Module 5: Cell Division: Replication & Reproduction KRC

Class Notes

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Instructions: Complete the class notes from the ppt slides. Use MS Words to fill in the blanks.

The Importance of Cell Division

1**. Why does a cell divide?** The purposes of cell division are: 1. **____Growth___ ,**
2 ___Maintenance_____ , 3. ____Reproduction_____,
4. ___Repair_____, and 5. _____Differentiation_____

2. The most important result of mitosis is the **___Exact_____**
_____Duplication_____ ***of the parent cell's genetic information*** .
3. All cell division is preceded by _____**DNA_____** **___Replication**_____.

The Cell Cycle

4**.** It is a continuous process. It includes **____Interphase_____ and**
_____Mitosis_____ **5.** During**__Interphrase_____,** cells engage in ____**Metabolic_____**activities, prepare for the next cell division.

Interphase: Interphase-S

6. S phase: ___**DNA ____ ___Replication_____**occurs. When S phase is complete each chromosome is
made up of two strands of_____**_Chromatids**_____.
7. The two chromatids are connected by a _____**Centromere**_____.

Mitosis-cell Replication
8. The __**Two** _____ events of cell division:
A. _____**_Mitosis**_____ It is the division of the ____**Nucleus**_____. Occurs in four phases (___**Prophase_____, _____Metaphase** _____ , _____**_Anaphase**_____, & _____**_Telophase**)__ that are continuous with one another.
B**___Cytosis_____**: Dividing the **__Cytoplasm___**into two new cells that will house the new **_____Nuclei___**_____ .

9. Prophase:
1) _____**Chromosomes**_____ become visible.
2) _____**Centrioles** ____ are used during animal cell division and they move to the poles.
3) _____**Spindle**_____ formation takes place. The fibers extending from cell pole to cell pole are called **_Spindles** _____.

4) ___**Nuclear**_____ _____**Membrane**____ disappears.
5) _____**Nucleolus**_____disappears.

10. Metaphase:
The spindle fibers move the chromosomes so that they are all arranged at the middle of the cell (_____**Equator**_____). The chromosomes are at the ___**Equator** __ .

11. Anaphase:

1) Chromosomes split at the**____Centromere_____.**
2) Each **___Chromatid**_____move towards the **___Pole____**in opposite direction. Each chromatid is now called the _____**Daughter**_____**Chromosome**_____.
3) At the end of anaphase, the daughter _____**Chromosomes**___ are at the _____**Pole**_____**.**

12. **Telophase** :
1) **_____Spindle_____** fibers disassemble (____Disappear __). 2) _____**Nuclear**_____**membranes**_____ form around the ____**two**____ new sets of chromosomes 3) _____**Chromatin**_____ uncoils.

4) _____**Nucleolus**___ reforms. 5) The ___**daughter** ___**cells**___ enter **_____Interphase_____**again.

13**. Cytokinesis:**
1) _____**Separates**___ the two new nuclei into two _____**New**___**Cells**_____. 2) Roughly ____**divides** ____the ___**cytoplasm** ____ and its ____**contents** ___ in half.

3) In ___**Animal cells**_____ _____**the**_____ cell membrane forms a **_____cleavage furrow_**. Cell **_pinches_**into two. 4) **In Plant**_____ cells ___**Cell**_____ ___**Plate**_____ is formed. A new ____**cell**_____ ___**wall**_____ is built, separating the nuclei.

Cancer
14. Uncontrolled mitotic division results in the formation of **_____Tumor____**_____.
15. Cancer is caused by a **____failure_____**to _____**control**_____ cell division. It leads to cells that divide too frequently. 19. **__Benign**_____ tumors are cell masses that **do not** __**Fragment**_____and _____**Spread**_____.

16. _____**Malignant**_____ tumors are cell masses that**___fragment_____,** **_____Spread_____**and ____**invade**_____ other tissues. This process is called ___**Metastasis**_____ .

Treatment Strategies −Surgery:

17. _____**Surgical**_____ removal. Once tumors are identified they can be _____**surgically**_____ removed.

Treatment Options– Chemotherapy and Radiation Therapy:

18. _____**Chemotherapy**_____ : Some_____**drugs**_____ will _____**target**_____ rapidly dividing cells.**____Normal ____Cells_____**that divide rapidly will _**suffer**___as well.

19. **Side Effects**: It weakens the____**Immune____System_____.** Causes ___**hair**__ loss.

20. **_____Radiation_____**therapy: Uses ____**x-rays**___ or ____ **gamma____** rays directed at the tumor to kill the cancerous cells**. _____Whole-Body_____** radiation is used to treat ___**leukemia_____.**

21. **Side Effects**: Can lead to____**radiation_____ __sickness_____.** Nausea, hair loss, etc.

22. Radiation most likely destroys cancer cells by inducing a process called**__Apoptosis_____.** Controlled **_____Cell____ _____Death_____** is termed apoptosis. Apoptosis leads to **_____Programmed_____**cell death.

