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ABSTRACT

These instructional objectives have been selected from materials submitted to the Curriculum Laboratory of the Graduate School of Education at UCLA. Arranged by major course goals, these objectives are offered simply as samples that may be used where they correspond to the skills, abilities, and attitudes instructors want their students to acquire. These objectives may also serve as models for assisting instructors to translate other instructional units into specific measurable terms. For other objectives in a related course see: ED 033 686 (Biology [First Semester]). (MB)

Instructional Objectives for a Junior College Course in General Biology

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I. Introduction

A. Value of biology

On the final exam, you should be able to write in essay form at least two specific examples which reflect the value of biology in the following areas, as indicated by the instructor in the progress of the course:

1. practical and technological
2. recreational
3. aesthetic
4. sociological

B. Approach of science

On the final exam, given any of the following terms, you should be able to:

1. Write a definition for the term,
2. or given the definition, apply it to the appropriate term,
3. or, when presented with an objective-type question referring to any of the terms, relate your knowledge and determine the correct answer.

   a. hypothesis
   b. theory
   c. natural law
   d. controlled experiment
   e. inductive
   f. deductive

C. Characteristics of life

By the third week of classes, you should be able to indicate the distinguishing characteristics of living organisms either:

1. in essay form,
2. or, by listing and defining the characteristics of living things.

The following concepts must be incorporated in your answer:

   a. growth
   b. responsiveness and irritability
   c. reproduction
   d. adaptability
   e. metabolism

II. The Cellular Basis of Life

You should be able to do the following by the third week of classes.

A. Given any of the following terms, you should be able to: (80% Efficiency)

1. describe the physical structure of the object represented by the term, or if given the description, identify the structure,
2. describe the function of the object represented by the term, or if given the function, identify the structure,
3. or, if given an objective-type question, relate your knowledge to determine the correct answer,
4. or, illustrate by drawing a diagram of the structures, or if given a diagram, be able to label correctly, the structures.

a. protoplasm
b. protoplast
c. primary cell wall
d. middle lamella
e. cell membrane
f. cytoplasm
g. mitochondria
h. plastids
i. ribosomes
j. endoplasmic reticulum
k. lysosome
l. centrioles
m. cilia
n. flagella
o. vacuoles
p. nucleus
q. chromosome
r. nucleolus
s. chloroplast
t. Golgi complex
u. nuclear membrane
v. chromatin
w. cristae

B. You should be able to differentiate between a plant and an animal cell. You may be asked to demonstrate this knowledge by:

1. making a list of cell structures found only in plants,
2. selecting from a list of cell structures those which are found only in plant cells.

C. You should be able to discuss in written form the basic concepts of the organization of living things from the cellular to the organismic level. Your discussion must include the following concepts:

1. cell
2. tissue
3. organ
4. organ systems
5. organism

III. Physical Basis of Life - Principles

You should be able to perform the following by the third week of classes.

A. Given any of the following terms, you should be able to:

1. write a definition for the term,

2. or given a definition, apply it to the appropriate term,
3. or, when presented with an objective-type question referring to any of the terms, relate your knowledge and determine the correct answer.

   a. First Law of Thermodynamics
   b. Second Law of Thermodynamics
   c. work
   d. energy
   e. entropy

IV. Chemical Basis of Life - Principles

You should be able to perform the following by the third week of classes.

A. Given any of the following terms, you should be able to: (80% efficiency)

   1. write a definition for the term,
   2. or given the definition, apply it to the appropriate term,
   3. or, when presented with an objective-type question, relate your knowledge and determine the correct answer.

      a. element
      b. atom
      c. electron
      d. proton
      e. neutron
      f. electropositive
      g. electronegative
      h. isotopes
      i. shell
      j. atomic weight
      k. molecules
      l. ion
      m. oxidation
      n. reduction
      o. catalysis
      p. nucleus of atom
      q. compound
      r. atomic number
      s. pH
      t. solute
      u. solvent

B. You should be aware of the nature of covalent, ionic and hydrogen bonds. You should be able to demonstrate this knowledge by:
   1. drawing a diagram of the three types of bonds,
   2. describe the three types of bonds
   3. given a description of any one of the three types of bonds, you should be able to select the term which applies to it.

C. You should be able to illustrate the process of ionization. You should demonstrate your knowledge by:

   1. describing the events in ionization,
   2. draw a diagram of an ionized compound

3. given a description of the process, you should be able to associate it with the correct terms.

