CURRICULUM GUIDE

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A Brochure for Teachers of Biology 30
in the High Schools
of Alberta

September 1963

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This brochure was prepared by the Biology Subcommittee of the Senior High School Curriculum Committee of the Department of Education for the use of teachers of Biology 30.

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In order that schools may not find themselves suddenly faced with excessive expenditures for laboratory supplies, it is proposed that equipment be purchased over a three-year period. For that reason the list of equipment has been divided into three sections, and it is proposed that a board may purchase a certain portion each year. e.g. equipment listed under "Year One" is considered a suitable minimum for the first year. Equipment under "Year Two" and "Year Three" may be added in succeeding years.

IV.	List of moderately priced reference books	13
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GENERAL INFORMATION

Books required (available at the School Book Branch)

Text: (a) ELEMENTS OF BIOLOGY: Weisz; McGraw-Hill

(b) Chemical Background for Biology 30: Brown

Laboratory Manual: LABORATORY EXERCISES FOR ELEMENTS OF BIOLOGY:
McGraw-Hill

Prerequisite:

The prerequisite for Biology 30 is a 'B' or better standing in Biology 20, Science 20 or Science 22.

Objectives:

1. To emphasize understanding of biological principles rather than memorization of terms, definitions, diagrams, etc. It is assumed that students will have a background knowledge of structure from studies of Biology 20.
2. To develop a deeper understanding of biological life, through a study of the processes involved.

Aims:

1. To study in depth such life processes as:
 - a) ingestion
 - b) digestion
 - c) absorption
 - d) assimilation
 - e) elimination
 - f) excretion
 - g) sensitivity
 - h) reproduction
2. To study the life processes in a representative group of organisms, both plant and animal. The organisms used may vary from school to school. (It should therefore be obvious that a final examination may not emphasize select organisms. Students and teachers may use any specimens or materials which are suitable.)

Laboratory Work

1. It is expected that at least one period per week will be spent in the laboratory.
2. Laboratory work will receive attention on final examinations. During the introductory three-year period, there shall be an increasing emphasis on this aspect of the course, to a maximum of 30% - 40% of course value. It is anticipated that this period of time should be sufficient to adequately equip a laboratory.

Final Examination:

1. The final examination shall be subjective.
2. The examination shall allow for variation in emphasis on topics by providing a measure of choice:
 - a) Two-thirds of the questions on the examination shall be answered.
 - b) The examination shall consist of three parts, reflecting a different approach to testing:
 - i) An essay-type question to test ability to organize and relate.
 - ii) A question testing knowledge and understanding of factual material. (Refer: METHODS AND MATERIALS FOR THE TEACHING OF BIOLOGICAL SCIENCES: Miller and Blaydes; McGraw-Hill, Chapter 6, pp. 68 - 85.)
 - iii) A question derived from or based on laboratory work.
 - c) Each part to have approximately equal weight.

References:

1. SCIENCE OF BIOLOGY: Weisz; McGraw-Hill -- This book is an elaboration of ELEMENTS OF BIOLOGY and is an essential part of the teacher's reference library.
2. INSTRUCTOR'S MANUAL TO ACCOMPANY ELEMENTS OF BIOLOGY: Weisz; McGraw-Hill (This one is recommended.)
3. INSTRUCTOR'S MANUAL TO ACCOMPANY SCIENCE OF BIOLOGY: Weisz; McGraw-Hill
4. A SOURCEBOOK FOR THE BIOLOGICAL SCIENCES: Morholt et al; Harcourt, Brace & Company (Excellent for laboratory techniques.)
5. PRINCIPLES OF MODERN BIOLOGY: Marsland; Holt, Rinehart & Winston
6. GENERAL BIOLOGY (Revised): Johnson, Laubengayer and Delaney; Holt, Rinehart and Winston
7. PRINCIPLES OF BIOLOGY: Buffaloe; Prentice-Hall

Periodicals:

1. Scientific American: Scientific American Inc., 415 Madison Avenue, New York 17, New York, U.S.A.
2. Science World: Scholastic Magazines Inc., 33 West 42 Street, New York 36
3. American Biology Teacher: Secretary-Treasurer, Department of Education, Temple University, Philadelphia 22, Pennsylvania, U.S.A.
4. A.I.B.S. Bulletin: American Institute of Biological Sciences, 2000 P Street N. W., Washington 6, D. C., U.S.A.

