TEXAS TECH UNIVERSITY
TTU K-12™

BIO 1A
Biology, First Semester
CBE Review (ONLINE)
(v.4.1)

To the Student:

After your registration is complete, you may take the online Credit by Examination for BIO 1A.

WHAT TO BRING

- calculator (standard or scientific are allowed)

ABOUT THE EXAM

The examination for the first semester of Biology consists of 40 multiple choice questions and 5 short-answer essay questions. The exam is based on the Texas Essential Knowledge and Skills (TEKS) for this subject. The full list of TEKS is included in this document (it is also available online at the Texas Education Agency website). The TEKS outline specific topics covered in the exam, as well as more general areas of knowledge and levels of critical thinking. Use the TEKS to focus your study in preparation for the exam.

The examination will take place under supervision, and the recommended time limit is three hours. You may not use any notes or books. A percentage score from the examination will be reported to the official at your school.

In preparation for the examination, review the TEKS for this subject. All TEKS are assessed. A list of key concepts is included in this document to focus your studies. It is important to prepare adequately. Since questions are not taken from any one source, you can prepare by reviewing any of the state-adopted textbooks that are used at your school. The textbook used with our BIO 1A course is:

> Miller and Levine, *Biology*, Pearson Education, 2015, ISBN 0-13-317640-1 (this title may also be known as *Miller & Levine Biology, Texas Biology Student Edition*)

Good luck on your examination!

BIO 1A Key Concepts: Major Topics

1. **The Nature of Life** (The Science of Biology; The Chemistry of Life)
2. **Ecology** (The Biosphere; Ecosystems and Communities; Populations; Humans in the Biosphere)
3. **Cells** (Cell Structure and Function; Photosynthesis; Cellular Respiration and Fermentation; Cell Growth and Division)
4. **Genetics** (Introduction to Genetics; DNA; RNA and Protein Synthesis; Human Heredity; Genetic Engineering)

Selected Vocabulary

The Nature of Life

science
observation
inference
hypothesis
controlled experiment
independent variable
dependent variable
control group
data
quantitative data
qualitative data
theory
bias
biology
DNA
stimulus
sexual reproduction
asexual reproduction
homeostasis
metabolism

Ecology

biosphere
species
population
community
ecology
ecosystem
biome
biotic factor
abiotic factor
autotroph
primary producer
photosynthesis
chemosynthesis
heterotroph
consumer
carnivore
herbivore
scavenger
omnivore
decomposer
detritivore
food chain
phytoplankton
food web
zooplankton
trophic level
ecological pyramid
biomass
biogeochemical cycle
nutrient
nitrogen fixation
denitrification
limiting nutrient

weather
climate
greenhouse effect
tolerance
habitat
niche
resource
competitive exclusion principle
predation
herbivory
keystone species
symbiosis
mutualism
parasitism
commensalism
ecological succession
primary succession
pioneer species
secondary succession
canopy
understory

deciduous
coniferous
humus
taiga
permafrost
photic zone
aphotic zone
benthos
plankton
wetland
estuary
population density
age structure
immigration
emigration
exponential growth
logistic growth
carrying capacity
limiting factor
density-dependent limiting factor
density-independent limiting factor

demography
demographic transition
monoculture
renewable resource
nonrenewable resource
sustainable development
desertification
deforestation
pollutant
biological magnification
smog
acid rain
biodiversity
ecosystem diversity
species diversity
genetic diversity
habitat fragmentation
ecological hot spot
ecological footprint
ozone layer
global warming

Cells

cell
cell theory
cell membrane
nucleus
eukaryote
prokaryote
cytoplasm
organelle

vacuole
lysosome
cytoskeleton
centriole
ribosome
endoplasmic reticulum
Golgi apparatus
chloroplast

mitochondrion
cell wall
lipid bilayer
selectively permeable
diffusion
facilitated diffusion
aquaporin
osmosis

isotonic
hypertonic
hypotonic
osmotic pressure
homeostasis
tissue
organ
organ system
receptor
adenosine triphosphate (ATP)
heterotroph
autotroph
photosynthesis
pigment
chlorophyll
thylakoid
stroma
NADP+
light-dependent reactions
light-independent reactions

photosystem
electron transport chain
ATP synthase
Calvin cycle
calorie
cellular respiration
aerobic
anaerobic
glycolysis
NAD+
Krebs cycle
matrix
fermentation
cell division
asexual reproduction
sexual reproduction
chromosome
chromatin
cell cycle
interphase
mitosis

cytokinesis
prophase
centromere
chromatid
centriole
metaphase
anaphase
telophase
cyclin
growth factor
apoptosis
cancer
tumor
embryo
differentiation
totipotent
blastocyst
pluripotent
stem cell
multipotent

