

EOC Review

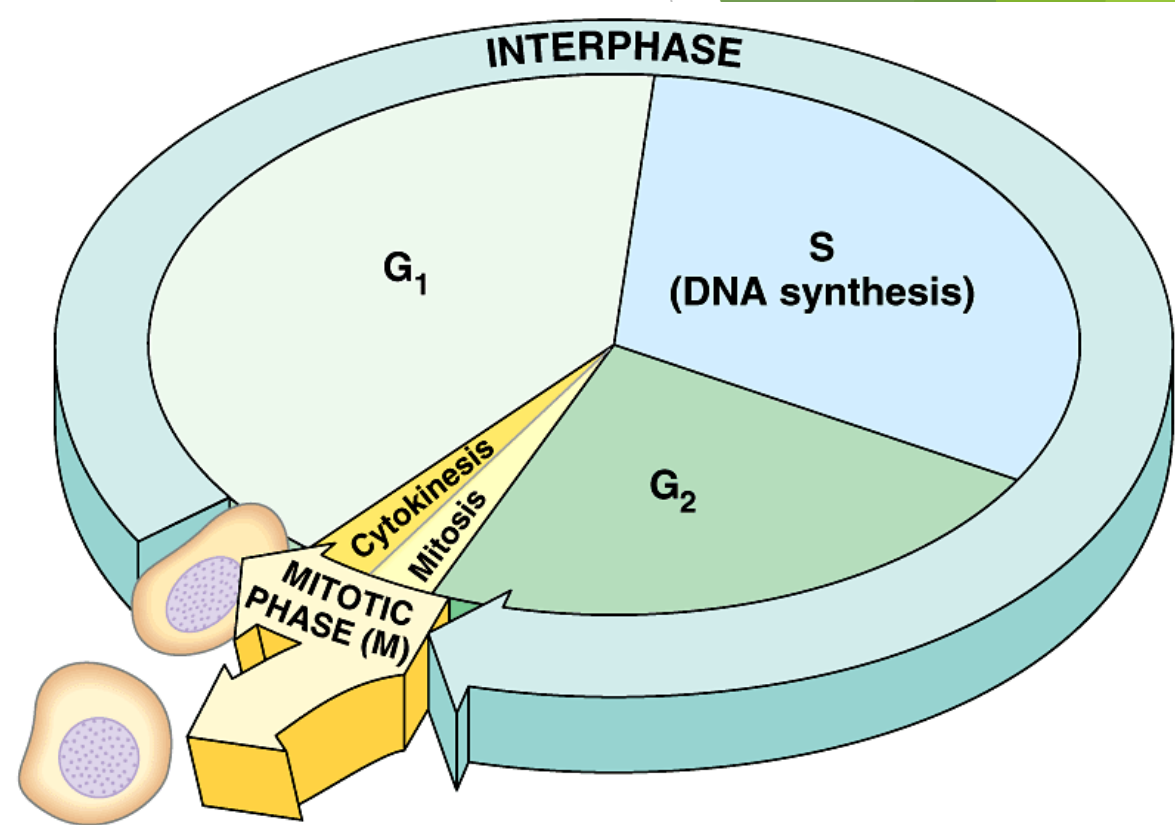
Biology

Standard 1.2.2

Grow and Reproduction of Cells

Cell Cycle

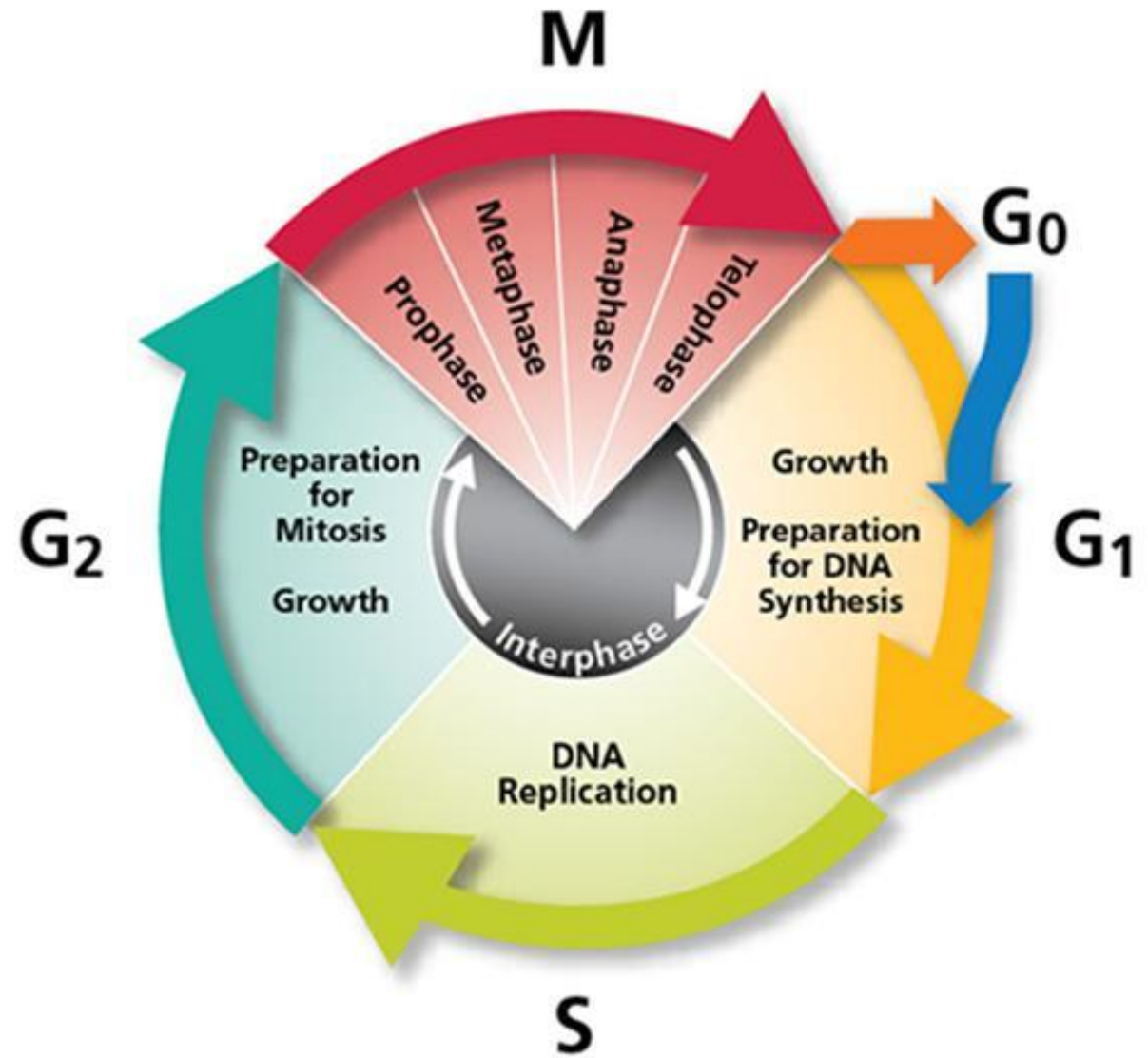
- ▶ The **Cell Cycle** describes the life of a cell from birth to death
- ▶ There are three main parts of the cycle:
 - ▶ **Interphase**-Normal cell activities; broken up into 3 parts
 - ▶ **Mitosis**-The process of cell division (1 cell becomes 2!)
 - ▶ **Cytokinesis**-The division of the organelles and cytoplasm following mitosis



Copyright © Pearson Education, Inc., publishing as Benjamin Cummings.

