

1st Semester Biology EXAM REVIEW

KEY

Answer each bullet for each Unit in addition to the number questions.

Unit 1 - Characteristics of Life (pgs 4-10)

- Identify and summarize the characteristics of life.
- Provide examples of the characteristics of life.

1. List and provide an example of the characteristics of life?

- ① Made of one or more cells (unicellular or multicellular)
- ② Displays organization (cells → tissues → organs)
- ③ Grows & Develops (baby → adult, tadpole → frog)

- ④ Reproduces (having kittens)
- ⑤ Responds to stimuli (running from a predator)
- ⑥ Requires Energy (eating food)
- ⑦ Maintains homeostasis (keep body temp constant)
- ⑧ Adapts & Evolves (cactus with long roots)

Unit 1 - Scientific Inquiry and Reflection (pgs 11-21)

- Explain the characteristics of science.
- Compare and contrast science and pseudoscience.
- Understand and use the metric system.
- Identify the scientific method.
- Answer questions using the scientific method.
- Differentiate between a control, independent and dependent variable.
- Differentiate between hypotheses, theories, and laws.

2. What is the difference between a hypothesis and an opinion?

Hypothesis can be tested by an experiment

Opinion is an explanation that cannot be tested

3. Why should experiments be controlled?

to have a standard of comparison to determine what factor caused the outcome/data

4. Bob wants to know if studying for tests improves test scores. Bob has 10 friends study before the test and 10 friends not study. He compared the results from the test and it showed that friends who studied scored 10% higher on their test.

How can this experiment be improved?

Larger sample size

Test the same group studying & not studying

Choose same study method & study time for all individuals

Identify the control group, experimental group, independent and dependent variables.

Who didn't study

Who studied
1

Studying
for
test

Test
Performance

Unit 2 -Chemistry of Life (pgs 148-174)

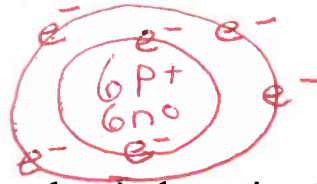
- Identify and diagram the parts of an atom.
- Identify the most common elements found in living things.
- Compare and contrast covalent and ionic bonding.
- Identify the parts of a chemical reaction.
- Describe the importance of enzymes in chemical reactions.
- Balance chemical equations and understand the law of conservation of matter.
- Describe the structure and function of the four biological macromolecules.
- Identify examples of the four biological macromolecules.
- Describe how dehydration and hydrolysis make and break down macromolecules.
- Understand the pH scale.
- Describe the difference between acids and bases.
- Describe why water is a good solvent.
- Explain why water is polar.
- Summarize hydrogen bonding.

5. What are the three parts of the atom? Identify their charges.

Proton p^+ Neutron n^0 electron e^-

6. Diagram a carbon atom and label the parts.

6 Protons
6 neutrons
6 electrons
] Nucleus



7. What are enzymes and why are they important to chemical reactions?

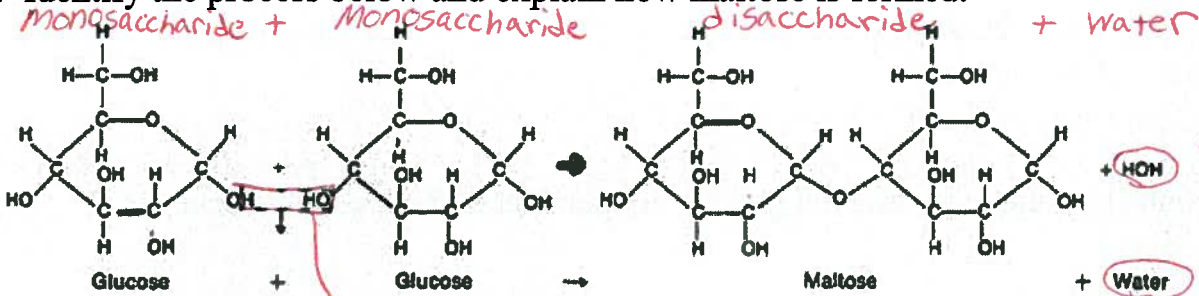
Proteins that speed up chemical reactions