Determination and Differentiation: ***All cells are genetically identical***.

23. Cells differ in the _____genes_____ ___they_____express_____.

24. _____**Determination**_____ is the process a cell goes through to select which genes it will express, ___**committing**_____ itself to becoming a certain cell type.

25. The process of cell specialization within a multi-cellular organism is called _____**_differentiation**_____.

***26. Meiosis*: Gamete Production and Sexual Reproduction (vocabulary)**

1. Formation of a new individual by union of two sex cells**____Sexual _____ ___Reproduction_____.**

2. The general term for sex cells are _____**Gametes**_____

3. In the male, the sex cells (gametes) are _____**Sperm**_____

4. In the female the sex cells (gametes) are _____**Egg_____ or ___Ovum**_____

5. The uniting of an egg and sperm is called _____**_Fertilization**_____

6. The single cell that forms as a result of fertilization: **___Zygote**_____

7. Paired chromosomes in a cell, that contain similar genes throughout their length: **_____Homologous_____ _Chromosome_____**

8. Alternate forms (specific version) of each gene in the pair of chromosome: ____**Allele**_____ Ex. Free__**Earlobe____,** is one version**_____Attached_____** earlobe is another version of the gene responsible for earlobe shape.

9. Cells that contain **____one_____** set of chromosomes: ___**Haploid Cells**_____

Example: _____**Eggs**_____ & _____**Sperm**_____

10.Cells that contain **____two___** sets of chromosomes: ___**Diploid** _____**Cells**_____

Example: ____**Zygote**_____

11. Cell division that produces sex cells: _____**Meiosis**_____

12.In the female meiosis takes place in the _____**Ovary**_____

13.In the male meiosis takes place in the _____**Testis**_____

14.The ovary and the testis are called the _____**Gonads**_____

15. Chromosomes that contain sex-determining genes: **____Sex Chromosomes_____**

XX in the__**Female**_____ Xy in the _____**Male**_____

16. All **other** chromosomes in the cell are called _____**Autosomes**_____

27. **Fertilization in the Human.**

# of chromosomes in a cell is denoted by the letter ___n_____

____Sperm_____ + ___eggs_____ = ____zygote_____ .

_____n_____ + ___n_____ = ____2n_____

28. **Meiosis.** **.**

Meiosis-Gamete Production

Step I Meiosis I: **_____Reduction_____Division___**

_____2n_____=_____n_____+____n_____

Step II Meiosis II: __**Equal** _____**Division**_____

___n_____ + **___n_____** = **_____n_____** + **__n_____** + **__n____** + **__n_____**

Meiosis I: Prophase I

29. Prophase I is similar to Prophase of mitosis. ___**Two**_____ other _____**important___events** __ take place during __**Prophase 1**_____ .

A)_____**__Synapsis__: _Homologous**_____Chromosomes pair & lie close to each other.

B)_____**Crossing _____ _____over_____:** exchange of equivalent sections of DNA between_ **_Homologous____ _Chromosomes_____.** As a result of crossing over, there is a mixing up of genes that are passed to the next generation.

Meiosis I: Metaphase I

30. During Metaphase I, the ____**Synapsed___** pairs of _____**homologus_____** chromosomes are moved into position at the **_____equatorial_____** plate.

Meiosis I: Anaphase I

31. ___**Homologous**___ pairs ___**separate_____** . **_____Homologs_____** move to_____**opposite_____ _____poles**____.

32. This process is called__**Segregation_____.**

33. ***Please Note***: _____**_Sister chromatids** __do not __**separate** ___ at this point.

34. Chromosome number is _**reduced**___ from ____**diploid**_____ to ____**haploid**_____.

Meiosis I: Telophase I

35. Chromatin _____**uncoils**___. _____**Nuclear**__ membrane _____**reforms**_____. ___**Nucleoli**___ reappear. _____**Cytokinesis**___ divides the two ___**haploid**_____ nuclei into two _____**daugher**_____ cells.

36. PS: _____**Each**_____ chromosome still contains _____**two**_____ sister _____**chromatids**_____.

Meiosis II: Prophase II

37. Similar to _____**prophase**_____ in _____mitosis_____ . ____**Nuclear Membrane**_ is disassembled. ___**Spindle**____ begins to form.

Meiosis II: Metaphase II

38. ____**Similar**_ to metaphase in___**mitosis**___. _____**Chromosomes**___ are lined up at the _____**Equator**_____.

Meiosis II: Anaphase II

39. _____**Centromeres**_____ divide. Sister _**chromatids separates** ___. They are now called _____**daughter**_____chromosomes.

Meiosis II: Telophase II

40. Similar to _____**telophase**_____ **and** ____**cytokinesis**_____ in mitosis

41. Things to Remember.

1) Meiosis II Results in formation of 4 _____**Haploid**_____ __**Cells**_____**.** 2) During Anaphase II, ___**Centromere**___of each ___**Chromosomes**_____ divide, and the_____**Chromatids** _____ now called _____**Daughter**_____ Chromosomes, move to the poles.