Genetics

genetics
fertilization
trait
hybrid
gene
allele
principle of dominance
segregation
gamete

probability
homozygous
heterozygous
phenotype
genotype
Punnett square
independent assortment
incomplete dominance
codominance

multiple allele
polygenic trait
homologous
diploid
haploid
meiosis
tetrad
crossing-over
zygote

transformation
bacteriophage
base pairing
replication
DNA polymerase
telomere
RNA
messenger RNA
ribosomal RNA
transfer RNA
transcription
RNA polymerase
promoter
intron
exon
polypeptide
genetic code
codon
translation
anticodon

gene expression
mutation
point mutation
frameshift mutation
mutagen
polyploidy
operon
operator
RNA interference
differentiation
homeotic gene
homeobox gene
Hox gene
genome
karyotype
sex chromosome
autosome
sex-linked gene
pedigree
nondisjunction

restriction enzyme
gel electrophoresis
bioinformatics
genomics
selective breeding
hybridization
inbreeding
biotechnology
polymerase chain reaction
recombinant DNA
plasmid
genetic marker
transgenic
clone
gene therapy
DNA microarray
DNA fingerprinting
forensics

Texas Essential Knowledge and Skills
BIO 1 – Biology

§112.34. Biology, Beginning with School Year 2010-2011.

(a) General requirements. Students shall be awarded one credit for successful completion of this course. Prerequisites: none. This course is recommended for students in Grade 9, 10, or 11.

(b) Introduction.

(1) Biology. In Biology, students conduct laboratory and field investigations, use scientific methods during investigations, and make informed decisions using critical thinking and scientific problem solving. Students in Biology study a variety of topics that include: structures and functions of cells and viruses; growth and development of organisms; cells, tissues, and organs; nucleic acids and genetics; biological evolution; taxonomy; metabolism and energy transfers in living organisms; living systems; homeostasis; and ecosystems and the environment.

(2) Nature of science. Science, as defined by the National Academy of Sciences, is the "use of evidence to construct testable explanations and predictions of natural phenomena, as well as the knowledge generated through this process." This vast body of changing and increasing knowledge is described by physical, mathematical, and conceptual models. Students should know that some questions are outside the realm of science because they deal with phenomena that are not scientifically testable.

(3) Scientific inquiry. Scientific inquiry is the planned and deliberate investigation of the natural world. Scientific methods of investigation are experimental, descriptive, or comparative. The method chosen should be appropriate to the question being asked.

(4) Science and social ethics. Scientific decision making is a way of answering questions about the natural world. Students should be able to distinguish between scientific decision-making methods (scientific methods) and ethical and social decisions that involve science (the application of scientific information).

(5) Science, systems, and models. A system is a collection of cycles, structures, and processes that interact. All systems have basic properties that can be described in space, time, energy, and matter. Change and constancy occur in systems as patterns and can be observed, measured, and modeled. These patterns help to make predictions that can be scientifically tested. Students should analyze a system in terms of its components and how these components relate to each other, to the whole, and to the external environment.

(c) Knowledge and skills.

(1) Scientific processes. The student, for at least 40% of instructional time, conducts laboratory and field investigations using safe, environmentally appropriate, and ethical practices. The student is expected to:

(A) demonstrate safe practices during laboratory and field investigations; and

(B) demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials.

(2) Scientific processes. The student uses scientific methods and equipment during laboratory and field investigations. The student is expected to:

(A) know the definition of science and understand that it has limitations, as specified in subsection (b)(2) of this section;

(B) know that hypotheses are tentative and testable statements that must be capable of being supported or not supported by observational evidence. Hypotheses of durable explanatory power which have been tested over a wide variety of conditions are incorporated into theories;

(C) know scientific theories are based on natural and physical phenomena and are capable of being tested by multiple independent researchers. Unlike hypotheses, scientific theories are well-established and highly-reliable explanations, but they may be subject to change as new areas of science and new technologies are developed;

(D) distinguish between scientific hypotheses and scientific theories;

(E) plan and implement descriptive, comparative, and experimental investigations, including asking questions, formulating testable hypotheses, and selecting equipment and technology;

(F) collect and organize qualitative and quantitative data and make measurements with accuracy and precision using tools such as calculators, spreadsheet software, data-collecting probes, computers, standard laboratory glassware, microscopes, various prepared slides, stereoscopes, metric rulers, electronic balances, gel electrophoresis apparatuses, micropipettors, hand lenses, Celsius thermometers, hot plates, lab notebooks or journals, timing devices, cameras, Petri dishes, lab incubators, dissection equipment, meter sticks, and models, diagrams, or samples of biological specimens or structures;

(G) analyze, evaluate, make inferences, and predict trends from data; and

(H) communicate valid conclusions supported by the data through methods such as lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports.

(3) Scientific processes. The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom. The student is expected to:

(A) in all fields of science, analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, including examining all sides of scientific evidence of those scientific explanations, so as to encourage critical thinking by the student;

(B) communicate and apply scientific information extracted from various sources such as current events, news reports, published journal articles, and marketing materials;

(C) draw inferences based on data related to promotional materials for products and services;

(D) evaluate the impact of scientific research on society and the environment;

(E) evaluate models according to their limitations in representing biological objects or events; and

(F) research and describe the history of biology and contributions of scientists.