Interphase

- ▶ **G1 phase** (Gap/Growth 1)-Period of cell growth
 - ▶ Cells can remain in the G1 phase indefinitely
 - ▶ Called G0
- ▶ **S phase** (Synthesis)-Period when DNA replication occurs
 - ▶ Once a cell copies its DNA, it must divide
 - ▶ S phase allows daughter cells to have exact copy of parent DNA after division!
- ▶ **G2 phase** (Gap/Growth 2)-Cell growth and preparation for Mitosis

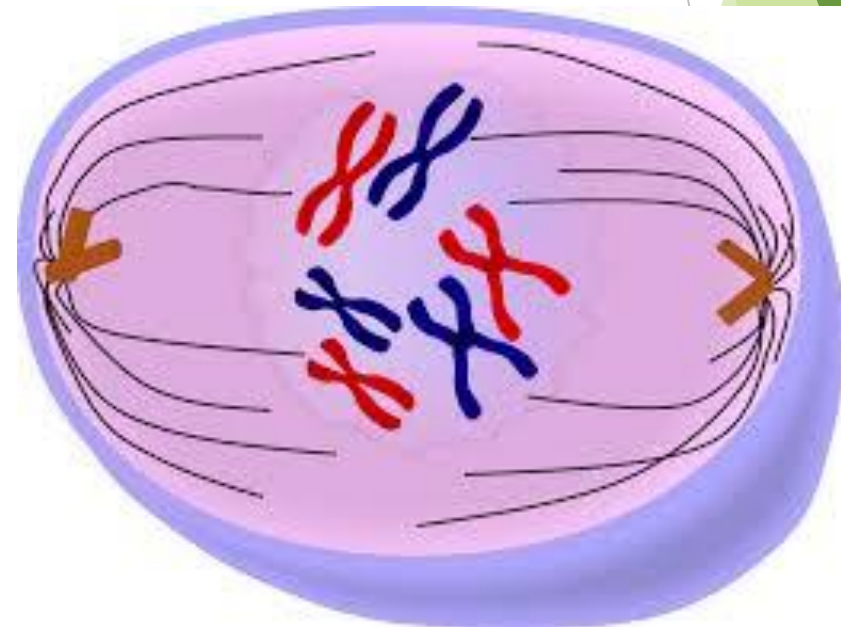
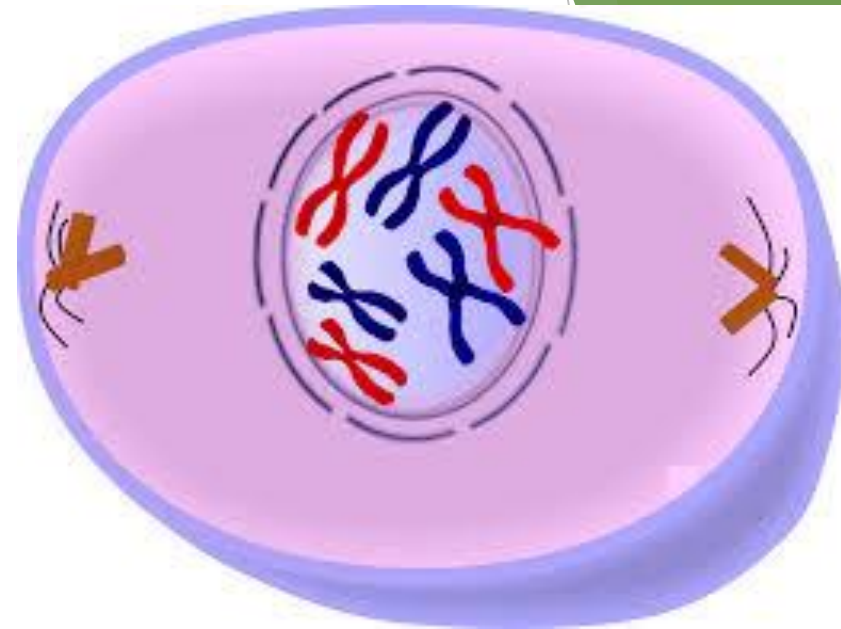


Mitosis: Overview

- ▶ **Mitosis** is a form of *asexual reproduction*-means only 1 organism required
- ▶ Occurs in response to the body's need for growth and repair
- ▶ 4 stages of mitosis: Prophase, Metaphase, Anaphase, Telophase

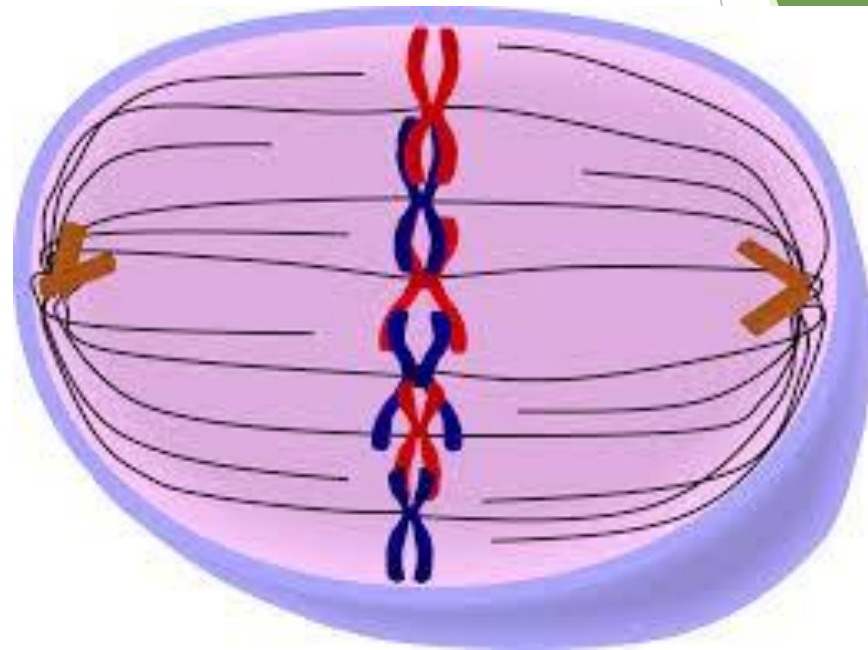
Mitosis: Prophase

- ▶ What Happens?
 - ▶ Nuclear membrane dissolves
 - ▶ Chromatin condenses into chromosomes
 - ▶ Chromatin: uncondensed DNA (looks like spaghetti)
 - ▶ Chromosome: condensed DNA (looks like X's)
 - ▶ Centrioles move to opposite ends of the cell
 - ▶ Spindle forms and spindle fibers extend from one side to the other



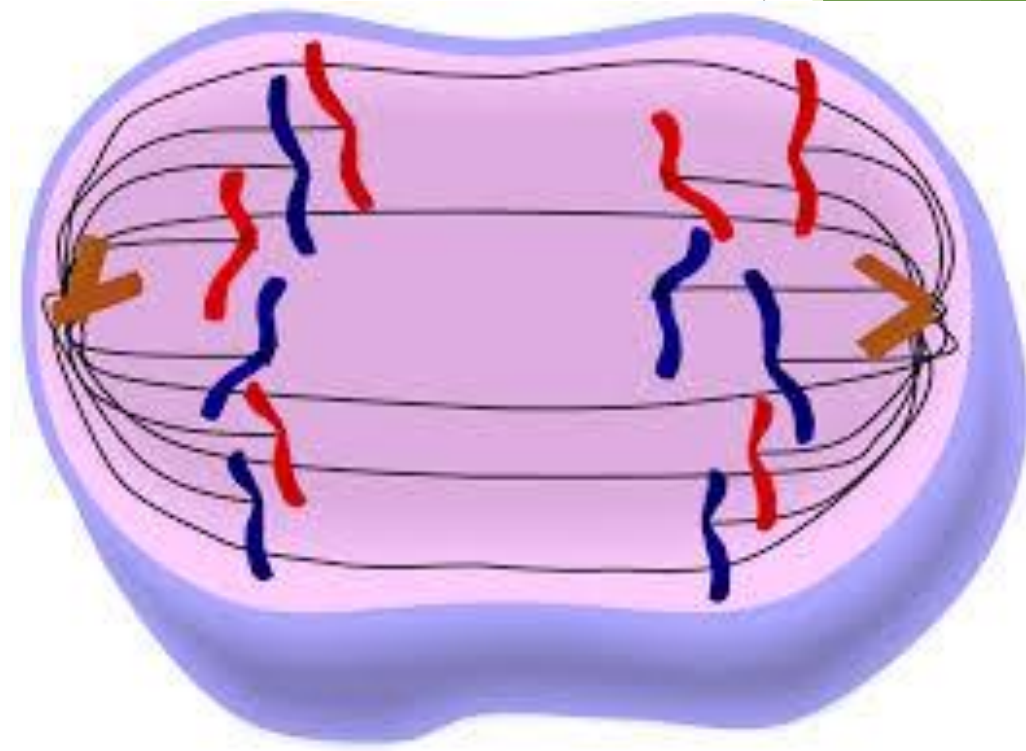
Mitosis: Metaphase

- ▶ What Happens?
 - ▶ Centromeres (middle of chromosome) attach to spindle fibers
 - ▶ Chromosomes are pulled to the middle of the cell



