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GENETICS UNIT REVIEW - CHAPTER 4 QUESTIONS

1. List the main advantage of:

a) asexual reproduction.

Asexual reproduction requires less energy to increase the population of a species, no need to find a mate, etc.

b) sexual reproduction.

Introduces genetic variation that may lead to members of a species that are better adapted to the environment and can thrive

2. List a decreased chance of survival in:

a) asexual reproduction.

Drastically changing environments pose great risk to populations of exactly identical species since they all are at risk of the same dangers. (If one dies from a disease, they are all at risk of death from the disease)

b) sexual reproduction.

Sexual reproduction requires significantly more energy than asexual reproduction, which may put members of a species at risk of being food for predators.

3. State three reasons for cell division.

Cell division occurs because:

- Replacing dead/damaged cells
- Growth
- Asexual reproduction for single-celled organisms

4. Compare and contrast meiosis in spermatogenesis and oogenesis.

Spermatogenesis: Occurs in males, meiosis produces 4 sperm, begins at puberty and continues into old age

Oogenesis: Occurs in females, meiosis produces 1 egg, begins before birth and some eggs enter meiosis again monthly after puberty and ends in menopause around 50 years of age.

5. Draw in the stages of mitosis or meiosis below if the diploid number is 4. Note that the cells appear to be

the same size (for simplicity of drawing) even though this may not actually be the case.

6. Describe the karyotype to the right.

a) Is this individual male or female?

Female since the individual has two X chromosomes.

b) Name the syndrome.

Trisomy 18 / Edwards Syndrome

7. Describe the karyotype to the left.

Is this a monosomy, trisomy, or bisomy?

Trisomy (16 has 3 pairs of chromosomes)

8. If there are 256 possible combinations of chromosomes for a mosquito gamete, how many pairs of chromosomes must a mosquito have? 2^8 = 256, so 8 chromosomes*(1 point)*

9. If an organism's somatic cells have 48 chromosomes, how many are in a gamete? 24

10. a) Describe the process of crossing over.

Synapsis occurs in early prophase 1 of meiosis. When matching chromosomes are together, the inner chromatids of separate chromosomes exchange equal and corresponding genes. After prophase 1, sister chromatids are no longer genetically identical and the 1 or 4 resulting gametes are always genetically different from each other.

b) What is another source of genetic diversity that occur in meiosis?

By independent assortment, each pair of chromosomes randomly aligns with the other pair of chromosomes, so the probability that the gamete is identical to either parents' gamete is very low (this is 0 since crossing over exists).

11. Define the following.

centromere

The spot at which the spindle attaches to the chromosome.

centrosome

Found in animal cells, location of the centrioles

Centriole

Found in animal cells, helps make the spindle fibres

13. What is an oncogene?

A gene that can cause cancer, a gene that controls the normal functioning of mitosis has mutated

14. What is the difference between a malignant and a benign tumour?

A malignant tumour can metastasize and enter the bloodstream, spreading all across the body. Malignant tumour cells also try to use surrounding cells to deliver nutrients to themselves. Benign tumours cannot metastasize, and their effects are limited to putting physical pressure on neighbouring cells.

15. Explain the differences in cytokinesis described below.

a) What occurs during plant cytokinesis that does not occur in animals?

A cell plate forms that eventually becomes the cell wall. The cell wall exists in plant cells but doesn't exist in animal cells.

b) What occurs during animal cytokinesis that does not occur in plants?

The cytoskeleton forming for the animal cell pinches the animal cells in two to form two different cells.

16. a) How are homologous chromosomes

similar?

Homologous chromosomes have identical genes.

b) How are they different? They may have different alleles

GENETICS UNIT REVIEW - CHAPTER 5 QUESTIONS

1) Short hair is a dominant trait in rabbits. Long hair is recessive. A cross between a short-haired female and a long-haired male produces a litter of one long-haired and 7 short-haired bunnies.

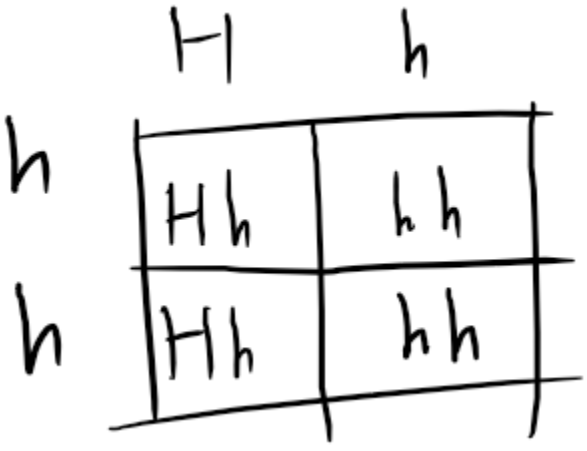
a) What are the genotypes of the parents? *Don't fill in square*

