CELL UNIT STUDY GUIDE

Unit 2 – The “Not So Secret” Lives of Cells

Test Topics:

- Microscopes and their use
- Cell Theory
- Cell Types (Prokaryotic vs. Eukaryotic)
- Organelles and Functions
- Viruses
- Homeostasis
- Cellular Transport (Diffusion, Osmosis, Active Transport)
- Mixtures, Solutions, and Suspensions

1. Microscopes

Video: https://drive.google.com/file/d/1942sNxJJJF93tWNC2TQGjHG3_gzBqIn_/view

Parts to Know:

- Eyepiece (10x)
- Objective Lenses (3–4)
- Stage and Stage Clips
- Coarse and Fine Focus Knobs
- Diaphragm
- Light Source & Dimmer Switch
- Arm and Base

Key Skills:

- Carry microscope correctly (one hand on arm, one under base)
- Start with lowest objective lens when focusing
- Total magnification = Eyepiece × Objective Lens
- Always use fine focus on high power

2. What Is a Cell?

Definition: The smallest unit of life that can carry out all life processes.
Cells are closed systems, self-replicate, and are the building blocks of all organisms.

3. The Cell Theory

1. All living things are made of one or more cells. (Schleiden, 1838)
2. Cells are the basic unit of structure and function in living things. (Schwann, 1839)
3. All cells come from preexisting cells. (Virchow, 1855)

4. Prokaryotic vs. Eukaryotic Cells

Prokaryotic (Bacteria):
- Small, simple (<10 µm)
- No nucleus, no membrane-bound organelles
- DNA in a single loop (plasmid)
- Reproduce by binary fission
- Always unicellular

Eukaryotic (Plants, Animals, Fungi, Protists):
- Large, complex (>10 µm)
- Has nucleus and membrane-bound organelles
- DNA in many linear chromosomes
- Reproduce by mitosis/meiosis
- Uni- or multicellular

All cells have: Cell membrane, DNA, Cytoplasm, Ribosomes

5. Organelles and Their Functions

Play:
https://biomanbio.com/HTML5GamesandLabs/Cellgames/cellexplorerpagehtml5.html

Nucleus – Control center; contains DNA
Cell Membrane – Controls what enters/leaves
Cytoplasm – Jelly-like substance that holds organelles
Mitochondria – Produces energy (ATP)
Ribosomes – Make proteins
Endoplasmic Reticulum (ER) – Moves materials
Golgi Apparatus – Packages proteins
Lysosomes – Digest waste
Vacuoles – Storage (large in plants)
Cell Wall – Structure and support (plants only)
Chloroplasts – Photosynthesis (plants only)

6. Endosymbiotic Theory

Proposed by Lynn Margulis (1970): some organelles (mitochondria, chloroplasts) were once free-living bacteria.
Evidence: Have their own looped DNA and reproduce independently.

7. Viruses

Not considered alive – cannot reproduce without a host cell.
Contain DNA or RNA but lack organelles or metabolism.
Purpose: make more viruses!

8. Homeostasis

Definition: Maintaining a stable internal environment.

Unicellular organisms: adapt to environmental changes quickly.
Multicellular organisms: specialized eukaryotic cells work together to maintain balance.
Humans have 4+ trillion cells, each contributing to homeostasis.

9. Cellular Transport

Video: https://drive.google.com/file/d/1WL7cga015tiDi0OuxPFFRJw06S5_MdHC/view
Play: https://biomanbio.com/HTML5GamesandLabs/Cellgames/celldefensehtml5page.html

Passive Transport (no energy; high → low)
- Diffusion: molecules spread evenly
- Facilitated Diffusion: uses protein channels
- Osmosis: water across a membrane

Active Transport (requires energy; low → high)
- Protein Pumps: move ions (e.g., Na+/K+)
- Endocytosis: cell takes in materials
- Exocytosis: releases waste or hormones

