|  |  |
| --- | --- |
|  | \*The Key Roles of Cell Division  The continuity of life is based on the \_\_\_\_\_\_\_\_\_\_\_\_\_ of cells, or cell division.  Cell division functions in:                  Cell division is an integral part of the \_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_, the life of a cell from its origin in the division of a parent cell until its own division into two daughter cells. |
| Most cell division results in **genetically \_\_\_\_\_\_\_\_ daughter cells.\***  A cell’s genetic information, packaged as DNA, is called its \_\_\_\_\_\_\_\_\_\_\_\_.  DNA molecules are packaged into \_\_\_\_\_\_\_\_\_\_\_\_\_.  Every eukaryotic chromosome consists of one long, linear DNA molecule associated with many proteins. Together, the complex is referred to as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.  Each eukaryotic species has a characteristic number of chromosomes in each cell nucleus.  Human \_\_\_\_\_\_\_\_\_\_\_\_\_\_ cells (all body cells except sperm and egg) have 46 chromosomes, made up of two sets of 23 (one from each parent).  Human \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ cells or \_\_\_\_\_\_\_\_\_\_\_\_\_\_ (sperm or eggs) have one set of 23 chromosomes, half the number in a somatic cell. |
|  | |
|  | ***\*Chromosomes during Eukaryotic cell division*** *are distributed into daughter cells*  Before cell division but after DNA replication, the chromatin \_\_\_\_\_\_\_\_\_\_\_\_\_, coiling and folding to make a smaller package.  Each duplicated chromosome consists of two \_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_ joined together, which contain identical copies of the chromosome’s DNA.  As the chromosomes condense, the region where the chromatids connect shrinks to a narrow area, made up of two \_\_\_\_\_\_\_\_\_\_\_\_\_.  Each centromere is a specialized region of one chromatid with specific \_\_\_\_\_\_\_\_\_\_\_\_\_.  The part of a chromatid on either side of the centromere is called an \_\_\_\_\_\_\_\_\_\_\_\_\_ of the chromatid.  When are sister chromatids considered individual chromosomes?  Mitosis is:  When and why do cells undergo mitosis?    The mitotic (M) phase of the cell cycle, which includes mitosis and cytokinesis, alternates with the much longer interphase.  Interphase accounts for about \_\_\_\_\_\_\_\_\_\_ of the cell cycle.   * G1 phase (“first gap”) * S phase (“synthesis”) * G2 phase (“second gap”) |
|  | |
|  | **\*The Mitotic Division of an Animal Cell**  For convenience, mitosis is usually divided into five subphases: **prophase**, **prometaphase**, **metaphase**, **anaphase**, and **telophase**.  Prophase, the chromosomes are \_\_\_\_\_\_\_\_\_\_\_\_\_\_, with sister chromatids \_\_\_\_\_\_\_\_\_\_\_\_\_.  The nucleoli \_\_\_\_\_\_\_\_\_\_\_\_\_.  The \_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_ begins to form. (Composed of: \_\_\_\_\_\_\_\_\_\_\_\_\_ )  The radial arrays of shorter microtubules that extend from the centrosomes are called \_\_\_\_\_\_\_\_\_\_\_\_\_.  Prometaphase, the nuclear envelope \_\_\_\_\_\_\_\_\_\_\_\_\_, and \_\_\_\_\_\_\_\_\_\_\_\_\_ from the spindle interact with the condensed \_\_\_\_\_\_\_\_\_\_\_\_\_.  Each of the two chromatids of a chromosome has a \_\_\_\_\_\_\_\_\_\_\_\_\_, a specialized protein structure located at the centromere.  Kinetochore microtubules:  Nonkinetochore microtubules:  Metaphase  Anaphase, the \_\_\_\_\_\_\_\_\_\_\_\_\_ divide, separating the \_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_.  Telophase, daughter \_\_\_\_\_\_\_\_\_\_\_\_\_ begin to form at the two poles.  Nuclear envelopes arise from the fragments of the parent cell’s nuclear envelope and other portions of the endomembrane system.  The chromosomes become \_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_. |
|  | |
|  | **\*The Mitotic Spindle**  How do the kinetochore microtubules function in the poleward movement of chromosomes?  What is the function of the *non*kinetochore microtubules?  \*Cytokinesis, division of the cytoplasm, typically follows mitosis.  In animal cells, cytokinesis occurs by a process called \_\_\_\_\_\_\_\_ .  The first sign of cleavage is the appearance of a *\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_* in the cell surface near the old *\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_*.  The contractile ring is made of *\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_* associated with molecules of the motor protein *\_\_\_\_\_\_\_\_*.  \*Mitosis in a plant cell  Cytokinesis in plants, which have cell walls, involves a completely different mechanism.  During telophase, vesicles from the *\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_* move along microtubules to the middle of the cell, where they coalesce to form a *\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_ .*  Mitosis in eukaryotes may have evolved from binary fission in bacteria.\*  Asexual reproduction of single-celled eukaryotes, such as an amoeba, includes mitosis and occurs by a type of cell division called \_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_, or “division in half.”  When replication is complete, the plasma membrane pinches inward to divide the parent E. coli cell into two daughter cells, each with a complete genome. |
|  | |
|  | \*The eukaryotic cell cycle is regulated by a molecular control system.  The frequency of cell division varies with cell type.  Examples? |
| Cytoplasmic signals drive the cell cycle.  The cell cycle appears to be driven by:  Cyclically operating molecules trigger and coordinate key events in the cell cycle.  A \_\_\_\_\_\_\_\_ in the cell cycle is a control point where stop and go-ahead signals regulate the cycle.  Animal cells generally have built-in \_\_\_\_\_\_\_\_ signals that halt the cell cycle at checkpoints until they are overridden by go-ahead signals.  \*Three major checkpoints are found in the: \_\_\_\_\_\_\_ , \_\_\_\_\_\_\_\_ , and \_\_\_\_\_\_\_\_ phases.  Most cells in the human body are in \_\_\_\_\_\_\_ phase. |
|  | |
|  | \*The cell cycle clock is regulated by \_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_ - \_\_\_\_\_\_\_\_ kinases.  Draw the fluctuation of MPF activity and cyclin concentration in the cell over time. What is MPF?  Peaks in the activity of one cyclin-Cdk complex, \_\_\_\_\_\_\_\_, correspond to peaks in cyclin concentration.  Cyclin level *\_\_\_\_\_\_\_\_* sharply during the S and G2 phases and then *\_\_\_\_\_\_\_\_* abruptly during mitosis***.***  MPF (“maturation-promoting factor” or “M-phase-promoting factor”) triggers the cell’s passage past the \_\_\_\_\_\_\_\_ checkpoint to the M phase.   * MPF promotes mitosis by *\_\_\_\_\_\_\_\_* a variety of proteins. * MPF acts both directly as a kinase and indirectly by activating other *\_\_\_\_\_\_\_\_*. * MPF stimulates *\_\_\_\_\_\_\_\_* of the nuclear envelope by phosphorylation of various proteins of the nuclear lamina during prometaphase of mitosis. * MPF also contributes to the molecular events required for *\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_* and spindle formation during prophase. * MPF triggers the \_\_\_\_\_\_\_\_ of cyclin, reducing cyclin and MPF levels during mitosis and inactivating MPF.   The effect of an external physical factor on cell division can be seen in \_\_\_\_\_\_\_\_ -\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_ of cell division.  \*Most animal cells also exhibit \_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_ for cell division.  **\*Cancer cells bypass external signals including:** |
| B | |