

In class examples

Example 1: a) Show why the possibility of getting a baby girl is 50%.



b) If you already have three girls, is the possibility of giving birth to another girl still 50%?

c) Which of a man's grandparents could not be the source of any of the genes on his Y-chromosome?

Example 2: Some human traits are sex-linked, usually meaning that only the X chromosome can carry the gene. Hemophilia in humans is due to an X-chromosome mutation. What will be the results of mating between a normal (non-carrier) female and a hemophilic male?



Fig 5.6. Insertion of a 3.8 Kilo base segment in the factor VIII gene is the most common mutation in haemophilia A

Example 3 A human female "carrier" who is heterozygous for the recessive, sex-linked trait causing red-green color blindness, marries a normal male. What proportion of their male progeny will have red-green color blindness?

Genetics Vocabulary

Allele — alternative forms of a gene for each variation of a trait of an organism

Dominant — observed trait of an organism that hides the recessive form of a trait

Recessive — trait of an organism that can be masked by the dominant form of a trait

Trait — characteristic that is inherited; can be either dominant or recessive

Genotype — combination of genes in an organism

Phenotype — outward appearance of an organism, regardless of its genes

Heterozygous — when there are two different alleles for a trait

Homozygous — when there are two identical alleles for a trait

Cross- mate a female with a male

Exercises

1. Women have sex chromosomes of **XX**, and men have sex chromosomes of **XY**.

Which of a woman's grandparents could not be the source of any of the genes on either of her **X**-chromosomes?

2. A human female "carrier" who is heterozygous for the recessive, sex-linked trait red color blindness, marries a normal male. **Draw a Punnett square.**

3. In pea plants, spherical seeds (S) are dominant to dented seeds (s). In a genetic cross of two plants that are heterozygous for the seed shape trait, what fraction of the offspring should have spherical seeds?

4. Is a phenotypic ratio of 3:1 in the offspring of a mating of two heterozygous organisms for a single trait expected if one gene is dominant over an allelic gene? Show why or why not.
5. a) When true-breeding tall stem pea plants are crossed with true-breeding short stem pea plants, if all offspring are tall, then the tall-pea gene is dominant over the short one. True?
- b) Show what happens when the 2nd generation tall peas are crossed.
6. Two unlinked genes affect mouse hair color. **CC** or **Cc** mice are streaked. Mice with genotype **cc** are albino because all pigment production and deposition of pigment in hair is blocked. At the second location on a different chromosome, the **B** allele (black streaked coat) is dominant to the **b** allele (brown streaked coat). A mouse with a black streaked coat is mated with an albino mouse of genotype **bbcc**. Half of the offspring are albino, one quarter are black-streaked, and one quarter are brown-streaked. What is the genotype of the black streaked parent?
(Hint: first list all four combinations, and then figure out which of the four will give the listed results)

More Protein Synthesis

7. In Huntington's disease (which impairs coordination, reasoning and emotions), the responsible and dominant gene is longer than the normal one. Specifically, the DNA-sequence **GTC** is repeated about 40 times, about 23 more than what normally occurs.

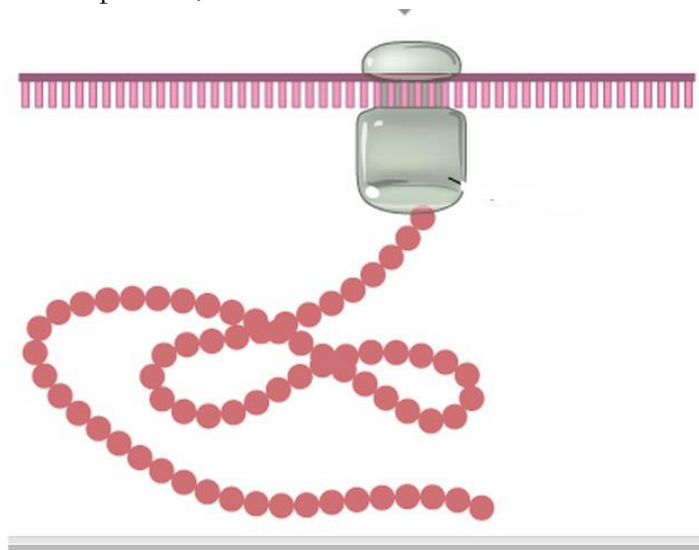
After translation, the protein produced has too many of the same amino acid in its sequence.

- What amino acid is being repeated?
- What three bases would be found on the transfer RNA molecule fetching the above amino acid?

8. Give two different DNA sequences that signal the end of a particular protein mole.

mRNA codes					
First Letter	Second Letter				Third Letter
	U	C	A	G	
U	phenylalanine	serine	tyrosine	cysteine	U
	phenylalanine	serine	tyrosine	cysteine	C
	leucine	serine	stop	stop	A
	leucine	serine	stop	tryptophan	G
C	leucine	proline	histidine	arginine	U
	leucine	proline	histidine	arginine	C
	leucine	proline	glutamine	arginine	A
	leucine	proline	glutamine	arginine	G
A	isoleucine	threonine	asparagine	serine	U
	isoleucine	threonine	asparagine	serine	C
	isoleucine	threonine	lysine	arginine	A
	(start) methionine	threonine	lysine	arginine	G
G	valine	alanine	aspartate	glycine	U
	valine	alanine	aspartate	glycine	C
	valine	alanine	glutamate	glycine	A
	valine	alanine	glutamate	glycine	G

9. Label the protein, ribosome and mRNA in the following:



10. On average, every day, an adult produces 1.3 g of protein per kg of body weight. If the average molar mass of human protein is 53 000 g/mole, how many molecules of protein are produced per second in a 100 kg adult?

11. For each amino acid, use the molecular formula and skeleton structure to draw the missing atoms and bonds.

<p>a)</p>	<p>b)</p>	<p>c)</p>
<p>Glutamic acid(Glu) $C_5H_9NO_4$</p>	<p>Glutamine(Gln) $C_5H_{10}N_2O_3$</p>	<p>Proline (Pro) $C_5H_9NO_2$</p>