8. How are covalent and ionic bonds made?

Covalent - Share electrons between atoms Ex. H_2O

ionic - atoms gain or lose electrons becoming + or - ions Ex. $Na^+ Cl^-$

9. Identify the process below and explain how maltose is formed.



H^+ & OH^- removed from glucose

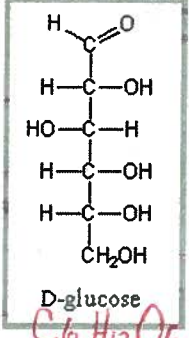
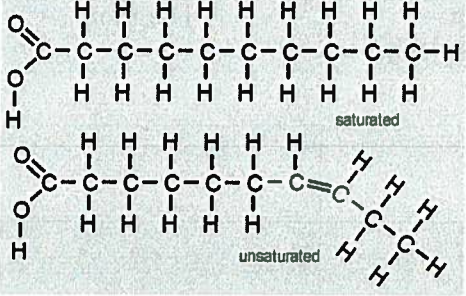
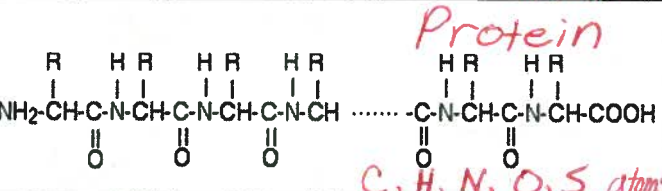
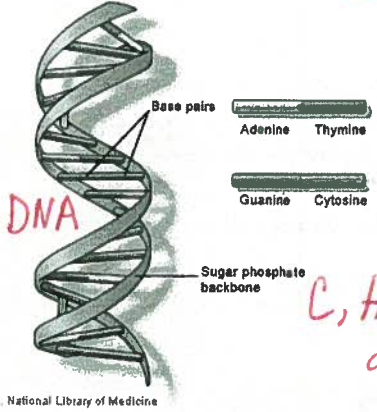
Dehydration Synthesis

Water is formed as a Product

10. How would hydrolysis break down maltose back into two glucose molecules?

Adding water to maltose to break it apart into glucose subunits.

11. Complete the table for the following organic macromolecules:

Macromolecule (Identify the diagram)	Subunit	Function
 <p>D-glucose $C_6H_{12}O_6$</p> <p>Carbohydrate $1C : 2H : 1O$</p>	Monosaccharide (single sugar)	<ul style="list-style-type: none"> • Provide & Store energy • Provide structure and support <p>Ex. glucose, glycogen</p>
 <p>Lipid mostly C & H atoms</p>	Glycerol & fatty acids	<ul style="list-style-type: none"> • Provide & Store energy • Provide barriers (cell membrane) <p>Ex. fats, oils</p>
 <p>Protein C, H, N, O, S atoms</p>	Amino Acid	<ul style="list-style-type: none"> • Speed Chemical reactions • Repair • Transport <p>EX. enzymes, meat</p>
 <p>DNA</p> <p>Base pairs: Adenine-Thymine, Guanine-Cytosine</p> <p>Sugar phosphate backbone</p> <p>Nucleic Acid C, H, N, O, P atoms</p>	Nucleotide 1. sugar 2. Phosphate 3. Nitrogen Base	<ul style="list-style-type: none"> • Store & Communicate genetic information <p>Ex. DNA, RNA</p>

Unit 3 - Cell Structure & Function (pgs 182-211)

- Summarize the principles of the cell theory.
- Identify the scientists that contributed to the cell theory.
- Compare compound light microscope to electron microscope.
- Differentiate between prokaryotic cell and a eukaryotic cell.
- Compare and contrast plant and animal cell structures.
- Identify and explain the structure and function of a typical eukaryotic cell.
- Summarize how the plasma membrane helps maintain homeostasis for the cell.
- Compare and contrast active and passive transport.
- Identify examples of active and passive transport.
- Differentiate between isotonic, hypotonic, and hypertonic solutions.

endocytosis, exocytosis

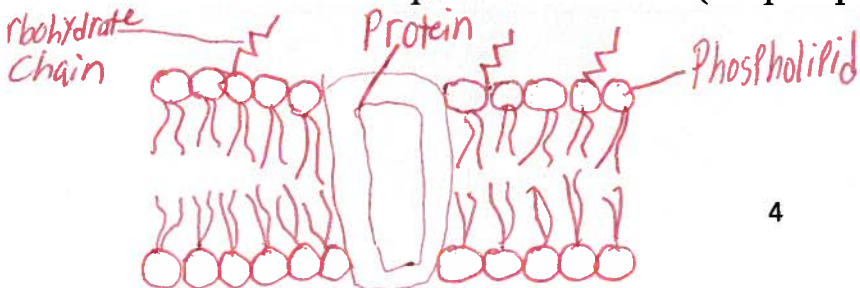
diffusion, facilitated diffusion, osmosis

