HIBBING COMMUNITY COLLEGE
COURSE OUTLINE

COURSE NUMBER & TITLE: CHEM 1020: Introduction to Chemistry:
CREDITS: 4 (3 Lec / 1 Lab)
PREREQUISITES: MATH 0971: Beginning Algebra, or equivalent

CATALOG DESCRIPTION:
Introduction to Chemistry is meant for students who have never taken a chemistry course. Topics include measurement, energy, atomic structure, chemical bonds, chemical reactions, stoichiometry, nuclear chemistry, gases, solutions, acids and bases and organic chemistry. Introduction to Chemistry is intended for non-science majors and may serve as a prerequisite for General Chemistry. Introduction to Chemistry may not be taken for credit if the student has already completed CHEM 1300 or equivalent.

OUTLINE OF MAJOR CONTENT AREAS:
I. Measurement
   A. Units
   B. Prefixes
   C. Dimensional analysis
   D. Significant figures
   E. Density
II. Energy and matter
   A. Energy
   B. Temperature
   C. Measuring heat energy
   D. States of matter
   E. Changes of state
III. Atoms and elements
   A. Elements and symbols
   B. Atomic structure
   C. Periodic table
   D. Electron configurations
IV. Chemical bonds
   A. Valence electrons
   B. Octet rule
   C. Ionic compounds
   D. Covalent compounds
   E. Nomenclature
V. Chemical quantities and reactions
   A. Balancing chemical equations
   B. Stoichiometry
VI. Nuclear chemistry
   A. Natural radioactivity
   B. Nuclear equations
   C. Radioactive isotopes

D. Radiation detection and measurement
E. Nuclear fission and fusion

VII. Gases
A. Properties of gases
B. Gas laws

VIII. Solutions
A. Aqueous solutions
B. Formation of ionic solutions
C. Factors affecting solubility
D. Percent composition
E. Molarity
F. Normality
G. Colloids and suspensions

IX. Acids and bases
A. Electrolytes
B. Acid/Base definitions
C. Acid/Base strength
D. Neutralization
E. pH
F. Buffers
G. Titration

X. Introduction to organic chemistry
A. Organic compounds
B. Structural isomers
C. IUPAC nomenclature system
D. Organic functional groups
E. Organic reactions
F. Polymers

COURSE GOALS/OBJECTIVES/OUTCOMES:

Students will

1. write the names and abbreviations for the metric units used in measurements of length, volume and mass.
2. use the numerical values of prefixes to write a metric equality.
3. use dimensional analysis to solve problems.
4. report answers to calculations using the correct number of significant figures.
5. calculate density of a substance and use density to calculate mass or volume.
6. describe kinetic and potential energy.
7. convert between Celsius and Kelvin temperature scales.
8. calculate heat lost or gained by a sample given the specific heat, mass, and temperature change.
9. calculate the energy of a sample using calorimetry data.
10. identify the physical state of a substance as a solid, liquid, or gas.
11. calculate the heat absorbed or released by a sample of water during a change of state.
12. write the name or symbol of selected elements.

13. describe the basic structure of the atom.
14. determine the atomic number and atomic mass of a given isotope.
15. describe the basic layout and features of the periodic table.
16. write the electron dot and electron configurations for any of the first 20 elements.
17. illustrate the use of the octet rule.
18. write the formulas of the simple ions of metals and nonmetals.
19. write the correct formula for binary and polyatomic ionic compounds.
20. diagram the electron dot structure for a covalent compound.
21. use electronegativity values to classify a bond as nonpolar covalent, polar covalent or ionic.
22. write the correct formula given a name, or name a compound given the formula.
23. determine the molecular weight/molar mass of a compound given the molecular formula.
24. convert between moles and grams of a substance.
25. balance chemical equations.
26. use principles of stoichiometry to determine amounts or reactants used or products formed in a chemical reaction.
27. describe energy changes in exothermic and endothemic reactions.
28. list the factors that affect reaction rate.
29. describe alpha, beta, and gamma radiation.
30. write an equation showing mass numbers and atomic numbers for radioactive decay.
31. describe the detection and measurement of radiation.
32. describe the processes of nuclear fission and fusion.
33. describe the kinetic-molecular theory of gases.
34. use the various gas laws.
35. identify the solute and solvent in a solution.
36. describe the process of dissolving an ionic solid in water.
37. calculate percent composition, molarity, and normality of a solution.
38. identify a mixture as a solution, colloid, or suspension.
39. identify the components in solutions of electrolytes and nonelectrolytes.
40. describe acids and bases using the Arrhenius and the Bronsted-Lowry definitions.
41. write the equation for the ionization of strong and weak acids and bases.
42. write a balanced equation for the neutralization reaction of an acid and a base.
43. calculate pH.
44. describe the role of buffers in maintaining the pH of a solution.
45. calculate the molarity or volume of an acid or base from titration data.
46. classify a compound as organic or inorganic.
47. draw the full structural formula and the condensed structural formula for simple alkanes, alkenes, alkynes, haloalkanes, cycloalkanes, aromatic hydrocarbons, alcohols, phenols, ethers, aldehydes, ketones, carboxylic acids, esters, amines, and amides.
48. use the IUPAC system to name simple alkanes, alkenes, alkynes, haloalkanes, cycloalkanes, aromatic hydrocarbons, alcohols, phenols, ethers, aldehydes, ketones, carboxylic acids, esters, amines, and amides.

49. describe some properties of simple alkanes, alkenes, alkynes, haloalkanes, cycloalkanes, aromatic hydrocarbons, alcohols, phenols, ethers, aldehydes, ketones, carboxylic acids, esters, amines, and amides.
50. identify cis-trans isomerism.
51. determine the products of simple addition reactions.
52. describe the bonding in benzene.
53. describe some simple chemical and physical properties of alkanes, alkenes, alkynes, haloalkanes, cycloalkanes, aromatic hydrocarbons, alcohols, phenols, ethers, aldehydes, ketones, carboxylic acids, esters, amines and amides.
54. describe the basic structure of simple polymers
55. perform laboratory experiments relevant to the lecture material studied.
56. collect and interpret data, both statistically and graphically.
57. present written findings of their experiments.
58. gain a deeper understanding of the role of science in everyday life and the implications of a scientifically illiterate public.

MNTC GOALS AND COMPETENCIES MET:
(3) Natural Sciences

HCC COMPETENCIES MET:
Thinking Creatively & Critically

STUDENT ASSESSMENT SHALL TAKE PLACE USING INSTRUMENTS SELECTED/DEVELOPED BY THE COURSE INSTRUCTOR.

SPECIAL INFORMATION: (SPECIAL FEES, DIRECTIVES ON HAZARDOUS MATERIALS, ETC.):
Hazardous chemicals will routinely be used in laboratory. Students will be supplied with pertinent information relating to these materials at the appropriate time.

AASC APPROVAL DATE: March 25, 2015

REVIEW DATE: March 2020

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