

Test Two Study Guide

1. Describe what is happening inside a cell during the following phases (pictures may help but try to use words):

Interphase: : *Consists of G1 / S / G2.*

Growing stage, cell doubles everything in its cytoplasm and duplicates its chromosomal DNA

(Mitosis):

Prophase: chromosomes condense, centrosomes separate to poles nucleus breaks down, spindles attach to centrosomes, chromosomes move to center of cell

Metaphase: chromosomes are aligned on the metaphase plate (equator)

Anaphase: : chromosomes move apart towards the poles of cell

Telophase: chromosomes arrive at poles, spindles detach from centrosomes, nuclei rebuild, chromosomes decondense

Cytokinesis: cells split apart, different in plants and animals

2. What is the difference between prophase of mitosis and prophase 1 of meiosis?

Mitosis= each duplicated chromosome appears as 2 sister chromatids joined together

Meiosis= homologous chromosomes each composed of 2 sister chromosomes come together as pairs. The resulting structure, consisting of four chromatids, is called a tetrad.

3. In meiosis, what is the difference between metaphase 1 and metaphase 2?

Metaphase I= chromosome tetrads aligned on metaphase plate

Metaphase II= chromosomes aligned on metaphase plate as they are in mitosis with only sister chromatids

4. What is the difference between telophase and cytokinesis?
Refer to question #1

5. How do a plant cell and an animal cell differ during cytokinesis?

Animal= cleavage furrow forms, contractile ring is made from microfilaments, the ring squeezes and pinches cell apart

Plant= plants have cell wall, new cell wall (cell plate) is built between daughter cells, no pinching to separate

6. Explain what is meant by crossing-over (recombination). Be sure and mention at what time it is taking place within the cell.

An exchange of corresponding segments between two homologous chromosomes at the chiasma. Occurs during prophase I of meiosis.

7. What is a nondisjunction event? Give an example using trisomy 21.

When members of a chromosome pair fail to separate in either meiosis I or meiosis II. Trisomy 21 is when there are three number 21 chromosomes resulting in Down Syndrome.

8. Describe Gregor Mendel's following laws:

Law of Segregation= *each allele will separate independently*

Law of Independent Assortment= *each gene will segregate alleles independently*

9. Why was Mendel considered "lucky"?

many traits did not follow his pattern of inheritance (incomplete dominance, multiple alleles, pleiotrophy, polygenic, linkage)

10. Deafness is a recessive disorder. Using a capital letter "D" to symbolize hearing and lower case "d" to show deafness make a Punnett square showing two heterozygotes mating.

	D	d
D	DD	Dd
d	Dd	dd

11a. According to the above square, what is the genotype for a homozygous hearing individual? DD

What is the **geneotypic** (typo- sorry) ratio for that individual? $1:2:1$

b. What is the genotype for a carrier of the deafness gene? (Remember that carrier means those that have one copy of the allele for the recessive disorder but do NOT display symptoms). Dd

What is the **geneotypic** ratio? $1:2:1$

c. What is the genotype for a deaf individual and what is the phenotypic ratio? dd $3:1$

d. What is the genotypic ratio of the complete Punnett square? How about the phenotypic ratio? $genotypic=1:2:1$

$phenotypic=3:1$

12. Maria has type O blood and her sister has type AB blood. The girls know that both their maternal grandparents are type A. What are the genotypes of the girls' parents?
 $Mom= IAi$
 $Dad= IAi$

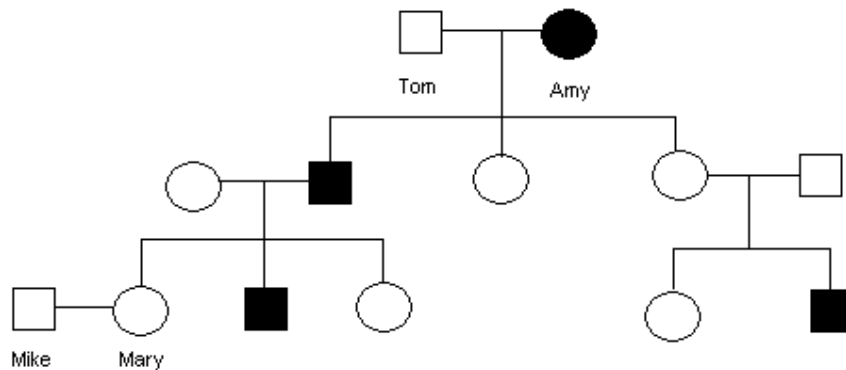
(first do square crossing mom's grandparents to find out what mom is. Since grandparents are type A they could be either $IAIA$ or IAi . We know the dad has to be IBi because they have a daughter with B in their blood and another with little "i". We also know the mom has to be IAi instead of $IAIA$ because one of the daughters has to inherit 2 little "i".)

