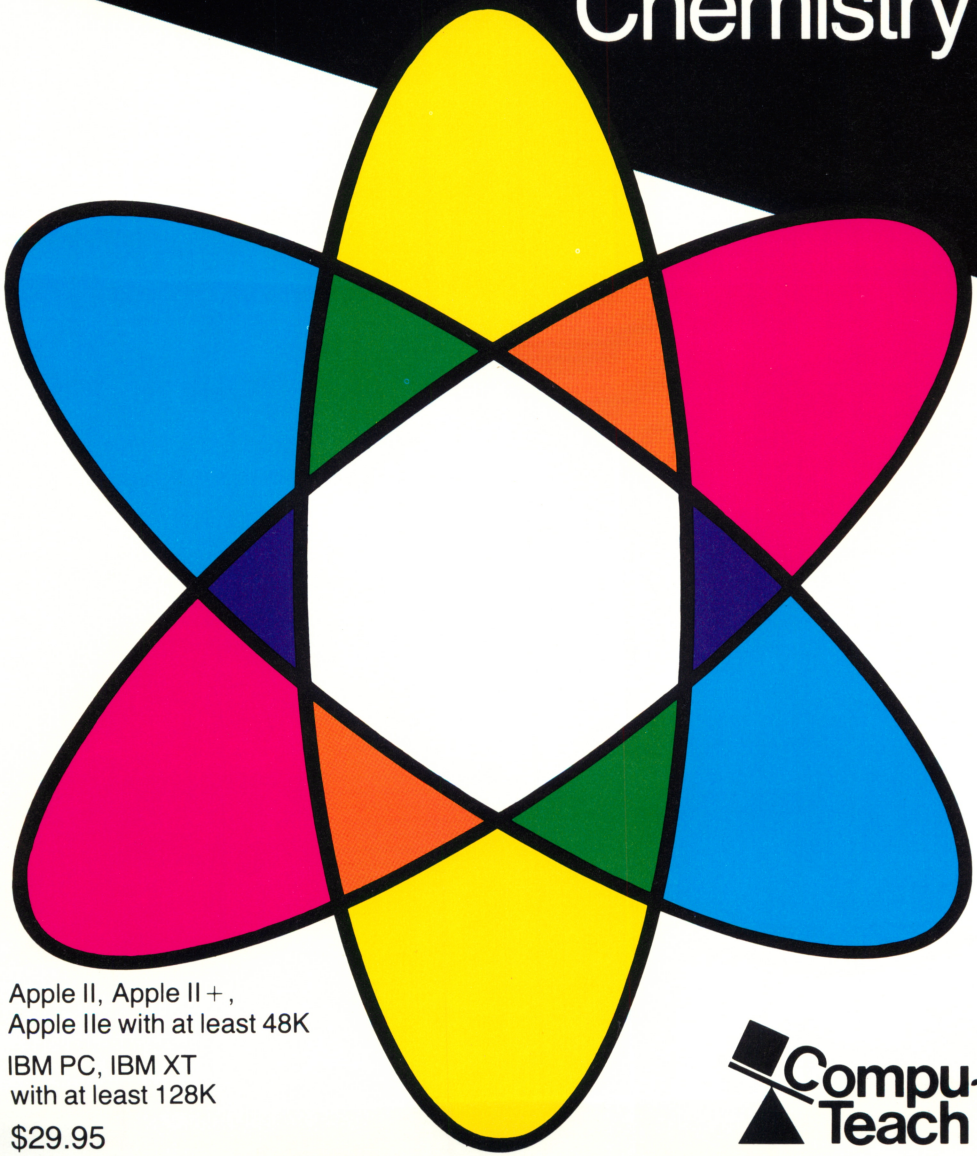
VIDEOCHEM

An Interactive Tutorial and Laboratory Session for Introductory Chemistry



Apple II, Apple II+,
Apple IIe with at least 48K

IBM PC, IBM XT
with at least 128K

$29.95

Compu-Teach

VIDEOCHEM

Apple II, Apple II +, Apple IIe with at least 48K

VIDEOCHEM

An Interactive Tutorial and Laboratory Session for Introductory Chemistry

240 Bradley Street
New Haven, Ct.

VideoChem will run on any Apple II with a Language Card and Applesoft, any Apple II+, Apple IIe, or Apple III (in Emulation Mode) with DOS 3.3 (16 sector), 1 disk drive, and at least 48K.

This booklet contains:

INTRODUCING *VIDEOCHEM*.

VideoChem is a program which uses vivid computer graphics and active participation to introduce simple concepts about atoms and how they can combine to form molecules. Through animation, *VideoChem* depicts the structure of the atom as electrons orbiting the nucleus, and it invites the user to aid in the construction of molecules in the VideoChem Lab. The "Lab" section of the program teaches the concepts of atomic bonding, ion types (positive and negative), and valence charge in the context of a chemical experiment.

