KEY: High 100, Low 47, Ave 79

Quiz 5 (Week 10)
BI-102, Fall '05, Dr. C. S. Tritt

Answer each question completely but succinctly. Use the amount of space provided as a guide to how detailed to make your answer. This is a 4 question, 100 point test. Point values are as indicated.

1. (20) A man with type A blood and a woman with type O blood have children with type A and O blood. Tell me as much as you can about the genotypes of the man and woman.

By inspection, hypothesize that the man is heterozygous (I^Ai). The women must be ii in order to have type O blood. The resulting cross and possible offspring would then be:

	I^A	i
i	I^Ai (type A)	ii (type O)
i	I^Ai (type A)	ii (type O)

which is consistent with the given information. Note that if the man had been I^AI^A all the children would have been heterozygous I^Ai with type A blood which is not consistent with the given information.

Claiming the man is I^AI^A was -15.

2. (30) Assume you discover a population of true breeding green eyed flies. When you cross your male green eyed flies with wild type females, all the female F_1 flies have green eyes and all the male F_1 flies have wild type eyes. When you cross your female green eyed flies with wild type males, all the F_1 flies have green eyes. Tell me as much as you can about the location and nature of the green eyed trait (is it on an autosomal or sex chromosome, if it is on one of the sex chromosomes is it on X or Y, is it dominate or recessive with respect to wild type eyes). Bear in mind that, like humans, flies use the XY mechanism of sex determination. You need only provide one explanation for these observations, even though it is possible that this problem has more than one valid solution.

The fact that the reciprocal crosses produce different results implies that the green eyed trait is sex linked. By inspection (essentially a guess), hypothesis that the trait is dominant and on the X chromosome (denoted as X^G as opposed to X and Y for the wild types). The true breeding green eyed male flies would then be X^GY and the females would be $X^G X^G$. The crosses would then be:

	X^G	Y
X	X^GX (green ♀)	XY (w.t. ♂)
X	X^GX (green ♀)	XY (w.t. ♂)

and

	X	Y
X^G	X^GX^G (green ♀)	X^GY (green ♂)
X^G	X^GX^G (green ♀)	X^GY (green ♂)

which is consistent with the given information.

Not labeling phenotypes and/or fully explaining logic -3. Saying the trait is not sex linked was -20. Saying it was on Y was -15. Saying it is recessive was -15.

3. (30) What are *Okazaki fragments*, with what cellular process are they associated and, in general, why do they form?

Okazaki fragment are relatively short segments of DNA synthesized on the lagging strand during replication. They form as a result of DNA synthesis always being done in the 5′ to 3′ direction.

Saying they are other than DNA was -10, saying they form during transcription (or translation) was -10, not saying they are the result of the direction of synthesis (saying 5′ to 3′ direction was **not** required) was -10. Confusing Okazaki fragments with introns was -20. Too vague

4. (20) State the "Central Dogma" of molecular biology **OR** describe, in general terms, what causes the termination of transcription.

Information flows from DNA to RNA to protein (graphically, DNA → RNA → protein). While exceptions to the central dogma are now known, the concept is still very useful because it is followed by most organisms in most cases.

Or

The *transcription terminator* base sequence causes termination of transcript. It consists of a sequence of repeating complementary bases followed by a series of bases (U's but you didn't have to say this) that only weakly bounds the RNA to the DNA. The repeating sequence of complementary bases causes the formation of a hairpin loop of RNA that leads to the separation of the weak bonds.

Saying termination is caused by a stop codon was 15. Stop codons are associated with the termination of **translation**.