H is the dominant gene that codes for short hair, h is the recessive gene that codes for long hair

Female: Hh

Male: hh

b) What phenotypic ratios were expected amongst the offspring? *Fill in the square.*



Should have been 50% long hair, 50% short hair

c) How many of the eight bunnies were expected to be long-haired? 4

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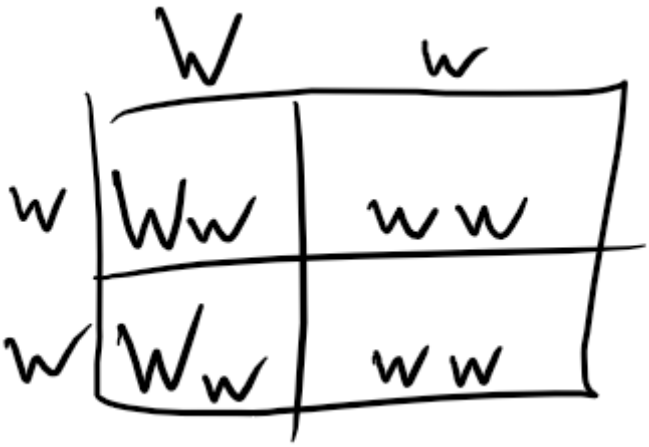
2) A widow's peak hairline is dominant to straight hairline. Cross a heterozygous widow's peak hairline person to a straight hairline person.



Genotype frequency: 1 Ww, 1 ww Phenotype frequency:1 widow's peak, 1 straight

3) Tall is dominant over dwarf and purple flowers is dominant over white. Cross a homozygous dominant with a homozygous recessive in the punnet square to the right. Cross of the F1 generation in the punnet square on the far right. State the phenotypic ratio of F2 individuals.

9 tall purples9 tall p

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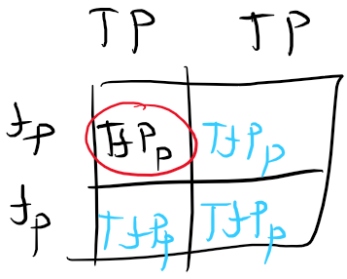
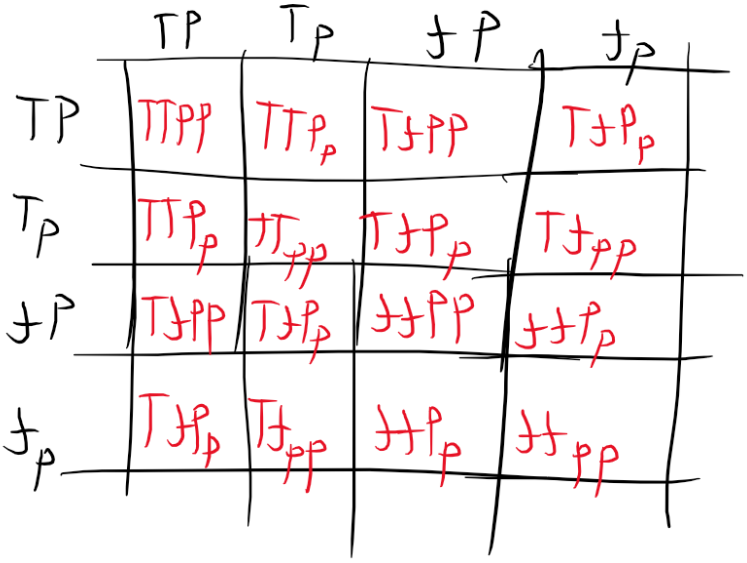
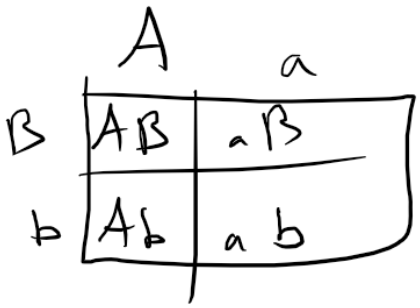




9 tall purples: 3 tall white: 3 dwarf
purple: 1 dwarf white

4) A heterozygous type A blood woman crossed with a heterozygous type B man



Genotype frequency:

AB:aB:Ab:ab

Phenotype frequency:

AB:B:A:ab

5) In a maternity ward, four babies become accidentally mixed up. The ABO blood types of the four babies are known to be: Baby Jane is O, Baby John is A, Baby Christopher is B, and Baby Robin is AB. The ABO types of the four sets of parents are determined as such: The Andersons are AB and O, the Browns are A and O, the

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Christiansons are A and AB, and the Dietrichs are O and O. Indicate which baby belongs to each set of parents.

