

Biology 120 – Unit Three Take Home Exam

Spring 2020

Mrs. Amy Vallette

Short Answer: 50 pts

Write/Type directly on these pages.

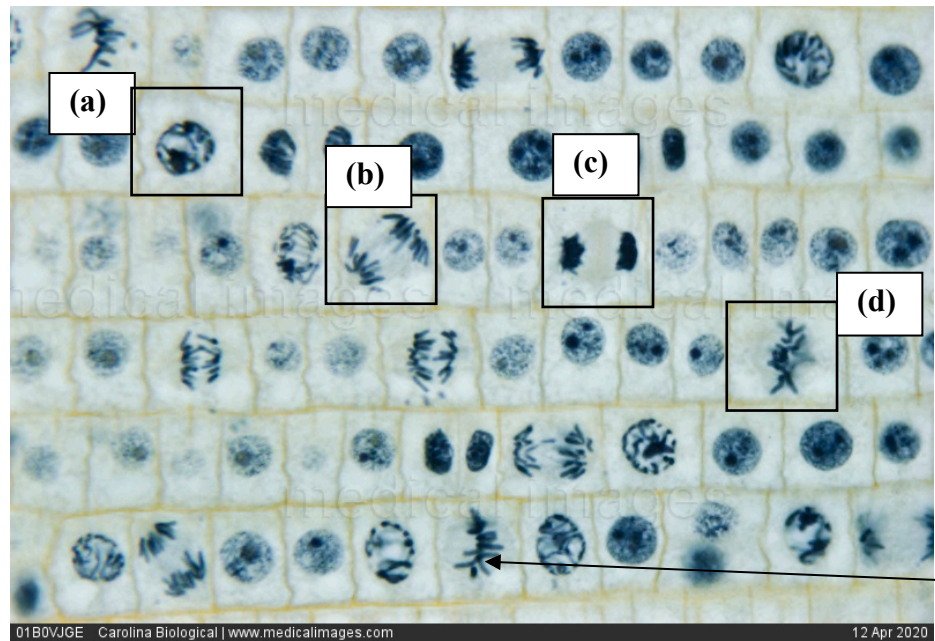
Part One: Diagrams. Label the following diagrams with the correct mitotic phase and identify any cell structures that are labeled. (10 pts)

1. Phase of cell (a):

2. Phase of cell (b):

3. Phase of cell (c):

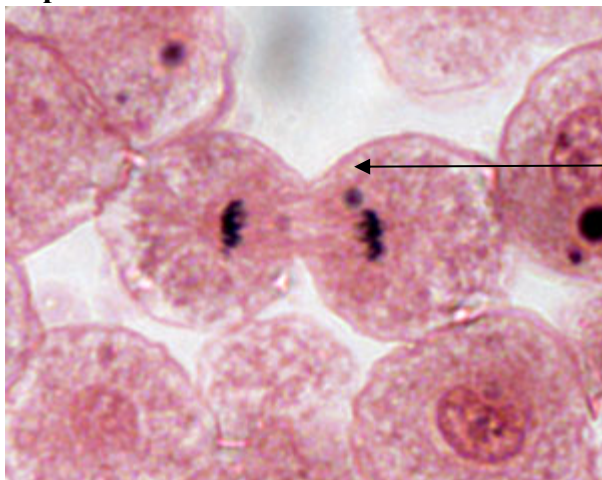
4. Phase of cell (d):



5. Structure the arrow is pointing to (black lines): _____

Diagrams continued:

The following cell is undergoing cytokinesis. Is it a plant cell or animal cell? How do you know? Explain.



Part Two: Genetic Problems: Answer each question as completely as you can. Show all work. (30 pts)

1. A disease called phenylketonuria (PKU) is caused by a **recessive** allele on an **autosome (not sex chromosome)**. Individuals born with this disease are unable to break down a certain amino acid (phenylalanine) and as a result a chemical called phenylketones build up in the brain. It can be a fatal condition, or severe brain damage can result, if it is not treated with a special diet immediately after birth.