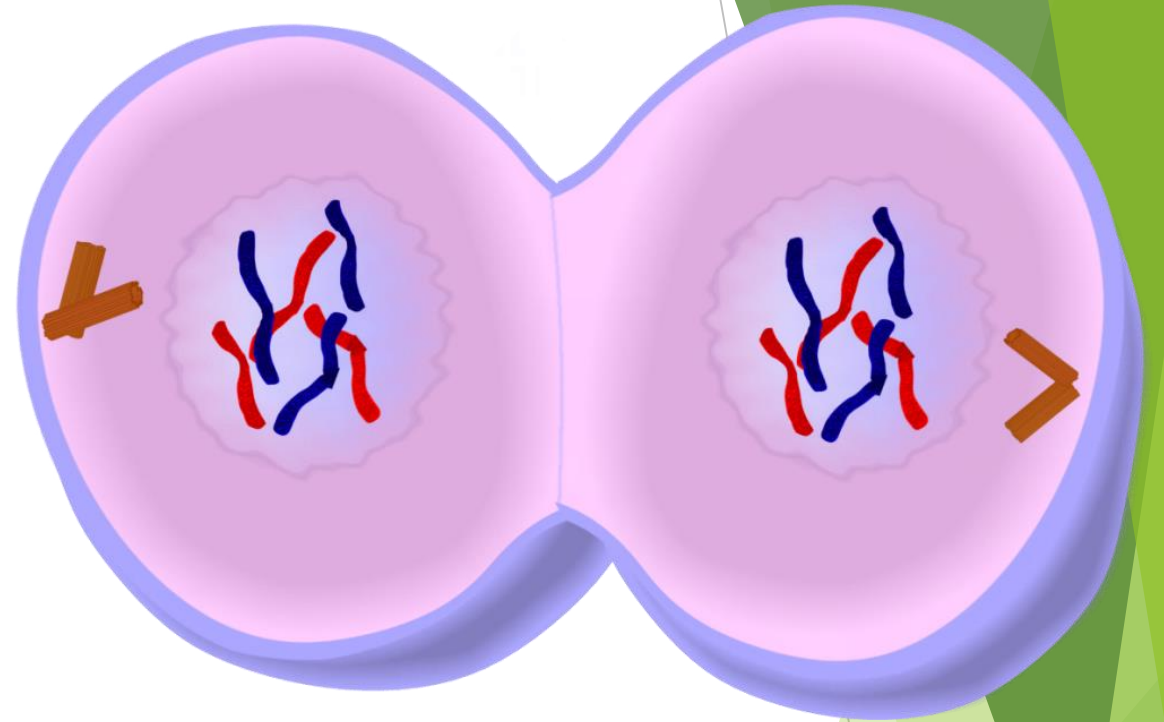
Mitosis: Anaphase

- ▶ What Happens?
 - ▶ Spindle fibers pull chromosomes apart
 - ▶ Each sister chromatid moves toward opposite end of the cell



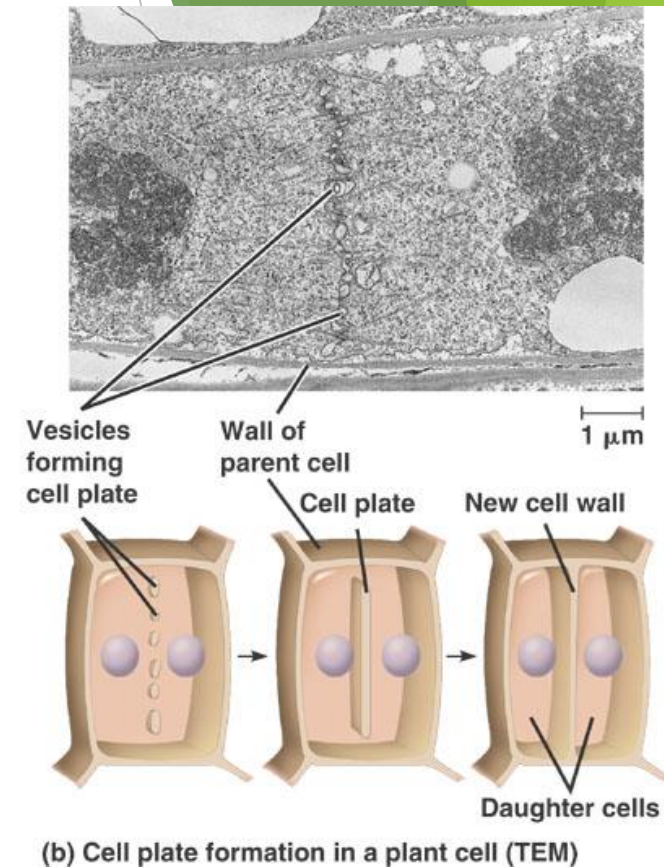
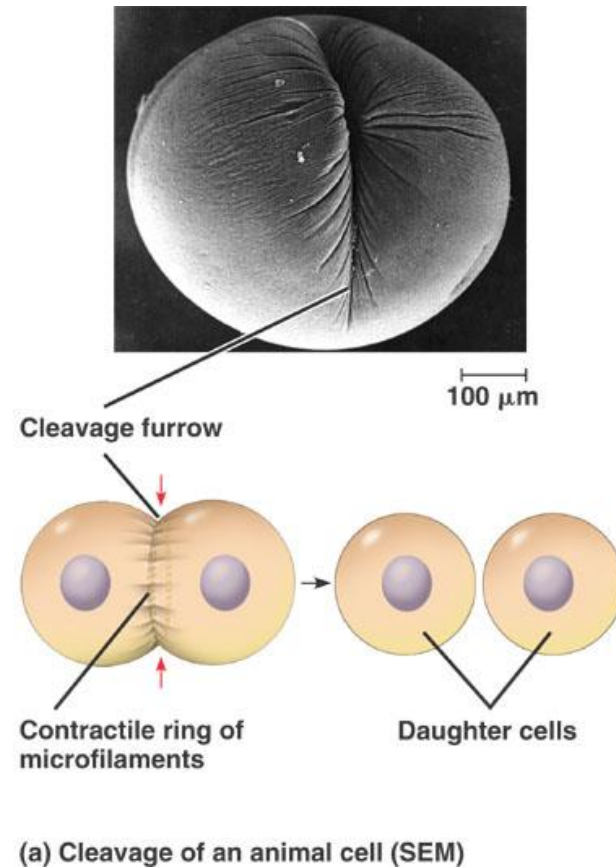
Mitosis: Telophase

- ▶ What Happens?
 - ▶ Nuclear membrane reforms
 - ▶ Spindle fibers disappear
 - ▶ Animal Cells:
 - ▶ Cell membrane pinches
 - ▶ Plant Cells:
 - ▶ New cell wall begins to form

