

UNIVERSITY OF BRITISH COLUMBIA

Biology 121 Section 225

Practice Midterm 2, Feb. 2013

Instructor: Dr. Carol Pollock

Name: \_\_\_\_\_ Student number: \_\_\_\_\_

Instructions:

1. Answer all questions in the space provided.
2. All writing must be in **INK**.
3. Answers may be in sentences or point form. Illustrations are acceptable but must be annotated.
4. Students suspected of any of dishonest practices will be immediately dismissed from the examination and will be subject to disciplinary action.
5. Other than **one side of one page** for summary notes and **one side of the same page for concept maps**, no other memory devices are permitted.
6. Students may not speak or in any other way communicate with other students while in the examination room.
7. Students may not expose their written paper to other students. The excuse of accidental exposure, forgetfulness, or ignorance will not be accepted.
8. Make sure you have **5** pages including this cover page.

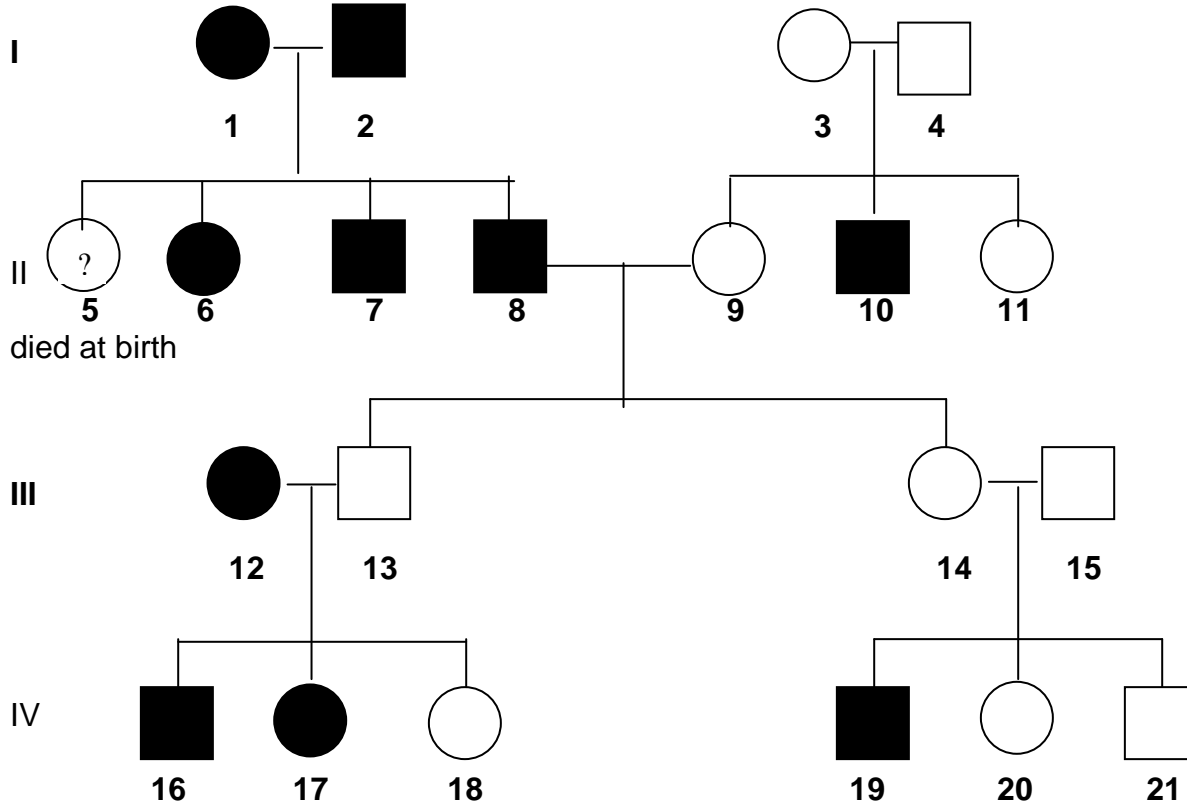
I have read and fully understand these instructions.

Student signature \_\_\_\_\_

Mark allocation:

Question	Marks possible	Your mark
1.	10	
2.	8	
3.	6	
4.	5	
5.	8	
6.	8	
Total	45	
Notes	1	
Concept map	1	
Total	45	

1. (10 marks) Lactose intolerance is a common genetic condition where adults cannot digest lactose, the sugar in milk. The following is a pedigree indicating individuals with lactose intolerance:



- a. What is the best explanation for how this trait is inherited, i.e., is it recessive or dominant? Is it autosomal or sex-linked? Justify your answer by referring to specific individuals from the pedigree. (5 marks)
- b. Write the possible genotypes of the following individuals: (3 marks)
- c. If individuals 8 and 9 had a third child, what is the probability that it would be lactose intolerant? Show all your work. (2 marks)

2. (8 marks) A true-breeding *Drosophila* with red eyes and normal body size (wild type) was crossed with a true-breeding *Drosophila* with sepia eyes and small body size. The F1 were all wild type for eye colour and body size. The F1 were crossed with *Drosophila* with sepia eyes and small bodies. The progeny were as follows:
- red eyes and normal body size 218
  - red eyes and small body size 56
  - sepia (dark brown) eyes and normal body size 44
  - sepia eyes and small body size 182
- a. Explain why you suspect these genes are on the same chromosome. (4 marks)
- b. How far apart are these genes on the chromosome? Show all your work. (4 marks)
3. (6 marks) You have been hired as a summer student to work in the UBC *Drosophila* lab. You are given a strain with apricot-colored eyes and asked to determine how this trait is inherited. You do the following crosses and then self the F1 (F1 x F1). You obtain these results:
- Cross A: Red-eyed female x apricot-eyed male  
 F1: all have red eyes  
 F2: 100 red-eyed females, 46 red-eyed males, 44 apricot-eyed males
- Cross B: Apricot-eyed female x red-eyed male  
 F1 all females have red eyes, all males have apricot eyes  
 F2: 48 red-eyed females, 52 apricot-eyed females, 46 red-eyed males, 45 apricot-eyed males
- Use the results from crosses A and B (F1 and F2) to explain how apricot eye colour is inherited. Justify your answer and show all your work.

- 4, (5 marks) Golden rice is an example of a genetically modified food. How has golden rice been modified (be specific)? Provide one argument for and one argument against the production of genetic modified foods.
5. (8 marks) Mendel also crossed pea plants homozygous for tall height and purple flowers (PPTT) with homozygous recessive short plants with white flowers (*pptt*). The F1 are *PpTt*. Assume crossing over is **not** occurring.
- a. Draw the arrangement of these chromosomes in the F1 at Metaphase I of meiosis. Place the alleles on the respective chromosomes and include the spindle microtubules. (4 marks)
- b. What is Mendel's Principle of Independent Assortment? Indicate how the arrangement of chromosomes at this stage provides evidence for Mendel's Principle of Independent Assortment. (4 marks)

6. (8 marks) Jane and John Doe recently gave birth to a darling baby boy. When he was brought to Jane for one of his feedings she had a strange feeling that he was not her son. There were two other boy babies in the nursery that day. These are their blood types as well as those of their parents:

Baby Doe – type O

Jane Doe type A

John Doe type AB

Baby X – type B

Mommy X – type O

Daddy X – type B

Baby Y – type AB

Mommy Y type A

Daddy Y type O

- a. Based on the blood type is Jane correct in assuming a switch has occurred? Explain. (4 marks)
- b. Who is the most likely candidate to be the real Baby Doe? Explain. (4 marks)