



# ACHEM

software

## A LEVEL (2)



## ADVANCED LEVEL DISC TWO

### Loading Programs

To load press SHIFT and BREAK together. Release BREAK, but keep SHIFT depressed until the disc engages. The disc title appears first, and the disc menu will automatically follow. Pressing 'any key' accelerates this change. Type the number of the program from the DISC MENU. The programs will also load and run using CHAIN "NAME", where NAME is the first mentioned file name under each program description. The program will stop at the title until the student or teacher is ready. If you press BREAK the disc menu will reappear.

If you fail to answer a question correctly, on any of the tests, you will be given the option of either making a further attempt, or obtaining a full explanation of the answer. A score is given. You are advised to use a calculator, paper and pen for 'Titrimetric Calculations'.

The programs are:-

### Titrimetric Calculations

Files:- AVOL, AVOLMEN, AVOL1, AVOL2

There is a choice of two types of calculation:-

a) Standardisation - You are required to calculate the concentration of one solution, knowing the concentration of the other. It is first necessary to calculate the answer, which is input into the computer e.g. 0.02 can also be given as  $2E-2$ .

b) Mole Ratio - You are required to calculate the simplest possible whole number ratio of reacting moles e.g. 2:1. The numbers are input separately without pressing RETURN. Also attempt writing the equation for the reaction, although this is given in the solution. The titrations involve hydrochloric acid, sulphuric acid, sodium carbonate, sodium hydroxide, sodium thiosulphate, iodine, silver nitrate, barium chloride, potassium manganate(VII), sodium nitrite and iron(II) sulphate.

### Conductivity

Files:- CONDUCT.

Data can be used for conductivity of solutions, where the electrolytic conductivity has been determined at various dilutions.

1) If your own data is to be used, and graph 4 is required (see below) the molar conductivity at infinite dilution should be given, if known. The readings (up to 30) from practical work or examination questions are then input in order of increasing dilution. Press 'E' to end. Pressing ESCAPE at any stage enables you to start again.

2) Stored data is available for either strong or weak electrolytes for demonstration purposes.

The data can be tabulated and various graphs drawn.

- a) electrolytic conductivity against dilution.
- b) molar conductivity against dilution.
- c) molar conductivity against square root concentration.
- d) degree of dissociation against dilution.

Options are selected by pressing numbers (do not press RETURN) and can be repeated.

### Synthesis of Nitrogen Compounds

File:- NITSYN

The task is to synthesise ten nitrogen compounds starting with nitrogen and a number of other given reagents. The compounds are ammonia, nitrogen oxide, nitrogen dioxide, concentrated nitric acid, ammonium chloride, lead nitrate, ammonium sulphate, sodium nitrate and sodium nitrite.

One possible solution is given on a teacher's information sheet.

It is possible to save partially completed 'games' on disc, using your initials. This file can be loaded next time the game is played.



Pressing 'H' or ESCAPE gives the list of options available. When selecting reagents for the reaction the chemical reagents can be used together with nitrogen compounds that have already been synthesised. No nitrogen compounds are available at the start of the game. Reagents can be selected from either list or from both lists, and any number of reagents can be selected. Both industrial processes and laboratory reactions have been included. If a mistake is made 'H' or ESCAPE may be pressed to make a new compound.

#### Order of Reaction

File:- ORDER.

First and second order reactions. Data can be used for rate of reaction where concentration of a reactant has been determined at various times during the course of the reaction. Any property that is directly proportional to the concentration of a reactant can be used instead of concentration.

Stored data can be used for teacher demonstration for either a first order or a second order reaction.

A maximum of thirty readings can be input from an experiment or examination question.

For first order reactions data can be obtained by inputting the half life or rate constant and initial concentration only. This could be useful to illustrate radioactive decay where count rate is used instead of concentration.

Data is tabulated and five graphs drawn by pressing numbers (do NOT press RETURN) and can be repeated.

Key:- [Ao] - initial concentration

[At] - concentration at time t

in - - natural logarithm

Pressing ESCAPE at any stage returns the user to the instructions.

### Trends in Chemical Properties

File:- PROPS

You are expected to have some knowledge of the reactions of the thirty elements listed in the program. However, complete explanations to the required answers are given, and a complete knowledge is not essential. It is hoped that the program will be an aid to learning the trends.

The questions include the following topics:-

- a) oxidation numbers,
- b) stability of carbonates
- c) solubility of carbonates
- d) acidic, basic and amphoteric properties of oxides and 'hydroxy compounds'. The term 'hydroxy compound' includes metal hydroxides and oxyacids of the non-metals which both contain either hydroxide ions or hydroxyl groups e.g.  $\text{H}_3\text{PO}_3$  could be written  $\text{P}(\text{OH})_3$ .
- e) solubility of hydroxides
- f) coloured ions
- g) products of hydrolysis of hydrides e.g. a 'hydroxy compound' and hydrogen or an acid.
- h) ionic and covalent nature of chlorides
- h) hydrolysis of chlorides
- i) reactions of elements with water, steam and hydrochloric acid.

Pairs of elements are chosen at random from within a group or a period of the Periodic Table; for thirty elements commonly studied at 'A' level. A statement is made about the properties of these elements or their compounds. You are required to answer T or F (True or False).



## Trends in Physical Properties

File:- TRENDS.

Pairs of elements are chosen at random from within a Group or a Period for the first twenty elements of the Periodic Table. You are expected to have some knowledge of the terms ionisation energy, atomic radius, ionic radius and electronegativity.

The questions asked compare:-

- a) pairs of properties for one element e.g. first and second ionization energies or atomic and ionic radius.
- b) one property for a pair of elements e.g. first ionization energy, atomic radius, ionic radius, electronegativity and melting point.

You are required to answer whether one value is higher ('H') or lower ('L') than the other value. The values are listed in the explanation.

## Emission Spectrum

File:- SPECTRA.

- of atomic hydrogen. Graphics and animation accompany an explanation on the origin of the Lyman and Balmer series of lines.

All diagrams of spectra and energy levels are drawn to scale and there is an accompanying text on screen.

The only input necessary is to press 'C' when the cue is made at the bottom of the text screen. You can then proceed to the next text or graphics screen.

### Vapour Pressure

Files:- VAPOUR, VAP2.

The user inputs a partial vapour pressure for propan-2-ol. The behaviour of a mixture of propan-1-ol and propan-2-ol is investigated in three graphics screens.

a) A graph of vapour pressure against mole fraction. The partial vapour pressure and total vapour pressure are tabulated and shown graphically. The vapour mole fraction is calculated.

b) A graph of boiling point against mole fraction. Vapour and liquid composition curves are drawn, and plots made for a series of simple distillations.

c) A simulation of the separation of molecules of propan-1-ol and propan-2-ol during fractional distillation.

The program is best used for teacher demonstration and class discussion. The complete topic can be explained without using blackboard diagrams or O.H.P.

NOTE:- Pressing ESCAPE can have different effects in each program, but usually allows you to restart the test. If this fails, pressing BREAK allows you to reselect the program from the DISC MENU.



