**ANSWER KEY Lab EXAM 1, Summer 2013.**

*Mean = 66.7pts (out of 100), Stdev = 14.5, Median score = 69*

*The following cut-offs are estimations, based on previous semesters, and are only meant to give you an idea of how you are performing in Bio1AL:*

*A+ >93, A = 88-93, A- =83-87.9, B+ =78-82.9, B =74-77.9, B- =70-73.9, C+ =66-69.9, C =59-65.9, C- =53-58.9, D+ =48-52.9, D =39-47.9, D- =35-38.9, F <35*

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | A | 6 | B | 11 | E | 16 | E | 21 | C | 26 | B | 31 | C | 36 | A | 41 | D | 46 | C |
| 2 | C | 7 | E | 12 | B | 17 | D | 22 | D | 27 | D | 32 | B | 37 | D | 42 | D | | |
| 3 | D | 8 | B | 13 | C | 18 | C | 23 | B | 28 | B | 33 | C | 38 | A | 43 | B | | |
| 4 | D | 9 | B | 14 | B | 19 | E | 24 | D | 29 | D | 34 | B | 39 | D | 44 | D | | |
| 5 | B | 10 | D | 15 | B | 20 | E | 25 | E | 30 | D | 35 | E | 40 | A | 45 | A | | |

1) Doubling the amount of enzyme will double the amount of activity (excess substrate). The activity is reported as OD/min/ng of enzyme. Thus the OD doubles but since the amount of enzyme doubled overall activity will be the same.
2) As A is reduced to $AH_2$, the absorbance goes down over the time course of the light exposure. DCMU blocks electron transport and thus the reduction of A. Since the graph on the right is plotting TRANSMITTANCE the data is the inverse of absorbance.
3) Non-unit length products are formed using the original large linear chromosomal DNA as the template. At an average of 1000nt/min, the polymerase will be limited in how long it can polymerize by the extension time. With each cycle the number of templates will increase.
4) For complementation to occur the strains must be of different mating types and different genetic loci.
5) A typical PCR reaction begins at a temperature that will denature duplex strands (highest), then goes down to a temperature low enough for primers to basepair with the template (low), and then has a longer extension time just above the melting temperature of the primers (middle). This high, low, middle cycle repeats until the end of the run, when the temperature is brought down to 4˚ to end the run.
6) All living cells have had a cell membrane. A, D and E are true statements. A is from the book. This is one criteria that establishes that the Archaea are more closely related to Eukaryotes.
7) About 20% of the students chose B but this is clearly false based upon the large numbers of Chl a and b in the Light Harvesting Complex (you also saw a band for Chl B in the pigment chromatography experiment in lab).
8) 1mL water = 1g, so 560µL = 0.56mL = 0.56g = 560mg
9) A → B is exergonic, so the forward reaction rate will be higher than the reverse reaction rate initially. At equilibrium the forward reaction rate = the reverse reaction rate so that there is no net change. This graph
10) ATP production requires a H+ gradient. Light only would be higher than light + methylamine as methylamine disrupts the proton gradient. O2 production would be slower in light only as light + methylamine increases the rate of electron transport (measured in this case by increased release of O2).
12) For A or T at a specific spot it is = 3/10 chance. For C or G at a specific spot it is = 2/10 chance.
13) You need not make the graph (but you could). An absorbance of 1 = 10% transmittance (-log of 1/10 = 1).
14) The exact constituents and their quantities of a yeast extract are unknown (it's just ground up yeast), so it is undefined.
15) Energy of activation is relative to the starting molecules.
16) There is no information to indicate the use of an enzyme.
17) Only glucose molecule M can isomerize between the ring and linear form. Carbon # 1 has the aldehyde group when in the linear form.
18) There is no reason to assume the DNA would self assemble. Choice C is False. D is also False. There would be no energy available to attach a new nucleotide if proofreading had occurred.
19) There is a difference of 2 pH units. The protonated from should predominate. Thus the ratio must be 1/100.
20) Homo is a Eukaryote (Chordate); Yeast is a Eukaryote (Fungi); Parameciun is a Eukaryote (Protista); Anabaena is Eubacteria (a cyanobacteria)
21) Note that doubling the amount of enzyme will double the Vmax but the Km will not change.
22) Since the field diaphragm is closed down, you will see the plates of the iris diaphragm, as an octagon when the condenser is properly positioned.
23) The forward and reverse primers for the same gene were included in the sequencing reaction, so the chromatogram shows the two sequences on top of each other. To get this graph we did this exact experiment and this was a section of the actual chromatogram.
24) Primers should not serve as template.
25) The first thing you need to do is BLAST the sequence to see what protein it likely is, before you look at OMIM.
26) There are 240 ng of DNA per 5ul (match intensity of band). Size is 200 bp long (position of band). There are several ways to derive the answer. A mole of DNA would weigh 1.2 X $10^5$ grams. (200 bp X 600 grams/mole bp). There are 240 ng/ 5 ul of DNA. Convert this to a liter makes it 240 X 10-3 g/5 Liters. (just keep the 5 in, or you can divide it if you want). 48 X $10^{-3}$ g/L = 4.8 X $10^{-2}$

