End of Course Review KEY

Review sheet

Biology I Name: _____

Review Tips: Review ALL vocabulary, notes, assignments and worksheets
Holt Biology – CP: Review Science Skills on pages 1050 – 1063 and Lab safety on pages xxiv – xxvii
Modern Biology – H: Review Lab safety & Science Skills on pages 1066 – 1085
Grade Rubric Suggestion: Count the total (19) pages completed. Count ½ pages as well.
Grade scale = 19-18/100. 17-16/90. 15-14/80. 13-12/70. 11-10/60. 9-8/50. 7-6/40. 5-4/30. 3-2/20.

Unit 1 – Intro to Biology
- What is Biology?
- Scientific method
- Reading graphs & charts
- Lab safety & equipment
- Properties of life

Unit 2 – Ecology
- Ecosystems & Biomes
- Food webs, pyramids and succession
- Populations and communities
- Geochemical cycles
- Conservation issues & solutions

Unit 3 – The Cell
- History of cell biology
- Intro to the cell
- Cell organelles
- Plant vs. animal cell features
- Microscope

Unit 4 - Biochemistry
- Carbon compounds
- Molecules of life
- Energy & chemical reactions
- Water & solutions
- Acids & bases

Unit 5 – Cell Transport
- Homeostasis
- Passive transport
- Active transport

Unit 6 – Cell Energy
- Photosynthesis
- Cellular respiration
- Aerobic respiration
- Anaerobic respiration

Unit 7 – Cell Cycle
- Mitosis
- Sexual / Asexual reproduction
- Chromosomes / Genes
- Mutations
- DNA
- RNA
- Protein synthesis

Unit 8 – Meiosis & Heredity
- Meiosis
- Law of dominance
- Law of segregation
- Law of independent assortment
- Sex-linked traits
- Punnett squares
- Pedigrees

Unit 9 – Evolution & Classification
- Darwinian evolution
- Natural selection
- Microevolution
- Evidence of evolution
- Macroevolution
- Classification of life
- Dichotomous key
- Taxonomy

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Biology I Name: _____

Unit 1 – Intro to Biology (CP Chapters 1-2+ / H Chapters 1-2+)

1. What is a hypothesis? (CP10 / H13)

   A testable idea or explanation that leads to scientific investigation

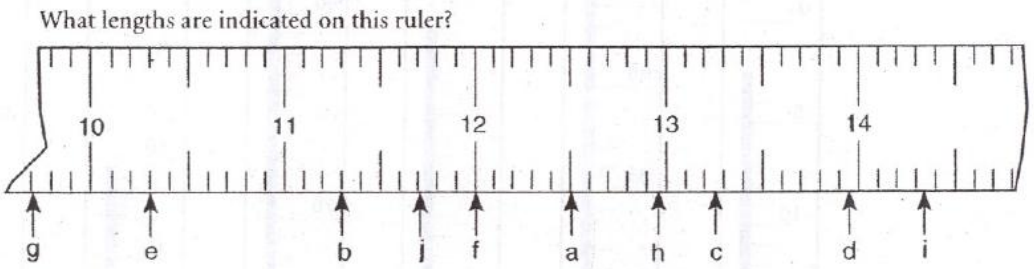
2. Why should sources of scientific information be credible, accurate, and relevant? (Class Notes)

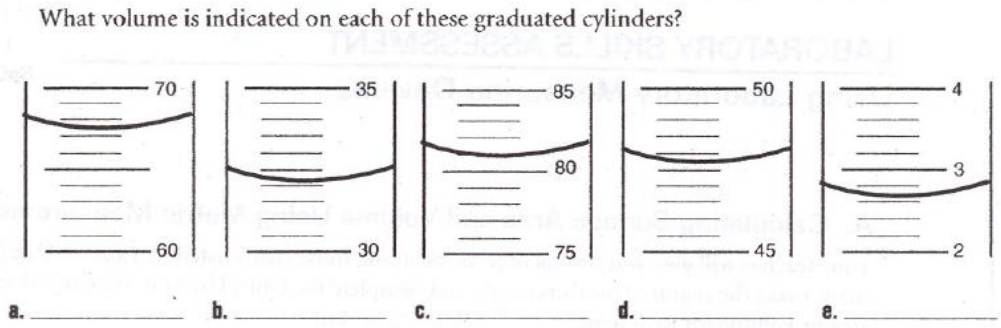
   Credible – from a reliable, unbiased, source

