

DIRECTIONS: Read each question carefully. Ask for help if any question is unclear. The number in parentheses by each question is the points for that question. Enough space is given for each question for a complete answer. **Please fill in your name on every page and student ID on the front page now!! All questions have a single answer unless otherwise stated.**

1. (20) Short Answer. Answer each of the following questions in the space provided. *You will be counted off for explanations that are not succinct.*

a) What is a cryptic mutation?

A mutation which involves changes in intron splicing, either stopping a normal intron from splicing or changing where it splices.

b) How are Histones used in Eukaryotic DNA structure?

Histones are the lowest level of structure. DNA is wrapped around an octamer of histones, forming nucleosomes.

c) Describe how mitochondrial traits are inherited.

Mitochondrial traits are maternally inherited.

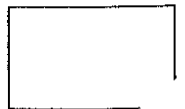
d) What is a Thymine Dimer? Explain a mode of repair that is under the control of the cell.

When two adjacent thymines bond to each other. They cannot basepair with their complementary A's. Two methods of repair under cellular control are excision repair and post-replication repair.

e) What is the function of PCR (i.e., why do we use it)? Give one drawback.

PCR is used to amplify DNA. Drawbacks include higher mutation rate, the need to have two primers, and the inability to amplify large sections of DNA.

Extra Credit: The topic I wish we could have spent more time on is.....



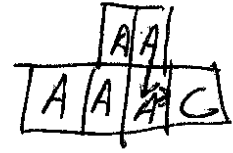
2. (8) Identify floral structure in the 4 whorls for a flower (what do they look like) when the B gene has been replaced by A (A is expressed where B normally is, as well as where A normally is).

Whorl 1 (outside): *Sepal*

Whorl 2: *Sepal*

Whorl 3: *Sepal*

Whorl 4 (inside): *Carpel*



3. (4) Circle ALL the genes that are proto-oncogenes.

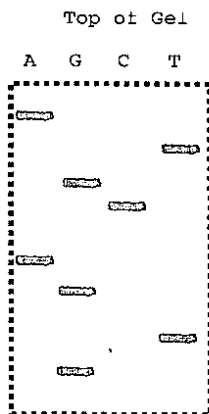
- a) BRCA-1
- b) myc
- c) p53
- d) ras
- e) rb

4. (12) The following are the four types of bacterial recombination we covered in class. Match the names with the attributes. Match the number for the type of recombination with the statement. **Numbers can be used more than one time, but only one number per answer.**

1. Conjugation 2. Generalized Transduction 3. Specialized Transduction 4. Transformation

- 1 Involves an F plasmid.
- 4 Involves DNA in the environment from dead bacteria.
- 4 The recipient has to be competent.
- 1 The size of the transferred DNA is time-dependent.
- 3 The recipient **chromosome** can *gain* DNA without exchanging it's DNA (can end up with extra DNA in the recipient).
- 2 Viral uptake of random DNA fragments.

5. (4) The following is a DNA sequencing gel.



a) Give the DNA double strand sequence for this region. Label the DNA as 5' and 3'.

5' GTGACGTA 3'
3' CACTG GAT 5' *Template*

b) Label the Template Strand in a).

6. (5) Circle ALL the following that are examples of base analogues.

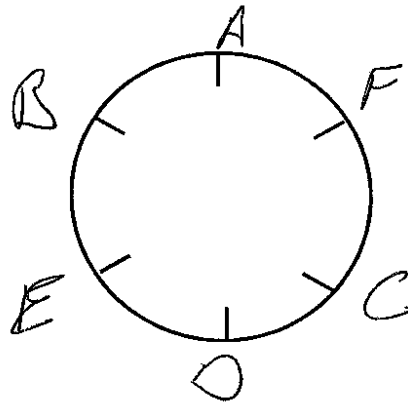
- a) 5-bromouracil
- b) Acridine Orange
- c) Enol form of Thymine
- d) Nitrous Acid
- e) Uracil

7. (2) Sex determination in yeast is an example of Replicative transposons.

