# PROVIDENCE COLLEGE

## Department of Chemistry

Army Specialized Training Program. Chemistry: ASTP-205

Time, per week: 2 hours lecture, 1 hour class, 3 hours outside study.

Text: Foster-Alyea: An Introduction to General Chemistry, Van Nostrand, 1942 printing. The numbers given below refer to *sections,* not pages.

### FIRST WEEK

1st Lecture: *Elements and Compounds*
Elements, Compounds and Mixtures (10-14). Atoms and Molecules (15-17).

2nd Lecture: *Equations*
Symbols, formulas, nomenclature (18-20). Physical and Chemical Changes (21-26).

Assignment:—Problem Sheet No. 1 (due at Class period of next week).

### SECOND WEEK

1st Lecture: *Oxygen and Hydrogen*
History, occurrence, preparation and properties of oxygen 28, (29, 30 read only) 31-35.
Oxidation and Combustion (36-42 read only).
History, occurrence, preparation and properties of hydrogen 45-50, (51, 52 read only).

2nd Lecture: *Valence*
Valence and Symbols (54-56). Nomenclature of elements and compounds (57-58).

Assignment:—Problem Sheet No. 2 (due as above at 1st Lecture of next week).

### THIRD WEEK

1st Lecture: *Water*
Composition of water by weight and by volume (61-62). (63-66 read only). Vapor pressure (67-69). (70-73 read only).

2nd Lecture: *Gas Laws*
Boyles', Charles' and Dalton's Laws (74-82). (83- read only). Diffusion of Gases, Graham's Law (84). Liquid and solid states of matter (85-90). (91-94 read only).

Assignment:—Problem Sheet No. 3.

## FOURTH WEEK

1st Lecture: *Kinetic Molecular Theory*
(95-100) (Skip mathematical derivations in sections 96 and 97). This lecture to be supplemented by a motion picture:—"Molecular Theory of Matter."

2nd Lecture: *Chemical Laws and Calculations*
Laws of Conservation of Mass, Definite Proportions, Multiple Proportions, Equivalent Weights, Combining Volumes (102-106) Chemical Calculations (107-111).

Assignment:—Problem Sheet No. 4.

## FIFTH WEEK

1st Lecture: *Atomic and Molecular Weights*
Determination of Approximate Atomic and Molecular Weights (112-119) (118, 119 read only). Determination of Exact Molecular and Atomic Weights (120-123).

2nd Lecture: *Acids, Bases and Salts*
Metallic Oxides—Bases (126-130, 139-141). Non-metallic Oxides—Acids (131-138, 142-146). Salts (125, 148-151).

Assignment:—Problem Sheet No. 5.

## SIXTH WEEK

1st Lecture: *Solutions of Non-electrolytes*
Types of Solutions (152, 153). Temperature and Pressure Effects on Solubility (154-157). Molar and Normal Solutions (160-161). Saturated and Supersaturated Solutions (162). Effect of Concentration on Freezing Point, Boiling Point, Vapor Pressure and Osmotic Pressure (162-167).

2nd Lecture: *Solutions of Electrolytes*
Arrhenius Theory of Ionization (168-170). Electrical Evidence for Ionization (171-175). Chemical Evidence for Ionization (176-181). Colligative Evidence for Ionization (182-184). This lecture to be supplemented by a motion picture, "Electrochemistry."

## SEVENTH WEEK

Energy + Chem. Change

1st Lecture: *Degree of Ionization*
Apparent Degree of Ionization (Arrhenius) (185). Debye-Huckel Theory (187). (186, 188 read only). Hydrogen Ion Concentration) pH (232). Indicators (147, 236).

2nd Lecture: Time devoted to Uniform Test on all matter to date.

Assignment:—Problem Sheet No. 6.

## EIGHTH WEEK

1st Lecture: *Equilibrium*
Rate of Chemical Reaction (207-208). Chemical Equilibrium and the Principle of Mass Action (209-217). This lecture to be supplemented by a motion picture: "Velocity of Chemical Reactions."

2nd Lecture: *Ionic Equilibrium*
Ionization Constant, Solubility Product, Common Ion Effect (219-222). Completed Ionic Reactions (223-225). *Catalysis* (33, 218). This lecture to be supplemented by a motion picture: "Catalysis."

Assignment:—Problem Sheet No. 7.

## NINTH WEEK

1st Lecture: *Nuclear Structure of the Atom*
Introductory (55c, 238, 239). Units of Structure (240-242). Isotopes (243-245).

2nd Lecture: *Radioactivity.*
Historical (246-247). Nature of Radioactivity (248-253). Radioactive Indicators and Artificial Radioactivity (254-259).

Assignment:—Problem Sheet No. 8.

## TENTH WEEK

1st Lecture: *Planetary Structure*
Electrovalent and Covalent Bonds (264-266). (Omit 260-263). Electronic nature of Oxidation and Reduction (59, 226-228). Balancing of Redox Equations (134).

2nd Lecture: *Periodic Classification of the Elements*
Historical (279-283). Basis of the Classification (284-286).

Assignment:—Problem Sheet No. 9.

## ELEVENTH WEEK

1st Lecture: *Application of the Periodic Classification, the Helium Group*
General Relationships (274), Helium (276), Argon (275), Neon, Krypton and Xenon (277). Radon (278). The Atmosphere (267-273 read only).

N.B. The Class hour each week will be devoted to quizzing and answering trainee's questions. Trainees are responsible for all matter to date.