10. Osmosis

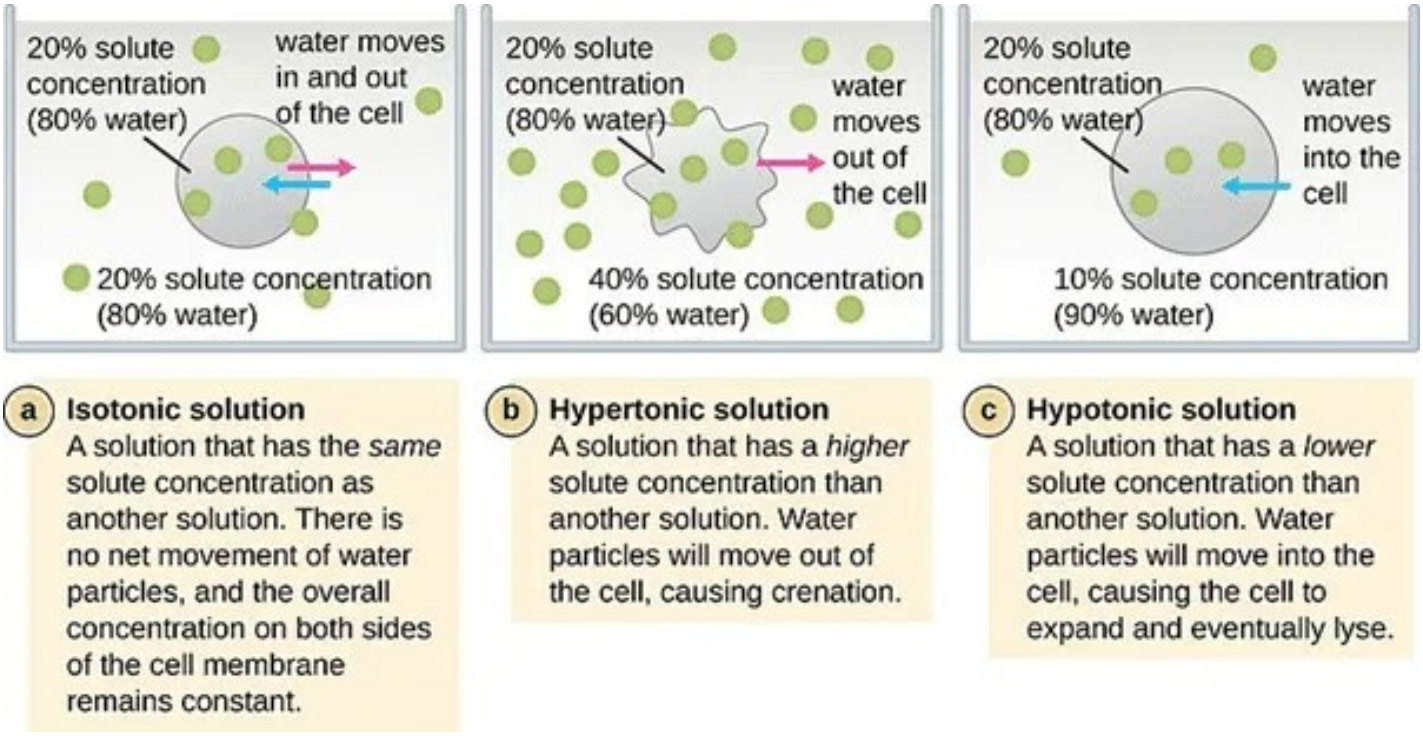
Video: https://drive.google.com/file/d/1Kd-aV4weQqQlY9fxc0WGRlqDDuv-bECw/view

Play: https://biomanbio.com/HTML5GamesandLabs/Cellgames/osmosis-interactivepage.html

Key Points:
- Water moves from high → low water concentration
- Uses diffusion or aquaporins (facilitated diffusion)
- Water is polar and moves passively

Solution Types:

- Hypertonic: cell shrinks (water out)
- Hypotonic: cell swells/bursts (water in)
- Isotonic: equal movement; cell stays same size



Organism Adaptations:
- Plants: cell walls prevent overexpansion (turgor pressure)
- Protists: contractile vacuoles remove water
- Fish: gills regulate salt/water
- Humans: kidneys maintain isotonic blood

11. Mixtures, Solutions, and Suspensions

Video: https://drive.google.com/file/d/1F_6hKc2uNTffh4Fplh_twNH-gAv3T7DG/view

Mixture: Physically combined substances.
Solution: Solute dissolves evenly in solvent (ex: saltwater).
Suspension: Particles remain suspended but don't dissolve (ex: muddy water).

Study Reminders

Complete your review sheet – it will be graded.
Use Bioman Bio games and videos to study.
Review osmosis and transport practice problems.
Extra help available after school before the test.
⚠ No extra credit – come prepared!

CELL UNIT – PRACTICE QUESTIONS

Microscopes

1. What is the total magnification if the eyepiece is 10x and the objective lens is 40x?
A. 4x
B. 40x
C. 400x
D. 10x

2. Which microscope part is used for fine focusing?
A. Coarse focus knob
B. Light source
C. Fine focus knob
D. Diaphragm

3. The diaphragm on a microscope is used to:
A. Adjust light intensity
B. Change magnification
C. Hold the slide in place
D. Clean the lenses

Cell Theory & Types

4. Which scientist stated that all plants are made of cells?
A. Virchow
B. Schwann
C. Schleiden

D. Hooke

5. Which statement is **not** part of the cell theory?
A. All cells come from preexisting cells
B. Cells are the basic unit of life
C. All living things are made of cells
D. Cells can be created from nonliving matter

6. Which feature is **found in all cells**?
A. Nucleus
B. Ribosomes
C. Mitochondria
D. Chloroplasts

7. Which characteristic best distinguishes eukaryotic cells from prokaryotic cells?
A. Presence of a nucleus
B. Ability to reproduce
C. Presence of cytoplasm
D. Ability to adapt

Organelles

8. Which organelle is known as the "powerhouse" of the cell?
A. Nucleus
B. Golgi apparatus
C. Mitochondria
D. Ribosome

9. The cell membrane is responsible for:
A. Storing nutrients
B. Controlling what enters and leaves the cell
C. Producing energy
D. Photosynthesis