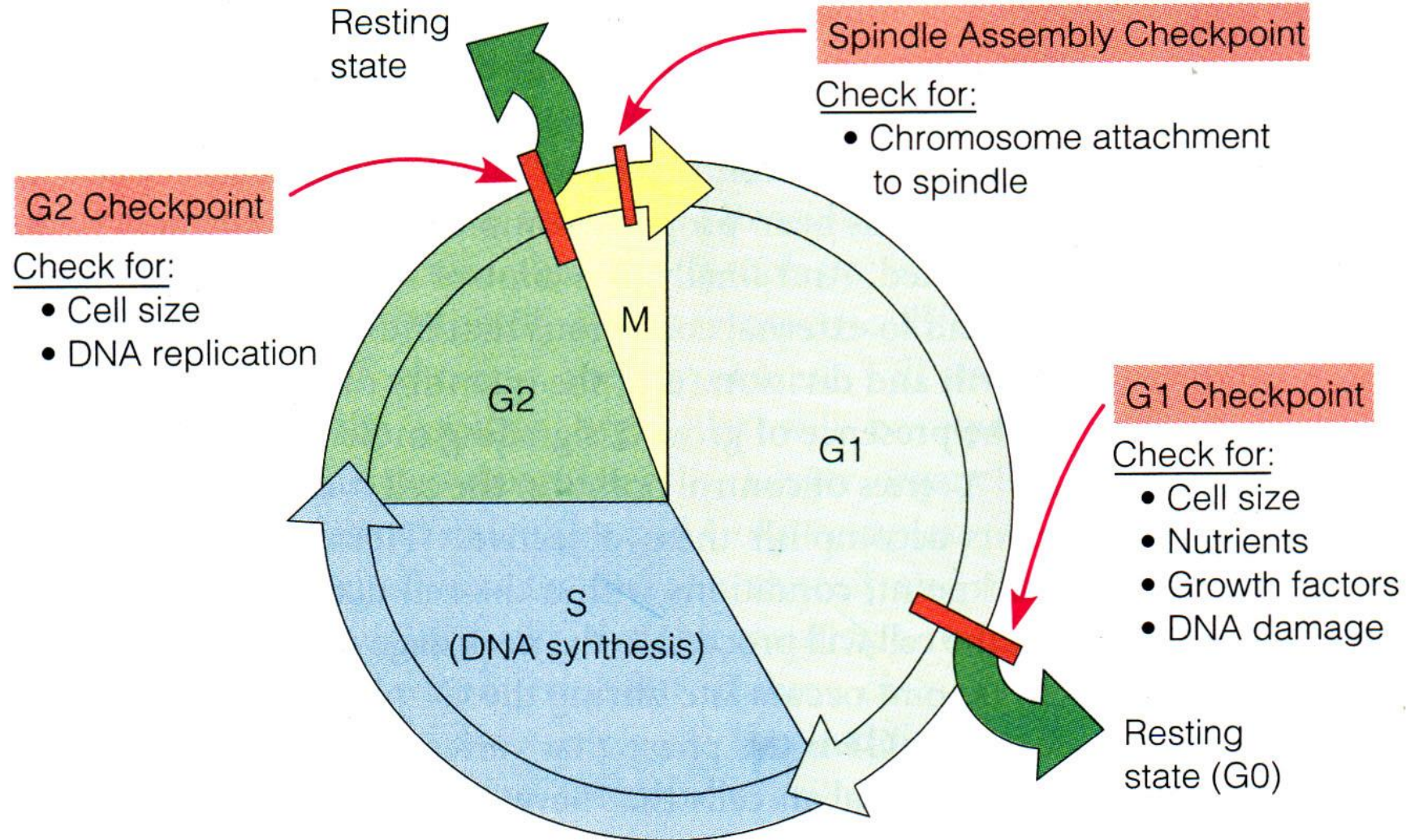


Cytokinesis

- ▶ The cell cycle ends with **cytokinesis** → the division of the cytoplasm
 - ▶ Accompanies *mitosis*
- ▶ This means one cell has divided into two cells, and those two cells can continue with their own independent cell cycles!

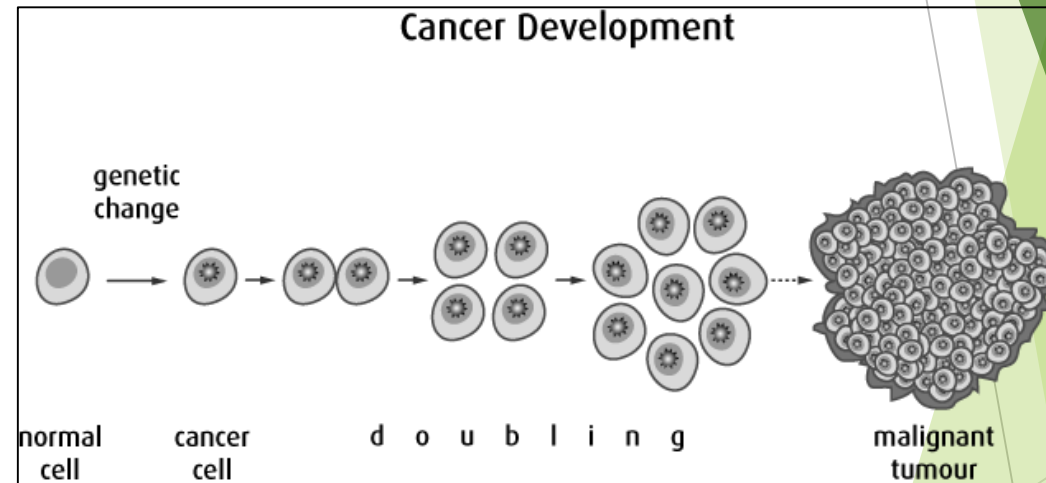


Regulation



Cancer

- ▶ Sometimes errors in the cell cycle can lead to cancer-
 - ▶ Errors can be genetic or due to an environmental toxin
- ▶ Internal regulation error followed by external; cells cannot “feel” their neighbors, and thus begin uncontrolled division
 - ▶ Lack density dependence (tumor) and anchorage dependence (metastasized cancer cells)



Things to Know:

- ▶ Outline the cell cycle - Growth1, Synthesis, Growth2, Mitosis, and Cytokinesis.
- ▶ Recognize mitosis as a part of asexual reproduction.
- ▶ Organize diagrams of mitotic phases and describe what is occurring throughout the process.

Video Review

- ▶ [Mitosis](#) (The Amoeba Sisters)
- ▶ [The Cell Cycle and Cancer](#) (The Amoeba Sisters)

