Competencies for CHEM 1010 (Introduction to Chemistry I)

Competency Number	Performances or Task The student will be able to:	Delivery Method	Evaluation Method
1	Use the steps in the scientific method in experimentation.	Lecture/notes	Problem.set/test
2	Convert between scientific notation and non-exponential numbers.	Lecture/notes	Problem set/test
3	Perform calculations involving experimental numbers.	Lecture/notes	Problem set/test
4	Know the meaning of the SI units for volume, and and temperature	Lecture/notes	Problem set/test
5	Explain the difference between mass and weight.	Lecture/notes	Problem set/test
6	Convert between temperature on the temperature scales of ^{o}C, ^{o}F and K	Lecture/notes	Problem set/test
7	Convert between SI units	Lecture/notes	Problem set/test
8	Convert between SI and American units	Lecture/notes	Problem set/test
9	Define the three states of matter and associated properties.	Lecture/notes	Problem set/test
10	Define energy, heat and specific heat and be able to work problems on these topics	Lecture/notes	Problem set/test
11	Define heat of fusion, heat of vaporization and be able to work problems on these topics	Lecture/notes	Problem set/test
12	Apply the rules of for significant figures i problem solving.	Lecture/notes	Problem set/test
13	Answer questions concerning Dalton's atomic theory and define proton, neutron, electron, atomic mass number, atomic number, ion, isotope and atomic mass and be able to relate these to atomic structure.	Lecture/notes	Problem set/test
14	Define group, period, main group, transition metals, inner transition metals, metals, nonmetal and metalloids. To understand their relationship to position on the periodic table..	Lecture/notes	Problem set/test
15	Write the electronic configuration, the shorthand electronic configuration and the orbital notation for atoms.	Lecture/notes	Problem set/test
16	Define ionization energy and electronegativity and predict the relative strength by periodic position.	Lecture/notes	Problem set/test

17	Write Lewis structures for mono centered compounds and poly centered compounds.	Lecture/notes	Problem set/test
18	Draw shapes for molecules having up to four bonds per atom	Lecture/notes	Problem set/test
19	Determine the oxidation numbers in atoms, molecules and ions.	Lecture/notes	Problem set/test
20	Name binary covalent, binary ionic and polyatomic ionic compounds.	Lecture/notes	Problem set/test
21	Write the formula binary covalent, binary ionic and polyatomic ionic compounds.	Lecture/notes	Problem set/test
22	Calculate the molar mass of a compound.	Lecture/notes	Problem set/test
23	Know the difference between accuracy and precision.	Lecture/notes	Problem set/test
24	Perform mole concept problems	Lecture/notes	Problem set/test
25	Balance a chemical equation.	Lecture/notes	Problem set/test
26	Perform reaction stoichiometry problems.	Lecture/notes	Problem set/test
27	Perform percent yield problems	Lecture/notes	Problem set/test
28	Know the factors which induce a reaction to occur.	Lecture/notes	Problem set/test
29	Understand the concepts of electrolyte, activity series and solubility rules.	Lecture/notes	Problem set/test
30	Predict the products, balance the molecular equation, the total ionic equation, the net ionic equation and identify the spectator ions in single displacement reactions.	Lecture/notes	Problem set/test
31	Predict the products, balance the molecular equation, the total ionic equation, the net ionic equation and identify the spectator ions in double displacement reactions.	Lecture/notes	Problem set/test
32	Identify a redox reaction and identify the reactants as oxidizing agents of reducing agents.	Lecture/notes	Problem set/test
33	Identify and balance composition and decomposition reactions.	Lecture/notes	Problem set/test
34	Differentiate between endothermic and exothermic reactions.	Lecture/notes	Problem set/test
35	Use the concepts of the kinetic theory of gases	Lecture/notes	Problem set/test
36	Use pressure and understand its units and how it is measured.	Lecture/notes	Problem set/test

