

Genetics (Molecular Biology)

4 Genes are a set of instructions encoded in the DNA sequence of each organism that specify the sequence of amino acids in proteins characteristic of that organism. As a basis for understanding this concept:

- 4.a** *Students know* the general pathway by which ribosomes synthesize proteins, using tRNAs to translate genetic information in mRNA.
- 4.b** *Students know* how to apply the genetic coding rules to predict the sequence of amino acids from a sequence of codons in RNA.
- 4.c** *Students know* how mutations in the DNA sequence of a gene may or may not affect the expression of the gene or the sequence of amino acids in an encoded protein.
- 4.d** *Students know* specialization of cells in multicellular organisms is usually due to different patterns of gene expression rather than to differences of the genes themselves.
- 4.e** *Students know* proteins can differ from one another in the number and sequence of amino acids.
- 4.f*** *Students know* why proteins having different amino acid sequences typically have different shapes and chemical properties.

WHAT IT MEANS TO YOU

If the DNA in each of your cells were stretched out end-to-end, it would measure more than two meters. A single DNA molecule is actually a chain of repeating units that carries a code that eventually controls protein production. Though there are only four different units in DNA, different combinations and sequences of these units produce the genetic diversity of all life as we know it.

STANDARD	CHAPTERS	PUPIL EDITION
4.a	8	243–247
4.b	8	243–247
4.c	8	252–255
4.d	8	248–251
4.e	2	44–48
4.f*	2, 8	44–48, 252–255

SAMPLE QUESTIONS

1. CCAGCAUAUGCC

A strand of messenger RNA contains the sequence shown above. How many amino acids are coded for in this sequence?

4.b

- A 3
- B 4
- C 6
- D 12

2. A mutation is *least* likely to affect the phenotype of an organism if the mutation

4.c

- A involves a frameshift.
- B exchanges one nucleotide for another.
- C does not affect the resulting protein.
- D occurs in a regulatory DNA sequence.

Answers: 1b, 2c

