $1s^2 2s^2 2p^6 3s^2$ or [Ne]$3s^2$ b) $1s^2 2s^2 2p^6 3s^1 3p^1$ or [Ne]$3s^1 3p^1$
c) $1s^2 2s^2 2p^6 3s^1$ or [Ne]$3s^1$ d) $1s^2 2s^2 2p^1$ or [He]$2s^2 2p^1$ e) non of the above

25. Which of the following molecules has two lone pairs of electrons around the central atom:

a) SI_5^- b) BrF_3 c) PF_5 d) PF_6^- e) SF_4