VIDEOCHEM—A NOTE TO TEACHERS.

This *VideoChem* program is a combination of tutorial and laboratory learning experience. It covers the elementary concepts of atoms, molecules, valences, and ionic bonding by using simple visual imagery without introducing complex nomenclature. The program is self-teaching and requires considerable student response, input, and interaction. The teaching concepts are reinforced with striking, visually appealing animation. The student is free to review earlier material at any time during the program. At the end of the program, a "Lab" session provides ample opportunity for experimentation and concept reinforcement.

As the program provides continuous on-screen instructions, students need few prior directions before running *VideoChem*, except in correct computer procedure and management. The clear program instructions encourage the student to experiment if he or she becomes confused about how to proceed.

THE EDUCATIONAL PRINCIPLES OF *VIDEOCHEM*.

VideoChem uses computer animation and graphics to introduce the concept of atoms not only as building blocks of the universe but also as physical objects that have certain properties and that obey certain physical laws. Atoms are also shown to make up chemicals, which, in turn, appear in or as common, everyday substances, such as cereal, toothpaste,

and salt. Atoms are graphically represented, and the user is invited to combine them in "chemical reactions."

Atoms are shown to have definite combinatory properties; a given atom can combine with some atoms, but not with others. The concept of polarity is introduced first by simple analogy, leading to the end of the lesson where the terms POSITIVE, NEGATIVE, and VALENCE are fully explained. Atoms which had been described at the beginning of the lesson as "group plus" or "can take two hydrogens" are now described as having plus or minus valences.

Finally, the user is given a "laboratory" experience in which to use this knowledge to determine the valences of unknown elements through the same interactive combination process introduced in the program.

INSTRUCTIONS FOR STARTING UP *VIDEOCHEM*.

For the Apple, Apple II, Apple+:

1. Turn off your computer.
2. Lift the door of the disk drive. (If you have two disk drives, use drive ONE.)
3. Gently slide the disk in, oval-cutout end first, label side up.
4. When the disk is completely inside, close the door on the disk drive until it clicks shut.
5. Turn the computer ON.

For the Apple IIe:

1. If your computer is OFF, then follow the instructions given above.
2. If your computer is already ON, insert the disk as described in instructions 2 through 4 above.
3. Then hold down the OPEN APPLE key while pressing CONTROL and RESET.

****IMPORTANT NOTE: IF YOU HAVE AN APPLE IIe, BE SURE THAT THE "CAPS LOCK" KEY IS ALWAYS DOWN WHEN YOU RUN THE PROGRAM.*

VideoChem will then be loaded from the disk into the computer. Please be patient until this process is completed.

If you are using the computer for the first time or are unsure of any of these terms or procedures, ask for help from an experienced person and consult your computer's reference manual for guidance. Proceed only when you know what to do.

RUNNING *VIDEOCHEM*—A LEARNING GUIDE.

VideoChem has clear, on-screen instructions at each point of the program. While the following notes provide a brief overview of the progression and action of *VideoChem*, the best way to learn how to use *VideoChem* is to load and run the program.

1. At the start of *VideoChem*, on-screen instructions will explain how to run the program. At various points in the program these instructions will tell you how to advance or how to backtrack for review.
2. As the program advances, you will be asked to combine the "atoms" shown on the screen. Directions for doing this are at the bottom of each "atom screen." Use only the keys indicated. The computer will ignore all keys other than those which are shown to move the "atoms" across the screen.
3. The culmination of the *VideoChem* program is the VideoChem Lab, where you will be asked to identify the valences of unknown atoms by using the lab's "facilities" and atoms of known valence. You will be shown on-screen directions both to conduct these experiments and to remind you of your options after each experiment is completed.
4. When you have finished *VideoChem*, you may rerun the program or remove the disk, replace it in its protective envelope, and turn off the computer. Always be sure that the red light on the disk drive is off before removing the diskette.

TO PARENTS—OUR EDUCATIONAL PHILOSOPHY.

Compu-Teach designs computer software which motivates and stimulates while it educates. Professor Roger Schank,

Chairman of the Yale University Computer Science Department, is the President and Founder of the company. Professor Schank is world-renowned for his work in the new field of Artificial Intelligence. Compu-Teach applies his work to the field of education. The educational philosophy underlying all of the programs developed by Compu-Teach is that the computer can make learning enjoyable, and when learning is enjoyable, it is most effective. Students should be actively engaged in learning, and Compu-Teach's educational programs help students participate fully in an interactive learning process.

In order to attain the highest educational and programming standards, Compu-Teach has brought together educational experts and computer scientists from major academic institutions across the country. These experts work hand-in-hand to develop our programs. In addition, our programs are tested by students to ensure that they are motivating, engaging, and easy to use.

Compu-Teach's educational experts help us develop the instructional materials we use, and our computer scientists design programs to engage the student's interest, imagination and intellect with extensive use of color, animation, and sound to stimulate and motivate the student.

