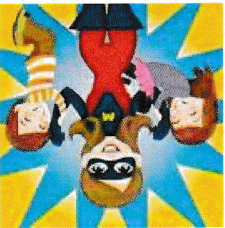


Genetics Problems Practice

Name: _____ Mark: _____/30 %



1. The Marvel family have a secret ... some of them are superheroes with enormous strength. Super-strength (N) is dominant over normal strength (n). A heterozygous member of the Marvel family with super-strength mates with a homozygous member possessing normal strength.

a. Give the genotypes of the two marvel family members mentioned above.

(2 marks)

Nn (1) $\times$ nn (1)

b. Draw a punnett square showing the cross above to determine the genotype and phenotype probability (%) of the first generation (F1) offspring.

(3 marks)

(1)

N	Nn	n
n	Nn	nn

genotypes

50% Nn

50% nn

phenotypes

50% super strength (1)

50% normal strength.

2. Two tongue rolling individuals have three children. One of these children cannot roll their tongue.

a. Explain how this can come about using the Punnett square below and a brief written explanation.

T	T	+
T	Tt	+
+	Tt	+
+	+	+

(3 marks)

① parent genotypes

① completed Punnett square

Explanation

If tongue rolling is dominant then two heterozygous parents will produce offspring with a 25% chance of not being able to roll their tongue ① as per the genotype shown in the Punnett square. If the couple were to have another child what would be the chance (%) that this child is:

(2 marks)

① 75%

i. able to roll their tongue?

① 25%

ii. unable to roll their tongue?

(4 marks)

3. The blood of Vogons (an ugly space race that you can find in the distant galaxies) comes in three colours, blue, green and yellow. If a blue-blooded Vagon mates with a yellow-blooded Vagon then all their offspring are green-blooded. Use an appropriate key and a Punnett square to calculate both the phenotype and genotype proportions for the offspring that you would expect to result from the crossing of two green-blooded Vogons.

① green blooded vogons - BY
" " - BB
" " - YY
blue blooded
yellow blooded

Y	B	Y
BY	BB	YY
Y	B	Y

genotype proportions

25% BB
50% BY
25% YY

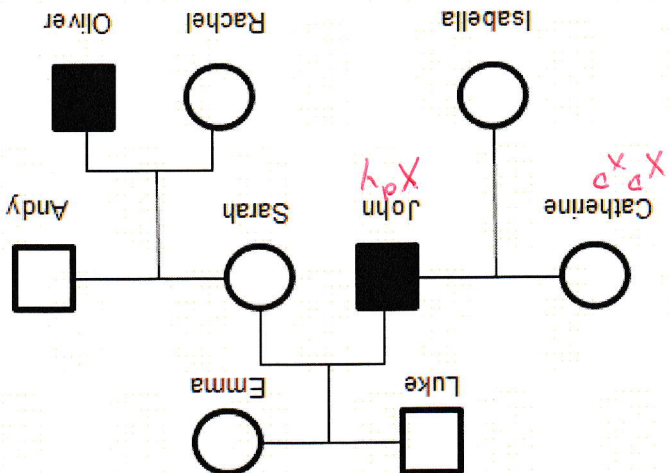
①

phenotype proportions

25% blue blooded
50% green blooded
25% yellow blooded

①

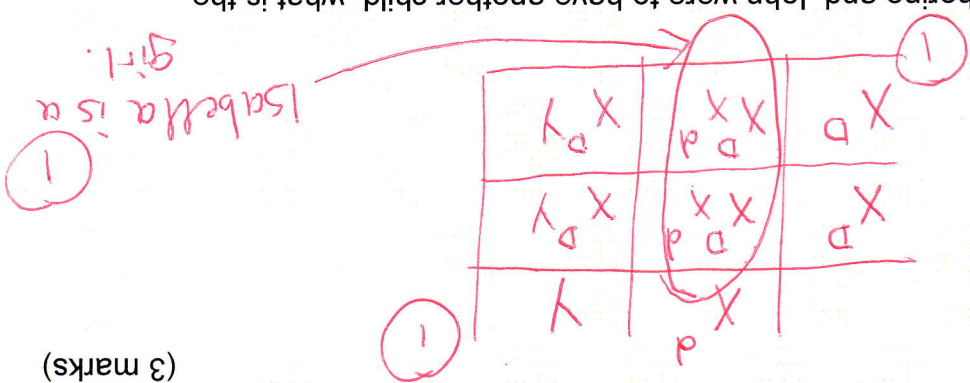
4. Duchenne's muscular dystrophy is an X-linked condition which is due to the inheritance of a recessive allele (d).