COURSE OUTLINE

<u>Chapter</u>	<u>Title and Comments</u>	<u>Approx. Tchg. Time (Weeks)</u>
1	The Nature of Science	3
	Part One - The Living World	
2	Replacement chapter by Dr. Brown	2
3	Cell and Organism	
4	Species and Community	
5	Community and Environment	
	Part Two - The Living Organism	
6	Protoplasm and Cells	2
7	Monera and Protista	
8	Metaphyta: Advanced Plants	
9	Metazoa: Advanced Animals	
	OMIT - material to be used as reference only	
	Part Three - Metabolism	
10	Autotrophic Nutrition	2
	--Emphasis on (a) Internal transport--essentially Biology 20 review (b) Photosynthesis--the teacher is recommended to supplement his presentation with Weisz, THE SCIENCE OF BIOLOGY. Examination material is limited to the text however.	
11	Heterotrophic Nutrition	2
12	Gas Exchange	
NOTE: Chapters 1 - 12 should be completed by Christmas		
13	Cellular Metabolism: Respiration	3
14	Cellular Metabolism: Energy Utilization	
	Part Four - Self-Perpetuation: The Steady State	
15	The Pattern of Control	2
16	Cellular Controls	
17	The Body Fluids	1½-2
18	Nervous Coordination	2
	--Omit chart p. 323 except as it applies to The Neural Receptors	
	--Diagram p. 340 is poor	
	--Diagram p. 341 - hair cells are in contact with the tectorial membrane	

Course Outline (cont'd)

Part Five - Self-Perpetuation: Reproduction		
19	The Pattern of Reproduction	
	--Mitosis and Meiosis are difficult concepts and are to be taught essentially as Biology 20 review.	
20	Reproduction: Monera, Protista, Metaphyta	2
21	Reproduction: Metazoa	
	--Chapters 20 and 21 essentially a review of <u>Biology 20.</u>	
Part Six - Self-Perpetuation: Adaptation		
22	Heredity	3
23	The Mechanism of Evolution	
24	The Course of Evolution	

Total time: 26 weeks

SUPPLIES FOR "YEAR ONE"

Labs: 2, 3, 6, 8, 10, 13, 15, 17, 20, 23, 25, 28 and 30.

Glass

Beakers -- 1 set of 50 ml., 100 ml., 250 ml., 400 ml., per two students

Cylinders -- graduated, 100 ml. low type - 1 per student

Cover slips -- 300 per class of 30 students

Jars -- quart with lids - 2 per 6 students

Medicine droppers -- 1 per student

Microscope slides -- 1 per student

Petri dish -- 1 per student

Pipette -- graduated, 10 ml. with rubber bulb - 2 per 4 students

Reagent bottles -- plain - 3 per student

Stirring rods -- 8" - 2 per 4 students

Test tubes -- #4 - 15 x 125 mm. - 1 doz. per 4 students

#6 - 18 x 155 mm. - 1 doz. per 4 students

#17 - 25 x 300 mm. - $\frac{1}{2}$ doz. per 6 students

Glass tubing 1/8" -- 6 feet per student

Vial -- with screw cap #6 - 21 x 70 mm. - 1 per 4 students

Equipment

Adhesive tape 1 $\frac{1}{2}$ " -- 3 feet per 6 students

Aquarium air breaker stones -- 2 per student

Applicator sticks -- 100 per class

Asbestos wire gauze -- 1 per student

Aspirin -- 1 bottle per class

Cardboard

Cotton -- absorbent - 1 lb. per class

Cork stoppers -- 100 assorted per class

Filter paper -- 15 cm.