D. You should be able to distinguish between an acid and a base. If told that a substance liberates a given type of ion, you should be able to state whether it is an acid or a base.

E. You should be able to distinguish between oxidation and reduction. If told what is happening in the outermost shell of an atom, you should be able to tell whether it has been oxidized or reduced.

F. You should be able to list or select from a list three ways to speed up chemical reactions.

G. You should be able to distinguish between a mixture, suspension, solution, and colloid. You should be able to demonstrate this knowledge by:

1. listing the properties of each
2. given the properties, supply the appropriate term.

H. Given the name of an element with its atomic number, you should be able to predict the relative chemical activity of the element from a knowledge of the structure of an atom of the element.

V. Chemical Basis of Life: The Molecules of Life

You should be able to perform the following by the end of the fifth week of classes.

A. Given any of the following terms, you should be able to: (80% efficiency)
1. write a definition for the term,
2. or given the definition, apply it to the appropriate term,
3. or, when presented with an objective-type question, relate your knowledge and determine the correct answer.

a. organic chemistry
b. carbohydrates
c. monosaccharides
d. polysaccharides
e. disaccharides
f. lipid
g. amino acid
h. proteins
i. nucleic acid
j. enzyme
k. substrate
l. apo-enzyme
m. co-enzyme
n. protoplasm
o. isomers
p. dehydration systhesis
q. hydrolysis
r. nucleotide

B. You should know the elements which are necessary to all forms of life. You should be able to demonstrate this knowledge by:

1. listing the elements,
2. given a list of elements, select those which are essential to life.

C. You should be able to recognize and write the chemical symbols for each of the essential elements. You will not be tested over this directly, but will need to know this in order to answer other test questions.

D. You should be able to draw a glucose molecule.

E. You should be able to recognize the following as monosaccharides:

1. glucose
2. fructose
3. galactose

You may be asked to demonstrate this knowledge by:

1. listing three examples of monosaccharides,
2. given a choice of terms, select the monosaccharides.

F. You should have the following knowledge of disaccharides:
1. You should know that sucrose and maltose are examples of disaccharides;
   a. You may be asked to give two examples of a disaccharide
   b. or given a list of sugars, you may be asked to select the ones which are dissaccharides.
2. You should know how many and what kinds of molecules go into the systhesis of a disaccharide, and how disaccharides are actually formed. You should be able to demonstrate this knowledge by:
   a. describing a disaccharide molecule,
   b. or given a description, you should recognize it as a disaccharide,
   c. describing the synthesis of a disaccharide molecule.

G. You should have the following knowledge of polysaccharides:
1. You should know that starch, glycogen, and cellulose are polysaccharides
   a. You may be asked to give three examples of a polysaccharide
   b. or you may be given a list and asked to select the polysaccharides
2. You should know how many and what kinds of molecules go into the synthesis of a polysaccharide, and how polysaccharides are actually formed. You should be able to demonstrate this knowledge by
   a. describing a polysaccharide molecule
   b. or given a description, you should recognize it as a polysaccharide,
   c. describing the formation of a polysaccharide molecule.

H. You should have the following knowledge of lipids:

1. be able to list the three types of lipids and their distinguishing features,
2. you should know the elements comprising lipids and their proportions
   a. you might be asked to give a generalized formula for true lipids
   b. or given a formula recognize it as that of a lipid.
3. you should know the types of molecules that comprise a lipid; you may be asked to:
   a. demonstrate this knowledge by drawing the structure of tristearin
   b. or given the formula for tristearin identify it as such.

I. You should be able to draw a generalized amino acid molecule, and be able to list at least three specific amino acids.

J. You should know what type of molecules comprise a protein, and how proteins are synthesized. You may be asked to:
1. describe a protein molecule,
2. or given a description, be able to recognize it as that of a protein,
3. describe the formation of a protein.

K. You should know the function of proteins, lipids, and carbohydrates in living systems. You may be asked to give a use of each of the three, or you may be given a function and asked to associate it with the appropriate term.

L. You should be able to draw a generalized picture of DNA and RNA.

M. You should know how RNA differs from DNA. You may be asked to list the ways in which DNA and RNA differ, or you may be given a list of characteristics and asked to match them with the appropriate compound.

N. You should be able to give a general function for DNA, and one for RNA. Given a list of functions, you should be able to associate the function with the term.

