7th grade Science **please put your name on the back**
Mrs. Zapinsky

Matching – choose the best answer

1)___ gamete	**a)** having the ability to become a few different (but not all) types of cell in the body
2)___ daughter cells	**b)** when two gametes join together
3)___ pluripotent	**c)** the division of a cell that halves the normal number of chromosomes.
4)___ multipotent	**d)** the division of a cell used for asexual reproduction and growth.
5)___ differentiated	**e)** definition of a cell with half the normal number of chromosomes
6)___ mitosis	**f)** the description of a cell that has a set structure and function
7)___ meiosis	**g)** the cells used for sexual reproduction.
8)___ fertilization	**h)** definition of a cell with the normal number of chromosomes
9)___ haploid	**i)** having the ability to become *any* of the cells in the organism's body
10) ____ diploid	**j)** two cells at the end of mitosis that are identical to each other and to the original cell.

Short Answers

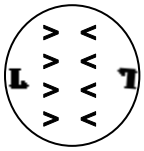
1) How is late Interphase in the cell's life cycle different from most of the rest of Interphase? (What happens in both interphase and late interphase?)

Most of interphase –

Late interphase –

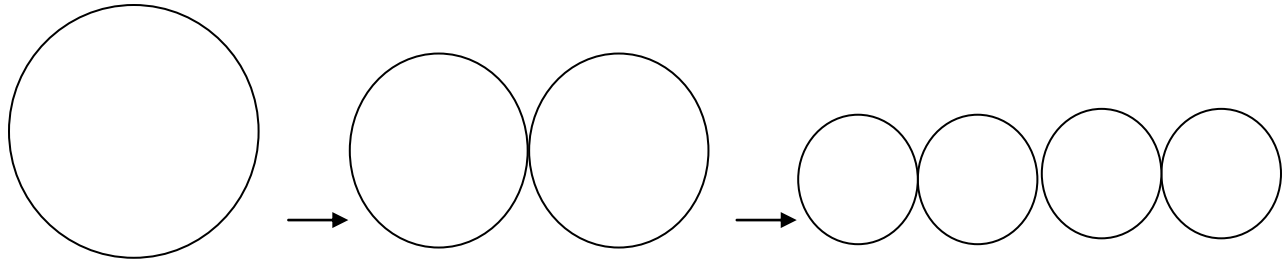
2) a) What happens during prophase of mitosis? (List all the events)	**b)** Why do those things *have to* happen during prophase?
i) _____ So that i) _____	_____
_____	
ii) _____ So that ii) _____	_____
_____	
iii) _____ So that iii) _____	_____
_____	

3 a) What is the step of mitosis shown in this diagram called?



b) What structures are pulling the chromosomes apart - shown and not shown? (use the names)

4) a) Draw what happens to the chromosomes during **meiosis** when the diploid number is **10** chromosomes. Use different colors for chromosomes from the grandmother and grandfather. (Please draw the chromosomes, centrioles, and the nuclear membrane and nucleolus, if there is one.)



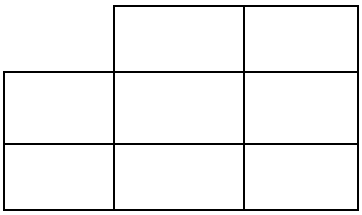
Meiosis I (metaphase) **Meiosis II** (metaphase) end result…

b) What happens to the chromosomes during metaphase of meiosis I, so that all the siblings in a family have totally different combinations of the genes from their grandparents? (All the children are different from each other.)

5) Why do gametes have to be haploid?

6) If there are two possible genes for the color on a ladybug's back, either red (R) or yellow (r)…..

a) Draw a Punnet square for the possible offspring of two ladybugs, one with the genes **Rr** and the other with the genes **rr**.



(Please make sure I can tell the difference between your R and r)

b) How many of the offspring will possibly have the genes rr? (you may use either a percentage or a fraction)

7) If a ladybug can have either a red gene or a yellow gene for the color of its back…..

a) If the red gene is 'stronger' than the yellow one, it is called a _____ gene. If the yellow is 'weaker', it is called a _____ gene.

b) If the red gene codes for the production of a protein, and the yellow gene does not, and a ladybug has one red gene and one yellow gene (**Rr**), what color will its back be?

c) If the gene shows incomplete dominance, and it has one red gene and one yellow gene (**Rr**), what color will its back be?

8) Height is a multi-gene trait, in addition to being influenced by the environment. This makes it very difficult to predict how tall the children of certain parents will be, and it also causes the wide range of possible heights of a person. What is a multi-gene trait?

9) In fruit flies, specific wing shape and eye color are a combination of traits that is often inherited together. For instance, red eyes are often inherited together with normal wings, whereas purple eyes are often inherited together with very small, useless wings.

a) What is it called when traits are often inherited together?

b) Why do some traits tend to get inherited together most of the time?

