Grade 10	Grade 11	Grade 12	
TAXONOMY • History of taxonomy • Binomial nomenclature • Classification • Taxonomy	INTRODUCTION TO CHEMISTRY Metric units and instrumentation • Observation and hypothesizing • Scientific notation • Careers in chemistry	KINEMATICS • Scalars and vectors • Length measurement • Acceleration • Fields and models	LIFEPAC 01
BASIS OF LIFE Elements and molecules • Properties of compounds • Chemical reactions • Organic compounds	BASIC CHEMICAL UNITS • Alchemy • Elements • Compounds • Mixtures	DYNAMICS • Newton's Laws of Motion Gravity • Circular motion • Kepler's Laws of Motion	LIFEPAC 02
MICROBIOLOGY The microscope • Protozoan • Algae • Microorganisms	GASES AND MOLES • Kinetic theory • Gas laws • Combined gas law • Moles	WORK AND ENERGY • Mechanical energy • Conservation of energy Power and efficiency Heat energy	LIFEPAC 03
CELLS Cell theories • Examination of the cell • Cell design • Cells in organisms	ATOMIC MODELS • Historical models Modern atomic structure • Periodic Law • Nuclear reactions	WAVES • Energy transfers Reflection and refraction of waves • Diffraction and interference • Sound waves	LIFEPAC 04
PLANTS: GREEN FACTORIES • The plant cell Anatomy of the plant • Growth and function of plants • Plants and people	CHEMICAL FORMULAS • Ionic charges • Electronegativity • Chemical bonds Molecular shape	LIGHT • Speed of light • Mirrors • Lenses • Models of light	LIFEPAC 05
HUMAN ANATOMY AND PHYSIOLOGY Digestive and excretory system • Respiratory and circulatory system • Skeletal and muscular system • Body control systems	CHEMICAL REACTIONS Detecting reactions • Energy changes • Reaction rates • Equilibriums	STATIC ELECTRICITY • Nature of charges • Transfer of charges • Electric fields • Electric potential	LIFEPAC 06
INHERITANCE Gregor Mendel's experiments • Chromosomes and heredity • Molecular genetics • Human genetics	EQUILIBRIUM SYSTEMS • Solutions • Solubility equilibriums Acid-base equilibriums • Redox equilibriums	CURRENT ELECTRICITY • Electromotive force • Electron flow • Resistance • Circuits	LIFEPAC 07
CELL DIVISION & REPRODUCTION • Mitosis and meiosis • Asexual reproduction • Sexual reproduction • Plant reproduction	HYDROCARBONS • Organic compounds • Carbon atoms • Carbon bonds • Saturated and unsaturated	MAGNETISM • Fields • Forces • Electromagnetism • Electron beams	LIFEPAC 08
ECOLOGY & ENERGY • Ecosystems • Communities and habitats • Pollution • Energy	CARBON CHEMISTRY • Saturated and unsaturated • Reaction types • Oxygen groups • Nitrogen groups	ATOMIC AND NUCLEAR PHYSICS • Electromagnetic radiation • Quantum theory • Nuclear theory • Nuclear reaction	LIFEPAC 09
APPLICATIONS OF BIOLOGY • Principles of experimentation • Principles of reproduction • Principles of life • Principles of ecology	ATOMS TO HYDROCARBONS • Atoms and molecules • Chemical bonding • Chemical systems • Organic chemistry	KINEMATICS TO NUCLEAR PHYSICS • Mechanics • Wave motion Electricity • Modern physics	LIFEPAC 10

INSTRUCTIONS FOR SCIENCE

The LIFEPAC curriculum from grades two through twelve is structured so that the daily instructional material is written directly into the LIFEPACs. The student is encouraged to read and follow this instructional material in order to develop independent study habits. The teacher should introduce the LIFEPAC to the student, set a required completion schedule, complete teacher checks, be available for questions regarding both content and procedures, administer and grade tests, and develop additional learning activities as desired. Teachers working with several students may schedule their time so that students are assigned to a quiet work activity when it is necessary to spend instructional time with one particular student.

The Teacher Notes section of the Teacher's Guide lists the required or suggested materials for the LIFEPACs and provides additional learning activities for the students. The materials section refers only to LIFEPAC materials and does not include materials which may be needed for the additional activities. Additional learning activities provide a change from the daily school routine, encourage the student's interest in learning and may be used as a reward for good study habits.