13. Following Mendel's laws, what would the phenotypic ratio of a homozygous pea crossed with a heterozygous pea be?
 $2:1$

14. Now try a double-heterozygous cross and give the phenotypic ratio.

(Refer to page 158 "The law of independent assortment is revealed by tracking two characteristics at once" and check out the pea crossing table using two heterozygous round yellow peas)

Phenotypic ratio is $9:3:3:1$



15. Duchenne Muscular Dystrophy occurs more often in males than in females. Use the chart from above to answer the following questions:

- A. Is DMD X-linked or Y-linked? *X linked*
- B. Is it dominant or recessive? *recessive*
- C. What is the genotype of Amy? $XgXg$
- D. What is the genotype of Mary's father? XgY
- E. What is the genotype of Mary's mom? $XGXg$
- F. What percentage of Mike's and Mary's boys would have DMD? And of their girls? *50% of boys would get DMD and 0% of girls*

(you can check out a cool chart on this by typing in "x-linked recessive" on wikipedia.com)

16. A homozygous hemophilia female has decided to have children with a normal male. How many of the children will have hemophilia? (Assume 2 boys and 2 girls)

Both boys will have the x-linked recessive disorder (100% of time will be YXr) and none of the girls will have it but will be carriers (100% of time will be $XRXr$).

17. What are the nucleic acids that are found in DNA? What about RNA?

*DNA= thymine (T), adenine (A), cytosine (C), guanine (G)
RNA= **uracil (U)**, adenine (A), cytosine (C), guanine (G)*

18. Given the DNA sequence CTTAATTCGAATTAAG, what is the complementary sequence?

*For DNA= GAATTAAGCTTAATTC
For RNA= GAAUUAAGCUUAAUUC*

19. Explain what the following enzymes do.

a. DNA helicase=*unwinds DNA*

b. DNA ligase=*glues together loose pieces*

c. DNA polymerase=*attaches nucleotides ONLY in the 5' to '3 direction!!!*

20. Name the three types of RNA that we discussed in lecture. Which one is responsible for transferring the correct amino acid to the protein being synthesized in translation?

mRNA, tRNA, rRNA
tRNA transfers

21. tRNA has anticodons to bind to which type of RNA? Draw a picture of what is happening.

Anticodon triplet is complementary to a codon triplet on mRNA.

22. mRNA has start and stop codons. At what phase of translation are they being utilized, respectively?

Start=Initiation
Stop= Termination

23. What is the "Central Dogma"? List the stages at which they are being utilized (ex. Replication).

Information flow= DNA----- RNA-----protein

*DNA to RNA= **transcription***
*RNA to protein= **translation***

24. Who is credited with discovering the structure of DNA? Which important female helped make this discovery possible?

***Watson and Crick** discovered the structure of DNA: the infamous double helix! Let's not forget our lady **Rosalind Franklin** without whose x-ray crystallographic image of DNA.*

25. Match the biotechnology.

a. used for making many copies of DNA fragments.

PCR

b. used for learning the order of nucleotide bases in a DNA fragment.

DNA sequencing

c. used to separate the DNA fragments into bands based on size.

Gel electrophoresis

d. used for determining gene expression.

microarray

Microarray

PCR

DNA sequencing

Gel electrophoresis

26. Restriction enzymes and DNA ligase are important in

a. uracil synthesis

b. unwinding DNA

c. cloning a gene into a plasmid

d. predicting cancers course

27. Add the following (a. through f.) to the beginning of the statement below and decide if the statement would be true or false.

_____ is an application of biotechnology

a. Cancer research **T**

b. Drug production **T**

c. Gene therapy **T**

d. Natural selection **F**

e. Improvement of agriculture **T**

f. Law enforcement crime investigations **T**

28. Fill in the blanks with the appropriate word from the list below.

Stem cells are undifferentiated making them valuable for research.

Homeotic genes are the master controllers that select the location of certain organs in the embryo's development.

stem cells

oncogenes

tumor suppressor genes

homeotic genes

29. When a cell's division becomes unregulated it is known as

- a. angiogenic
- b. invasive
- c. metastatic
- d. overproliferation**

30. When blood vessels form, beginning to feed a tumor, the tumor is

- a. angiogenic**
- b. invasive
- c. metastatic
- d. overproliferation

31. The stage of cancer that is characterized by tumors spreading to new locations in the body is

- a. angiogenic
- b. invasive
- c. metastatic**
- d. overproliferation

32. Pick the reason why radiation treatment for cancer patients has many side effects.

- a. nonspecific
- b. harmful to rapidly dividing cells
- c. harmful to normal tissues
- d. may cause mutations leading to new cancers
- e. all of the above**

stay tuned for answers to the review coming tomorrow....

Rosie's Tips For the Test

Read over lecture slides (almost all the answers for this review sheet are there...SWEET!)

Read through Yves test 2 "lecture notes" posted on website- these are the most important highlights from lecture.

Go through the covered chapters and skim the vocab words in bold and their definitions. Make sure you recognize and know the ones that were mentioned in class.

Try to read over the review and the end of each chapter. Again- important highlights. Also, on Yves web page is the test 2 "outline" which mentions some end of chapter questions that are relevant to the test/lectures. Give 'em a try. The answers for these are in the back of the book.

Sleep well, eat good, and call your mother on Sundays.

GOOD LUCK!!!

