

BIO 211:

ANATOMY & PHYSIOLOGY I

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CHAPTER 03 and Lab

Overview of the CELL CYCLE

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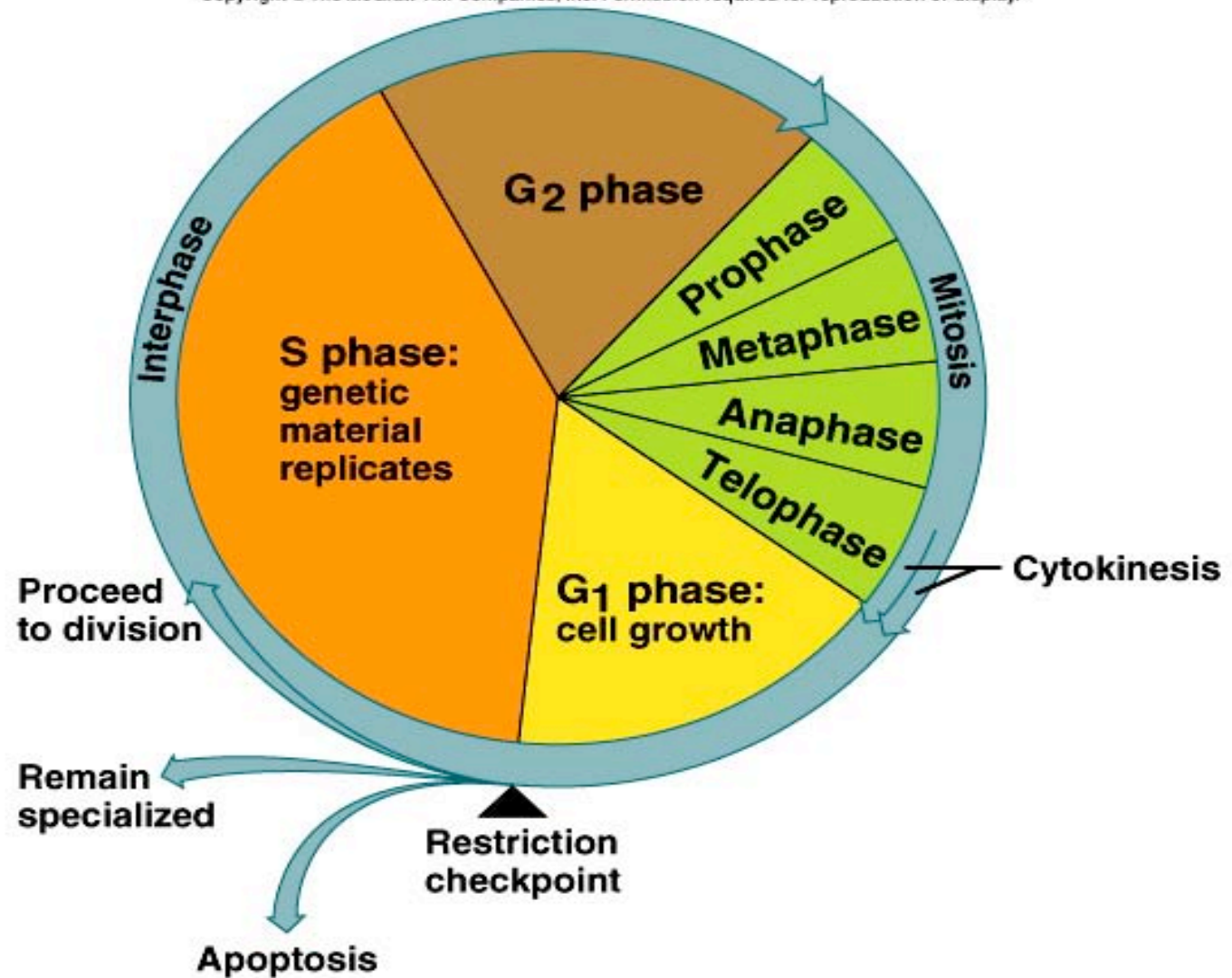
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The Cell Cycle

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Series of changes a cell undergoes from the time it forms until the time it divides-



Stages:

interphase

mitosis

cytoplasmic division

differentiation

The Cell Cycle

A. The Cell Cycle

1. During the **first growth phase, G_1** , (your text refers to G as "gap") the cell synthesizes new proteins and grows in size. At the end of this phase, **centrioles replicate**.
2. During the **S, or synthesis phase**, the cell undergoes **semiconservative replication of DNA**.
3. **G_2 , the second growth phase**, is a **brief period** in which the **cell makes the enzymes needed for cell division**.
 G_1 , S, and G_2 are collectively known as **interphase**.
4. During the **M, or mitotic, phase**, the nucleus replicates its contents (**karyokinesis**).