   Accurate – the degree to which the information is true or accepted

   Relevant – the degree to which the information is connected to the topic of interest

3. Use the laboratory tools below to record the **METRIC** unit indicated. (CP1058 / H23 Class Notes)





   Ruler: G(9.7cm), E(10.3cm), B(11.3cm), J(11.7cm), F(12.0cm), A(12.5cm), H(12.95cm), C(13.25cm), D(13.95cm), I(14.35)

   Graduated Cylinder: A(67.5mL), B(32.5mL), C(81.0mL), D(47.7mL), E(2.65mL)

4. Your scientific work should be done with precision and accuracy. What does that mean? (Class Notes)

   Precision – the degree to which measurements made in the same way agree with each other

   Accuracy – the degree to which the value measured agrees with the true or accepted value

5. List and describe the steps of the scientific method. (CP10-12 / H13-17)

   a. **State the Problem**
   b. **Gather Information (Make observations)**
   c. **Form a Hypothesis**

d. Test the Hypothesis - Design an Experiment

e. Record and Analyze Data

f. Form a Conclusion

g. **Repeat**

6. Describe what an independent and dependent variable are in an experiment. (CP11 / H15-16)

Independent Variable – the single factor that scientists change in an experiment

Dependent Variable – the factors that may change in response to the independent variable

7. Determine the independent and dependent variable in the following statements. (CP11, 1060 / H15-16)
   a. The higher the temperature of water, the faster an egg will cook.

      I – temperature of water

      D – time it takes to cook the egg

   b. Grass will grow taller if it is watered a great deal and if it is fertilized.

      I – amount of fertilizer and water

      D – length of grass

   c. If the amount of calcium chloride added to water increases, the temperature of the water also increases.

      I – amount of calcium chloride

      D – temperature of the water

8. What is the difference between the control group and the experimental group? (CP11 / H15)

Control group – serves as the standard for comparison because the group receives no experimental treatment

Experimental group – Identical to the control group except for one factor (variable)

9. What are the three basic types of graphs and what is require for each? (CP1060 / H16-17 Class Notes)

   Line - For continuous quantitative data

   Bar - For non-continuous data (usually in categories)

   Pie - For data that are parts of a whole

10. What is the difference between direct and inverse variation? (Class Notes)

Direct Variation – as one variable increases, the other increases as well

Inverse Variation – as one variable increases, the other decreases

11. Convert the following units (Class Notes / H1072)

    467 meters is **467,000** mm 1.24 kg is **1,240** g 1,284 mL is **1.284** L

12. Compare and contrast scientific investigation and technological design. (CP1050-1053 / Class Notes)
    Scientific Investigation - Goal is to answer a question, perhaps advance the knowledge of science
    Technological design - Goal is to create a specific outcome, perhaps advance the standard of living in societies

Unit 2 – Ecology (CP Chapters 4-6 / H Chapters 18-22)

