Concepts:

•Cancer

•Cell Cycle

•Mitotic Phase

The Cell Cycle: Vocabulary & Figures

•Metastastis, benign, malignant, density dependent inhibition, anchorage dependence

•Cell Cycle: Interphase (G1, S, G2), M phase (mitosis, cytokinesis)

•Chromosome, sister chromatids, centromere, nuclear envelope

•Mitotic spindle, microtubules, aster, metaphase plate

•Mitosis, prophase, prometaphase, metaphase, anaphase, telophase

Chapter 12, Figs:12.18, 19 ,2 ,4, 5, 6

Cancer cells do not exhibit density-dependent inhibition or anchorage dependence (Fig 12.18, 12.19)

Loss of Cell Cycle Controls in Cancer Cells

•Cancer cells do not respond normally to the body's control mechanisms

•Cancer cells form tumors, masses of abnormal cells within otherwise normal tissue

•If abnormal cells remain at the original site, the lump is called a benign tumor

•Malignant tumors invade surrounding tissues and can metastasize, exporting cancer cells to other parts of the body, where they may form secondary tumors

Why do cells divide? (Fig 12.2)

•In unicellular organisms, division of one cell reproduces the entire organism

•Multicellular organisms depend on cell division for: growth and development, tissue renewal

•What to do to divide “M PHASE” : MITOSIS AND CYTOKINESIS

•M phase results in genetically identical cells (hint: DNA/ “nuclear” division is important!)

•A dividing cell duplicates its DNA, breaks down nuclear envelope, allocates the two copies to opposite ends of the cell: MITOSIS- DIVIDING THE NUCLEUS

•Next, the cytoplasm divides, and the cell splits in two: CYTOKINESIS- DIVIDING THE REST OF CELL

M Phase (Cell division) is only part of the Cell Cycle (Fig 12.5)

Phases of the Cell Cycle

•The cell cycle consists of

–Interphase (cell growth, metabolism and copying of chromosomes in preparation for cell division)

- G1 phase (“first gap”)
- S phase (“synthesis”) DNA synthesis
- G2 phase (“second gap”)

–Mitotic (M) phase (mitosis and cytokinesis)

M PHASE A dividing cell duplicates its DNA, breaks down nuclear membrane, allocates the two copies to opposite ends of the cell, and splits into daughter cells

Every eukaryotic species has a characteristic number of chromosomes in each cell nucleus

Somatic (nonreproductive) cells have two sets of chromosomes:

Gametes (reproductive cells: sperm and eggs) have half as many chromosomes as somatic cells

DIVIDING CHROMOSOMES during Cell Division Fig 12.4
In preparation for cell division, DNA is replicated: S phase
Each duplicated chromosome has two identical sister chromatids, which separate during cell division
The centromere is the narrow "waist" of the duplicated chromosome, where the two chromatids are most closely attached

DO NOT CONFUSE CENTROMERE WITH CENTROMSOME!!!

Mitosis is conventionally divided into five phases (12.6):
Prophase
Prometaphase
Metaphase
Anaphase
Telophase

Cytokinesis is well underway by late telophase

PROPHASE
REMEMBER: DNA IS ALREADY DOUBLED
(S PHASE) **MICROTUBULES** SHOOT OF **MITOTIC SPINDLE**

PROMETAPHASE
NUCLEAR ENVELOPE FRAMENTS, ALLOWS **MICROTUBLES** TO COME IN AND GRAB CHROMOSOMES AT **CENTROMERE**

METAPHASE
MICROTUBULES FROM EACH END ("POLE") CONTACTING THE CHROMOSOMES
MICROTUBULES ALIGN CHROMOSOMES ON **"METAPHASE PLATE"**

ANAPHASE
MICROTUBULES PULL SISTER CHROMATIDS APART, MOVE TOWARD POLES
CELLS ELONGATE

TELOPHASE
NUCLEAR ENVELOPE REFORMS
DIVISION OF CYTOPLASMS STARTS

CYTOKINESIS
DIVISION OF CYTOPLASM
TWO CELLS FORM