If you have limited facilities and are not able to perform all the experiments contained in the LIFEPAC curriculum, the Science Project List for grades 3-12 may be a useful tool for you. This list prioritizes experiments into three categories: those essential to perform, those which should be performed as time and facilities permit, and those not essential for mastery of LIFEPACs. Of course, for complete understanding of concepts and student participation in the curriculum, all experiments should be performed whenever practical. Materials for the experiments are shown in Teacher Notes—Materials Needed.

LAB SAFETY

A few simple rules will guide your safe use of chemicals and equipment in a science laboratory.

1. Always wear safety goggles and lab apron. Surgical gloves are also helpful.
2. Wipe up all spills immediately with a wet sponge. Wash out the sponge with lots of water.
3. Wash off any chemicals from hands or other body parts with lots of water.
4. Handle all equipment and chemicals with care and caution.
5. Keep focused on the task at hand. Distractions lead to accidents.
6. Plan ahead. Read through each experiment before you start. Be sure to have plenty of room to work.
7. Carry out the experiments on a level, hard, non-porous table top. This makes cleanup easy.
8. Wash and clean up all equipment exposed to chemicals as soon as the activity is completed. Dirty equipment can mean danger.
9. Be sure to use a well ventilated room. Sometimes chemicals can have a very strong odor.
10. Have fun.

Materials Needed for LIFEPAC

Required:

- plastic syringe (10 to 50 cc) with rubber stopper to fit top, mass hanger with mass pieces up to 3 kg, (can use 8 oz cans of food as weight)
- ring stand with platform ring
- 2 balloons, cloth measuring tape, thermometer
- cardboard (optional)
- balance, pH paper, 400-ml and 600-ml beaker, hot plate, chemicals (4.4 g Cu (NO,),, (7 g powdered Zn, 30 ml 6M NaOH, 70 ml 3 M H_2SO_4), 5 inch watch glass or glass square
- Recipes for making solutions:
  6M NaOH = dissolve 24.0 grams of solid NaOH in 100 ml of solution
  3M H_2SO_4 = slowly pour 16 ml of concentrated (18. M) H_2SO_4 into 90 ml of water. Slowly add enough water to make 100 ml of solution.

Suggested:

Frisch, O. R. *The Nature of Matter*. New York:
Frisch, O. R. *Working with Atoms*. New York: Basic Books Inc 1965.
E. P. Dutton and Company, 1973.

Additional Learning Activities

Section I Kinetic Molecular Theory

1. In the back of a room, release the odors of orange, perfume, and ammonia, one at a time. Have fellow students spread throughout the room. Time the spread of each odor.
2. Measure out 5 ml of water into two identical beakers. Keep one at 85°C and the other at 95°C. Note the length of time it takes each sample to evaporate completely. Repeat three times and graph the data.

Section II Boyle's Law

1. Pump up a tire or ball using a hand pump. Explain why pumping becomes more difficult with time.
2. Talk to a diver or welder and learn why tank; must not be dropped or punctured.

Section III Charles' Law

1. Talk to a balloonist and learn why flights are not scheduled for hot days.
2. Talk to a tire expert and learn why tire pressures may have to be altered between summer and winter.
3. Many aerosol can labels indicate that the can should not be stored at temperatures greater than 120°F. Bring in such a label and determine the importance of the warning.

Section IV Combined Gas Law

none

Section V Moles

1. Find a copper, silver, or gold coin. Determine its mass and then mathematically calculate the number of atoms in that coin. Repeat for any other pure elements you can find.
2. Weigh out one mole of NaCl, $C_{11}H_{22}0_{11}$, H_20, and C. Explain to several friends that each sample has the same number of molecules.

1. g
2. i
3. e
4. b
5. c
6. d
7. f
8. k
9. j
10. h
11. Either order:
    a. amines
    b. amides
12. primary
13. Either order:
    a. amino acids
    b. peptide (amide)
14. ketone
15. water
16. Example:
    formic acid
17. true
18. true
19. true
20. false
21. a. 1
    b. 3
    c. 2
    d. 3
22. a. 2
    b. 1
    c. 2
    d. 2
23. Examples; any order:
    a. butyl
    b. isopropyl
    c. methyl
24. Either order:
    a. improbability of the chemicals getting together
    b. left-handed nature of proteins from living things