

BIOLOGY SECOND SEMESTER EXAM STUDY GUIDE

All the information below can be found in your notes or textbook. Remember this is only a guide. There will be questions on the exam that are not mentioned on this handout. The exam will count for 10% of your semester grade (commercial represents other 10%) and will consist of 75 multiple choice questions (HALF OF YOUR FINAL EXAM GRADE...AS COMMERCIAL ACCOUNTS FOR OTHER HALF). Reviewing old labs & homework will be helpful!

Introduction & The Scientific Method

- Common definitions:
 - Hypothesis
 - Control
 - Data
 - Independent variable
 - Observation
 - Dependent variable
- What are some of the characteristics that all living organisms possess (essential life functions)?
- Know the steps of the scientific method.
- Be able to identify the variables if given a description of an experiment.
- Labs: Pill bug and termite observations

Unit 7: Matter and Energy in Ecosystems

- Common Definitions:
 - abiotic components of ecosystems
 - biological molecule
 - breakdown of food molecules
 - carbon cycle
 - carbon dioxide
 - cellular energy conversion
 - cellular respiration
 - chemical bond
 - chemical organization of organisms
 - consumer
 - energy requirements of living systems
 - flow of energy
 - flow of matter
 - nitrogen cycle
 - organic compound
 - organic compound synthesis
 - organic matter
 - photosynthesizing organism
 - producer
 - product
 - reactant
 - recombination of chemical elements
 - release of energy
 - transforming matter and/or energy
 - transporting matter and/or energy
 - trophic level
- Explain how cells transform energy from one form to another through the processes of photosynthesis and respiration.
- Identify the reactants and products in the general reaction of photosynthesis.
- Compare and contrast the transformation of matter and energy during photosynthesis and respiration.
- Describe how organisms acquire energy directly or indirectly from Sunlight
- Illustrate and describe the energy conversions that occur during photosynthesis and respiration.
- Recognize the equations for photosynthesis and respiration and identify the reactants and products for both.
- Explain how living organisms gain and use mass through the processes of photosynthesis and respiration.
- Write the chemical equation for photosynthesis and cellular respiration and explain in words what they mean.
- Lab: How does Energy flow through Ecosystems

Sample questions:

- The universal form of energy for all living organisms is _____, which ultimately come from the _____.
- Only ten percent of the energy stored in an organism can be passed on to the next trophic level. The remaining energy is used to maintain the life processes of the organism and the rest is utilized how?
- An algae bloom is the rise of an algae population in an aquatic environment. Algae blooms can occur when large amounts of fertilizer runoff enter a lake.
 - As algae blooms grow, some die, and bacteria reproduce rapidly as they consume the dead matter.
 - This causes a massive increase in bacteria populations in a lake.

What is a **damaging** effect of algae blooms?

- Calculate the energy required in the 3rd trophic level if the 5th trophic level requires 2500 calories.
- What would most likely be the result of a new species of producer being introduced into an ecosystem?

Unit 8: Population Ecology and Human Impacts on Ecosystems

- Common Definitions:
 - abiotic component of the ecosystem
 - biological adaptations
 - carrying capacity
 - ecosystem stability
 - equilibrium of ecosystems
 - exponential growth
 - global warming
 - greenhouse effect
 - human modification of the ecosystem
 - population dynamics
 - reproductive capacity
 - succession
- Propose how moving an organism to a new environment may influence its ability to survive and predict the possible impact of this type of transfer.

3. Describe ecosystem stability. Understand that if a disaster such as flood or fire occurs, the damaged ecosystem is likely to recover in stages of succession that eventually result in a system similar to the original one.
4. Human Impact: Humans can have tremendous impact on the environment. Sometimes their impact is beneficial, and sometimes it is detrimental
5. Describe the greenhouse effect and list possible causes.
6. List the possible causes and consequences of global warming.
7. Graph changes in population growth, given a data table.
8. Explain the influences that affect population growth.
9. Predict the consequences of an invading organism on the survival of other organisms.
10. Lab: Mark and Recapture, random sampling

Sample questions:

- i. What is one of the leading accounts for the greenhouse effect on earth?
- ii. Make a graph showing the data table below. WHAT is the shape of this graph?