1. Describe the trophic levels of a food chain. (CP86-87 / H368)
   First Trophic Level – Contains Primary Producers (Autotrophs)
   Second Trophic Level – Contains Primary Consumers (Herbivores)
   Third and Fourth Trophic Levels - Secondary and Tertiary Consumers (Carnivores and Omnivores)
2. Define the term & identify the different types of organisms at each level. (CP86-87 / H367 Class Notes)
   Autotrophs - use energy from the sun or energy stored in chemical compounds to produce energy (CP197 / H113)
   Heterotrophs – must consume their energy (CP434 / H113)
   Herbivores - Eat plants (autotrophs) (CP87 / H367)
   Carnivores - Eat other heterotrophs (CP87 / H367)
   Predators – kill their own food (CP79, 115 / H399)
   Scavengers – eat animals that are already dead (Class Notes)
   Omnivores - Eat both autotrophs and heterotrophs (plants and animals) (CP87 / H367)
   Detritivore (AKA decomposers) - decompose organic matter and return nutrients to soil, water, and air (CP86 / H367)
3. How does the energy, number of organisms, and biomass change as you from one trophic level to the next? (CP86-89 / H369)
   At each Trophic Level, the Energy stored in an organism is about <u>1/10</u> that of the Level Below it. <u>(10%).</u>
   Organisms at <u>Higher</u> Trophic Levels, Large Carnivores, tend to be <u>Fewer</u> in number than those at Lower Trophic Levels, Producers.
   Biomass (living organic matter) is reduced at each trophic level as well

4. What is an ecosystem? (CP79 / H362)

   All the organisms in a given area and the abiotic factors that affect them

5. How do predator and prey populations affect each other? (CP109-111 / H399)

   They are cyclic in nature. As the prey population increases the predator population will also start to increase. As the prey population decreases, the predator population will follow.

6. Describe the symbiotic relationships: parasitism, mutualism, and commensalisms. (CP109-111 / H403)

   Parasitism – One organism benefits, the other is harmed

   Mutualism - Both organisms benefit

   Commensalism – One organism benefits, the other is neither harmed nor benefits

7. What is a niche? What will happen if the niche of two species overlaps too much? (CP113 / H365, 401)
   a. **Role and position a species has in its environment including all biotic and abiotic interactions as an organism meets its needs for survival**
   b. **If two species are competing for the same niche, one will most likely drive the other out and take control of the niche.**

8. Define and give examples of density-dependent factors. (CP105 / H388)

   Density-Dependent Factors have an increased effect as population increases (more organisms, more risk): Disease, competition, parasites, food

9. Define and give examples of density-independent factors. (CP105 / H388)

   Density-Independent Factors affect all populations regardless of their density (more organisms, same risk): Temperature, storms, natural disasters, drought, habitat destruction, pollution

10. Define and give examples of biotic and abiotic factors. (CP79 / H363)

    Biotic – the living parts of the ecosystem: All the organisms in the ecosystem, plants, animals, etc.

    Abiotic – the nonliving parts of the ecysystem: weather, soil, temperature, etc.

11. Define and give examples of primary succession. (CP81 / H409)

    When organisms colonies new areas (that have never had life): after a volcano eruption, a paved street

12. Define and give examples of secondary succession. (CP81 / H409)

    When organisms colonize an area that once had life that was wiped out: Forest Fire

13. Describe how the following processes play a role in the Carbon Cycle. (CP91 / H372-373 Class Notes)

a. Photosynthesis - **Autotrophs take in carbon dioxide from the atmosphere and convert it to simple sugars.**

b. Respiration - **Organisms break down glucose and carbon is released into the atmosphere as carbon dioxide.**

c. Decomposition - **When organisms die, decomposers break down carbon compounds which both enrich the soil or aquatic sediments and are eventually released into the atmosphere as carbon dioxide.**

d. Conversion of biochemical compounds - **Organisms store carbon as carbohydrates, proteins, lipids, and nucleic acids in their bodies. When animals eat, those compounds can be: used for energy, converted to compounds that are suited for the predator's body, released to the atmosphere as methane, and other gases.**

e. Combustion - **When wood or fossil fuels (which were formed from once living organisms) are burned, carbon dioxide is released into the atmosphere.**

f. Weathering of rocks - **Bones and shells fall to the bottom of oceans or lakes and are incorporated into sedimentary rocks such as calcium carbonate. When sedimentary rocks weather and decompose, carbon is released into the ocean and eventually into the atmosphere.**

