

**Practice Test on Cell Biology (the REAL test is on Friday the 17th)**

LO: Describe and explain the Central Dogma. SLE: Meet NGSS.

On the real test, you will be given this chart of the genetic code (from [openstax.org/details/biology](http://openstax.org/details/biology)).

		Second letter				
		U	C	A	G	
First letter	U	UUU } Phe UUC } UUA } Leu UUG }	UCU } Ser UCC } UCA } UCG }	UAU } Tyr UAC } <b>UAA Stop</b> <b>UAG Stop</b>	UGU } Cys UGC } <b>UGA Stop</b> UGG } Trp	U C A G
	C	CUU } Leu CUC } CUA } CUG }	CCU } Pro CCC } CCA } CCG }	CAU } His CAC } CAA } Gln CAG }	CGU } Arg CGC } CGA } CGG }	U C A G
	A	AUU } Ile AUC } AUA } <b>AUG Met</b>	ACU } Thr ACC } ACA } ACG }	AAU } Asn AAC } AAA } Lys AAG }	AGU } Ser AGC } AGA } Arg AGG }	U C A G
	G	GUU } Val GUC } GUA } GUG }	GCU } Ala GCC } GCA } GCG }	GAU } Asp GAC } GAA } Glu GAG }	GGU } Gly GGC } GGA } GGG }	U C A G
						Third letter

1. Translate the following DNA sequence into an amino acid sequence:

A-C-C-G-C-C-G-A-A-G-A-G-C-C-C

2. Complete this sentence:

Osmosis is the diffusion of \_\_\_\_\_ through a \_\_\_\_\_ membrane.

3a. Complete this chemical equation:

\_\_\_\_\_ + \_\_\_\_\_ → 6CO<sub>2</sub> + 6H<sub>2</sub>O + energy (recaptured as ATP)

3b. What process does this chemical equation represent?

3c. Where in eukaryotic cells does this process take place?

- a. cell membrane   b. chloroplasts   c. mitochondria   d. nucleus   e. ribosome

4. DNA electrophoresis is the process of

- changing the charge of DNA by swapping out the phosphates for sulfates
- digesting DNA into smaller pieces
- mutating DNA with radiation
- separating pieces of DNA based on size

5. Which is NOT an original part of the cell theory, as formulated in the 1800s?

- All living things are composed of cells.
- Cells are the basic unit of structure and function of living things.
- DNA runs the cell by telling it which proteins to make.
- New cells come from existing cells.

6. What is the function of the endoplasmic reticulum (ER) and Golgi complex?

- hold the genetic material of the cell
- process and package new proteins
- protect the interior of the cell by keeping bad stuff out
- transcribe DNA to RNA

7. At right is a diagram of a typical DNA gel. The dark slits near the top are the wells into which the DNA is pipetted. Circle the smallest piece (or pieces, if there is a tie) of DNA. (Image from yourgenome.org.)



8. If a protein is 400 amino acids long, Olivia claims that the messenger RNA (mRNA) that gets translated into this protein must be at least 1203 bases long. Explain why she is right.

9. If you give the artificial mRNA A-U-G-A-U-G-A-U-G-A-U-G... to a ribosome, the resulting protein contains only the amino acid methionine. Explain how this suggests that in the genetic code, 3 RNA bases (not 1 or 2 or 4) code for each amino acid.

10. If a cell undergoing mitosis has 20 chromosomes, each of its daughter cells will have \_\_\_\_ chromosomes.

- a. 0   b. 5   c. 10   d. 20   e. 40   f. can't tell from the information given

11. Ben Tice (previously introduced as Sven Tice's fictional fake brother) does experiments in which he attempts to get 3 different proteins (hemoglobin, RNA polymerase, and myosin) into human cells. He finds that these proteins are not able to cross the cell membrane. He concludes that cell membranes are impermeable to nutrients. Do you agree, disagree, or partly agree? Explain.

12. The fruit fly *Drosophila melanogaster* has been used in lots of important biology research. Most of its cells have 4 pairs of chromosomes (8 chromosomes total). Draw a cell at metaphase 2 of meiosis 2. Show and label the chromosomes and spindle.

13a. In genes like BRCA1 and BRCA1, substitution mutations are \_\_\_\_\_ pathogenic.

- a. never   b. sometimes   c. usually   d. always

13b. What is a substitution mutation?

14. Sex-linked traits are controlled by genes on the X chromosome. Why are males more likely than females to display recessive traits such as red-green colorblindness?

15. Say whether each statement is true of DNA, RNA, both, or neither.

- a. a type of nucleic acid: \_\_\_\_\_
- b. a product (end result) of translation: \_\_\_\_\_
- c. includes the base guanine (G): \_\_\_\_\_
- d. can move from the nucleus to ribosomes: \_\_\_\_\_
- e. different forms include a “messenger” (m) form and a “transfer” (t) form \_\_\_\_\_

16. As we have seen, there is a gene controlling earlobe appearance (either attached or unattached). This trait is NOT sex-linked; that is, the relevant gene is not on the X chromosome. Unattached lobes are dominant over attached ones.

a. If the two possible alleles are E and e, what genotype(s) result(s) in a phenotype of unattached earlobes?

b. Two people who both have genotypes of Ee have children together. What are their children’s possible genotypes, with what odds (percentages)?

c. What are their children’s possible phenotypes, with what odds (percentages)?