

Science 10 - Some Extra Genetics Questions

1. Human blood type is determined by three different alleles. The A and B alleles are codominant and the i allele is recessive.

| Phenotype | Possible Genotypes |
|-----------|--------------------|
| Type A | AA or Ai |
| Type B | BB or Bi |
| Type AB | AB |
| Type O | ii |

What is the probability that a woman heterozygous for type A blood and a man with type O blood will have a child with type O blood?

| | | |
|---|----|----|
| | i | i |
| A | Ai | Ai |
| i | ii | ii |

Answer 50 %

What is the probability that a woman homozygous for type A blood and a man with type O blood will have a child with type A blood?

| | | |
|---|----|----|
| | i | i |
| A | Ai | Ai |
| A | Ai | Ai |

Answer 100 %

What is the probability that a woman heterozygous for type A blood and a man heterozygous for type B blood will have a child with type AB blood?

| | | |
|---|----|----|
| | B | i |
| A | AB | Ai |
| i | Bi | ii |

Answer 25 %

Show ALL the possible genotypes for the offspring of a woman with type A blood and a man with Type B blood.

Answer AB, Ai, Bi, ii

If both the mother and father have Type O blood, what is the probability that an offspring will have Type A blood? 0 %, Type B blood? 0 %, Type AB blood? 0 %, Type O blood? 100 %

A person with no B alleles has antibodies for the B antigen. A person with no A alleles has antibodies for the A antigen. A person with blood type AB has no antibodies for A or B antigen. A person with type O has antibodies for the A and B antigen. Which blood type is the universal donor? O

Which blood type is the universal recipient? AB

2. A red-eyed male fruit fly and a re-eyed female fruit fly produce the following offspring:

- ✓ all the females have red eyes
- ✓ half the males have red eyes
- ✓ half the males have white eyes

| | | |
|-------|-----------|---------|
| | X^R | Y |
| X^R | $X^R X^R$ | $X^R Y$ |
| X^r | $X^R X^r$ | $X^r Y$ |

What are the genotypes of the parents?

- A. $X^r Y$ and $X^R X^r$
- B. $X^r Y$ and $X^R X^R$
- C. $X^R Y$ and $X^R X^r$** ←
- D. $X^R Y$ and $X^R X^R$

Answer C

"r" is for white eyes and is (dominant/recessive) recessive. "R" is for red eyes and is (dominant/recessive) dominant. Eye colour in fruit flies is a sex-linked trait.

3. State whether each of the following involve:

I) complete dominance, II) incomplete dominance, or III) codominance.

- a) A black mouse is crossed with a white mouse producing only white offspring. I
- b) A red snapdragon plant is crossed with a white snapdragon plant producing pink offspring. II
- c) A red carnation plant is crossed with a white carnation plant producing red and white striped offspring. III
- d) Two individuals with normal blood-clotting ability produce a son with hemophilia. I
- e) A red bull and a white cow have a roan-coloured calf. Roan colouration results when both red and white hairs are present. III

4. Crossing two hybrids results in a phenotypic ratio of 1:2:1. What type(s) of inheritance would give this ratio?

| | | |
|-----|------|------|
| | R | r |
| R | RR | Rr |
| r | Rr | rr |

- I.** Codominance, ~~II.~~ Complete dominance, ~~III.~~ Sex-linked inheritance **IV.** Incomplete dominance

- A. II only **B. I and IV only** C. I, II and IV only D. I, III and IV only

5. In the inheritance of a trait that shows complete dominance, the phenotypic **and** genotypic ratio of the offspring are **both** 1:1. What are the genotypes of the parents?

| | | |
|-----|------|------|
| | H | h |
| h | Hh | hh |
| h | Hh | hh |

| | | |
|-----|------|------|
| | H | H |
| H | HH | NH |
| h | Nh | HH |

- A.** Hh and hh B. HH and hh C. Hh and HH D. HH and HH

6. Having a widow's peak (P) is dominant and having a straight hairline (p) is recessive. If there is a 100% chance that a particular individual will have a widow's peak, which of the following are the genotypes of the parents?

- A. $pp \times pp$ B. $Pp \times Pp$ **C. $PP \times pp$** D. $Pp \times pp$

| | | |
|-----|------|------|
| | P | P |
| p | Pp | Pp |
| p | Pp | Pp |

7. Which of the following describes **phenotype**?

| | |
|----------------|--|
| I | TT |
| II ✓ | brown eyes |
| III | the genes for a particular trait |
| IV ✓ | the physical appearance of an organism |

- A. I and II only B. I and IV only C. II and III only **D. II and IV only**

8. Which of the following crosses would result in only **heterozygous** offspring?

- A. $tt \times tt$ B. $Tt \times tt$ C. $Tt \times Tt$ **D. $TT \times tt$**

| | | |
|---|----|----|
| | T | T |
| t | Tt | Tt |
| t | Tt | Tt |

Use the following information to answer question 9.

| | | |
|-----|----------------------|-----------------------------------|
| I | $Hh \times Hh$ | H = hairy toes h = smooth toes |
| II | $Hh \times hh$ | |
| III | $HH \times Hh$ | |
| IV | $HH \text{ and } hh$ | |

9. The hairy toe allele is dominant and the smooth toe allele is recessive. Which of the following crosses have equal chances of producing heterozygous hairy toed individuals?