(4) Science concepts. The student knows that cells are the basic structures of all living things with specialized parts that perform specific functions and that viruses are different from cells. The student is expected to:

(A) compare and contrast prokaryotic and eukaryotic cells;

(B) investigate and explain cellular processes, including homeostasis, energy conversions, transport of molecules, and synthesis of new molecules; and

(C) compare the structures of viruses to cells, describe viral reproduction, and describe the role of viruses in causing diseases such as human immunodeficiency virus (HIV) and influenza.

(5) Science concepts. The student knows how an organism grows and the importance of cell differentiation. The student is expected to:

(A) describe the stages of the cell cycle, including deoxyribonucleic acid (DNA) replication and mitosis, and the importance of the cell cycle to the growth of organisms;

(B) examine specialized cells, including roots, stems, and leaves of plants; and animal cells such as blood, muscle, and epithelium;

(C) describe the roles of DNA, ribonucleic acid (RNA), and environmental factors in cell differentiation; and

(D) recognize that disruptions of the cell cycle lead to diseases such as cancer.

(6) Science concepts. The student knows the mechanisms of genetics, including the role of nucleic acids and the principles of Mendelian Genetics. The student is expected to:

(A) identify components of DNA, and describe how information for specifying the traits of an organism is carried in the DNA;

(B) recognize that components that make up the genetic code are common to all organisms;

(C) explain the purpose and process of transcription and translation using models of DNA and RNA;

(D) recognize that gene expression is a regulated process;

(E) identify and illustrate changes in DNA and evaluate the significance of these changes;

(F) predict possible outcomes of various genetic combinations such as monohybrid crosses, dihybrid crosses and non-Mendelian inheritance;

(G) recognize the significance of meiosis to sexual reproduction; and

(H) describe how techniques such as DNA fingerprinting, genetic modifications, and chromosomal analysis are used to study the genomes of organisms.

(7) Science concepts. The student knows evolutionary theory is a scientific explanation for the unity and diversity of life. The student is expected to:

(A) analyze and evaluate how evidence of common ancestry among groups is provided by the fossil record, biogeography, and homologies, including anatomical, molecular, and developmental;

(B) analyze and evaluate scientific explanations concerning any data of sudden appearance, stasis, and sequential nature of groups in the fossil record;

(C) analyze and evaluate how natural selection produces change in populations, not individuals;

(D) analyze and evaluate how the elements of natural selection, including inherited variation, the potential of a population to produce more offspring than can survive, and a finite supply of environmental resources, result in differential reproductive success;

(E) analyze and evaluate the relationship of natural selection to adaptation and to the development of diversity in and among species;

(F) analyze and evaluate the effects of other evolutionary mechanisms, including genetic drift, gene flow, mutation, and recombination; and

(G) analyze and evaluate scientific explanations concerning the complexity of the cell.

(8) Science concepts. The student knows that taxonomy is a branching classification based on the shared characteristics of organisms and can change as new discoveries are made. The student is expected to:

(A) define taxonomy and recognize the importance of a standardized taxonomic system to the scientific community;

(B) categorize organisms using a hierarchical classification system based on similarities and differences shared among groups; and

(C) compare characteristics of taxonomic groups, including archaea, bacteria, protists, fungi, plants, and animals.

(9) Science concepts. The student knows the significance of various molecules involved in metabolic processes and energy conversions that occur in living organisms. The student is expected to:

(A) compare the structures and functions of different types of biomolecules, including carbohydrates, lipids, proteins, and nucleic acids;

(B) compare the reactants and products of photosynthesis and cellular respiration in terms of energy and matter;

(C) identify and investigate the role of enzymes; and

(D) analyze and evaluate the evidence regarding formation of simple organic molecules and their organization into long complex molecules having information such as the DNA molecule for self-replicating life.

(10) Science concepts. The student knows that biological systems are composed of multiple levels. The student is expected to:

(A) describe the interactions that occur among systems that perform the functions of regulation, nutrient absorption, reproduction, and defense from injury or illness in animals;

(B) describe the interactions that occur among systems that perform the functions of transport, reproduction, and response in plants; and

(C) analyze the levels of organization in biological systems and relate the levels to each other and to the whole system.

(11) Science concepts. The student knows that biological systems work to achieve and maintain balance. The student is expected to:

(A) describe the role of internal feedback mechanisms in the maintenance of homeostasis;

(B) investigate and analyze how organisms, populations, and communities respond to external factors;

(C) summarize the role of microorganisms in both maintaining and disrupting the health of both organisms and ecosystems; and

(D) describe how events and processes that occur during ecological succession can change populations and species diversity.

(12) Science concepts. The student knows that interdependence and interactions occur within an environmental system. The student is expected to:

(A) interpret relationships, including predation, parasitism, commensalism, mutualism, and competition among organisms;

(B) compare variations and adaptations of organisms in different ecosystems;

(C) analyze the flow of matter and energy through trophic levels using various models, including food chains, food webs, and ecological pyramids;

(D) recognize that long-term survival of species is dependent on changing resource bases that are limited;

(E) describe the flow of matter through the carbon and nitrogen cycles and explain the consequences of disrupting these cycles; and

(F) describe how environmental change can impact ecosystem stability.

Source: The provisions of this §112.34 adopted to be effective August 4, 2009, 34 TexReg 5063.