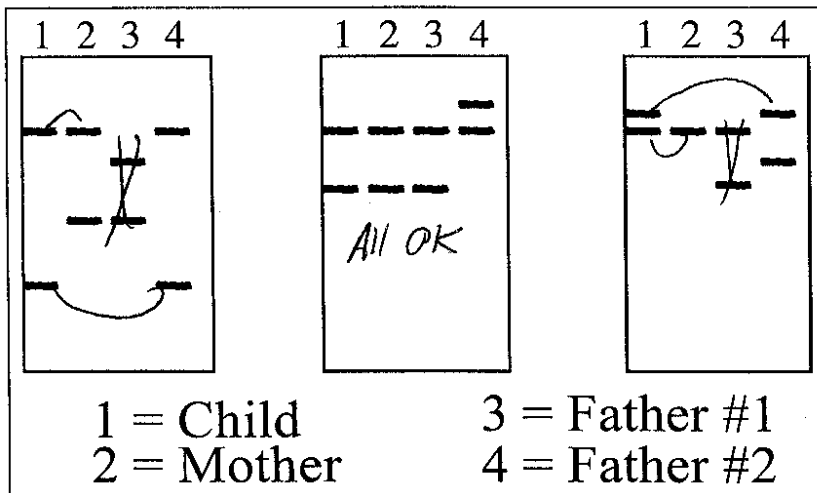
8. (4) We have set up an experiment for conjugation mapping. We use interrupted mating experiments to create the following table for 6 different genes from our bacteria.

Strain	Earliest			Latest
1	A	F		
2	E	D	C	
3	B	E	D	
4	D	C	F	

From these data, reconstruct the conjugation map for these traits with this species.



9. (6) We are interested in the paternity of a child. We take DNA samples from the mother and two possible fathers, and run a VNTR analysis on 3 loci. The results are give as:



Circle ALL the possible fathers who can be excluded based on these data.

Father #1

Father #2

14. (10) Fill in the number of the term best described by each phrase. Each number is used at most once.

- | | |
|-----------------------|-----------------------------|
| 1. Amplification | 7. Intron Processing |
| 2. Bicoid Proteins | 8. Loss of Telomere Length. |
| 3. Developmental Fate | 9. Pair-Rule |
| 4. Gap | 10. Segment Polarity |
| 5. Homeotic | 11. Transdetermination |
| 6. Imaginal Disks | |

5 *Hox* are an example.

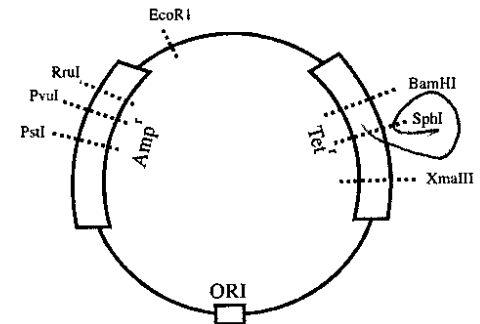
4 Hunchback is an example.

2 Involved with determining Anterior and Posterior for a zygote.

11 The ability to change cellular development by moving the cells to new surroundings.

9 The same gene is expressed in alternate segments.

15. (3) Consider the following plasmid cloning vector. We are interested in cloning a piece of human DNA in this plasmid, using the **SphI** restriction endonuclease. To detect our DNA, we make three replica plates, MM, MM + tetracycline, and MM + ampicillin. Circle the description of the colonies we wish to keep.



- a) Survives with MM and Tet. Dies with Amp.
- b) Survives with MM, Amp, and Tet.
- c) Survives with MM and Amp. Dies with Tet.
- d) Never survives.

Coding Dictionary

	U	C	A	G	
U	UUU Phe	UCU	UAU Tyr	UGU Cys	U C A G
	UUC	UCC Ser	UAC	UGC	
	UUA Leu	UCA	UAA Stop	UGA Stop	
	UUG	UCG	UAG Stop	UGG Trp	
C	CUU	CCU	CAU His	CGU	U C A G
	CUC Leu	CCC Pro	CAC	CGC Arg	
	CUA	CCA	CAA Gln	CGA	
	CUG	CCG	CAG	CGG	
A	AUU	ACU	AAU Asn	AGU Ser	U C A G
	AUC Ile	ACC Thr	AAC	AGC	
	AUA	ACA	AAA Lys	AGA Arg	
	AUG Met	ACG	AAG	AGG	
G	GUU	GCU	GAU Asp	GGU	U C A G
	GUC Val	GCC Ala	GAC	GGC Gly	
	GUA	GCA	GAA Glu	GGA	
	GUG	GCG	GAG	GGG	

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