O. You should be able to list or select from a list, the characteristics of enzymes.

P. If given a list of compounds, you should be able to distinguish between those that are organic and inorganic.

Q. You should be able to list, or given a list select, the important properties of water.

VI. Autotrophic nutrition
(You should be able to do the following by the seventh week of class)

A. Given any of the following terms, you should be able to:
1. write a definition for the term,
2. or given the definition, apply it to the appropriate term,
3. or, when presented with an objective-type question referring to any of the terms, you should be able to relate your knowledge and determine the correct answer.

1. autotrophic
2. chlorophyll a
3. chlorophyll b
4. lamellae
5. grana
6. stroma
7. light reaction
8. dark reaction
9. cytochrome
10. photophosphorylation

B. You should know which parts of the Spectra are most efficient in photosynthesis. To demonstrate this knowledge, you may be asked to:
   1. give the two most efficient colors in photosysthesis
   2. or given a list of colors, sleect the two which are most effective.

C. You should know the raw materials and end products of photosynthesis. You may be asked to demonstrate your knowledge by one or both of the following:
   1. select from a list or write the empirical formula for photosynthesis.
   2. List or select from a given list, the end products of photosynthesis.

D. You should know the steps of the light reaction. You should be able to demonstrate your knowledge by selecting from a list of processes, those which accur in the light reaction.

E. You should know the steps of the dark reaction. You may be asked to demonstrate your knowledge by selecting from a list of processes, those which occur in the dark reaction.

F. You should know the factors which limit photosynthesis. You may be asked to list or select from a list, those factors which may limit photosynthesis.

VII. The Metabolism of Cells
(You should be able to do the following by the seventh week of class)

A. Given any of the following terms, you should be able to: (80% efficiency)
   1. write a definition for the term,
   2. or given the definition, apply it to the appropriate term,
   3. or, when presented with an objective-type question referring to any of the terms, you should be able to relate your knowledge and determine the correct answer.

1. hormones
2. diffusion
3. osmosis
4. turgar pressure
5. hypertonic
6. hypotonic
7. isotonic
8. differentially permeable membrane
9. plasmolysis
10. active transport
11. phagocytosis

12. pinocytosis
13. homeostasis
14. poikilothermic
15. homeothermic
16. metabolism
17. passive transport
18. dialysis
19. crenation
20. Brownian movement

B. You should be able to list eight factors which affect the cellular environment.

C. You should be able to describe three different ways in which materials may enter a cell, or given a list of mechanisms, select those which permit materials to enter a cell.

D. You should be able to describe what will happen if a plant or an animal cell is placed in a hypertonic, hypotonic, or an isotonic solution. If given a list of statements, you should be able to select those which best describe the events.

VIII. Heterotrophic Nutrition
(You should be able to do the following by the ninth week of class)

A. Given any of the following terms, you should be able to: (80% efficiency)
   1. write a definition for the term,
   2. or given the definition, apply it to the appropriate term,
   3. or, when presented with an objective-type question referring to any of the terms, you should be able to relate your knowledge and determine the correct answer.

1. intracellular digestion
2. extracellular digestion
3. saprophyte
4. heterotrophic
5. amylase
6. ingestion
7. digestion
8. phagocytosis
9. peristalsis
10. chyme
11. pepsin
12. gastrin
13. lipase
14. bile
15. trypsin
16. Carboxypeptidase
17. ribonucleose
18. deoxyribonucleose
19. aminopeptidases
20. tripeptidase
21. dipeptidases
22. maltose
23. sucrose
24. lactose

25. holozoic
26. parasitic
27. absorption
28. salivary glands
29. gall bladder
30. penitoneum
31. cholesterol
32. insulin

B. You should know the physical structure, secretions, and functions of the following organs in digestion: 1) mouth, 2) esophagus, 3) stomach, 4) liver, 5) duodenum, 6) pancreas, 7) large intestine. You should be able to demonstrate your knowledge by listing the organs of digestion, their secretions and functions, or you may be given a list of organs and asked to match functions and secretions with the appropriate organ.

C. Given a list of statements, you should be able to select those which apply to the process of absorption.

D. Given a list of statements, you should be able to select those which are associated with liver functions.

E. You should be able to describe briefly various disorders and diseases of the digestive system, such as: 1)diabetes, 2)ulcers, 3)gall stones, 4)peritonitis.