Time (hrs)	Bacteria Colonies
1	100
2	200
3	400
4	800
5	1600
6	3200
7	6400
8	12800
9	25600
10	51200

- iii. In secondary succession what is the correct order of growth?
- iv. Some scientifically developed chemicals are sprayed on trees in orchards to control insect pests. How does the use of such chemicals potentially do the most harm to the environment?
- v. Give an example of a gas which is NOT a harmful greenhouse gas?
- vi. draw a graph showing a populations before and after it reaches carrying capacity.

You are attempting to determine the population of lady slipper flowers in a forest plot. You have obtained the data below.

10 m x 10 m plot

4									5
			5			4			
				6					
	3								0
		4				5			

What is the ESTIMATED total flower population in the 10m² plot?

Unit 9: Division and Chromosome Mutations

1. Common Definitions:

a. cancer	j. haploid	r. new gene combinations
b. carcinogenic	k. gametes	s. progeny
c. chromosome	l. genetic variation	t. recombination of genetic material
d. chromosome pair	m. jumping genes	u. sex cell
e. crossing over	n. karyotype	v. sex chromosomes
f. deletion	o. meiosis	
g. DNA replication	p. mitosis	
h. diploid	q. mutation	
i. duplication of genes		
2. Explain cell division, growth, and development as a consequence of an increase in cell number, cell size, and/or cell products.
3. Describe how, through cell division, cells can become specialized for specific function.

4. Compare and contrast the processes of cell division (mitosis and meiosis), particularly as those processes relate to production of new cells and to passing on genetic information between generations.
5. Explain why only mutations occurring in gametes (sex cells) can be passed on to offspring.
6. Explain how it might be possible to identify genetic defects from just a karyotype of a few cells.
7. Explain that the sorting and recombination of genes in sexual reproduction result in a great variety of possible gene combinations from the offspring of two parents.
8. Recognize that genetic variation can occur from such processes as crossing over, jumping genes, and deletion and duplication of genes.
9. Explain that gene mutation in a cell can result in uncontrolled cell division called cancer. Also know that exposure of cells to certain chemicals and radiation increases mutations and thus increases the chance of cancer.
10. Lab: Ideal Cell Size, Chromosome studies, karyotype activities

Sample questions:

- i. What causes cells to become different (i.e. liver cells vs. muscle cells)?
- ii. Which function is more difficult in larger cells than in smaller cells?
- iii. A female, non-pregnant guinea pig is exposed to X-rays. Its future offspring will be affected only if a mutation occurs in one of the guinea pig's _____ cells
- iv. Down Syndrome and Turner Syndrome are two diseases which can be detected by comparing the karyotypes of normal individuals with those having the disease. An abnormal karyotype will show which of the following?
- v. Growth of a multi-cellular organism is MAINLY due to _____?
- vi. write a statement that best describe WHAT cancer actually is.
- vii. If the diploid number of chromosomes in a dog's body cells is 78, then the haploid number of chromosomes in each sex cell (sperm or egg) is:

