

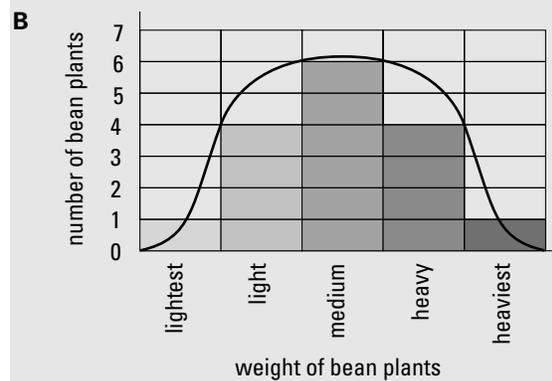
## Section 17.2 Review Answers

### Student Textbook page 609

- In crossing over, non-sister chromatids in a tetrad exchange pieces of chromosomes in prophase I of meiosis. During the study of two traits (genes found on the same chromosome), it was observed that unexpected phenotypic ratios appeared in the next generation. Because the point at which a crossover occurred was between these genes, their alleles were separated onto different chromosomes and, therefore into different gametes. Genes found on the same chromosome are called linked genes because they are expected to be found in the same gamete. With the observation of crossing over, it was determined that genes, as well as chromosomes, could assort independently. It was further determined that any given pair of linked genes would separate with a predictable frequency, and that this frequency varied among different pairs of linked genes. This is because a crossover is more likely to occur between genes that are farther apart on a chromosome than between genes that are closer together.
- The man is  $X^CY$  and the mother is a carrier of the colour blindness allele  $X^CX^c$ .
  - The child is male ( $X^cY$ ) because males inherit their X chromosome from the mother, and the Y chromosome from the father. In females, one X is inherited from the father and one from the mother. Since the father has normal colour vision his  $X^C$  carries the normal gene. Therefore, all daughters will either be homozygous dominant for colour vision ( $X^CX^C$ ) or heterozygous and carriers like the mother,  $X^CX^c$ .
- No, a person with type AB blood could not have a child with type O blood, because a parent with AB blood type would produce gametes with  $I^A$  and  $I^B$  alleles, resulting in offspring with type A, B, or AB blood, depending on the blood type of the other parent.
- She has no chance of getting an agouti rabbit. Agouti rabbits have genotypes  $CC$ ,  $Cc^{cb}$ ,  $Cc^b$ , or  $Cc$ . Neither the Himalayan rabbit (genotypes  $c^bc^b$  or  $c^bc$ ), nor the albino rabbit (genotype  $cc$ ) will carry the dominant allele  $C$ .
- You would expect to find five weight classes. Students may use a Punnett square or a bar graph like those shown below to explain why this is the case.

**A**

		<i>AaBb</i>			
		<i>AB</i>	<i>Ab</i>	<i>aB</i>	<i>ab</i>
<i>AaBb</i>	$\sigma$ <i>AB</i>	<i>AABB</i> heaviest	<i>AABb</i> heavy	<i>AaBB</i> heavy	<i>AaBb</i> medium
	<i>Ab</i>	<i>AABb</i> heavy	<i>AAbb</i> medium	<i>AaBb</i> medium	<i>Aabb</i> light
	<i>aB</i>	<i>AaBB</i> heavy	<i>AaBb</i> medium	<i>aaBB</i> medium	<i>aaBb</i> light
	<i>ab</i>	<i>AaBb</i> medium	<i>Aabb</i> light	<i>aaBb</i> light	<i>aabb</i> lightest



Phenotypic ratio = 1 lightest : 4 light : 6 medium : 4 heavy : 1 heaviest

- Environmental factors also determine the range of bean phenotypes, including soil mineral nutrients, water, and sunlight. Additional genetic factors also determine the growth of the beans.
- Genes are influenced by environmental factors. The cooler outdoor temperatures influence gene expression for fur colour in Siamese cats, and stimulate the production of darker hair colour than is found in indoor cats, which are at a constant warm temperature.