IX. The Uses of Food (Cellular Respiration)
(You should be able to do the following by the ninth week of class)

A. Given any of the following terms, you should be able to:
1. write a definition for the term
2. or given the definition, apply it to the appropriate term,
3. or, when presented with an objective-type question referring to any of the terms, you should be able to relate your knowledge and determine the correct answer.

1. Anabolism
2. Catabolism
3. Fermentation
4. respiration
5. anaerobic
6. aerobic
7. ATP
8. oxidation
9. ADP
10. Electron Transport System
11. dehydrogenation

B. You should be able to contrast respiration and photosynthesis. You may be asked to write four statements which are true of respiration, but just the opposite is true of photosynthesis. You should also be able to select from a list of statements, those which are true of respiration, but just the opposite is true of photosynthesis.

C. You should know the raw materials and end products of respiration. You may be asked to demonstrate your knowledge by

one or both of the following:

1. Write or select from a list the empirical formula for respiration.
2. List or select from a list the end products and raw materials of respiration.

D. You should know the events of glycolysis. Given a list of processes, you should be able to recognize those which occur in glycolysis.

E. You should know that the energy released in respiration is stored in the ATP molecule. You should be able to:
   1. choose from a list, that compound associated with high-energy phosphate bonds.
   2. write a word equation illustrating energy transport.

G. You may be asked to list or select from a list, six ways in which the cell uses the energy derived from respiration.

X. Chemical Coordination in Animals
(You should be able to do the following by the thirteenth week of class)

A. Given any of the following terms, you should be able to:
   1. write a definition for the term,
   2. or given a definition, apply it to the appropriate term,
   3. or, when presented with an objective-type question referring to any of the terms, you should be able to relate your knowledge and determine the correct answer.

   1. endocrine gland
   2. hormone
   3. hyperthyroidism
   4. hypothyroidism
   5. Islets of Langerhans
   6. pheromones
   7. endocrinology

B. You should know the physical description, location, and function of the following glands:

   1. Given the physical description, location or function, you should be able to select the appropriate term
   2. or given the term you should be able to select the physical description, location or function.
   3. or given a diagram, correctly identify the various parts.

   1. pineal
   2. pituitary
   3. thyroid
   4. thymus
   5. adrenals
   6. pancreas
   7. ovaries
   8. testes

C. You should know the events associated with the estrogen cycle. You should be able to:

1. list the events of the cycle,
2. or given a list, select those which pertain to the estrogen cycle.

D. You should be able to:
1. list four techniques used by scientists to determine the function of glands and hormones.
2. If given a list of techniques, select those employed in endocrinology.

E. You should be able to list, or select from a list, the steps involved in the molting of crabs.

F. Given a description of specific disorders and malfunctions, you should be able to determine and select from a list the gland responsible.

XI. (a) Nervous Coordination: Stimulus Receptors
(You should be able to do the following by the thirteenth week of class)

A. Given any of the following terms, you should be able to: (80% efficiency)
1. write a definition for the term,
2. or given the definition, apply it to the appropriate term,
3. or, when presented with an objective-type question referring to any of the terms, relate your knowledge and determine the correct answer.

a. Photoreceptors
b. ommatidia
c. compound eye
d. sclerotic coat
e. cornea
f. choroid coat
g. iris
h. retina
i. cones
j. rods
k. vitreous humor
l. rhodopsin
m. tympanic membrane
n. onicles
o. Eustachian tube
p. cochlea
q. chemoreceptors
r. internal chemical receptors

B. Given a drawing of a cross section of the human eye, you should be able to label the parts.

C. You should be able to write the function of the following terms, or given the function, select from a list the appropriate term to match the function.

1. cornea
2. iris
3. virtreous humor
4. rod
5. cone
6. tympanic membrane
7. ovule
8. Eustachian tube
9. cochlea

D. Given a drawing of the human ear, you should be able to label the parts.

XI. (b) Nervous Coordination: The Conductors

A. Given any of the following terms, you should be able to:
   1. write a definition for the term,
   2. or given the definition, apply it to the appropriate term,
   3. or, when presented with an objective-type question referring to any of the terms, relate your knowledge and determine the correct answer.

      a. Cell body
      b. Axon
      c. Myelin sheath
      d. Schwann cell
      e. Dendrites
      f. Sensory neurons
      g. Association Neurons
      h. Motor neurons
      i. Synapse
      j. Acetylcholine
      k. Cholinesterase
      l. Central nervous system
      m. Peripheral nervous system
      n. Mixed nerves
      o. meninges
      p. Neuron
      q. Stimulus
      r. Response
      s. Ganglion

B. You should be able to:
   1. list the processes which occur in the passage of a nerve impulse
   2. or given a list, select those events which occur during a nerve impulse.

