Name:_____ Dr. Reichler's Bio 325-uex Spring 2009 Quiz 4/16

1) How could looking at someone's genes help determine their risk of developing cancer? Could data about someone's environment help determine their risk of developing cancer? Explain.

2) Is p53 gene of a cancerous cell likely to be absent or over-expressed?

3) After surgery to remove a tumor under what circumstances would you want to follow-up with radiation or chemotherapy?

4) How could PCR be used to differentiate between a haploid or diploid cell? Would a single PCR reaction be sufficient?

5) Which occurs first during meiosis, crossing-over or random assortment?

6) Would having fewer chromosomes lead to more or less genetic diversity in offspring?

7) Are the sister chromatids that line up in the second cell division of meiosis identical?

8) What can explain the disappearance in one generation and later reappearance in a subsequent generation of a trait?

9) Can one parent with A blood type and another parent with B blood type have an offspring with O blood type?

10) If liking chocolate is coded for by a gene on the X chromosome with not liking chocolate as the recessive allele, and a woman who dislikes chocolate mates with a man who likes chocolate, and they are having fraternal male/female twins, what is the probability for each of their offspring to like chocolate?

11) When would a female provide more than 50% of her DNA to her offspring?

12) Why would some areas of the X chromosome in females not need to be inactivated?

13) Genes that cause PWS and AS are closely linked on Chromosome 15. People with these diseases rarely reproduce, but let's suppose that a couple produces two children with AS. One child, Pat, has has two children with PWS. The other child, Robin, has one child with AS. Does one of Pat and Robin's parents have AS or PWS? If so, is it their mom or dad? What are the sexes of Pat and Robin?

Answers:

1) Mutations in genes that code for products that regulate the cell cycle can lead to cancer. Many of these mutations are induced by toxins from the environment.

2) Absent, p53 should induce apoptosis in cells with mutations.

3) If the tumor is benign, eadiation might be used to ensure that all cancer cells are removed or dead. If the cancer is malignant, chemotherapy might be used to kill any other tumors that were not removed or detected during surgery.

4) If PCR primers can be designed for different alleles, then the presence of different products would indicate homologous chromosomes. Multiple genes would have to be checked because homozygous alleles would give the same results as haploid.

5) Crossing-over occurs as the DNA is packaging, and independent assortment occurs later as the DNA is lining up.

6) Less diversity due to fewer combinations by independent assortment.

7) If crossing over has occurred then they are not identical.

8) Recessive alleles or imprinting/epigenetics.

9) Yes. If one is AO and the other BO.

10) 100% of males will dislike chocolate and none of the females.

11) For her male offspring the X chromosome from mom is much larger than the Y chromosome from dad.

12) The pseudoautosomal regions are present on the X and Y chromsome. So males have 2 copies and females do not need to compensate for having 2 X chromosomes.

13) Pat and Robin's mother is abnormal. We know this because Pat and Robin both have Angelman syndrome. The AS gene is inactivated in the sperm, so both children must have inherited the deletion from their mother. Therefore, they did not get the gene from their mother, and the gene from their father is normally inactivated. This causes them to have Angelman syndrome. We do not actually know if Pat and Robin's mother has AS or PWS. We only know she has the deletion. Their mother could have either AS or PWS, depending on whether their mother inherited the deletion from Pat and Robin's grandmother or grandfather.
Pat is a male because he has children with PWS. He transmitted the chromosome carrying the deletion to his two children, and the mother of Pat's children normally inactivates the PWS gene in the egg. Therefore, both children have PWS. As in the answer about the parents, we know Robin is a female because she has a child with AS.