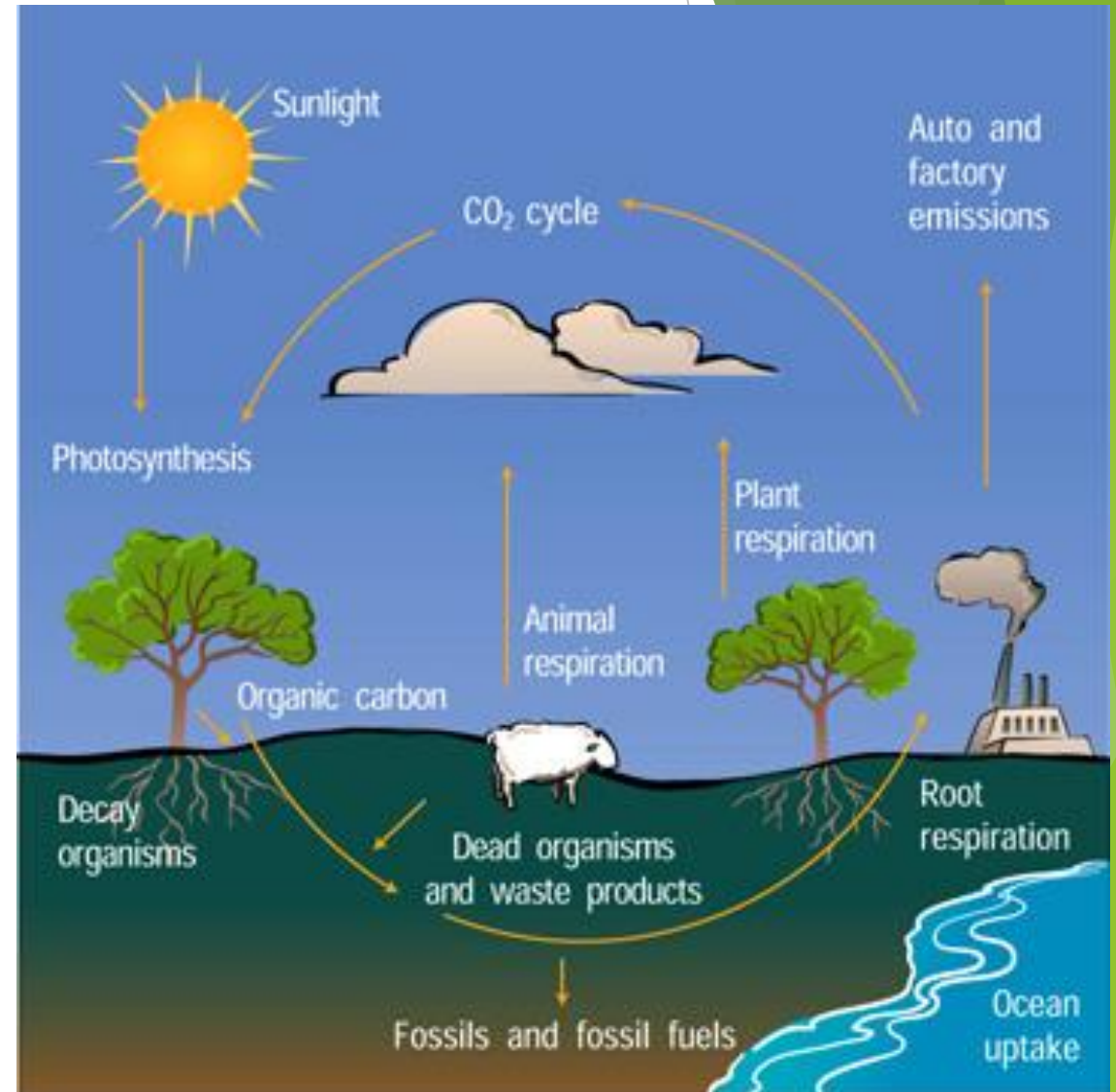
Standard 2.1.1 and 2.1.4

Nutrient Cycles and Population Graphs

Carbon Cycle

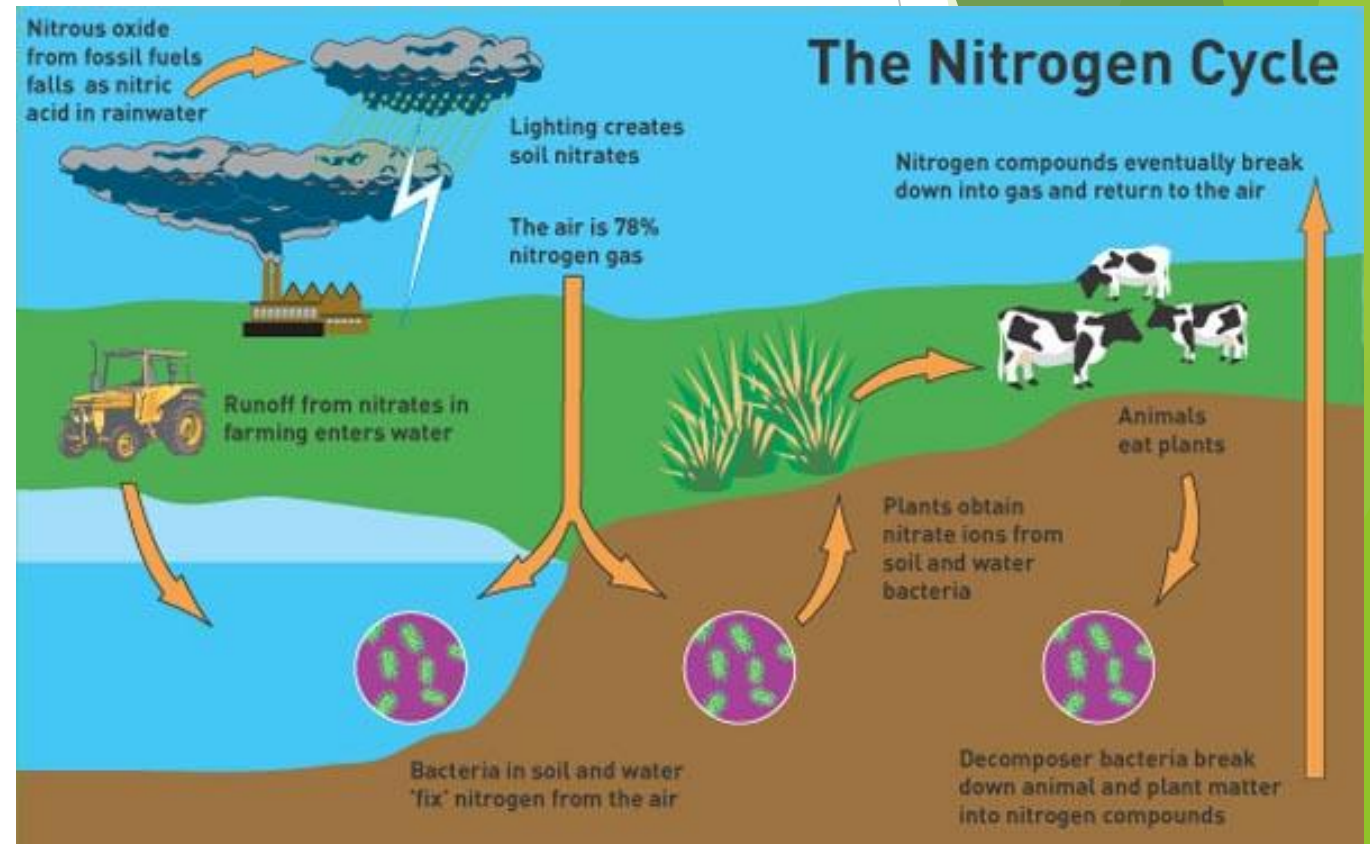
► Carbon Cycle:

- **Photosynthesis:** Moves Carbon from inorganic carbon dioxide to organic glucose (carbon fixation)
- **Cellular Respiration:** Moves carbon from organic glucose to inorganic carbon dioxide (and releases stored energy for organisms)
- **Decomposition:** Moves carbon in living organisms to organic matter in soil (bacteria, fungi)
- **Climate Change:** Burning of fossil fuels and other human activities increase the amount of carbon dioxide in the atmosphere faster than photosynthetic organisms can respond; leads to global climate change



