

13

60

Name: Answer Key
Date: _____

S4 Biology: Mendelian Genetics Unit Test

Answer all questions directly on this test.!

Part A: Matching Match each letter of the definition with the correct word. (1 mark each)

- | | |
|-----------------------------------|--|
| <u>E</u> 1. heredity | a) A pair of chromosomes containing the same genes in the same locations |
| <u>K</u> 2. genotype | b) Occurs during Prophase 1. |
| <u>A</u> 3. Homologous chromosome | c) A genotype containing both a dominant and a recessive allele. |
| <u>M</u> 4. meiosis | d) A cell that contains only half the set of normal chromosomes of a normal cell. |
| <u>I</u> 5. Phenotype | e) The passing of characteristics from parent to offspring. |
| <u>F</u> 6. mitosis | f) The process of cell division. |
| <u>O</u> 7. test cross | g) An organism containing a complete set of chromosomes. |
| <u>C</u> 8. heterozygous | h) When both alleles are expressed and the result is a third phenotype that is intermediate to the two alleles. |
| <u>J</u> 9. dihybrid cross | i) The actual expression of a particular gene. |
| <u>B</u> 10. crossing over | j) P1: AaBb x AaBb |
| <u>D</u> 11. haploid | k) The actual allelic combination of an individual for a specific trait. |
| <u>G</u> 12. diploid | l) Chromosomes have lined up in homologous pairs along the equator of the cell. Spindle fibres attach to centromeres. |
| <u>H</u> 13. incomplete dominance | m) The process of gamete formation. |
| <u>N</u> 14. DNA | n) Also known as the blueprint of life. |
| <u>L</u> 15. Metaphase 1 | o) A cross used to determine if an organism is heterozygous for a particular trait. |

15

Part B: True or False Determine if the following statements are true or false. Write the word TRUE or FALSE. If it is false, correct the underlined word to make it true. (~~2 marks each~~) 1 mark each.

1. The result of mitosis is two identical daughter cells.

True

2. When Mendel crossed a purebred dominant plant with a purebred recessive plant, the F1 generation all showed the dominant trait.

True

3. A,B,O blood groups are an example of incomplete dominance.

False - multiple alleles.

4. David Suzuki is known as the father of genetics.

Gregor Mendel - False.

5. RrDd x RrDd. The expected phenotypic ratio of this cross would be 3:1

False - 9:3:3:1

6. If two rabbits heterozygous for white fur had 100 offspring, it would be expected that 75 of the offspring would have white fur.

True

7. If you had the genotype "hh" you would be heterozygous for long hair.

False - homozygous.

8. If a male affected with colour-blindness (X^bY) mates with a female who is homozygous for normal vision (X^BX^B) all their male children will be colour-blind.

False

9. During prophase I of meiosis, homologous pairs of chromosomes pair up and undergo crossing over.

True

10. A pedigree is a chart that shows a particular phenotypic trait from one generation to the next.

True

Part C: Short Answer Answer all of the following questions. Show all of your work.

1.

- a. Describe the differences between *incomplete dominance* and *co-dominance*. (2 marks)

Co-dominance → both traits expressed equally

Incomplete Dominance → results in a third phenotype b/w the two phenotypes.

- b. Identify the inheritance pattern shown by the following parental crosses: (5 marks)

i. Aa x Aa

Dominant/Recessive.

ii. $I^A I^A \times I^A i$

Multiple Alleles

iii. BW x WW

Co-Dominance

iv. EE' x E'E'

Incomplete Dominance

v. $X^B X^b \times X^b Y$

Sex-linked.

2. A woman sues a man for support of her child. She has blood type A, her child has blood type O, and the man has type B. Could the man be the father? Show your work and explain. (5 marks)

Yes if: $P_1: I^B i \times I^A i$

$F_1:$

	$I^B i$	$I^A i$
$I^A i$	$I^A I^B$	$I^A i$
$i i$	$i I^B$	$i i$

25% of O type child

3. In a certain breed of pigs, black coat colour and white coat colour are codominant to each other. If a breeder was breeding pigs and mated a black and white pig together what would be the expected outcomes of their offspring if they had a litter of 12 pigs. (5 marks)

$P_1: BB \times WW$

= 100% Bw Pigs

All 12 pigs would be black+white.

4. The F_1 phenotypic ratio for eye colour (a sex linked trait) from a cross of fruit flies is 2 red eyed females: 1 red eyed male: 1 white eyed male. Determine the genotypes and the phenotypes of the parent generation. (5 marks)

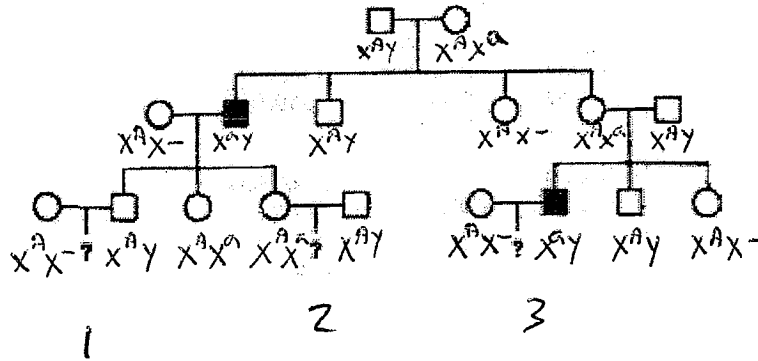
$P_1: X^R X^r \times X^R Y$

$F_1:$

	X^R	X^r
X^R	$X^R X^R$	$X^R X^r$
Y	$X^R Y$	$X^r Y$

2 Red Eyed ♀: 1 Red Eyed ♂: 1 White Eyed ♂.

5. The accompanying pedigree concerns a rare disease that is incapacitating but not fatal.



- a. Determine the type of inheritance pattern of this disease. (2 marks)
- 2
sex-linked recessive.
- b. Write the genotype of each individual according to your proposed mode of inheritance directly on the tree. (4 marks)
- 4
- c. If you were the families doctor, how would you advise the three couples in the third generation about the likelihood of having an affected child. (3 marks)

3
Couple 1 → chance is very low as the allele is rare + male is normal
Couple 2 → there is a 25% of having an affected ♂, all ♀ normal
Couple 3 → not likely, but all ♀ will be carriers.

6. In dogs, coat colour is regulated by two genes. One gene controls the colour, and the other gene controls the expression of the colour. B results in Black coat colour; b results in brown colour. D results in no colour deposition in the fur resulting in a white coat; d – result in colour deposition.

In a cross between a completely heterozygous white dog and a brown dog, what will be the resulting genotypes and phenotypes of the offspring? (5 marks)

P_i: BbDd × bbdd

	BD	Bd	bD	bd
F _i bd	BbDd	Bbdd	bbDd	bbdd

Genotypes: BbDd - 25%
Bbdd - 25%
bbDd - 25%
bbdd - 25%

5
Phenotypes: 50% White Dogs
25% Black Dogs
25% Brown Dogs