Interphase

- very active period
- cell grows
- cell maintains routine functions
- cell replicates genetic material to prepare for nuclear division
- cell synthesizes new organelles to prepare for cytoplasmic division
- Phases:
 - **G phases** – cell grows and synthesizes structures other than DNA
 - **S phase** – cell replicates DNA

Mitosis

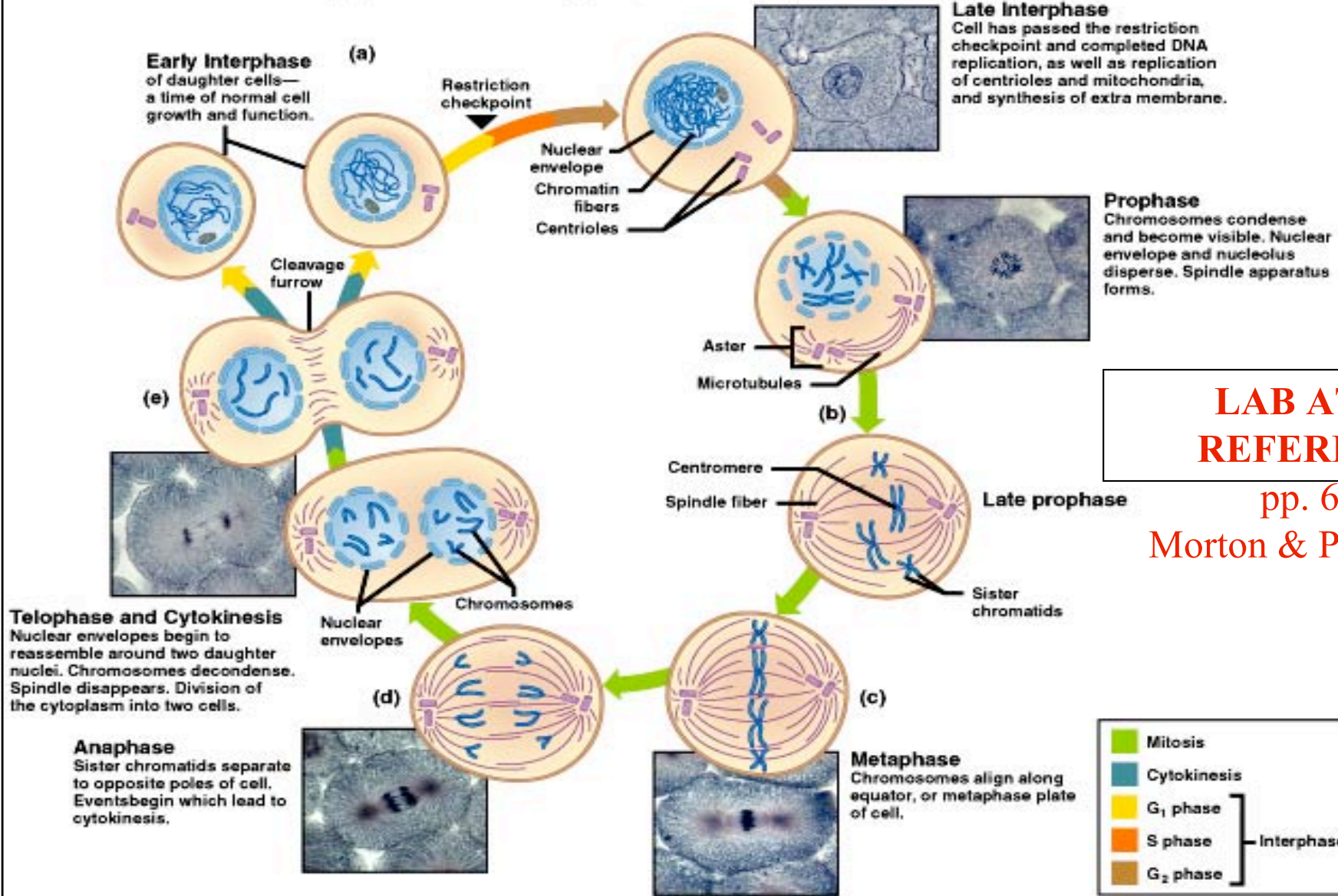
**LAB ATLAS
REFERENCE:**

pp. 6 - 7
Morton & Perry, 1998

- produces two daughter cells from an original cell
- nucleus divides – **karyonkinesis**
- cytoplasm divides – **cytokinesis**
- Stages:
 - **prophase** – chromosomes form;
nuclear envelope disappears
 - **metaphase** – chromosomes align midway
between centrioles
 - **anaphase** – chromosomes separate and
move to centrioles
 - **telophase** – chromatin forms;
nuclear envelope forms

Mitosis

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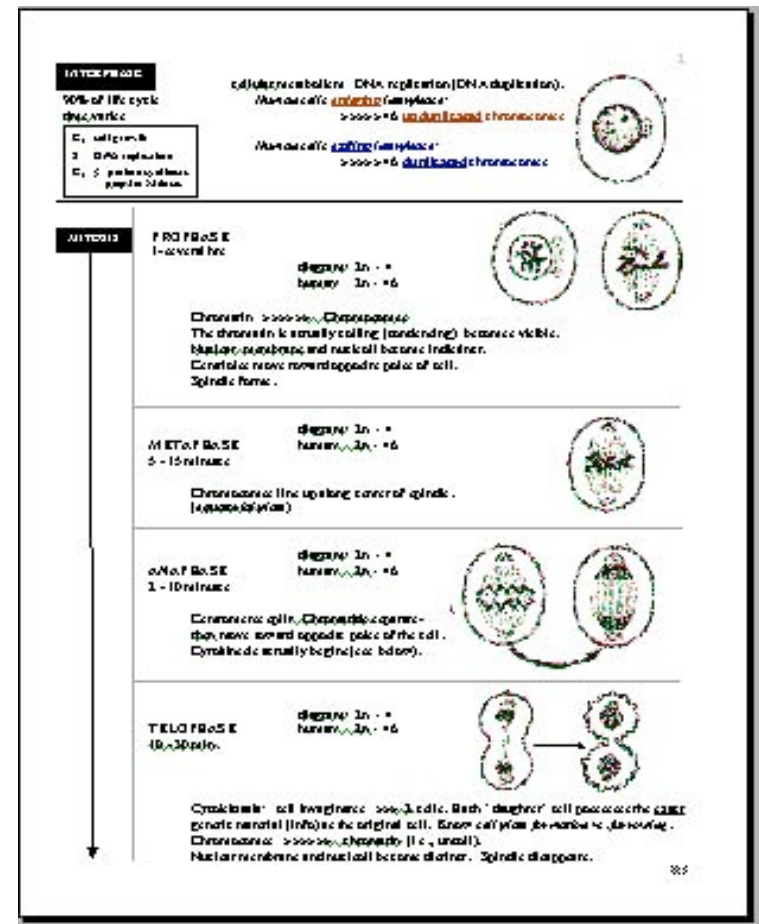
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Cytoplasmic Division

(CYTOKINESIS)

- **begins during anaphase**
- **continues through telophase**
- **contractile ring pinches cytoplasm in half (furling)**

Be sure to get the separate, one-page download called: **MITOSIS SKETCH**



Control of Cell Division

- **cell division capacities vary greatly among cell types**
 - skin and blood cells divide often
 - liver cells divide a specific number of times then cease
- **chromosome tips (telomeres) that shorten with each mitosis provide a mitotic clock**
- **cells divide to provide a more favorable surface area to volume relationship**
- **growth factors and hormones stimulate cell division**
 - hormones stimulate mitosis of smooth muscle cells in uterus
 - epidermal growth factor stimulates growth of new skin
- **contact inhibition**
- **tumors are the consequence of a loss of cell cycle control**

Tumors

Two types of tumors

- **benign** –
usually remains
localized
- **malignant** –
invasive and
can metastasize; cancerous

Genes that cause cancer

- **oncogenes** –
activate other genes that
increase cell division
- **tumor suppressor gene** –
normally regulate mitosis;
if inactivated they will not
regulate mitosis

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Normal cells
(with hairlike cilia)

