

## Quiz 2

Name: Solution

1. Explain the difference between meiosis and mitosis. (result, process, when and where it happens)

Mitosis is a fairly simple process of a cell duplicating itself. It happens in plants and animals and is by far the most common process of cell duplication. First a cell duplicates all 46 chromosomes and then the cell splits with 46 in each. This creates two identical cells.

Animals that reproduce sexually undergo meiosis to form gametes (sperm cells and eggs). Meiosis is a more complicated process for several reasons. 1. The chromosomes cross after duplicating to 96. 2. The cell splits once and then those 2 new cells split again. 3. The resulting 4 daughter cells are all different from one another.

2. What would happen if two sperm fertilized one egg?

- The resulting embryo would have 2 copies of every chromosome.
- The resulting embryo would have 3 copies of every chromosome.**
- This is the process that creates fraternal twins.
- a and b
- a and c

3. If dimples are dominant and Mom has dimples but Dad does not, can they have a child with dimples? Explain

Yes they can. If the gene is dominant, it will always express itself (show up). Use the gene D. If mom has dimples, she's either DD or Dd. Dad does not so he must be dd. . Having no dimples would be dd. As long as their child has at least one dominant allele (D) they will have dimples.

4. If dimples are dominant and neither Mom nor Dad has dimples, can their child have dimples? Explain

No they cannot. If the gene is dominant, it will always express itself (show up). If neither parent has dimples, then they must not carry them either. Use the gene D. Having no dimples would be dd. If both parents are dd then no offspring can get a D.

5. How can a person be a carrier of a trait or disease that they themselves do not have?

If the trait/disease is recessive that means a person can carry it and not express it (show it). For example if the gene is H then a person who is heterozygous Hh will carry it but not express it. If they are hh then they will express it.

6. If Sarah and her husband both have curly hair but are both heterozygous (carriers) for straight hair, what are the odds that their first child will have straight hair?

I'll choose H to signify the hair gene. H is dominant (curly hair) and h is recessive (straight hair). Sarah and her husband both have curly hair and are carriers for straight hair: Hh.

	H	h
H	HH	Hh
h	Hh	hh

The punnett square shows one of four children with hh which will express straight hair. So 1/4 or 25% chance.

**7. What are stem cells? Where can they be found (include all locations you are aware of)**

Stem cells are cells that are continuously dividing throughout your life. Stem cells undergo mitosis, producing one daughter that will leave the cell cycle and become a specific cell type, and another daughter that will continue to undergo mitosis. In this way, stem cells are a constantly renewing population. Early embryos are comprised entirely of stem cells in that all the cells are still dividing and can make any of the specialized cell types the embryo will need. Even later in development, stem cells are present in the body usually, they only make one kind of cell (for example, blood or skin), but one of the unique properties of stem cells is that they can be converted into different cell types by exposing them to different signals. For this reason, they have been useful for all sorts of therapy.

Found in umbilical cord, embryo, bone marrow, testes (to make sperm), various other parts of the body.

**8. What will happen to an embryo at the stage of having eight cells if one of its cells is removed? Explain your reasoning.**

It will develop normally. At 8 cells each cell in the embryo is an undifferentiated stem cell. All are identical and one less makes no difference.

**9. Explain why options A and C below are incorrect.**

What was unusual (first of its kind) about the form of PGD (Preimplantation Genetic Diagnosis) that was used with Molly's brother Adam?

- A. He was the first embryo where PGD was used to remove unwanted genetic characteristics.
- B. He was the first embryo selected in a lab for his immune system so he could help Molly.
- C. He was the first embryo where PGD was used to give Adam the specific genes needed to help Molly

Option A is incorrect because it says that PGD "removes" unwanted genetic characteristics. Option C is incorrect because it says that PGD "gives" specific genes to Adam. In both cases the options suggest that doctors/researchers are able to in some way change the genetic characteristics of an embryo. We do not have the technology (not to mention the ethical issues) to alter genetic make up of an embryo. PGD is only a "screening". They can look and see generally (not even specific detail) what genes exist and choose an embryo with the matching genes to Molly.