Unit 10: DNA/RNA and Protein Synthesis

1. Common Definitions:

a. amino acid sequence	m. genetic mutation	x. recombination of genetic material
b. cell nucleus	n. genetic variation	y. ribosome
c. chromosome	o. inherited trait	z. storage of genetic information
d. complementary sequence	p. messenger RNA	aa. transcription
e. DNA	q. molecular synthesis	bb. translation
f. DNA molecule	r. new gene combinations	cc. transfer RNA
g. DNA sequence	s. nucleated cell	
h. DNA subunit	t. phylogenetics	
i. double helix	u. protein	
j. enzyme	v. protein structure	
k. gene	w. protein synthesis	
l. genetic diversity		
2. Explain that the information passed from parents to offspring is transmitted by means of genes that are coded in DNA molecules. These genes contain the information for the production of proteins.
3. Recognize that every species has its own characteristic DNA sequence.
4. Describe the structure and function of DNA.
5. Predict the consequences that changes in the DNA composition of particular genes may have on an organism
6. Propose possible effects (on the genes) of exposing an organism to radiation and toxic chemicals.
7. Demonstrate how the genetic information in DNA molecules provides instructions for assembling protein molecules and that this is virtually the same mechanism for all life forms.
8. Describe the processes of replication, transcription, and translation and how they relate to each other in molecular biology.
9. Explain how mutations in the DNA sequence of a gene may be silent or result in phenotypic change in an organism and in its offspring.
10. Lab: DNA Model

Sample questions:

- A strand of mRNA containing the repeating sequence AAUCAGACGAAG could code for which of the following amino acid sequences?
- Which of the following is NOT part of the structure of a DNA molecule?
- Using the amino acid chart (fig 1), what amino acid would be created from the mRNA sequence U G G?
- What do we call a single trait that is controlled by more than two alleles?
- Use the DNA template given to write the amino acid sequence created.
TACCCGCAACT

Codons Found in Messenger RNA

		Second Base				
		U	C	A	G	
First Base	U	Phe Phe Leu Leu	Ser Ser Ser Ser	Tyr Tyr Stop Stop	Cys Cys Stop Trp	U C A G
	C	Leu Leu Leu Leu	Pro Pro Pro Pro	His His Gln Gln	Arg Arg Arg Arg	U C A G
	A	Ile Ile Ile Met	Thr Thr Thr Thr	Asn Asn Lys Lys	Ser Ser Arg Arg	U C A G
	G	Val Val Val Val	Ala Ala Ala Ala	Asp Asp Glu Glu	Gly Gly Gly Gly	U C A G
						Third Base

Unit 11: Mendelian and Molecular Genetics

1. Common Definitions:

- | | | |
|-----------------------|---------------------------|---------------------------------------|
| a. allele | m. genotype | y. protein |
| b. chromosome | n. heterozygous | z. protein synthesis |
| c. chromosome pair | o. homologous chromosome | aa. Punnett Square |
| d. co-dominant traits | p. human genetics | bb. recessive traits |
| e. DNA replication | q. independent assortment | cc. recombination of genetic material |
| f. dominant trait | r. law of Segregation | dd. sex cell |
| g. gene encoding | s. meiosis | ee. sex chromosomes |
| h. gene expression | t. Mendelian genetics | ff. sex-linked traits |
| i. genetic diversity | u. new gene combinations | gg. shared characteristics |
| j. gene location | v. phenotype | hh. storage of genetic information |
| k. genetic mutation | w. phylogenetics | |
| l. genetic variation | x. polygenic traits | |

2. Draw and label a homologous chromosome pair with heterozygous alleles highlighting a particular gene location.
3. Differentiate between dominant, recessive, co-dominant, polygenic, and sex-linked traits.
4. Explain the genetic basis for Mendel's laws of segregation and independent assortment.
5. Determine the genotype and phenotype of monohybrid crosses using a Punnett Square.
6. Recognize that genetic engineering techniques provide great potential and responsibilities.
7. Describe how inserting, deleting, or substituting DNA segments can alter a gene.
8. Recognize that an altered gene may be passed on to every cell that develops from it and that the resulting features may help, harm, or have little of no effect on the offspring's success in its environment.

Sample Questions:

9. The gene for brown fur (B) in rabbits is dominant over white (b). Complete the Punnett square below (do this on your answer form) for a cross between two brown (Bb) fur rabbits. Select the correct genotype and phenotype.
10. If a red-eyed male fruit fly is mated with a white-eyed female fly, the resulting cross produces only red-eyed females and white-eyed males. What does this cross show?

Unit 12: Evolution

1. what is a cladogram and what is its purpose?
2. What are 3 things that can be determined from a cladogram?
3. Define evolution.
4. What is cytochrome C and what is its significance?