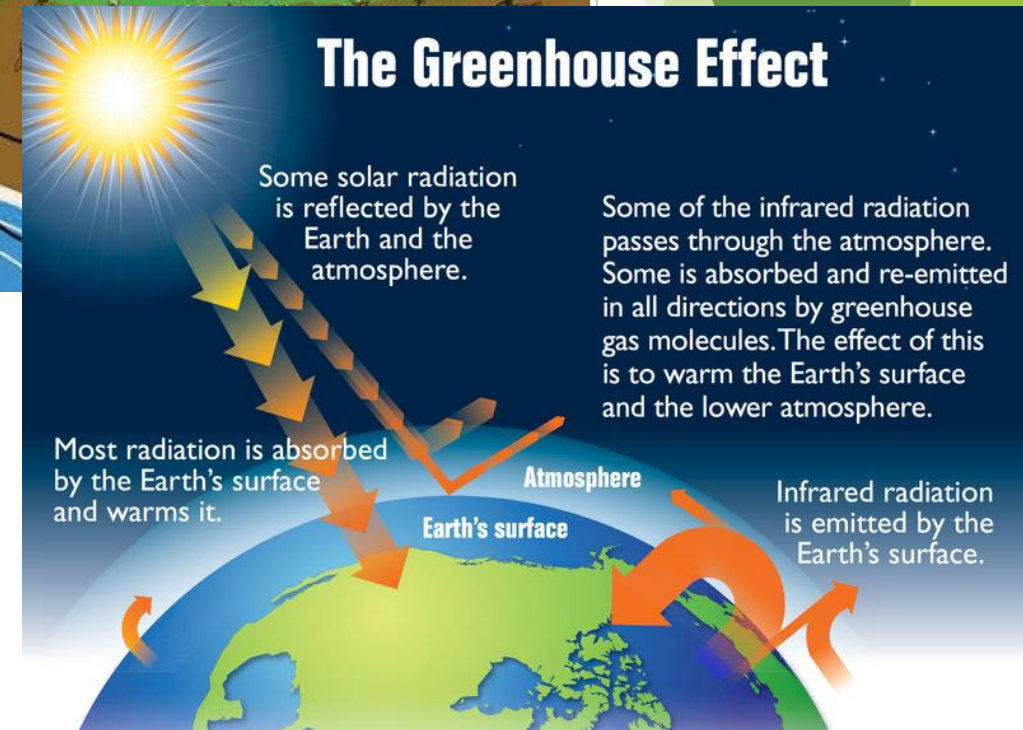
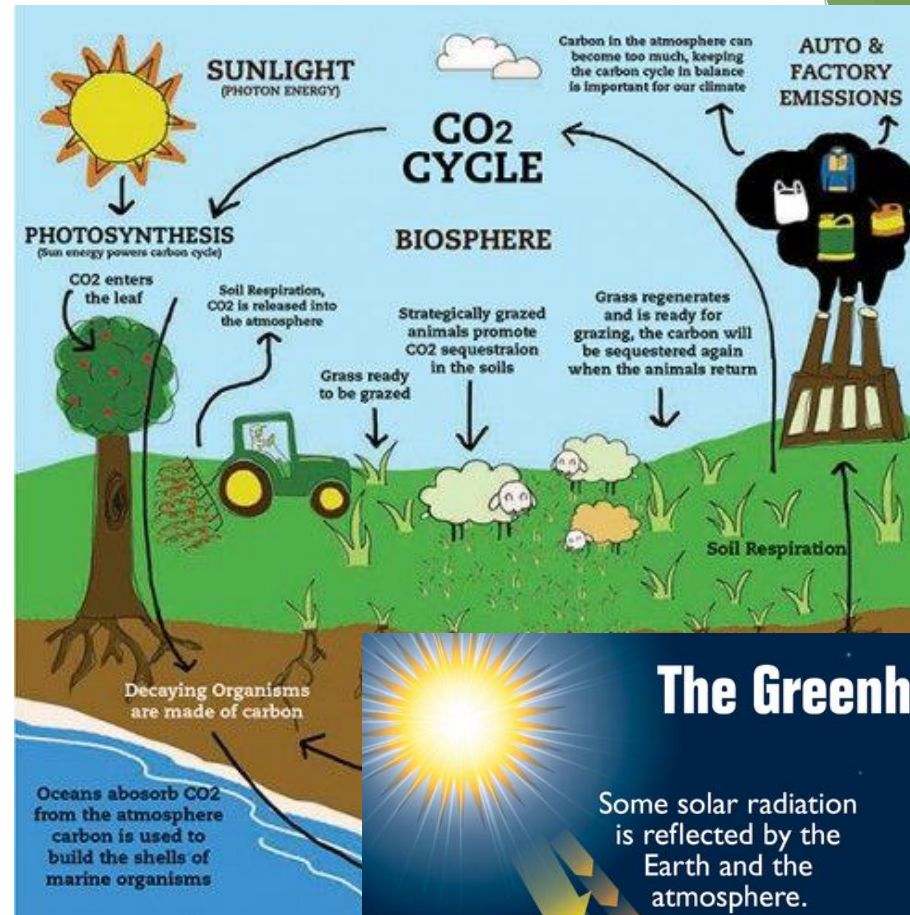
Nitrogen Cycle

- ▶ **Nitrogen Fixing Bacteria:** Convert nitrogen in atmosphere (as N_2) to an organic form that plants can absorb through their roots (nitrates/nitrites).
 - ▶ Nitrogen is now available to plants (and animals, through the food chain) to be used in the production of proteins and nucleic acids (DNA and RNA)



Climate Change

- ▶ Factors that influence climate:
 - ▶ Greenhouse Effect
 - ▶ Human impact on atmospheric CO₂
 - ▶ Natural environmental processes
 - ▶ Volcanic eruption
 - ▶ Other geological processes



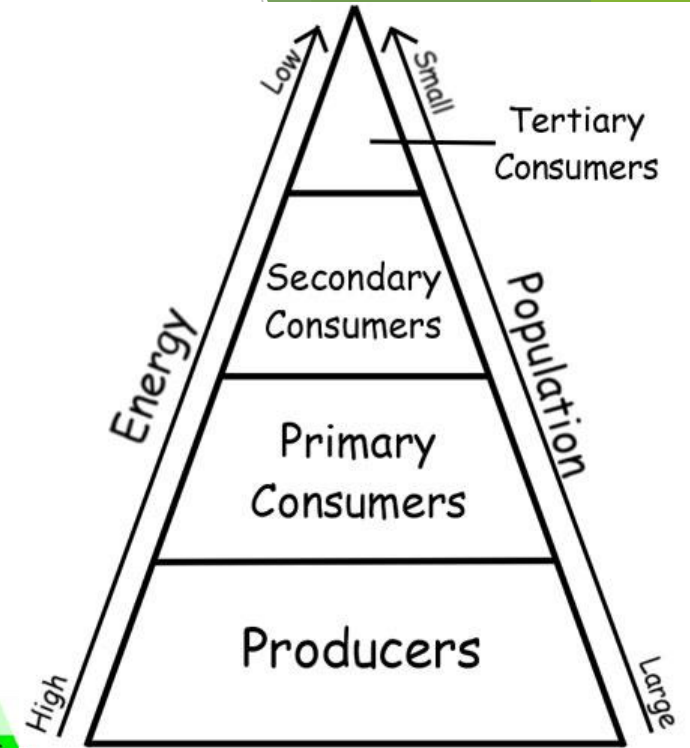
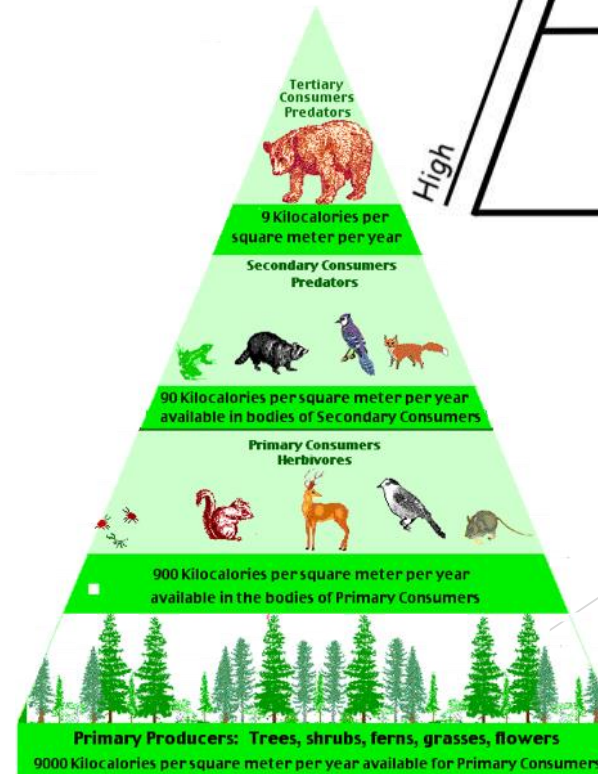
Energy Pyramids

▶ Energy Pyramids

- ▶ Energy is transferred **up** the pyramid, to higher trophic levels, as organisms are eaten
- ▶ Efficiency: **10%** of energy is transferred with each trophic level.