14. Describe how the following processes play a role in the Nitrogen Cycle. (CP92 / H373-374)
    a. Nitrogen-fixation - **Nitrogen-fixing bacteria, which are found in the soil, root nodules of plants, or aquatic ecosystems, are capable of converting nitrogen found in the air or dissolved in water into the forms that are available for use by plants.**
    b. Intake of nitrogen by organisms - **Plants take in the nitrogen through their root systems in the form of ammonia or nitrate and in this way, nitrogen can enter the food chain.**
    c. Decomposition - **When an organism dies or from animal waste products, decomposers return nitrogen to the soil.**
    d. Denitrification - **Denitrifying bacteria break down the nitrogen compounds in the soil and release nitrogen into the atmosphere.**
15. Describe how the following processes play a role in the Water Cycle. (CP90 / H371-372)
    a. Intake of water by organisms - **Organisms take in water and use it to perform life functions (such as photosynthesis or transport of nutrients).**

b. Transpiration - **Plants release water back into the atmosphere through the process of transpiration (the evaporative loss of water from plants).**

c. Respiration - **All organisms metabolize food for energy and produce water as a by-product of respiration.**

d. Elimination - **Most organisms need water to assist with the elimination of waste products.**

16. What is the greenhouse effect? (CP129 / H436)

    The greenhouse effect is the normal warming effect when gases (such as carbon dioxide, oxygen, methane, and water vapor) trap heat in the atmosphere.

17. Describe how the atmosphere, geosphere, and hydrosphere play a role in the biosphere. (Class Notes / H371-372, 436-437)

    Our atmosphere is primarily composed of materials from life's processes: Oxygen, Carbon Dioxide, Nitrogen, and Water.

    The hydrologic cycle is maintained by the energy of the Sun and the effect of weather.

    As part of the geosphere, the soils on Earth are constantly being generated and eroded.

18. Describe how population growth, technology, and resource consumption play a role in the sustainability of our environment. (CP125 / H444)

    Answers will vary. (Standard B6.6)

Unit 3 – The Cell (CP Chapters 7-8 / H Chapter 4)

1. What are the three parts of the cell theory? (CP152 / H70)

   1. All organisms are composed of one or more cells

   2. The cell is the basic unit of organization of organisms

   3. All cells come from preexisting cells

2. What is the difference between a prokaryotic cell and a eukaryotic cell? (CP154-155 / H75)

   Prokaryotes - Do NOT have membrane-bound organelles

   Eukaryotes - DO have membrane-bound organelles

3. Be able to identify and describe the function of the following organelles.

   a. Nucleus **- Functions in the genetic control of the cell** (CP157 / H74)

   b. Mitochondria **- Cellular respiration, a process that provides the cell with energy** (CP161 / H80)

c. Chloroplasts **- Contains the green pigment Chlorophyll that absorbs energy from sunlight to convert carbon dioxide and water into sugar during photosynthesis** (CP161 / H89)

d. Lysosomes **- Small organelles containing digestive enzymes to break down food particles, worn out organelles, bacteria, and viruses into particles that can be used by the rest of the cell** (CP158-159 / H82)

e. Vacuoles **- Stores materials such as water, salts, proteins, and carbohydrates** (CP160 / H87)

f. Ribosomes **- Protein synthesis** (CP157 / H80)

g. Endoplasmic reticulum (smooth and rough) **- ER is a complex, extensive network that transports materials throughout the inside of the cell** (CP158-159 / H81)
- Rough ER: Has ribosomes attached
- Smooth ER: Has no ribosomes

h. Golgi apparatus **- Modifies, collects, packages, and distributes molecules within the cell or outside the cell** (CP158-159 / H82)

i. Cilia **- Helps to move the cell or its outer environment; some organisms use them to capture food** (CP502-503 / H85)

j. Flagella **- Helps to move the cell or its outer environment; some organisms use them to capture food** (CP162 / H85)

k. Cell membrane **- Boundary of the cell, Controls what goes in and out of the cell through the selectively permeable membrane, Maintains cell's homeostasis** (CP154 / H77)

l. Nuclear membrane **- Surrounds the nucleus, Regulates the materials that pass between the nucleus and the cytoplasm** (CP157 / H79)

m. Cell wall **- Gives the cell added support and protection** (CP154 / H88)