Labels

Lancets -- sterile disposable - 1 per student

Litmus paper -- red and blue

Microscope -- 1 per 4 students at least (preferably 1 per 2 students)

Nails 4" -- 2 lbs. per class

Paper bags -- 1 per student

Razor blade and holder or scalpel and blades -- 1 per 2 students

Refrigerator -- 1 per laboratory (desirable for storage of specimens)

Ring and ring stand -- 1 per 2 students

Ring clamps -- 1 per 2 students

Rubber tubing 1/8" -- 1 foot per 4 students

Scissors -- dissecting - 1 pair per 4 students

Stoppers -- solid gum rubber #2 - 16 to 20 mm. - 2 lbs. per class

#5 - 23 to 27 mm. - 3 lbs. per class

#7 - 30 to 37 mm. - 2 lbs. per class

#30(0) - 13 to 17 mm. - 2 lbs. per class

Stoppers -- gum rubber - one hole #3 - 18 to 24 mm. - 1 lb. per class

Stoppers -- gum rubber - two holed - 1 lb. per class

Test tube holder -- 1 per 2 students

Test tube rack -- 1 per 2 students

Test tube brush -- one per 4 students

Toothpicks -- 1 box per class

Tongs -- 1 per 4 students

Vacuum wax - 1 lb. per class

Wax marking pencil (grease pencil) -- 1 per student

Sphygmomanometer (Aneroid)

Stethoscope

While it would be desirable to have these two instruments in the laboratory it may be more practical to have a medical doctor or a nurse come in and give a demonstration on the use of this equipment.

Autoclave or pressure cooker and hotplate -- 1 per laboratory

An autoclave is desirable for sterilizing equipment. A pressure cooker with hotplate might serve the same purpose.

Perishable Material

Celery

Eggs

Geranium plant (Pellargonium) -- 3 plants per class

or Impatiens

Wandering Jew (Zebriana)

Chemicals and Dry Stores

Acetic acid -- $C_2H_4O_2$

Alcohol - ethyl -- C_2H_5OH

Ammonium hydroxide -- NH_4OH

Benedict's solution -- qualitative

Blood typing sera -- anti-A and anti-B

Calcium chloride -- $CaCl_2$

Calcium hydroxide -- $Ca(OH)_2$

Calcium sulphate -- $CaSO_4$

Carbon tetrachloride -- CCl_4

Copper sulphate crystals -- $CuSO_4$

Dyes -- Carmine - soluble - powdered

Janus green - powdered

Methylene blue - powdered

Neutral red

Safranin - 1% aqueous solution

Sudan IV - powdered

Formaldehyde

Gelatin - powdered

Glucose - 1 lb. per class of 30 students

Glycogen - powdered

Hydrochloric acid - HCl

Iodine crystals -- 4 oz. per class of 30 students

Mercuric chloride -- HgCl_2

Milk -- powdered skim milk

Olive oil

Pepsin

Phenolphthalein

Potassium hydroxide -- KOH

Potassium iodide - KI

Rennin tablets (Junket)

Sodium bicarbonate -- NaHCO_3

Sodium chloride -- NaCl

Sodium fluoride -- NaF

Sodium hydroxide -- NaOH

Starch -- powdered

Sucrose -- 1 lb. per class of 30 students

Vaseline

Water -- distilled

ADDITIONAL SUPPLIES FOR "YEAR TWO"

Labs: 1, 4, 7, 9, 11, 12, 14, 18, 22, 24, 26, 31

Glass

Aquarium -- 10 gallon minimum - 1 per class

Beakers -- 1000 ml. - 1 per 4 students

Erlenmeyer flasks - 250 ml. -- 2 per 4 students

Filter funnel -- 1 per 4 students

Florence flask and stopper to fit 300 ml. -- 1 per 4 students

Slides, prepared of human blood

Test tubes -- bacteriological culture - 13 x 100 mm. without lip - 2 per 4 students

