

Advanced Biology

semester 1 final exam

REVIEW GUIDE

Your semester one exam consists of 30 multiple-choice questions and 5 short answer questions about your paper. The exam will count 10% of your final semester grade. This is enough for it to affect your grade, but not drastically change your grade.

On this side of the review guide, there are practice questions. Solutions are on the reverse side: Practice questions are answered in paragraphs (in order) and answers to sample problems are in a table.

General science and macromolecules

1. What does “biology mean?”
2. What is a macromolecule?
3. Why is it useful to study macromolecules?
4. Where do macromolecules exist?
5. What elements are macromolecules made of?
6. What are the common names for the macromolecules?
7. What are the monomers for each of the macromolecules?
8. Where in your body can you find proteins?

Cell Structure

9. What kinds of things are made of cells?
10. What is the property called wherein the plasma membrane (cell membrane) only lets small molecules pass through?
11. Describe the structure of a plasma membrane...
12. What’s the difference between diffusion and osmosis?
13. What are prokaryotic cells?
14. How are prokaryotic cells different from eukaryotic cells?
15. What are the important organelles called (7)?
16. What are the functions of those organelles?
17. Where are DNA and RNA found?
18. What does “ploid” refer to?
19. What are the sex chromosomes?
20. What is the probability that a pregnant woman will give birth to a girl?
21. How are dominant traits and recessive traits written when using a Punnett square?
22. How is homozygous different from heterozygous?
23. What are the possible outcomes of a heterozygous crossed with a heterozygous? (Tt x Tt)
24. What is the biological definition of a mutation?
25. Are mutations rare or common?
26. How do most mutations affect the organism in which they exist?

Genetics problems

27. What would the complementary DNA strand be to this DNA strand: ATGAAG?
28. What would the complementary DNA strand be to this DNA strand: GCTCGA?
29. What would the mRNA strand read that was transcribed from this DNA strand: ATCGCG?
30. What would the mRNA strand read that was transcribed from this DNA strand: CTAAGC?

Lab procedures

31. What is the first thing you do in a laboratory activity?
32. When using a microscope, how do you prepare a “wet mount slide”?
33. Why do wet-mount specimen need to be thin?
34. What is the total magnification of a compound microscope with an eyepiece of 10X & an objective of 4X?

Use an amino acid wheel to translate the following sequences:

35. What would be the amino acid chain translated from this mRNA: AAU-ACG-UCG
36. What would be the amino acid chain translated from this mRNA: CUG-AUC-CAU
37. What would be the amino acid chain transcribed and then translated from this DNA sequence: GTACTCGAT

Sci Lit Paper:

38. What was your topic and thesis?
39. Summarize your “How it works” section
40. List the points you used to defend your thesis

General biology and Macromolecules

Biology is the study of living things and their relationships among each other and their environment. In microbiology, scientists examine the basis of life: the molecules that make up living things and how those molecules interact. The molecules that make up all living things are called macromolecules.

The biological macromolecules can be found in all living things. There are four types of macromolecules: amino acids, carbohydrates, nucleic acids and lipids. These four molecules are made almost entirely from four different atoms: carbon (the most important) hydrogen, oxygen, and nitrogen.

Proteins are very large macromolecules usually made of multiple strings of their monomer units: amino acids. Carbohydrates, commonly called sugars and starches, are smaller macromolecules made from the monomer unit: monosaccharide. Lipids, or fats, are the other smaller macromolecule made from fatty acids. Nucleic acids are the largest known molecules (DNA & RNA) and are made of long strings of bases.

Cell structure

All living things are made of cells. Basic “unorganized” living things that lack a nucleus are called prokaryotic. More advanced living things are called eukaryotic and have organized or specialized parts of cells called organelles. (Multi-cellular organisms have specialized cells, our muscles, organs, and skin, which are made primarily of protein.) Organelles are specialized membranes or membrane-bound components of cells. The outer membrane is called the plasma membrane, or cell membrane. It is a bi-layer of lipid molecules. A polar head faces out and non-polar tails form the interior of the membrane. The membrane is said to be semi-permeable. This means that small molecules can diffuse through it, water can osmote across it, but large molecules cannot pass through it.

Other important organelles are: Cytoskeleton (supports the cell), Nucleus (protects DNA), Ribosomes (build proteins), Endoplasmic reticulum (channels proteins and hosts ribosomes) Golgi apparatus (packages proteins) Mitochondria (cellular respiration: breaks down glucose to get energy), and in plants: cell wall (support) and chloroplasts (use sunlight to build glucose)

Genetics

Genetics is the study of DNA and inheritance. Geneticists define the chromosomal material received from one parent as “ploid” and use an “n” to represent it. Therefore, fertilization can be written $n+n \rightarrow 2n$. Autosomal (regular) cells are “2n” and sperm and ova are “n.”

Much of genetics focuses on the X and Y chromosomes. Males are XY and females are XX. An ovum contains an X and a sperm can contain an X or a Y. The probability of producing a female or a male is 50%.

Autosomal dominant genes are abbreviated with capital letters and recessive genes are lowercased. BB is homozygous-dominant, Bb is heterozygous (also called carrier) and bb is recessive. When Bb is crossed with Bb the probability outcome is 1:2:1 (or 25% : 50% : 25%) BB:Bb:bb.

Mutation is a random change in the genetic code. Mutations are common and natural. There are millions in your body, but the vast majority goes unnoticed. Mutation is the driving force of evolution.

G2P is gene to protein: the pathway that tracks a DNA code to an amino acid chain. There are 5 nucleic bases in DNA and RNA and they are abbreviated with the following letters: C,G,A,U,T. In DNA, C pairs across from G and A pairs across from T. In RNA, C-G and A-U (there is no T in RNA) A DNA codon of TAC will have an RNA strand of AUG. This is the single start codon. There are 3 codons that will “stop” the production of an amino acid, thus marking the end of the aa-chain.

Lab procedures

When working in the laboratory, safety is the single most important thing. That is why we ALWAYS read ALL the directions first. Then we ask questions, put on safety gear, and secure loose clothing before collecting materials. We never dump anything down the drain because of environmental hazards. If there is an accident or an injury, always inform the teacher right away.

We spent three different labs using microscopes. We learned how to prepare wet-mount slides: a glass slide with a thin specimen and a cover slip, all held together by the adhesion of water. When making a wet mount, we learned that we need a thin specimen so that light can pass through it. We learned how to focus the images and how to calculate the power of magnification: eyepiece power X objective lens power.

Answers to #'s 34-37

34. $10 \times 4 = 40X$	36. leu – ile – his
35. asn – thr – ser	37. his – glu – leu