**Biology 9: Unit 6 Practice #1 Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Block: \_\_\_\_**

1. Describe, with the aid of a diagram, the behaviour of chromosomes in the different phases of meiosis.

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**(3)**

2. (i) Define Mendel’s law of segregation.

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(ii) Describe the process of meiosis.

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**(2)**

(iii) Explain the relationship between Mendel’s law of segregation and meiosis.

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3. (i) Define *gene*.

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**(1)**

4. (i) Define *allele*.

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(ii) Explain how gene and allele differ and give an example of each.

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**(4)**

\_\_\_\_\_5. If a purple flowered (Pp) and a white flowered pea plant (pp) are crossed, what will the offspring be? **Show work off to the side**

A. 1 : 1 ratio of purple and white flowers

B. 3 : 1 ratio of purple to white flowers

C. 1 : 3 ratio of purple to white flowers

D. All purple flowers

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\_\_\_\_\_6. Mendel crossed pure breeding (homozygous) tall pea plants that had coloured flowers with pure breeding dwarf pea plants that had white flowers. All of the resulting F1 plants were tall and had coloured flowers.

If Mendel had crossed these F1 plants with a pure breeding strain of dwarf pea plants with coloured flowers, what proportion of tall coloured plants would be expected in the offspring? **Show your work off to the side.**

A. 

B. 

C. 

D. 

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\_\_\_\_\_7. A parent organism of unknown genotype is mated in a test cross. Half of the offspring have the same phenotype as the parent. What can be concluded from this result? **Show your work below**

A. The parent is heterozygous for the trait.

B. The parent is homozygous dominant for the trait.

C. The parent is homozygous recessive for the trait.

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\_\_\_\_\_8. Which of the following represents a test cross to determine if phenotype T is homozygous **or** heterozygous? (**Note**: allele T is dominant to allele t.)

A. Phenotype T crossed with another phenotype T

B. Phenotype T crossed with a phenotype T which is homozygous

C. Phenotype T crossed with a phenotype T which is heterozygous

D. Phenotype T crossed with phenotype t

**Biology 9: Unit 6 Practice #2 Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Block: \_\_\_\_**

1. (c) In a species of plant, tall is dominant to short and the production of round seeds is dominant to that of wrinkled seeds. The alleles are unlinked.

A plant heterozygous for both characteristics is crossed with a plant homozygous for tall with wrinkled seeds.

Use the letters:

T  allele for tall

t  allele for short

R  allele for round seed

r  allele for wrinkled seed.

Determine the phenotypes and genotypes of the offspring of this cross. Show your work

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**(6)**

2. In *Zea mays*, the allele for coloured seed (C) is dominant over the allele for colourless seed (c). The allele for starchy endosperm (W) is dominant over the allele for waxy endosperm (w). Pure breeding plants with coloured seeds and starchy endosperm were crossed with pure breeding plants with colourless seeds and waxy endosperm.

(a) State the genotype and the phenotype of the F1 individuals produced as a result of this cross.

genotype .............................................................................................................................

phenotype .............................................................................................................................

**(2)**

(b) The F1 plants were crossed with plants that had the genotype c c w w. Calculate the expected ratio of phenotypes in the F2 generation, assuming that there is independent assortment. Use the space below to show your working.

Expected ratio .....................................................................................................

**(3)**

3. A farmer has rabbits with two particular traits, each controlled by a separate gene. Coat colour brown is completely dominant to white. Tailed is completely dominant to tail-less. A brown, tailed male rabbit that is heterozygous at both loci is crossed with a white, tail-less female rabbit. A large number of offspring is produced with only two phenotypes: brown and tailed, white and tail-less, and the two types are in equal numbers.

(i) Deduce the pattern of inheritance of these traits.

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**(2)**

(ii) State both parents’ genotypes and the gametes that are produced by each during the process of meiosis.

Male genotype: ........................................................................................

Female genotype: ........................................................................................

Male gametes: ........................................................................................

Female gametes: ........................................................................................

**(2)**

(iii) Predict the genotypic and phenotypic ratios of the F2 generation. Show your working.

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**(2)**

4. Mendel crossed pure breeding (homozygous) tall pea plants that had coloured flowers with pure breeding dwarf pea plants that had white flowers. All of the resulting F1 plants were tall and had coloured flowers.

If Mendel had crossed these F1 plants with a pure breeding strain of dwarf pea plants with coloured flowers, what proportion of tall coloured plants would be expected in the offspring?