Jane: Dietrichs

John: Browns

Christopher: Andersons

Robin: Christiansons

6) In some chickens, the gene for feather color is controlled by codominance. The allele for black is FB and the allele for white is FW. The heterozygous phenotype is known as erminette.

What is the genotype for: black chickens? FBFB white chickens? FWFW erminette chickens? FBFW

If two erminette chickens were crossed, what is the probability that:

They have a black chick? 25% have a white chick? 25%

7) In snapdragons, flower color is controlled by incomplete dominance. Flowers are red, white, or pink.

a. What is the phenotype of a plant with the genotype $C^R C^R$? red

b. What is the phenotype of a plant with the genotype $C^r C^r$?white

c. What is the phenotype of a plant with the genotype $C^R C^r$?pink

answer.

A pink-flowered plant is crossed with a white-flowered plant. What is the probability of producing a pink-flowered plant? 50%

What cross will produce the most pink-flowered plants? Show a punnett square to support your

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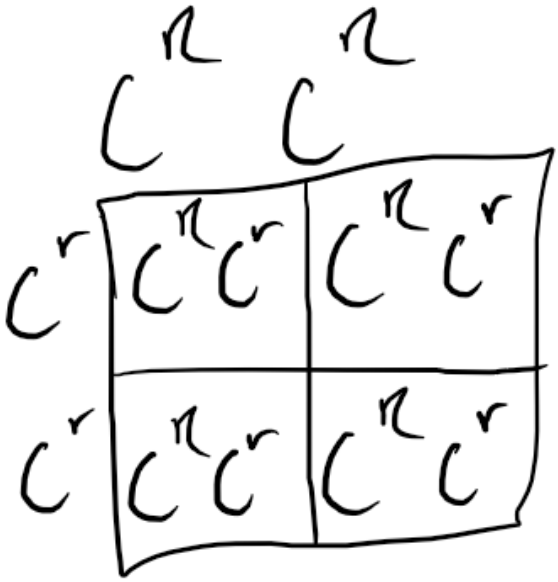
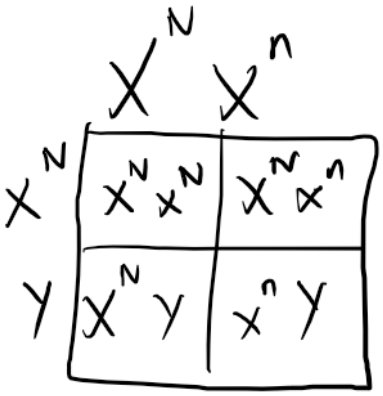


Cross between a red flower and a white flower

8) In humans, red-green colour-blindness is a sex-linked trait located on the X chromosomes. Normal vision (XN) is dominant to colour-blindness (X^n). What are the results of the following cross:

A Heterozygous female and male with normal vision



Genotype frequency:

X^NX^N:X^NX^n:X^NY:X^nY

Phenotype frequency:

2 females with normal vision, 1 male with normal vision, 1 male with red-green colour

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blindness

9) If a normal woman carrying the sex linked gene for colour blindness marries a normal male,

a. what percentage of their sons will be colour blind? 50%

b. What if she marries a colour blind male? 50%

10) Refer to the pedigree on the right. Hemophilia is a recessive X-linked condition.

Number all individuals on the pedigree at the top of each shape.

How many have hemophilia? Males 3 females 2

How many children did the couple in row I have? 2

What is the genotype for Individual I.1? X^NY Phenotype? Normal male

What is the genotype for Individual IV.1? X^nY Phenotype? Hemophilia male

11) Determine the pattern of inheritance and assign genotypes.

Shaded in mice have black fur. Unshaded have white fur.
What characteristic is dominant?

shaded

Write the genotypes of I.1 Aa I.3 aa II.4 aa

GENETICS UNIT REVIEW - CHAPTER 6 QUESTIONS

1) What is the complementary DNA strand of G T A C T G? C A T G A C

2) How are the complementary strands of DNA bonded? Hydrogen bonds

3) What are the three different point mutations? Deletion, insertion, substitution

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4) Which point mutation is the most benign and why? Substitution only affects one amino acid, while the other point mutations affect more than one. A substitution could still represent the correct or similar amino acid and the protein could still function. If an insertion or deletion should occur, this would shift the reading frame and every subsequent codon would be changed.