A genetic counselor meets with two parents that are concerned whether or not they will have a child with the disease. **Both individuals are phenotypically normal, although the woman's mother suffered from the disease. There is no history of the disease in the man's family but he has tested positive for being a carrier.**

The couple would like to know what the chance is of having a child 1) with PKU, 2) that is a carrier. Show work. (3 pts)

Key:

Male: _____

Female: _____

1) Chance of having a child with PKU:

2) Chance of having a child that is a carrier:

2. One type of severe familial myopia (extreme near-sightedness) is caused by a **dominant** gene. It is **NOT sex-linked**. If a man who has normal eye sight, marries a woman who has familial myopia and is homozygous, what are the chances that they will have a child with this disorder? (3 pts)

Key:

Male: _____

Female: _____

Chance of child with disorder:

3. The gene for eye color is found on the **X-chromosome** in fruitflies. The dominant allele is red (ruby) while white is the recessive allele. In **each** of the following, determine whether the fruitfly would be male or female and what color the eyes would be. (2 pts)

- a. $X^R X^r$ _____ c. $X^r X^r$ _____
 b. $X^r Y$ _____ d. $X^R Y$ _____

4. Hemophilia is a **recessive, sex-linked trait**. A man with hemophilia marries a woman who has normal blood clotting as well but whose father has hemophilia. What type of phenotypes can they expect to see in their offspring? (3 pts)

Key:

Male: _____

Female: _____

Phenotypes:

6. In humans, straight hair is **incompletely dominant** with curly hair. The heterozygous condition results in wavy hair. Cross a wavy hair individual with a curly hair individual. What is the phenotypic ratio (or %'s) of offspring?) (3 pts)

Key:

Wavy Hair Parent: _____

Curly Hair Parent: _____

Phenotypes:

7. Suppose in dragons that breathing fire is dominant to the inability to breathing fire. On a separate set of chromosomes is the gene for scales. Having scales is dominant to not having scales. (2 pts)

What is the genotype of a dragon that is able to breathe fire and is heterozygous but does not have scales?

8. There has been a major mix-up in the hospital because of a major computer virus that infected the system. There are three babies and three couples. DNA testing is costly and time consuming. Fortunately, blood types of each are known and were not lost in the computer crash. See if you can use that information to match each baby with his/her parent to prevent the hospital from having to do DNA testing. Each set of parents has only one baby in the hospital. **Show your work.** (6 pts)

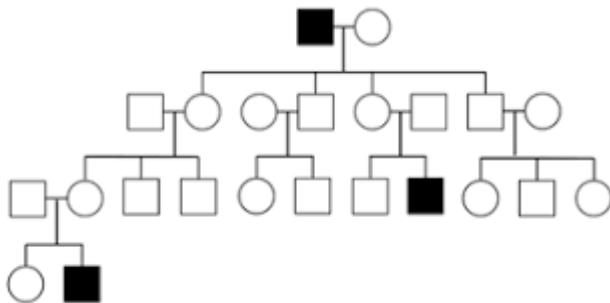
Parents

- Mom—Blood type A
Dad – Blood type A
- Mom – Type AB
Dad – Type B
- Mom – Type: O
Dad – Type AB

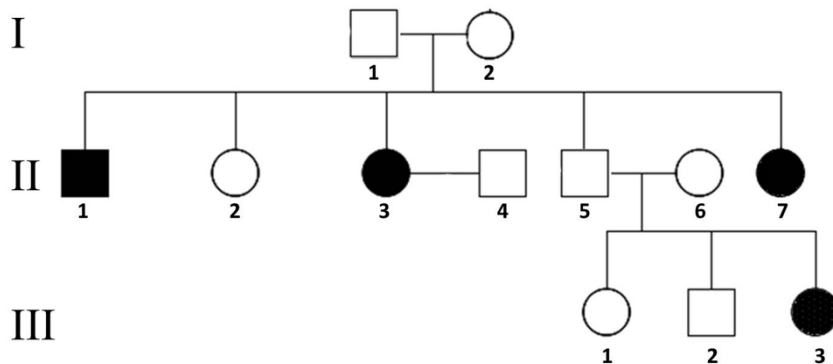
Babies

- Type AB
- Type O
- Type A

10. What is the most likely mode of inheritance for the pedigree below? Explain your reasoning. (2 pts)



9. The pedigree below traces the inheritance of sickle cell anemia in a certain family. Affected individuals, indicated here by the colored circles and squares, have hemoglobin with a different amino acid which then causes the red blood cells to become sickle shaped under low oxygen conditions. It is **autosome (non-sex-linked), recessive disorder**. (6 pts)



a) How many marriages are there?