g / L. A mole would weigh 1.2 X $10^5$ grams (600 grams/mole bp X 200 bp long). (1 mole/1.2 X $10^5$ grams) X 4.8 X $10^{-2}$ g / L = 4 X $10^{-7}$ Moles/L.
27) Must use letters GS or gs, depending upon if mutant allele is dominant or recessive. Female is true breeding, if X linked then the F1 males must have brown stripe and can't be green stripe. But males show both traits, the trait cannot be X linked. Since the female is true-breeding brown stripe this allele must be recessive to the green stripe. Must use GS for the green stripe alleles.
28) The image through the field of view of the microscope is inverted top to bottom and left to right of the actual specimen on the stage. Since you want to have the specimen be down and to the left in the field of view, you would move the stage up and to the right.
29) Very closely related species requires that you select a genetic locus that shows wide variability (not highly conserved).
30) Krebs cycle releases CO2 at two steps: Isocitrate → $\alpha$-ketoglutarate and $\alpha$-ketoglutarate → succinyl CoA
31) Need to prevent amylase acting upon amylose.
32) An individual who is homozygous at this locus such that one allele has an insertion/deletion relative to the other would yield two different sized fragments (an Amplified fragment length polymorphism).
33) For all three traits the ration of normal to mutant is 1:1. Thus ½ normal bristles X ½ elongated antennae = ¼ if these two loci are genetically unlinked. Matches the data. Thus ½ normal bristles X ½ normal flight = ¼ if these two loci are genetically unlinked. We see only 10 of 100 so these two loci must be linked and this lower number represents a result of a recombination event and larger numbers is parental. Thus one parental chromosome is bb+ qf. The other parental chromosome is bb qf+.
34) Need to have a probability of 1/1 X $10^9$ = 15 nucleotides long.
35) 1N = 4 means 2N = 8. Metaphase I = 8 duplicated chromosomes (with sister chromatids) paired up as homologs.
36) The number of genes does NOT alter with the ploidy.
37) Hetero with hetero means ¼ = homo dominant, ¼ = homo recessive, ½ = heterozygous. Homo mutants die so the ratio becomes 1/3 homo dominant and 2/3 heterozygous, thus 1/3 = normal two kidneys.
38) You start with the oxidized form, so you use P. You need phosphate buffer to lyse the chloroplasts and expose the thylakoid membranes.
39) Each incorporation of ddCTP results in the termination of 10%. Thus when there are 1 X 106 template molecules there will be 100,000 terminated molecules that are 5th nculeotides long (added to the primer). These leaves 900,000 to terminate at the 6th position and 10% of those terminate (90,000). Leaves 810,000 to terminate at the 7th position which means 81,000 terminate. About 730,000 left (810-81). Thus at the 8th position there are about 73,000 molecules (leaving about 660,000) so at the 14th position there should be about 66,000 and another 600,000 that can continue. They can only continue to the 16th position as the template ends. Band should be present as the primer is radioactive.
40) Same logic except ratio is different and location of termination is different. 500,000 at the 1st position, 250,000 at the 2nd position, 125,000 at the third position, 62,500 at the 4th position, 31,250 at the 13th position is too low to show a band.
41) The blank in the Hill reaction is just water, phosphate buffer, and chloroplasts, so it is safe to go down the sinks, as is starch. However the blanks used in the Enzyme lab have DNS, so are disposed of as a hazardous chemical.
42) *Trichonympha*.
43) If the two mutations had been at the same genetic locus they would not complement. Thus there are two different genetic loci. The trait maps to a Z chromosome. Females from group 1 are mutant for trait 1 but wild type for ALL other loci, including the 2nd genetic locus that affects feather color.

Female = Z $g1g2^+$ / W. Males = Z $g1^+g2$ / Z $g1^+g2$

| | | |
|---|---|---|
| | Z $g1^+g2$ | Z $g1^+g2$ |
| Z $g1g2^+$ | Male, Normal | Male, Normal |
| W | Female, mutant | Female, mutant |
| | | |

44) Parental chromosome is largest numbers, either A+BC or AB+C+.
45) Lowest number represents double recombinants. Compared to the largest numbers the one locus that looks different is the A allele. (ABC versus A+BC). Thus the A locus maps between the B and C loci.
46) Rewrite parental genotypes in correct order = BA+C/B+AC+. Between A and B loci recombinants are BAC+ (100) and B+A+C (100) and you must also include the double recombinants (10 and 10). Thus about 10 map units.