10. Which organelle is found only in plant cells?
A. Lysosome
B. Chloroplast
C. Ribosome
D. Golgi apparatus

11. What is the function of ribosomes?
A. Produce proteins
B. Store DNA

C. Break down waste
D. Transport lipids

Viruses & Endosymbiotic Theory

12. Viruses are **not considered living** because they:
A. Contain RNA
B. Can reproduce only inside a host cell
C. Have cell walls
D. Use energy

13. The endosymbiotic theory suggests that:
A. DNA is found only in the nucleus
B. Cells can live independently
C. Mitochondria and chloroplasts originated as free-living bacteria
D. All organelles are identical

Homeostasis

14. Homeostasis refers to:
A. Reproduction of cells
B. Maintaining stable internal conditions
C. Cell movement
D. Energy production

15. In multicellular organisms, homeostasis is maintained by:
A. Random changes in cells
B. Specialized cells performing specific functions
C. Only nerve cells
D. External environment

Cellular Transport

16. Which type of transport requires energy?
A. Diffusion
B. Osmosis
C. Active transport
D. Facilitated diffusion

17. In osmosis, water moves:
A. From low to high water concentration
B. From high to low water concentration
C. Only into the cell
D. Only out of the cell

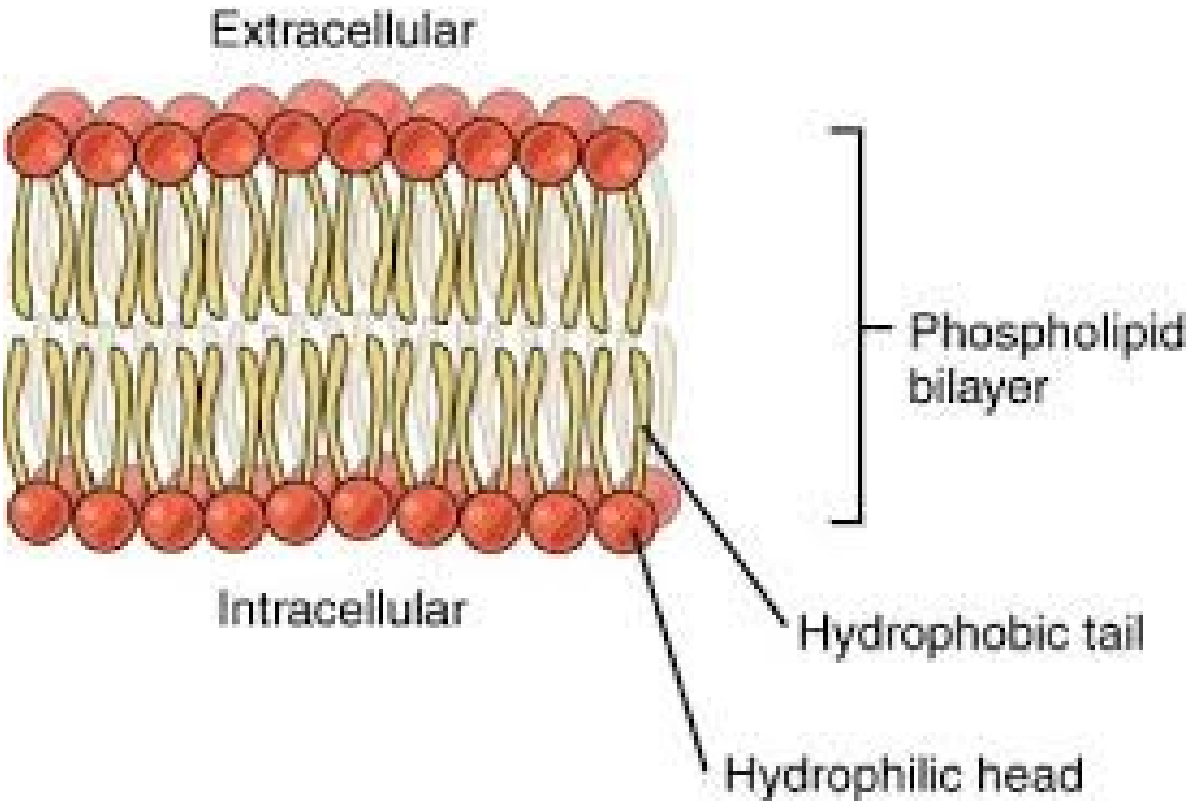
18. A cell placed in a hypertonic solution will:
A. Swell
B. Shrink
C. Stay the same
D. Burst

19. Which process uses vesicles to bring materials into the cell?
A. Exocytosis
B. Endocytosis
C. Diffusion
D. Osmosis

20. Which process describes molecules moving from high concentration to low concentration without energy?
A. Active transport
B. Diffusion
C. Endocytosis
D. Exocyto

Differences between plant and animal cells

phospholipid bilayer diagram with polarity and cell surface markers



Enzymes

Transport proteins

Aquaporin

Cell membrane protiens

Importance of concentration gradient

Calculate the direction or amount of solute and water that moves across a membrane

Multicelled vs single celled organisms.

Nuclear envelope

Dna

Rna

Nucleolus

Rough and smooth endoplastic reticulum

Centrioles

Capsule flagella and pili

Organization of life

Colonial cells

How proteins are produced and exported from cell