A.  B.  C.  D. 

5. Brachydactyly, abnormal shortness of the fingers, was the first human genetic disorder found to be caused by a dominant allele.

The pedigree below shows a family with affected males ■, unaffected males □, affected females ● and unaffected females ○.



What are the genotypes of the father and mother in the first generation, using the symbol B for the dominant alleles and symbol b for recessive allele?

A. bb and BB B. bb and Bb C. Bb and BB D. BB or Bb and bb

**(Total 1 mark)**

**Biology 9: Unit 6 Practice #3 Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Block: \_\_\_\_**

\_\_\_\_ 1. How does the X chromosome differ from the Y chromosome in humans?

A. The Y chromosome is longer.

B. Some genes on the X chromosome are absent from the Y chromosome.

C. The genes are the same but some on the Y chromosome are not expressed.

D. The X chromosome determines sex.

2. The diagram below shows the pedigree of a family with red green colour-blindness, a sex-linked condition.



(a) Define the term *sex-linkage*.

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**(1)**

(b) Deduce, with a reason, whether the allele producing the condition is dominant or recessive.

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**(1)**

(c) (i) Determine all the possible genotypes of the individual (2nd generation–1) using appropriate symbols.

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**(1)**

(ii) Determine all the possible genotypes of the individual (3rd generation–4) using appropriate symbols.

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(iii) Determine all the possible genotypes of the individual (3rd generation–3) using appropriate symbols.

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(iv) Determine all the possible genotypes of the individual (1st generation–1) using appropriate symbols.

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(v) Determine all the possible genotypes of the individual (2nd generation–2) using appropriate symbols.

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(d) A boy inherited red-green colour-blindness from one of his grandfathers. Deduce, giving your reasons, which of his two grandfathers was also colour-blind.

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**(2)**

\_\_\_\_\_3. The pedigree chart below shows the inheritance of a genetic disease in a family. What is the nature of the allele that causes this disease?



A. Dominant and sex linked

B. Dominant and non-sex linked

C. Recessive and sex linked

D. Recessive and non-sex linked

**Provide a reason/work for your answer to question #3.**

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**(1)**

\_\_\_\_\_4. Hemophilia is sex-linked and is caused by a recessive allele. A woman’s father has hemophilia, but her husband does not. What is the probability of the women and her husband having a child with hemophilia?

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| --- | --- | --- |
|  | **Probability of a son having hemophilia** | **Probability of a daughter having hemophilia** |
| A. | 50% | 0% |
| B. | 0% | 0% |
| C. | 100% | 0% |
| D. | 0% | 50% |

**Provide a reason/work for your answer to question #3.**

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**(1)**

5. The following diagram represents a two generation pedigree showing the blood groups of the individuals. The female has been married to two different individuals.



(a) Define the term *co-dominant* *alleles*.

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**(1)**

(b) Deduce with a reason the probable father of 2nd generation–1.

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**(2)**

(c) If 2nd generation–3 marries a man with blood group AB, predict the possible genotypes of the children.

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**(3)**

6. A genetic cross was made between pure-breeding snapdragon plants with red flowers and pure-breeding snapdragon plants with white flowers. The cross produced F1 offspring that had only pink flowers. When the F1 plants were self-pollinated, the resulting F2 generation had some red, some white and some pink flowers.

(i) Identify the relationship between the red and white alleles for flower colour.

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**(1)**

(ii) Deduce the genotype of the F1 plants.

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**(1)**

(iii) Construct a Punnett grid to show the cross between two F1 plants.

**(2)**

(iv) Deduce the proportion of the different phenotypes of the F2 offspring.

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**(1)**

\_\_\_\_\_7. Which human trait shows a pattern of polygenic inheritance?

A. ABO blood type

B. Sickle cell anemia

C. Skin colour

D. Co-dominant alleles

**(Total 1 mark)**

8. Sickle cell anemia is a serious disease caused by a single base substitution mutation. Explain how a single base substitution mutation can have significant consequences for an individual.

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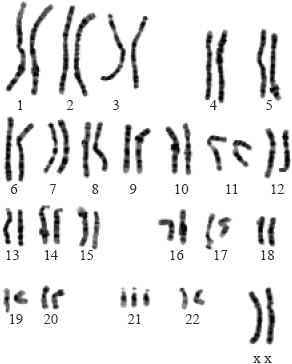
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9. What can be concluded on the basis of the following karyotype and identify the purpose of a karyogram?



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