C. You should be able to:
   1. describe the events which occur in a synapse,
   2. or given a list, select those processes which occur during a synapse.

D. You should be able to list or place in a list, a group of events which occur in a reflex action.

E. Given the following, you should be able to give the function and location, or given a list, select the function and location appropriate to the term.

1. Medulla oblongata
2. Cerebellum
3. Cerebrum

F. You should be able to list or select from a list, the organs which are inervated by the parasympathetic and the sympathetic nervous systems.

G. Given a diagram of a neuron, you should be able to identify the various parts.

XII. Nervous Coordination: The Effectors
(You should be able to do the following by the thirteenth week of class)

A. Given any of the following terms, you should be able to:
1. write a definition of the term,
2. or given the definition, apply it to the appropriate term,
3. or, when presented with an objective-type question referring to any of the terms, relate your knowledge and determine the correct answer.

a. Pseudopodia
b. Cilia
c. Flagella
d. Ligament
e. Origin
f. Insertion
g. Tendon
h. Filaments
i. Myosin
j. Actin
k. Motor unit
l. Skeletal muscle
m. Cardiac muscle
n. Smooth muscle

B. You should be able to describe the three types of muscles, or given a description, match the correct muscle type with the definition.

C. You should be able to describe the events which take place during muscle contraction, or given a list of events, select those which occur during muscle contraction.

D. You should be able to describe the structure of a skeletal muscle, or select from a list, those structural units which compose a skeletal muscle.

E. You should be able to give the function of each of the three types of muscles, or given a list of functions, match the correct muscle type.

XIII. Responsiveness and Coordination in Plants

(You should be able to do the following by the thirteenth week of class)

A. Given any of the following terms, you should be able to:

1. write a definition for the term,
2. or given the definition, apply it to the appropriate term,
3. or, when presented with an objective-type question referring to any of the terms, relate your knowledge and determine the correct answer.

a. nastic movements
b. tropisms
c. phototropism
d. geotropism
e. coleoptile
f. auxin
g. apical dominance
h. adventitious roots
i. gibberellin
j. photoperiodism
k. photochrome

B. You should be able to list, or select from a list, six ways auxin affects plant function.

C. You should be able to describe Went's experiments and their results. You may also be given a description of an experiment, and asked to predict the result.

D. You should be able to discuss responses of the cocklebur. For each of the following:
   a. Photototropism
   b. Production of flowers when nights become at least 8 1/2 hours long,
   c. Geotropism of the root.

1. where and how the stimulus is detected,
2. where and how the response is carried out,
3. how the information is transmitted from the first region to the second.

XIV. The Reproduction of Cells and Organisms
(You should be able to do the following by the fifteenth week of class)

A. Given any of the following terms, you should be able to: (80% efficiency)

1. write a definition for the term,
2. or given the definition, apply it to the appropriate term,
3. or, when presented with an objective-type question referring to any of the terms, relate your knowledge and determine the correct answer.

1. asexual reproduction
2. budding
3. sporulation
4. fragmentation
5. mitosis
6. gamete
7. isogametes
8. heterogametes

9. sperm
10. egg
11. meiosis
12. haploid
13. diploid
14. crossing over
15. cleavage
16. morphogenesis
17. embryo
18. blastocoel
19. blastula
20. gastrulation
21. endodermal cells
22. mesodermal cells
23. notochord
24. somites
25. ectodermal cells
26. seminiferous tubules
27. testis
28. edididymis
29. vas deferen
30. seminal vesicle
31. prostate gland
32. penis
33. urethra
34. vagina
35. cervix
36. uterus
37. ovary
38. fallopian tube
39. follicle
40. corpus luteum

B. You should be able to describe the phases of mitosis, or given a description, associate the phase with the term.

C. You should be able to describe the phases of meiosis, or given a description, associate the phase with the term.

D. Given a diagram of the male and female human reproductive systems, you should be able to:
   1. label the parts
   2. state the function of each of the parts.

E. You should be able to describe the stages of development of the frog egg, or given a description, select from a list the term which is applied to that stage.