b) How many generations are there?

c) What is the relationship between II - #5 and II-#7?

d) Give the genotypes for each of the following:

I - #1 _____ I - #2 _____ II-#3 _____

II - #4 _____ II-#7 _____ III-#1 _____

Part Four: Protein Synthesis – (10 pts) (Questions are on the next page)

		Second base					
		U	C	A	G		
First base	U	UUU } Phenylalanine (Phe) UUC } UUA } Leucine (Leu) UUG }	UCU } Serine (Ser) UCC } UCA } UCG }	UAU } Tyrosine (Tyr) UAC } UAA Stop UAG Stop	UGU } Cysteine (Cys) UGC } UGA Stop UGG Tryptophan (Trp)	U C A G	Third base
	C	CUU } Leucine (Leu) CUC } CUA } CUG }	CCU } Proline (Pro) CCC } CCA } CCG }	CAU } Histidine (His) CAC } CAA } Glutamine (Gln) CAG }	CGU } Arginine (Arg) CGC } CGA } CGG }	U C A G	
	A	AUU } Isoleucine (Ile) AUC } AUA } AUG Met or start	ACU } Threonine (Thr) ACC } ACA } ACG }	AAU } Asparagine (Asn) AAC } AAA } Lysine (Lys) AAG }	AGU } Serine (Ser) AGC } AGA } Arginine (Arg) AGG }	U C A G	
	G	GUU } Valine (Val) GUC } GUA } GUG }	GCU } Alanine (Ala) GCC } GCA } GCG }	GAU } Aspartic acid (Asp) GAC } GAA } Glutamic acid (Glu) GAG }	GGU } Glycine (Gly) GGC } GGA } GGG }	U C A G	

Name: _____ # _____

1. Given the following DNA coding strand, transcribe it into mRNA, translate it to amino acids and show the transfer RNA anticodon. (6 pts)

DNA Coding Strand: T A C G C C T T A T C T C C G T A G A T T

mRNA

Amino acid sequence:

tRNA anticodon:

2. Using the above DNA coding strand, suppose nucleotide #4 was deleted. How is the resulting protein changed? Be specific. (2 pts)

3. How would the mutation compare if nucleotide #4 was changed from a G to a T? (1pt)

4. What type of mutation is this? (1 pts)

Integrity Statement: Please read the following statement and sign below if it is true. If you feel you have not followed these guidelines and would like a different exam to do own your own, please contact me. Thank you for being honest in these trying times!

I testify that I completed the exam on my own using my own notes and book and I have not discussed the exam content with anyone.

Signature

Name: _____ # _____

Feedback – Can you give me some feedback on how the online version of Biology is going?

1. Are you finding the online lectures helpful? _____

Comment:

2. Are you attending class? _____ Listening to the recording? _____

How helpful has the live class been?

What could be changed to make the live class more helpful?

3. Do you feel like you know what it is expected of you? _____

Comments:

4. Are you finding the Mastering Biology assignments helpful? _____

Are you doing them in one sitting or over several days? _____

Do you watch the animations/videos that go with the questions? _____

5. What could I change/add to make this experience of finishing Biology online more positive?

6. What has been the hardest part about moving to the online format for Biology?

7. What is your biggest concern for these next four weeks?

8. Help me understand your situation:

Are you working? _____ If so, from home or outside the home?

How many classes are you taking? _____

Are you caring for children/siblings/other family members during this time? _____

Is there anything I can do to help support you better?