a. If John suffered from Duchenne's muscular dystrophy and Catherine was not a carrier, what is Isabella's genotype and phenotype? (2 marks)

1 $X^D X^D$
does not suffer from Duchenne's
Muscular dystrophy (but is a carrier)

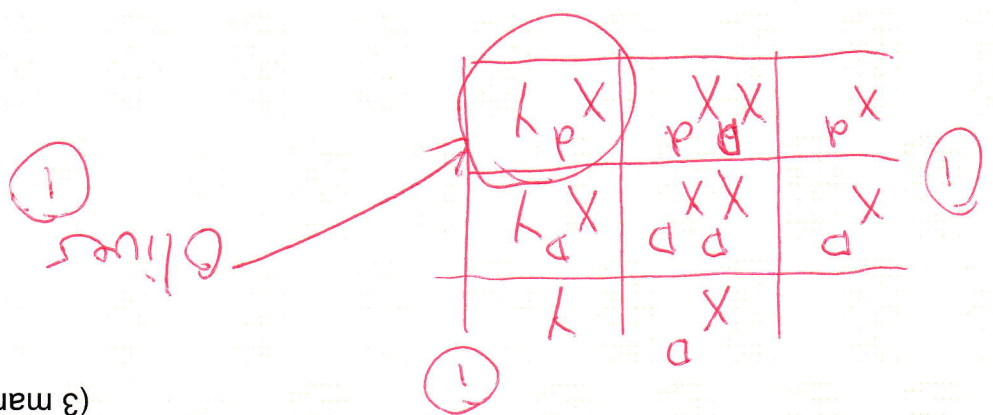
b. Give the genotypes for Catherine and John and draw a Punnett square to show how you determined your answer to the previous question. (3 marks)



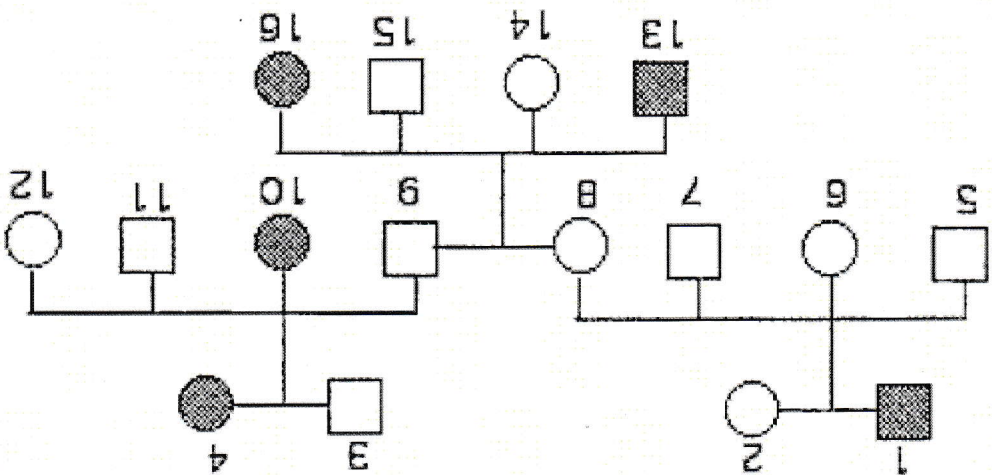
c. If Catherine and John were to have another child, what is the probability of them having a:

- i. Girl with the condition *0%* *1*
- ii. Boy with the condition *0%* *1*

d. Oliver's parents (Sarah and Andy) are both unaffected by the condition. Give the genotypes of his parents and draw a Punnett square to show why Oliver is affected by the condition. (3 marks)



5. The autosomal pedigree below shows the Unibrow characteristic.



- a. Determine if the condition (shaded individuals) is dominant or recessive and provide one piece of evidence from the pedigree that justifies your answer.

(2 marks)

Recessive

①

Individuals 13 + 16 have the condition but their parents 8 + 9 do not. Therefore must be recessive gene.

(1 mark)

- b. How many family members have unibrows?

5

①

- c. What is the genotype of individual #4?

uu

①

(1 mark)

- d. Are individuals #8 and #9 homozygous or heterozygous?

heterozygous

①

(1 mark)

- e. What is the genotype of individual #2?

UU or Uu

①

(1 mark)

however more likely UU as no offspring have condition