Equipment

Burette clamp - 1 per 2 students

Cheese cloth - 1 package per class of 30

Dialysis cellulose tubing 5/8" diameter -- 6 per 4 students

Clamps - pinch type -- 2 per 4 students

Dissecting probes - straight and sharp -- 1 per 4 students

Dissecting probes - blunt -- 1 per 4 students

Dissecting pins -- 1 doz. per 4 students

Forceps -- 2 pair per 4 students

Frog pinning board or substitute -- 1 per 4 students

Incubator or substitute -- 1 per 8 students

Mortar and pestle - 225 -- 1 per 4 students

Rubber tubing 1/8" I.D. -- 3 feet per 4 students

Rubber tubing 1/2" -- 2 1/2 feet per 4 students

Sand - fine washed

Seed flats and loam to fill -- 1 per 4 students

Chemicals and Dry Stores

Acetylcholine -- 1 x 10 cc. vial per class of 30 students

Adrenalin sulfate -- 1 x 10 cc. vial per class

Ammonium phosphate -- $(\text{NH}_4)_2\text{PO}_4$

Barium chloride crystals -- BaCl_2

Benzene

Bromothymol blue dye - powdered

Calcium carbonate - chips

Chromic nitrate crystals -- $\text{Cr}(\text{NO}_3)_3$

Ethylene glycol

Ferric chloride -- FeCl_3

Ferric nitrate -- $\text{Fe}(\text{NO}_3)_3$

Ferrous sulfate -- FeSO_4

Glycerine

Glycogen - powdered

Maltose -- 1 lb. per class of 30 students

Manganese chloride -- MnCl_2

Manganese dioxide -- MnO_2

Nitric acid -- HNO_3

Oxalic acid

Pancreatin - powdered

Potassium chlorate -- KClO_3

Potassium ferrocyanide -- $\text{K}_4\text{Fe}(\text{CN})_6$

Potassium permanganate -- KMnO_4

Silver nitrate crystals -- AgNO_3

Soap -- liquid green

Sodium carbonate -- Na_2CO_3

Sodium silicate (water glass)

Sulphuric acid -- H_2SO_4

Perishable Materials

Albino sorghum (Kaffir corn) -- 100 seeds per 4 students

Beets -- 15 grams per 4 students

or deep red Coleus leaves -- 5 per 4 students

Elodea -- 6 bunches per class of 30 students

Green leaves

Viable seeds (50 ml. of any one of the following: wheat, oats, radishes,
barley, etc.)

ADDITIONAL SUPPLIES NEEDED TO COMPLETE ALL LABS
"YEAR THREE"

Labs: 5, 16, 19, 21, 27, 29 and 32

Glass

Drosophila culture bottles - $\frac{1}{2}$ pint milk bottles or similar type small jars -- 2 per 4 students

Ignition tubes - 25 x 200 mm. -- 2 per 4 students

Equipment

Centrifuge or substitute -- 1 per class of 30 students

Dissecting tray -- 1 per 4 students

Dry cell - 1.5 volt -- 1 per 4 students

Insulated copper wire - 18 to 22 gauge -- 4 feet per 4 students

Hypodermic syringe - 2 ml. -- 1 per 4 students

Drosophila Guide by M. Demere and R. P. Kaufmann
Carnegie Institution of Washington
1530 P Street N. W.
Washington 5, D. C.
(price 25¢) - 1 per 4 students

Perishable Materials

Drosophila - wild type -- 1 culture per class of 30 students) order 2 - 3
Drosophila - vestigial wing - 1 culture per class of 30 students) weeks in
advance

Frogs (Rana pipiens or grass frogs) -- four per group of four students

Chemical and Dry Goods

Agar-agar - powdered -- 1 lb. per class

Bile salts

Corn meal - yellow -- 5 lbs. per class

Corn syrup (Karo) - 2 lbs. per class

Mold inhibitor - sodium propionate

Molasses - dark -- 1 lb. per class

DATE DUE SLIP

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