

APPENDIX A: Matched Exam Questions

See methods for equation used to calculate Point Biserial Correlation (PBS).
Correct answer for each question indicated in bold.

Inheritance LBL: Multiple Alleles Bloom's Level 2- Comprehension	
<p>Date: Fall 2008, Section: A Correct: 21%, 88/423 PBS: 0.3</p> <p>16 alleles are known to exist for a given gene in a diploid organism. This means that any given individual of that species can have:</p> <ul style="list-style-type: none">a. Up to 16 chromosomes with that geneb. Up to 16 genes for that traitc. A haploid number of 8 chromosomesd. Up to, but not more than, 16 different traitse. At most, 2 alleles for that gene	<p>Date: Fall 2009, Section: A and B Correct: 68%, 505/742 PBS: 0.39</p> <p>Rabbit fur color is determined by one gene and four alleles that show various dominance interactions. As a result, rabbits can possess fur of several colors from white to dark grey. How many different alleles could a dark gray rabbit carry for fur color?</p> <ul style="list-style-type: none">a. 1b. 2c. 4d. 8e. 16

Inheritance LBL: Blood Type Bloom's Level 3 Application	
<p>Date: Fall 2008, Section: B Correct: 73%, 316/431 PBS=0.31</p> <p>A woman who has blood type A has a daughter who is type O and a son who is type B. Which of the following is a possible genotype for the mother?</p> <ul style="list-style-type: none">a. $I^A I^A$b. $I^B I^B$c. iid. $I^A I^B$e. $I^A i$	<p>Date: Fall 2009, Section: A Correct: 84%, 356/423 PBS=0.39</p> <p>A man who has blood type B has a daughter who is type A and a son who is type O. Which of the following is a possible genotype for the father?</p> <ul style="list-style-type: none">a. $I^A I^A$b. $I^B I^B$c. iid. $I^A I^B$e. $I^B i$

Organelle LBL: Ribosomes
Bloom's Level 3 Application

Date: Fall 2008, Section: A
Correct: 18%, 75/423
PBS=0.36

A free ribosome that binds to an mRNA molecule coding for a lysosomal proton pump in the lysosome membrane will:

- a. cleave off the signal peptide region before starting protein synthesis
- b. **bind to the ER and synthesize the protein directly into rER membrane**
- c. bind to the ER and synthesize the protein into the rER lumen
- d. synthesize the protein in the cytosol and transport it to the lysosome
- e. synthesize the protein in cytosol and package it in vesicles for transport to lysosome

Date: Fall 2009, Section: A
Correct: 40%, 168/423
PBS=0.49

A free ribosome that binds to an mRNA molecule coding for a potassium channel that is located in the membrane of an axon will:

- a. synthesize the protein in the cytosol and insert it directly into the axon membrane
- b. synthesize the protein in the cytosol, package it in a vesicle, and transport to axon
- c. cleave off the signal peptide region before starting protein synthesis
- d. bind to the ER and synthesize the protein into the rER lumen
- e. **bind to the ER and synthesize the protein directly into the rER membrane**

Date: Fall 2009, Section B
Correct: 38%, 125/329
PBS=0.42

A proton pump molecule that is synthesized for addition to a lysosome membrane will be made by:

- a. **a free ribosome which will bind to rough ER and insert it into the rough ER membrane**
- b. a free ribosome and inserted directly into a mitochondrion
- c. a free ribosome and released into the cytosol
- d. a bound ribosome on the rough ER and delivered for exocytosis by a kinesin
- e. a free ribosome which will then bind the rough ER and insert it into the lumen

Organelle LBL: Nuclear Transport
Bloom's Level 3 Application

Date: Fall 2007, Section: A
Correct: 39%, 170/436
PBS=0.41

Activation of cytoplasmic receptor X causes an increase in mRNA encoding aquaporin channels. What type of localization signal would you expect receptor X to have?

- a. Rough endoplasmic reticulum docking
- b. Golgi docking
- c. Lysosomal import
- d. Nuclear export
- e. **Nuclear import**

Date: Fall 2009, Section: A and B
Correct: 76%, 574/752
PBS=0.34 Section A and PBS=0.46 Section B

Vitamin A affects embryonic development by regulating homeotic genes differentially in cells based on their location within the embryo. Vitamin A binds to retinoic acid receptors and this causes them to bind to DNA and regulate transcription. What type of localization signal would you expect to see on retinoic acid receptors?

- a. Mitochondrial import
- b. Channel export
- c. **Nuclear import**
- d. Nuclear export
- e. Rough endoplasmic reticulum binding

Cloning LBL: Restriction Enzymes
Bloom's Level 2 Comprehension

Date: Fall 2008, Section: B
Correct: 61%, 261/431
PBS: 0.48

Restriction enzymes:

- a. recognize specific DNA sequences**
- b. cut mRNA
- c. copy DNA for PCR (polymerase chain reaction)
- d. ligate "sticky" ends of DNA
- e. protect RNA from degradation

Date: Fall 2009, Section: A and B
Correct: 73%, 521/709
PBS: 0.46

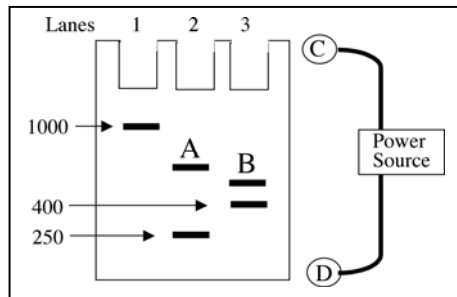
Restriction enzymes:

- a. recognize specific DNA sequences**
- b. cut mRNA
- c. copy DNA for PCR (polymerase chain reaction)
- d. ligate "sticky" ends of DNA
- e. protect RNA from degradation

Cloning LBL: Plasmids Bloom's Level 3 Application

Date: Fall 2008, Section: A and B
Correct: Average = 4.0 ± 0.04 out of 5 points,
n=854

A recombinant plasmid was successfully cut with different restriction enzymes and the DNA was run on the gel below.

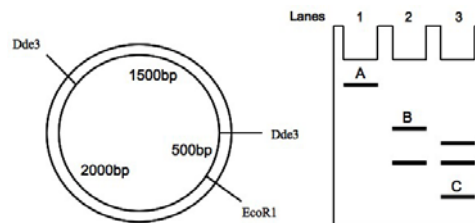


Lane 1: plasmid cut with EcoR1
Lane 2: plasmid cut with HindIII
Lane 3: plasmid cut with Dde1

- How many EcoR1 sites in plasmid
one
- What is the size of band A
750
- What is the size of band B
600
- The end of the electrode labeled C is
positive / **negative**
- In which direction are the fragments
moving? **From C to D** / From D to C

Date: Fall 2009, Section: A and B
Correct: Average = 3.9 ± 0.05 out of 5 points,
n=709

Some enzymes are delivered to your lab without labels. To solve the puzzle you add the enzymes to three tubes of a plasmid with a known restriction map that is shown below. The numbers indicate the distance between each of the restriction sites shown. When you run the resultant DNA fragments on a gel, you get the pattern shown below. Tube 1 is run in lane 1, Tube 2 is run in lane 2, and Tube 3 is run in lane 3.



Using this information answer the following questions.

- Given: Restriction enzyme(s) used in Tube 1:
EcoR1
- Restriction enzyme(s) used in Tube 2:
Dde3
- Restriction enzyme(s) used in Tube 3:
EcoRI and Dde3
- Size in bps of band labeled A:
4000
- Size in bps of band labeled B:
2500
- Size in bps of band labeled C:
500