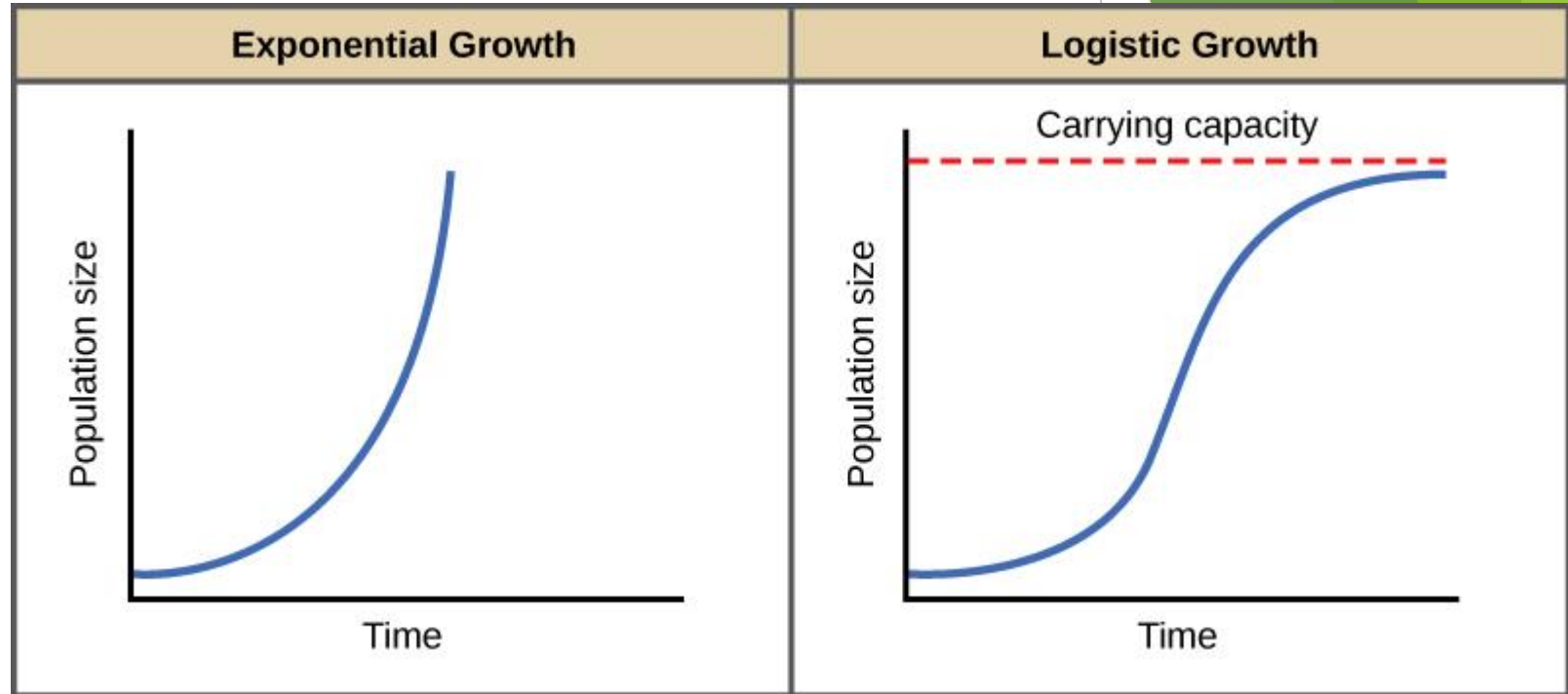
▶ Source of energy: the **Sun**

- ▶ **Radiant Energy** (Sun) is converted to **Chemical Energy** by photosynthetic organisms and stored in chemical compounds of organic matter.



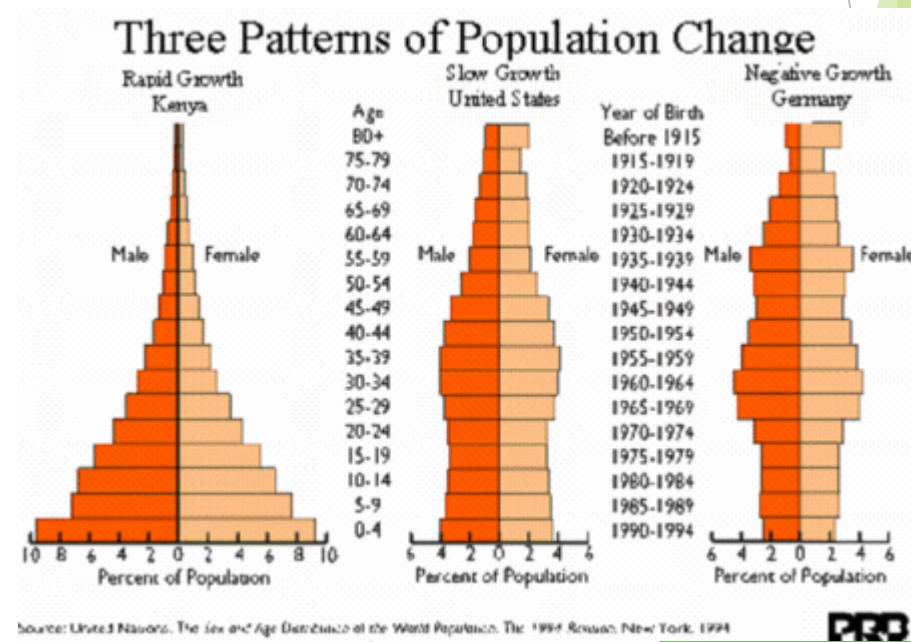
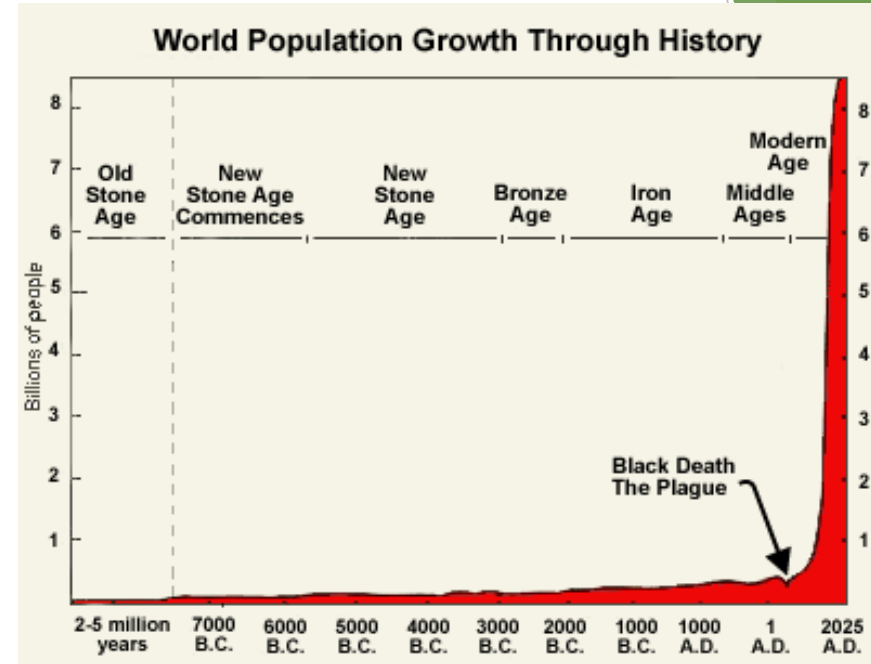
Population Growth

- ▶ Factors that limit population growth:
 - ▶ Food availability
 - ▶ Climate
 - ▶ Water
 - ▶ Territory
- ▶ Be able to identify the **carrying capacity** on a graph



Population Graphs

- ▶ Interpret Human Population Graph
- ▶ Influencing Factors
 - ▶ Historical Changes
 - ▶ Birth and Death Rates
 - ▶ Population Size
 - ▶ Population Density
 - ▶ Resource Use on Environment
- ▶ Effect of disease on ecosystem balance
 - ▶ Examples: AIDS, influenza, tuberculosis, Dutch Elm Disease, Pfiesteria



Standard 2.1.2

Survival and Reproductive Success



SURVIVAL AND REPRODUCTIVE SUCCESS

- ▶ *Adaptation*-Any trait an organism acquires over time that helps it survive in its environment
- ▶ Can be structural, behavioral, or reproductive
 - ▶ *Structural*-Physical features an organism has that help it survive
 - ▶ *Behavioral*-Something an organism does to help it survive
 - ▶ *Reproductive*-An organism chooses the “correct mate” to reproduce and raise offspring





ADAPTATIONS

- ▶ *Transport and Excretion*-Organisms maintain balance; move nutrients into cells and waste out
- ▶ In plants: Vascular and nonvascular

Vascular Plants	Nonvascular Plants
Vascular tissue contains special cells for transport of water and nutrients	Lack of roots and stems means plants must take water directly through their cells
	

ADAPTATIONS

- ▶ *Respiration*-organisms take in and release gases (we will discuss more later)
- ▶ *Nutrition*-feeding adaptations that allow organisms to get nutrition

Autotrophic	Heterotrophic
Organisms that gain energy through making their own food (ex. Plants)	Organisms that gain energy through eating their food (ex. Us!!)
	

ADAPTATIONS

- ▶ Reproduction, Growth, and Development-Organisms have adaptations to distribute their population

Sexual	Asexual
Reproduction involving sex (needs a male and female)	Reproduction without sex (can be 1 organism)



Example: Seeds have a hard protective coating that allows them to survive some harsh conditions; some are small/prickly to allow transport

BEHAVIORAL ADAPTATIONS

- ▶ Behavioral adaptations can be innate or learned
 - ▶ *Innate* = “hard-wired;” you are born knowing how to do this
 - ▶ *Learned* = learned behavior either by interacting with the world or being taught!