12. Complete the chart:

Organelle	Function	Location (Plant, Animal, Both)	Diagram
Ribosome	<i>Makes Protein</i>	<i>B</i>	
Mitochondria	<i>Converts food to usable energy</i>	<i>B</i>	
Nucleus	<i>Controls cell activities</i>	<i>B</i>	<i>Nucleus</i>
Nucleolus	<i>Makes ribosomes</i>	<i>B</i>	<i>Nucleolus</i>
Chloroplast	<i>Converts sunlight to stored energy</i>	<i>P</i>	
Cytoskeleton	<i>SUPPORTS cell</i>	<i>B</i>	<i>cytoskeleton</i>
Golgi Apparatus	<i>Packages and Ships Proteins</i>	<i>B</i>	<i>Golgi</i>
Endoplasmic Reticulum <i>(Rough or Smooth)</i>	<i>site of chemical reactions</i>	<i>B</i>	
Vacuole	<i>Stores water</i>	<i>B</i> <small>small in animal cells</small>	<i>Vacuole</i>
Lysosome	<i>Cleans up & digests worn out cell parts</i>	<i>A</i>	

suicide sac

13. Draw and label the plasma membrane (i.e. phospholipid bilayer).

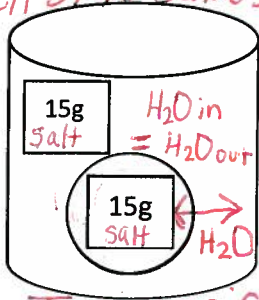


Controls what enters & leaves the cell. Helps maintain homeostasis.

O = cell □ = solution

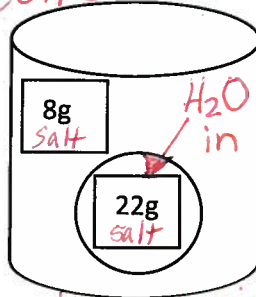
14. Show how a cell would change in the following isotonic, hypotonic, and hypertonic solutions:

Cell stays same size



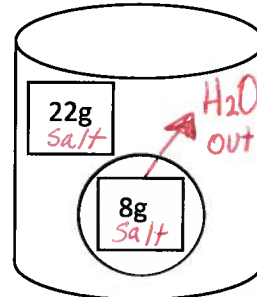
Isotonic

Cell swells



Hypotonic

Cell shrinks



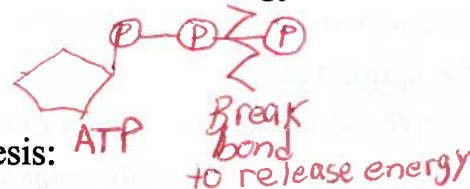
Hypertonic

Unit 4 - Cellular Energy (pgs 216-236)

- Identify the laws of thermodynamics.
- Identify the ultimate source of energy for living things.
- Describe the structure of ATP and why ATP is important to organisms.
- Identify where energy is stored in the ATP molecule.
- Summarize the process of photosynthesis (light dependent and light independent/Calvin).
- Summarize the process of cellular respiration (Glycolysis, Krebs, & Electron Transport).
- * Identify the reactants and products of photosynthesis and cellular respiration.
- * Write the chemical reactions for photosynthesis and cellular respiration.
- Explain how organisms obtain and use energy.
- Identify cell structures involved in photosynthesis and cellular respiration.
- Summarize fermentation.
- Compare alcoholic fermentation and lactic acid fermentation.

15. Write the reaction that shows the breakdown of ATP to release energy for cell use:

Bond between phosphates is broken to release energy



16. Please complete the table in respect to photosynthesis:

Stage	Location	Substance(s) Used	Substance(s) Made
Light Reactions	Chloroplast (Thylakoids)	Sun light Water	Oxygen (O ₂) Some ATP
Dark Reactions (Calvin Cycle)	Chloroplast (Stroma)	Carbon dioxide (CO ₂)	Glucose (C ₆ H ₁₂ O ₆)

* Equations for Photosynthesis & Cell respiration

17. Please complete the table in respect to cellular respiration:

Stage	Location	Substance(s) Used	Substance(s) Made	Amount of ATP created
Glycolysis <i>Anaerobic</i>	<i>Cytoplasm</i>	<i>Glucose</i>	<i>2 Pyruvate</i>	<i>2 ATP</i>
Kreb's Cycle <i>Aerobic</i>	<i>Mitochondria</i>	<i>2 Pyruvate → Acetyl CoA</i>	<i>6 CO₂</i>	<i>2 ATP</i>
Electron Transport Chain <i>Aerobic</i>	<i>Mitochondria</i>	<i>O₂</i>	<i>6 H₂O</i>	<i>32 ATP</i>