37	Use Boyle's law, Charles' law, Gay-Lussac's law and Graham's law to work problems dealing with gases.	Lecture/notes	Problem set/test
38	Define the intermolecular forces that exist between compounds.	Lecture/notes	Problem set/test
39	Understand the effect dipole-dipole interactions, hydrogen bonding and London dispersion forces have on gases, liquids and solids.	Lecture/notes	Problem set/test
40	Describe the properties of liquids, i.e. evaporation, condensation and boiling point.	Lecture/notes	Problem set/test
41	Relate the shape of a molecule to its relative boiling point.	Lecture/notes	Problem set/test
42	Understand the meaning of allotropes, crystalline solids and amorphous solids.	Lecture/notes	Problem set/test
43	Differentiate between homogeneous mixtures and heterogeneous mixtures.	Lecture/notes	Problem set/test
44	Identify the parts of a solution and the characteristics of a solution.	Lecture/notes	Problem set/test
45	Define unsaturated, saturated and supersaturated.	Lecture/notes	Problem set/test
46	Relate solubility to "likeness," temperature and pressure.	Lecture/notes	Problem set/test
47	Work problems using the various units of concentration.	Lecture/notes	Problem set/test
48	Work dilution problems.	Lecture/notes	Problem set/test
49	Understand the dissolution process.	Lecture/notes	Problem set/test
50	Define colloids, suspensions and emulsions.	Lecture/notes	Problem set/test
51	Work problems dealing with colligative properties.	Lecture/notes	Problem set/test
52	Define kinetics and rate	Lecture/notes	Problem set/test
53	Define the two condition for and effective collision.	Lecture/notes	Problem set/test
54	Understand activation energy and energy diagrams for endothermic reaction and exothermic reactions.	Lecture/notes	Problem set/test
55	Know the affect of the reaction rate of reaction as it refers to the nature of the reactants, the concentration , the temperature and the presence of a catalyst.	Lecture/notes	Problem set/test
56	Know the difference between homogeneous and heterogeneous catalysts	Lecture/notes	Problem set/test

57	Know the definition of reversible and irreversible reactions.	Lecture/notes	Problem set/test
58	Define dynamic equilibrium	Lecture/notes	Problem set/test
59	Define equilibrium constants and be able to write equilibrium expressions.	Lecture/notes	Problem set/test
60	Calculate equilibrium constants from equilibrium concentrations.	Lecture/notes	Problem set/test
61	Calculate equilibrium concentration from equilibrium constants.	Lecture/notes	Problem set/test
62	Know the affect of adding or removing a reactant or product on the position of equilibrium.	Lecture/notes	Problem set/test
63	Know the affect of changing the temperature o the position of the equilibrium or the equilibrium constant for exothermic reactions and endothermic reactions.	Lecture/notes	Problem set/test
64	Know the affect of changing the pressure on the position of the equilibrium.	Lecture/notes	Problem set/test
65	Know the affect of adding a catalyst on the position of the equilibrium or the equilibrium constant.	Lecture/notes	Problem set/test
66	Know the Arrhenius definition of acids and bases.	Lecture/notes	Problem set/test
67	Know the Brønsted-Lowry definition of acids and bases.	Lecture/notes	Problem set/test
68	Know how to use conjugate acid conjugate base theory	Lecture/notes	Problem set/test
69	Know the definition for amphoteric (and amphiprotic) species.	Lecture/notes	Problem set/test
70	Calculate the K_a from the equilibrium concentrations.	Lecture/notes	Problem set/test
71	Know the reactions of acids with metals, metal hydroxides, metal oxides, metal carbonates, metal hydrogen carbonates, ammonia and amines.	Lecture/notes	Problem set/test
72	Know the concept of auto ionization.	Lecture/notes	Problem set/test
73	Define the water ionization constant, K_w .	Lecture/notes	Problem set/test
74	Perform calculation using K_w and the hydronium and hydroxide concentrations.	Lecture/notes	Problem set/test
75	Know the definition of Ph and be able to perform pH calculations.	Lecture/notes	Problem set/test

76	Know how pH relates to acidity and basicity.	Lecture/notes	Problem set/test
77	Define indicators and how they are used.	Lecture/notes	Problem set/test
78	.Define pK_a and be able to calculate it.	Lecture/notes	Problem set/test
79	Be able to predict the acidity, basicity or neutrality of an aqueous salt solution	Lecture/notes	Problem set/test
80	Define buffers and discuss the two types.	Lecture/notes	Problem set/test
81	Define the Henderson-Hasselbach equation.	Lecture/notes	Problem set/test
82	Determine the pH of an equilmolar mixture in a buffer solution.	Lecture/notes	Problem set/test
83	Determine the pH of an non equilmolar mixture in a buffer solution.	Lecture/notes	Problem set/test
84	Define buffer capacity.	Lecture/notes	Problem set/test
85	Understand the carbonate and phosphate buffer systems.	Lecture/notes	Problem set/test
86	Understand titration reactions and perform calculations based on them	Lecture/notes	Problem set/test
87	Define equivalence, equivalent weight and normality as it refers to titrations.	Lecture/notes	Problem set/test