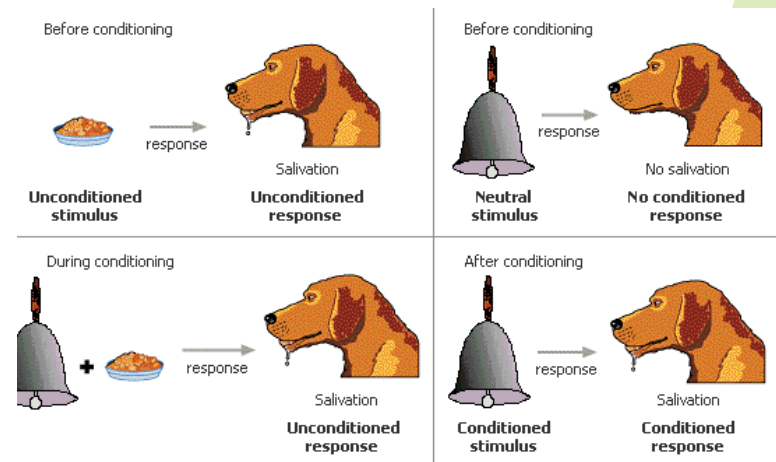
INNATE BEHAVIORS

- ▶ *Suckling*-Babies are born knowing how suckle; adaptation allows them to be nourished
- ▶ *Taxes/Taxis*-movement of an organism in response to a stimulus (ex. Light or food)
- ▶ *Migration*-seasonal movement of animals in response to resource availability



LEARNED BEHAVIORS

- ▶ *Habituation*-an animal stops responding to a stimulus after too much exposure
- ▶ *Imprinting*-Baby recognizes something as parent/objet of trust
- ▶ *Classical conditioning*-Learning a new behavior through association (ex. Pavlov's dog)
- ▶ *Trial and Error*-Animal associates behaviors with the consequences they produce



Standard 2.1.3

Relationships between Organisms

RELATIONSHIPS IN COMMUNITIES

- ▶ *Predator/Prey*-one organism hunts and kills another organism for food
 - ▶ Ex. The lion (predator) hunts the gazelle (prey)
- ▶ *Competition*-two organisms compete over a common resource (food, territory, etc.)



Not all interactions among organisms involve eating each other...

- ▶ *Symbiosis* = organisms *living* together
- ▶ 3 Types of symbiotic relationships
 - ▶ Mutualism
 - ▶ Commensalism
 - ▶ Parasitism



Mutualism

- ▶ *Mutualism* = benefits both organisms in relationship



<https://www.youtube.com/watch?v=Xm2qdxVVRm4>

Commensalism

- ▶ **Commensalism** = one organism benefits and the other is unaffected



Note: There is debate that commensalism is just early mutualism! Maybe we don't understand all the benefits?

Parasitism

- ▶ **Parasitism** = one organism benefits and the other is harmed
- ▶ **PARASITES** (like viruses) don't immediately kill host... use it first - sometimes kill it later!



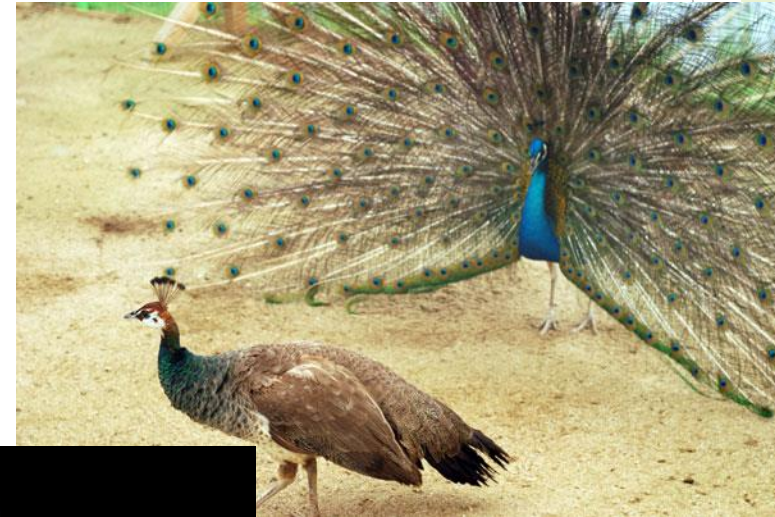
ORGANISM INTERACTIONS

- ▶ Communication within society using pheromones-bees, ants, and wasps!
 - ▶ Ex. Ants use pheromones to determine family members, to summon for attack/defense, and even to warn other ants when they are squashed
 - ▶ Ex. Bees use pheromones to communicate and maintain organization in their colony



ORGANISM INTERACTIONS

- ▶ *Courtship Dances*-animals sometimes have rituals (may be a dance, vocalization, or display of beauty/power) in order to select a reproductive partner

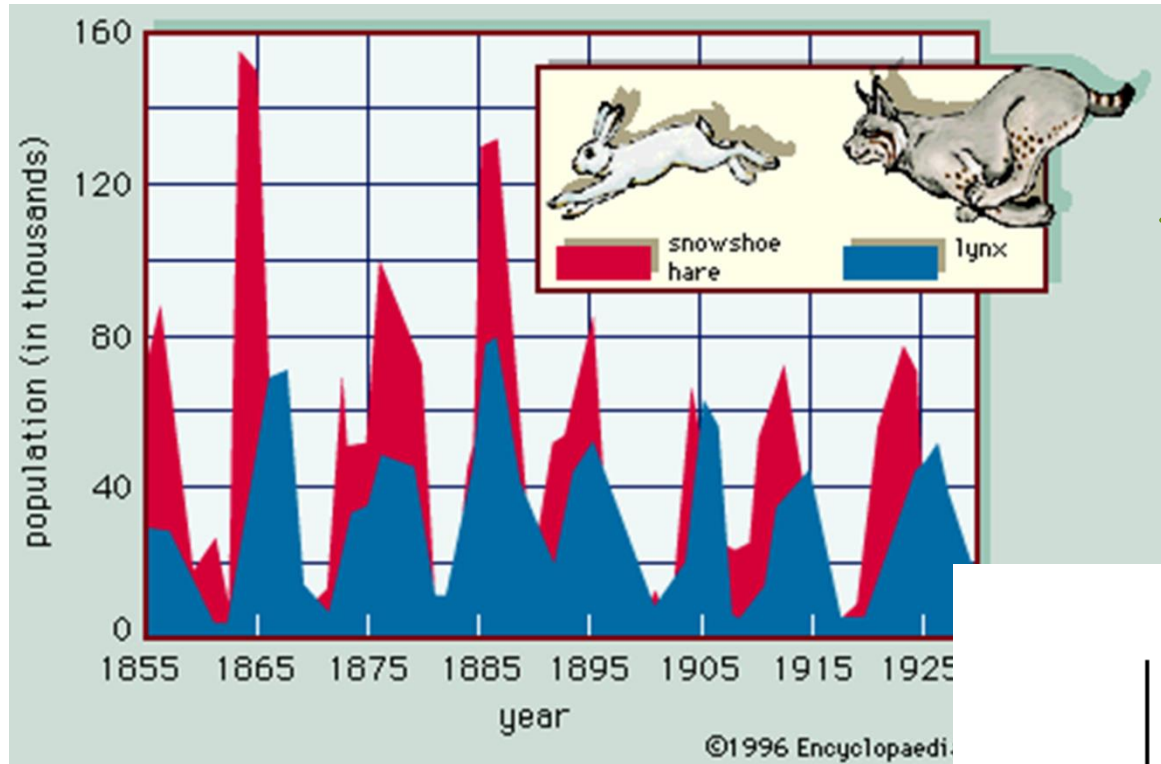


ORGANISM INTERACTIONS

- ▶ *Territorial Defense*-animals may defend their territory against other organisms, in or outside of their species
 - ▶ Ex. Male fighting fish will build a nest and maintain that territory during breeding season, acting particularly defensive against other males



PREDATOR/PREY RELATIONSHIPS



What happens to prey populations as prey increases?
Decreases?