Furthermore, our programs give students a strong sense of control over the computer. Students enjoy the feeling that the computer is responding to their guidance and input, thus providing additional motivation. The programs monitor student progress so as to provide information and support when appropriate, making the instruction responsive to each student's needs.

MORE ABOUT CHEMISTRY.

WHAT IS A VALENCE?

As described in *VideoChem*, atoms are comprised of a nucleus of protons and neutrons surrounded by orbiting electrons. Each proton carries a +1 charge; each neutron carries no charge; each electron carries a −1 charge. Thus, the center

of the atom is a heavy clump of positive and neutral material, while ultra-light orbiting electrons surround the atom with negative charges. In a "normal" or neutral atom, there are as many electrons orbiting the atom as there are protons in the nucleus. Different atoms, however, have different structures. Some atoms have electrons so far away from their nucleus that they are very weakly held; such electrons can be drawn away to be "borrowed" by another atom. This leaves the atom with more positive particles than negative particles; thus, it becomes positively charged. As you might guess, some atoms can become negatively charged too.

There are places in the orbits around an atom where electrons are very strongly drawn, almost like the way moths are drawn to a light in the dark. Atoms with these places available tend to attract weakly held electrons, such as from the atom described above, and thus gain a negative charge. Chemists call atoms which have a positive or negative charge IONS, and the outer electrons are called VALENCE electrons. Thus, the VALENCE CHARGE of an atom or ion describes whether it has extra electrons (negative) or is lacking electrons (positive) and how many electrons are extra or missing.

HOW DOES THIS MAKE ATOMS BOND?

A basic principle in physics and chemistry is:

OPPOSITES ATTRACT; LIKES REPEL.

Positive charges attract negative charges and repel other positive charges. Likewise, negative charges attract positive charges and repel other negative charges. Thus, an ion with a POSITIVE charge, such as SODIUM, would be attracted to an ion with a NEGATIVE charge, such as CHLORINE. The atoms move together until they are so close that they can share some of their electrons; the extra positive charge on the sodium ion is balanced by the extra negative charge on the chlorine ion. The two ions have become a molecule: SODIUM CHLORIDE (common, everyday salt).

Not all atoms are built the same; some tend to bond more

strongly than others. Others take so much effort to make them bond that they are practically unbondable. The gas in a NEON sign, for instance, has no valence electrons to give away and no room to include more — characteristics which make it a very sturdy and independent atom. So you would never find a chemical like neon chloride anywhere in nature.

IF ATOMS HAVE ELECTRICAL CHARGES, WHY DON'T WE GET ELECTRIC SHOCKS FROM SALT?

The electric charges on a single atom are incredibly small. But, more importantly, these charged ions never exist independently of one another. You can never mix up a beaker of positive ions because everywhere there is a positive, there must be a matching negative. When ions combine, they form neutral compounds which bond no further. The charge on a salt molecule is zero; one minus-charge and one plus-charge equals zero-charge.

CREDITS

Produced by Roger Schank, Ph.D.
Concept by Jaime Carbonell, Ph.D.
Design and Program by Michael Curiale, Ph.D. and Jaime Carbonell, Ph.D.
Design Support by Stephen Slade, James Galambos, Ph.D. and Elliot Soloway, Ph.D.
Documentation by Robert Parker

Graphics routines from Penguin Software's Graphics Magician were written by Mark Pelczarski, David Lubar and Chris Jochumson.

Compu-Teach is developing an integrated curriculum of educational software, and other programs in that curriculum are available now.

VIDEOCHEM

Vivid, animated computer graphics are used in this program to introduce elementary concepts of chemistry. The principles of atom structure and bonding are clearly depicted in simple visual imagery providing realistic examples of otherwise abstract concepts.

The program, a combination of tutorial and laboratory learning experiences, introduces information about atoms, molecules, valences and ionic bonding, all explained in clear language reinforced with striking, visually appealing animation.

Since the program provides continuous on-screen instructions, students need few prior directions before running the program. Once begun, the program is self-teaching and requires considerable student input and interaction. At any time during the program, the student is free to review earlier material to strengthen the newly learned concepts.

At the end of the instructional section, a "Laboratory Session" allows the student to simulate atomic bonding in the context of a chemical experiment. This simulation recreates a learning situation which would otherwise be inaccessible to the student because of the risk involved. In a simulated experiment, the student is free to explore and discover chemical combinations without risk.

VideoChem provides clear, animated graphics to explain and teach complex chemical concepts, while simulated experimental situations allow for learning and reinforcement of this new knowledge.

Graphics developed using Penquin Software's Graphics Utilities

Apple II, Apple II+, Apple IIe with at least 48K

IBM PC, IBM XT with at least 128K

$29.95

Compu-Teach

COVER PRINTED IN U.S.A.