XV. Sexual Reproduction in Plants
(You should be able to do the following by the fifteenth week of classes)

A. Given any of the following terms, you should be able to: (80% efficiency)

   1. write a definition for the term,
   2. or given the definition, apply it to the appropriate term,
   3. or, when presented with an objective-type question referring to any of the terms, relate your knowledge and determine the correct answer.

XVI. Genetics: The Work of Mendel
(You should be able to do the following by the sixteenth week of class)

A. Given any of the following terms, you should be able to:

1. write a definition for the term,
2. or given the definition, apply it to the appropriate term,
3. or, when presented with an objective-type question referring to any of the terms, relate your knowledge and determine the correct answer.

a. germplasm
b. somaplasm
c. allele
d. homozygous
e. heterozygous
f. gamete
g. phenotype
h. genotype
i. monohybrid
j. dihybrid
k. dominant
l. recessive
m. incomplete dominance
n. qualitative
o. quantitative

B. Given a list of statements, you should be able to select Mendel's laws from that list.

C. You should be able to work a monohybrid and dihybrid cross. You should be able to demonstrate this knowledge by:

1. Given the genotype of the parents, predict the genotype and phenotype of the offsprint.
2. Given the phenotype of the parents, and the genotype of the offspring, give the genotype of the parents.

D. Discuss in essay form, genetics in the U.S.S.R., incorporating the following:

1. Origin of the theory
2. Political considerations which led to the adoption of this theory
3. The resulting consequences to Russian agriculture.

XVII. The Chromosome Theory of Heredity
(You should be able to do the following by the sixteenth week of class)

A. Given any of the following terms, you should be able to:
(80 % efficiency)

1. write a definition for the term,
2. or given the definition, apply it to the appropriate term,
3. or, when presented with an objective-type question referring to any of the term, relate your knowledge and determine the correct answer.

1. gametophyte
2. sporophyte
3. antheridia
4. archegonia
5. protonema
6. fronds
7. rhizome
8. sorus
9. prothallus
10. microspores
11. megaspores
12. cones
13. seed
14. germination
15. stamen
16. pistil
17. petals
18. sepals
19. perfect
20. imperfect
21. ovules
22. egg cell
23. polar nuclei
24. micropyle
25. pollination
26. fertilization
27. plumule
28. hypocotyl
29. radicle
30. cotyledom

B. You should be able to list the stages in a moss life history, or given the stages, asked to arrange them in the appropriate order.

C. You should be able to list the stages in a fern life history, or given the stages, asked to arrange them in the appropriate order.

D. You should be able to list the stages in the life history of a gymnosperm, or given the stages, asked to arrange them in the appropriate order.

E. You should be able to describe the steps in the formation of the pollen grain, or given the steps, be able to associate the stage with the appropriate term.

F. You should be able to describe the steps in the formation of the embryo sac, or given the steps, be able to associate the stage with the appropriate term.

G. Given a diagram of a flower, you should be able to:
   1. label the parts,
   2. state the function of each part.

H. You should be able to:
   1. list the structures of a seed,
   2. label a diagram of a seed.

a. gene locus
b. autosome
c. sex chromosomes
d. sex linkage
e. nondisjunction
f. chromosomal aberrations
g. polyploid
h. diploid
i. haploid
j. linkage
k. cross over
l. deletions
m. synapsis
n. inversions
o. translocation

B. Given a sex linked characteristic, and the genotypes of the parents, you should be able to predict the occurrence of the characteristic in the next generation.

C. You should be able to describe, or given descriptions of the four types of chromosomal aberrations, match the aberration with the term applied to it.

XVIII. The Nature and Action of Genes
(You should be able to do the following by the sixteenth week of class)

A. Given any of the following terms, you should be able to:

1. write a definition for the term,
2. or given the definition, apply it to the appropriate term,
3. or, when presented with an objective-type question referring to any of the terms, relate your knowledge and determine the correct answer.

a. DNA
b. RNA
c. bacteriophage
d. mutation
e. multiple alleles

B. You should know how DNA and RNA replicate themselves. You should be able to demonstrate this knowledge by:
1. listing and explaining the steps of replication, or
2. by drawing a diagram illustrating replication

C. You should be able to list or select from a list, three causes of mutations.

D. You should know how protein synthesis occurs, and be able to demonstrate this knowledge by:
1. listing and explaining the steps in order,
2. drawing a diagram illustrating the process of protein synthesis.