10) How do cells within one organism become "differentiated" as the organism develops, so that the cells look different from each other and have different jobs from each other, even though all the cells within the organism have the same exact chromosomes? (example – a heart cell and a brain cell)

Thinking questions. Answer three out of five. Do a fourth for extra credit

1) All the people in Shprintze's family have freckles ***except*** for Shprintze. Shprintze does not have freckles. She is convinced that she is adopted.

Because F and f are very similar, please use different colors for the genes, so I can tell the difference.

a) Draw a Punnett square to diagram the genes for Shprintze's parents and their possible children to show that Shprintze **is the real child** of her parents, even though both the parents and the other children in the family have freckles, and she does not.

Did you make freckles dominant or recessive?

What are Shprintze's genes? ___ ___

b) Draw one possible Punnett square of the genes for Shprintze's parents and their possible children that shows that Shprintze **is definitely adopted** – that she can't be their child. The parents and the other children in the family have freckles, and she does not. (There could be more than one right answer.)

Did you make freckles dominant or recessive?

What are Shprintze's genes? ___ ___

2) Researchers have found a specific gene variation that occurs *more often* in men who are Cohanim than in any other group of men around the world, although it is sometimes found in non-Jews as well.

a) How does this gene get passed down *only* to the ***sons*** of Cohanim, but ***never*** to the daughters?

b) Most Levi'im do **not** have this mutation. Think back in time…..would it be possible that there might be male Levi'im with the same gene variation as the Cohanim? (explain either how or why not)

c) How is it possible that the same gene variation can sometimes be found in the DNA of a non-Jew? (I can think of several possible ways, any possible answer will do.)

3) There is a disease called hemophilia in which the protein that usually helps to form blood clots doesn't work properly. If a person with hemophilia gets a cut they can bleed to death, chas v'shalom. The gene for the blood clotting protein is found on the 23rd pair of chromosomes. Hemophilia is a disease that is sometimes found in boys and **sometimes, *but much less frequently***, found in girls. Fill in the questions below to show several facts you know about the 23rd pair of chromosomes, *and* the expression of genes in general, that can explain the fact that hemophilia is a sex-linked disease found mostly (but rarely) in boys, and only very, very, very rarely in girls?

a) Besides blood clotting, what is one of the main jobs of chromosome #23 in people?

b) What is the chromosome #23 pair for girls? ___ ___
for boys? ___ ___

c) On which ***one*** of the two variations of chromosome #23 do you think the gene for hemophilia is found? __ (one letter only)

d) Why does it ***have*** to be on that particular one of the two variations of chromosome #23, rather than on the other of the two types?

e) Do you think that the gene for hemophilia is dominant or recessive?
Why does it make sense that it should be dominant/recessive?

f) Why can't the other one of the two chromosomes in pair #23 make up for the disease gene in boys?

4) Science fiction books often feature the cloning of a person. You can imagine that a rich, arrogant world leader might want to use cloning to live forever, and keep his vision of ruling his country going forever.

a) What is cloning? (give a general definition, not how it is done)

b) Would it be possible to live forever, just by cloning yourself over and over again? Why/why not?

c) Would the cloned offspring necessarily look exactly the same, or have the same outlook on life and the same interests, therefore staying the same type of ruler as the original? Why/why not?

5) There are more patients with diseases that need organ transplants than there are organ donors, so scientists are hoping to create replacement organs using stem cells, either embryonic stem cells, or adult stem cells.

a) What is the ethical debate (the arguments about ***both*** Right and Wrong) that goes along with using human **embryonic** stem cells to try to create replacement organs?

Right:	Wrong:

b) Why might it be better, anyway, to use a person's own 'adult' stem cells to create a replacement organ, rather than using embryonic stem cells from an unrelated embryo?

c) Instead of trying to create entirely new hearts as organ replacements, some scientists have been working on injecting adult stem cells from bone marrow into damaged hearts. Those stem cells differentiate into different cell types, depending on <u>where</u> they wind up, and they strengthen the damaged hearts. The same stem cell type can become new heart muscle, smooth muscle, or blood vessel cells, depending on what other cells are nearby, meaning they are responding to signals in their environment. Why does it make sense for stem cells to be able to change into different cell types, depending on what other cells are around them?

d) An Israeli scientist discovered that when using embryonic stem cells to strengthen a damaged organ, the exact timing of the transplant makes a difference. The best time is just after the embryonic stem cells start to differentiate into multipotent cells, rather than using pluripotent stem cells. Why is this the best time?

What might happen if the transplant used cells from an **earlier** embryonic state?

What might happen if the transplant used cells from a **later** state?