Problem Set 3  
P. Sengupta

Note: This is for a total of TWO (2) points. 4th question on reverse side.

1. How can skin color have a different heritability value at different times of the year? Explain briefly.

Environment (tanning for example) has an effect on the skin color phenotype. So measurements at different times of the year will yield different values.

2. A woman with Turner syndrome is color-blind (recall that color-blindness results from an X-linked recessive mutation). Both her father and mother have normal vision. Explain how she comes to be colorblind. Did the nondisjunction occur in her father or her mother?

Turner syndrome is XO. Since the woman is color-blind, but her father is not, her X chromosome must have come from her mother who is heterozygous for the color-blindness gene. She didn’t receive any sex chromosomes from her father – so nondisjunction must have happened in her father.

3. On a fox ranch, a mutation arose that gave a platinum coat color. Since the color was very popular, breeders tried to get a true-breeding platinum strain. But every time they crossed two platinums, they got some normal foxes. For example, repeated matings of a pair of platinum foxes gave 82 platinum and 38 normal progeny. Similar ratios were obtained with other platinum fox breedings too. Explain what’s going on briefly.

Say gene for platinum is p and for normal is P. Normal is PP, platinum is Pp and pp is lethal. So Pp X Pp gives rise to 1 PP (normal): 2 Pp (platinum) and 1 pp (dead).

I also accepted partial penetrance as an answer.
4. Diabetes has a concordance value of 65% in MZ twins, and 18% in DZ twins. What do these numbers indicate about the relative importance of genes vs environment in the diabetic phenotype?

The concordance value is higher in MZ, than in DZ twins suggesting that genetics does play a role. But since the value in MZ twins is so much lower than 100% which is what it should be if diabetes was solely caused by genetics, environment also plays a major role.