ANSWER KEY.

ZornScience
zornscience.org

Transcription

Biology | ANSWER KEY

Directions: Answer each question in the space provided. Show your work for every calculation. For Claim, Evidence, Reasoning (CER) questions, write all three parts.

1. Transcribe this DNA template strand into mRNA: TACCTTGGGAAATC

AUGGAACCCUUUAG

2. The coding strand of a gene is ATGAAACCCGGG. Write the mRNA that is made from this gene. (Hint: what is different between mRNA and the coding strand?)

The mRNA matches the coding strand with U in place of T: AUGAAACCCGGG.

3. An mRNA reads AUGCCUAAG. Write the DNA template strand and the DNA coding strand that it came from.

Template strand: TACGGATTC (pair each mRNA base with its DNA partner: A with T, U with A, G with C, C with G).

Coding strand: ATGCCTAAG (the same as the mRNA with T in place of U).

4. A student wrote this mRNA: AUGCTTAAG. Explain the mistake and write the correct version of the last six bases.

mRNA does not contain thymine (T). It has uracil (U) instead. The correct last six bases are CUUAAG.

5. List the three steps of transcription in order and give one sentence for each.

1. Binding: RNA polymerase attaches to the promoter at the start of the gene.
2. Elongation: the polymerase moves along the gene and builds the mRNA by pairing RNA bases with the template strand.
3. Termination: the polymerase reaches the terminator and releases the mRNA.

CC BY-NC-SA 4.0 | zornscience.org

6. What does RNA polymerase do, and what is the template strand?

RNA polymerase unwinds a short section of DNA and builds an RNA strand. The template strand is the DNA strand that is read to make the RNA. The RNA is complementary to it.

7. The coding region of a gene is 1,200 nucleotides long and ends with a stop codon. How many codons does the mRNA have, and how many amino acids will the protein have? Show your work.

Codons = 1,200 / 3 = 400. The stop codon does not code for an amino acid, so amino acids = 400 - 1 = 399.

8. Why does a eukaryotic cell process its pre-mRNA before it leaves the nucleus? Describe what happens during splicing.

The pre-mRNA contains introns that are not part of the final message. The cell cuts out the introns and joins the exons together, which is called splicing, to make the finished mRNA.

9. The table shows mRNA amounts (arbitrary units) in two cell types of the same person. Write a Claim, Evidence, Reasoning response: do these cells have different DNA?

Gene	Skin cell	Pancreas cell
Gene A (used in all cells)	40	42
Gene B (insulin gene)	0	88
Gene C (skin protein)	75	1

Claim: The cells probably do not have different DNA. They use different genes.

Evidence: Gene B mRNA is 88 units in the pancreas cell and 0 in the skin cell. Gene C mRNA is 75 units in the skin cell and 1 in the pancreas cell. Gene A mRNA is about the same in both.

Reasoning: Cells in one person come from the same fertilized egg and contain the same DNA. Different amounts of mRNA mean that different genes are being transcribed in each cell type.

CC BY-NC-SA 4.0 | zornscience.org