Cancer cells

Stem and Progenitor Cells

Stem cell

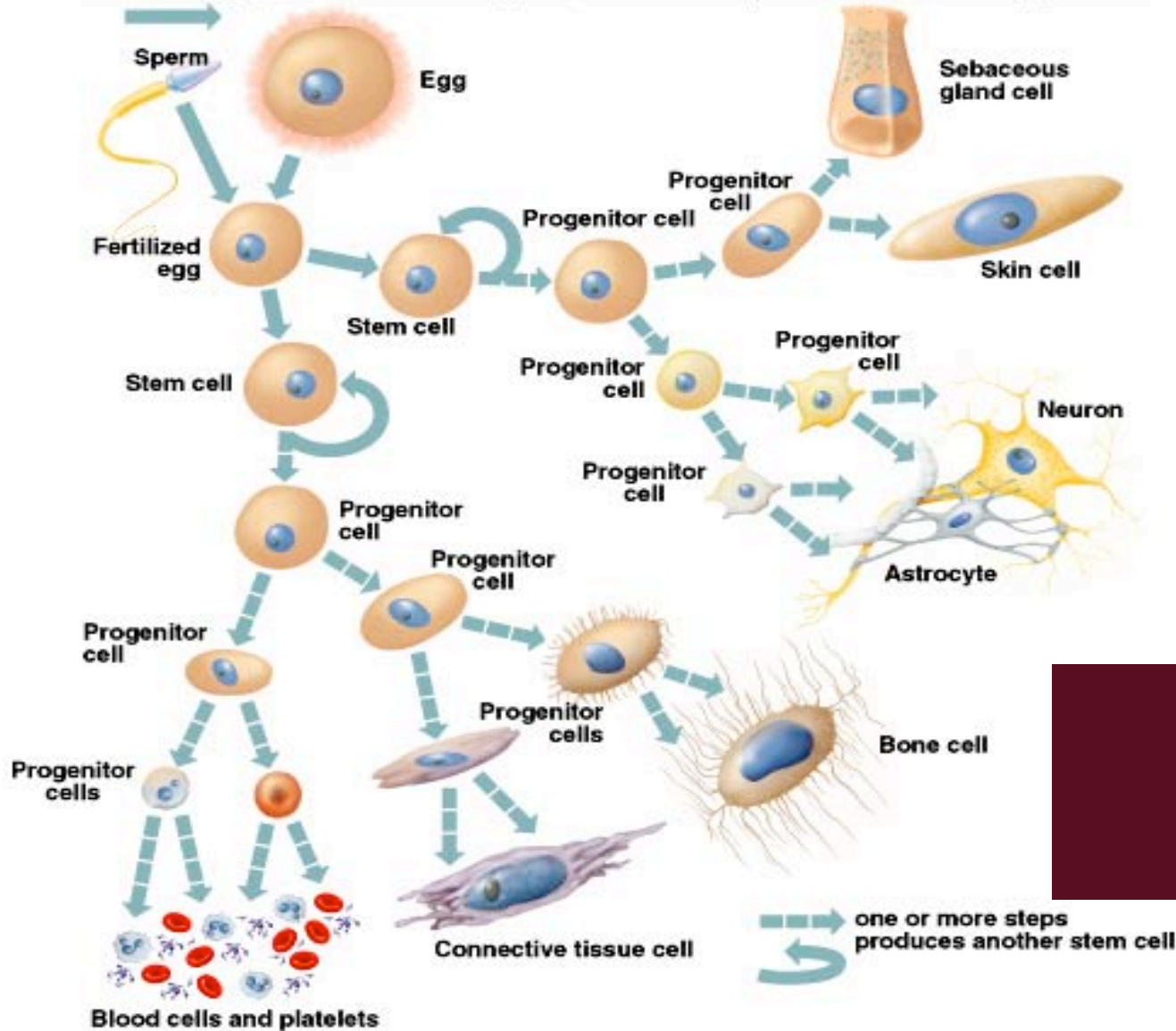
- can divide to form two new stem cells
- can divide to form a stem cell and a progenitor cell
- **totipotent** – can give rise to any cell type
- **pluripotent** – can give rise to a restricted number of cell types

Progenitor cell

- committed cell
- can divide to become any of a restricted number of cells
- pluripotent

Stem and Progenitor Cells

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The End