- A. I, II and III only**
 B. I, II and IV only
 C. I, III and IV only
 D. I, II, III and IV

| | | |
|---|----|----|
| | H | h |
| H | HH | Hh |
| h | Hh | hh |

50%

| | | |
|---|----|----|
| | H | h |
| h | Hh | hh |
| h | Hh | hh |

50%

| | | |
|---|----|----|
| | H | H |
| H | HH | HH |
| h | Hh | Hh |

50%

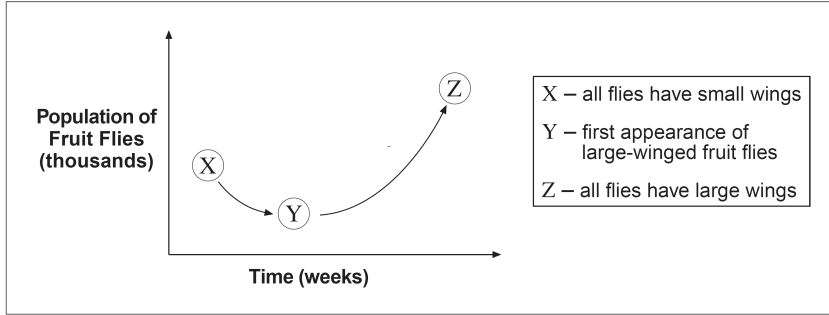
| | | |
|---|----|----|
| | H | H |
| h | Hh | Hh |
| h | Hh | Hh |

100%

10. In codominance, heterozygous individuals have both phenotypes.

- A. True**
 B. False

Use the following graph of the effect of a mutation on a fruit fly population to answer qu. 11.



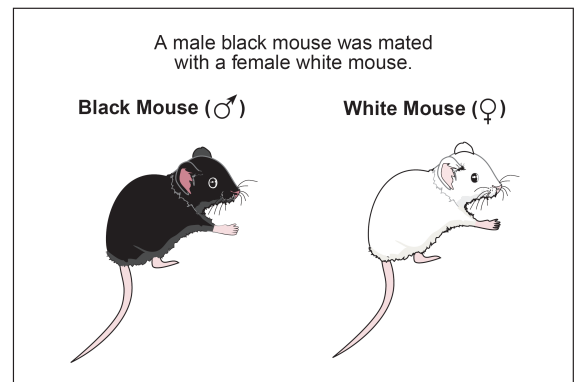
11. The mutation increasing the size of wings in fruit flies was positive for this fruit fly population.

- A. True B. False

Use the following information to answer question 12.

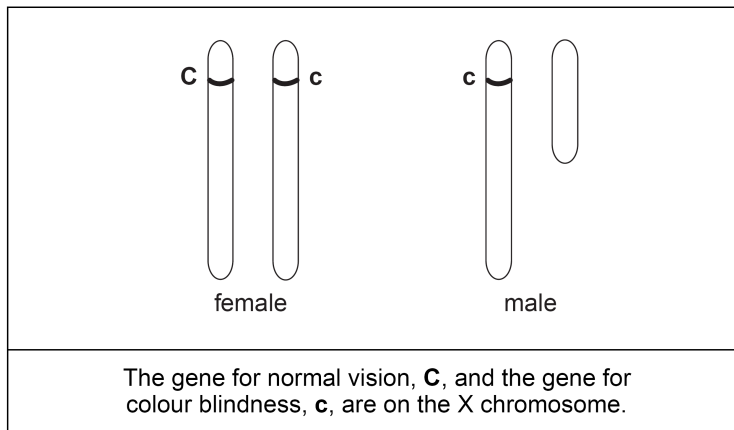
12. Which of the following describes the genotype of the female parent if she can only produce white offspring?

- A. heterozygous only
 B. homozygous recessive only
 C. homozygous dominant only
 D. homozygous dominant or heterozygous



13. A woman who is heterozygous for colour blindness and a man with colour blindness are considering having children. What is the probability of having a child who is **both** male and colour-blind?

- A. 100%
 B. 75%
 C. 25%
 D. 0%



| | | |
|-------|-----------|---------|
| | X^c | Y |
| X^C | $X^C X^c$ | $X^C Y$ |
| X^c | $X^c X^c$ | $X^c Y$ |