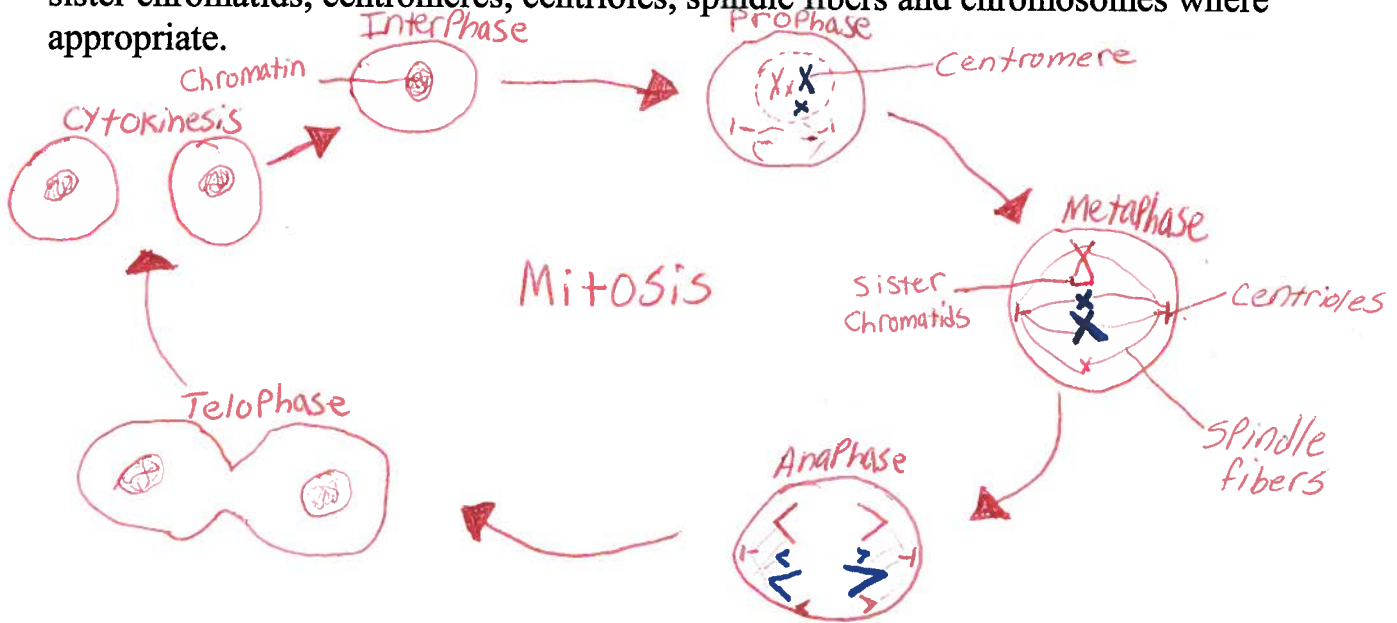
Net

Total = 36 ATP

Unit 5 - Cellular Reproduction (Ch 9 pages 242-259 & 10.1 Meiosis 268-276)

- Explain why cells are small.
- Identify what limits cell size.
- Recognize and summarize the stages of the cell cycle (Interphase, Mitosis, Cytokinesis).
- Identify the structures involved in the cell cycle.
- Explain how the cell divides its nucleus in Mitosis.
- Differentiate between plant and animal cell Cytokinesis.
- Understand the results of mitosis and the cell cycle.
- Identify the number of chromosomes in daughter cells as a result of mitosis.
- Explain how the cell cycle is regulated.
- Describe cancer and how it relates to the cell cycle.
- Explain apoptosis.
- Summarize stem cells and their importance.
- Recognize and summarize the stages of meiosis and the structures involved.
- Explain how meiosis provides genetic variation.
- Understand the results of meiosis and the chromosome number in each new cell.
- Recognize and summarize the stages of meiosis.
- Summarize the results of meiosis.
- Compare and contrast mitosis and meiosis.
- Explain why cell division is important.

18. Diagram the stages of interphase, mitosis and cytokinesis. Be certain to label chromatin, sister chromatids, centromeres, centrioles, spindle fibers and chromosomes where appropriate.



19. If a parent cell has 18 chromosomes, how many chromosomes will each daughter cell have after **mitosis**?

↓
makes
Body cells

18 chromosomes in each
daughter cell

* Chromosomes is the same

20. If a parent cell has 18 chromosomes, how many chromosomes will each daughter cell have after **meiosis**?

↓
makes
Sex cells
(gametes)

9 chromosomes in each
daughter cell

* Chromosomes is half

21. Identify 2 similarities and 3 differences between mitosis and meiosis.

Mitosis	Both	Meiosis
Makes Body cells	• Interphase occurs Prior	• Makes Sex cells (gametes)
identical cells	• DNA replication occurs Prior	• Unique cells
1 cell division		• 2 cell divisions

22. Draw a cell with 4 chromosomes in metaphase of mitosis and in metaphase 1 of meiosis.

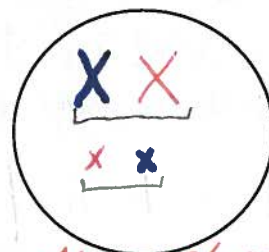
Mitosis

Meiosis

chromosomes
line up
in a straight
line at
equator of cell



7

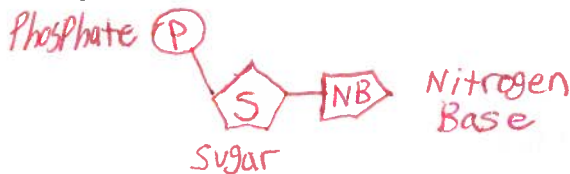


Both
Homologous Pairs of
Chromosomes are
side-by-side, no
straight line

Unit 6 - DNA & Protein Synthesis (Ch. 12 pgs 324-351)

- Summarize the basic structure of DNA.
- Diagram or label the structural components of DNA.
- Explain how DNA replicates.
- Describe the importance of DNA replication.
- Summarize the three types of RNA including their function.
- Compare and contrast DNA & RNA.
- Explain how DNA and RNA are involved in transcription.
- Describe the process of transcription and where it takes place in the cell.
- Explain how RNA is involved in translation.
- Describe the process of translation and where it takes place in the cell.
- Analyze the importance of protein synthesis.
- Decode a segment of DNA into the correct amino acid sequence (protein).
- Explain how genes are regulated.
- Describe how mutations occur.
- Identify examples of mutations.
- Analyze how mutations can affect protein synthesis.
- Differentiate between a somatic (body) cell and sex cell mutation.

23. Diagram the three parts of a nucleotide:



24. If one side of the double helix reads T G G | C A A | G T C | C G T what does the other side of the double helix (complimentary strand of DNA) look like?

ACC | GTT | CAG | GCA

25. How many codons would this segment of DNA (please see question 24) encode for?

1 Codon = Set of 3 Nitrogen bases (letters)

So, 4 codons

26. If a gene reads T G G | C A A | G T C | C G T what would be the mRNA sequence that would be transcribed from this segment of DNA?

ACC | GUU | CAG | GCA⁸

27. What anticodons would correspond to the codons created in question ~~25~~²⁶?
~~tRNA~~

UGG CAA GUC CGU

28. What amino acids are being coded for from this sequence of DNA (codon chart pg 338 in textbook)?

Use mRNA from Question #26
ACC GUU CAG GCA

Thr - Val - Gln - Ala

29. Please complete the table in respect to gene expression:

Process	Location	Description
Transcription	Nucleus	DNA → mRNA
Translation	Ribosome in cytoplasm	mRNA → Protein

30. What is a mutation?

a change in the DNA sequence

31. Identify 3 possible causes of mutations.

- Radiation
- Chemicals
- Viruses

32. How can mutations affect protein function?

Mutations may change the amino acid sequence, which may result in a different protein.

Unit 7 - Heredity & Mendelian Genetics (Ch 10.2 & 10.3) pgs 277-285)

- Summarize traits are passed from parents to offspring.
- Differentiate between heterozygous ^{Aa} and homozygous ^{AA or aa} genotypes.
- Describe Mendel's Law of Segregation and Law of Independent assortment.
- Identify genotypes and phenotypes of parents and offspring.
- Differentiate between traits, genes, and alleles.
- Analyze how dominant and recessive alleles display phenotypes.
- Conduct single trait crosses and determine the genotype and phenotype of the offspring.
- Predict the genotypes and phenotypes.
- Explain genetic recombination and identify examples.
- Summarize polyploidy and how it affects different organisms.

33. Cystic fibrosis is a disorder due to a recessive allele (c). Complete a cross between two parents who are heterozygous for this trait.

Parent 1 Genotype:

Cc Normal carrier

Parent 2 Genotype:

Cc Normal carrier

F₁ Genotypes:

$1CC : 2Cc : 1cc$

	C	c
C	CC Normal	Cc Normal
c	Cc Normal	cc Cystic fibrosis

$C = \text{Normal}$
 $c = \text{Cystic fibrosis}$

F₁ Phenotypes:

$\frac{3}{4}$ Normal 75%
 $\frac{1}{4}$ Cystic fibrosis 25%