4. Which of the parts above are in an animal cell? Which are in a plant cell?

Organelle	**Animal Cell**	**Plant Cell**
Nucleus	**X**	**X**
Mitochondria	**X**	**X**
Chloroplast		**X**
Lysosome	**X**	**X**
Vacuole	**X**	**X**
Ribosome	**X**	**X**

ER	**X**	**X**
Golgi Apparatus	**X**	**X**
Cilia or Flagella	**X**	**X**
Cell Membrane	**X**	**X**
Nuclear Membrane	**X**	**X**
Cell Wall		**X**

5. Which of the parts above are in a prokaryotic cell? Which are in a eukaryotic cell?

Organelle	Prokaryotic Cell	Eukaryotic Cell
Nucleus		**X**
Mitochondria		**X**
Chloroplast		**X**
Lysosome		**X**
Vacuole		**X**
Ribosome	**X**	**X**
ER		**X**
Golgi Apparatus		**X**
Cilia or Flagella	**X**	**X**
Cell Membrane	**X**	**X**
Nuclear Membrane		**X**
Cell Wall	**X**	**X**

6. What cell differentiation? What kind of cells can go through this? (CP166 / H160, 223, 652)

Cell differentiation is the process by which a cell becomes specialized for a specific structure or function. All cells undergo cell differentiation.

Unit 4 – Biochemistry (CP Chapters 3, 36 / H Chapters 2-3)

1. Describe how temperature, pH, and catalysts affect chemical reactions. (CP66 / H36, 57)

Temperature – gaining or losing heat energy

pH – most organisms need to be kept in a small range of acidity for reactions to properly occur

a. **Buffers within an organism regulate pH so homeostasis is maintained**
b. **A small change in pH can disrupt cell processes**

Catalysts – a substance that changes the rate of reaction or allows the reaction to occur at a lower temperature

c. **Catalysts are not consumed or altered in a reaction, can be used over and over**
d. **Enzymes are catalysts in living organisms**

2. What is activation energy? (CP65 / H36)

   It is the amount of energy needed for a particular reaction to occur

3. What are enzymes and how can they affect chemical reactions? (CP66 / H57)

   A catalyst is a substance that changes the rate of reaction or allows the reaction to occur at a lower temperature, Enzymes are catalysts in living organisms

4. Describe the following for Proteins. (CP62, 177, 892 / H56 Class Notes)
   a. Elements of which they are composed

      Carbon, Hydrogen, Oxygen, and **Nitrogen** and sometimes **Sulfur**

   b. Building blocks

      Amino Acids, There are 20 different amino acids

      i. **12 amino acids are made in the human body**
      ii. **Humans need to consume the other 8 amino acids from sources such as nuts, beans, or meat.**

   c. Functions

      - **Contractile proteins help control movement such as proteins in the muscles which help control contraction.**
      - **Hormone proteins coordinate body activities such as insulin which regulates the amount of sugar in the blood.**
      - **Enzymatic proteins accelerate the speed of chemical reactions such as digestive enzymes which break down food in the digestive tract.**
      - **Structural proteins are used for support such as connective tissue and keratin that forms hair and finger nails.**

- **Transport proteins transport many substances throughout the body such as hemoglobin which transports oxygen from the lungs to the other parts of the body to be used by cells in cellular respiration.**

d. Food Sources

Meat, nuts, or beans

5. Describe the following for Carbohydrates. (CP60, 892 / H55-57 Class Notes)
   a. Elements of which they are composed

      Carbon, Hydrogen, and Oxygen

   b. Structure/Types

      Monosaccharides – 1 ring (simple sugars)

      Glucose (cell's primary source of energy)

      Disaccharides – 2 rings

      Sucrose (table sugar)

      Polysaccharides – 3 or more rings (complex carbohydrates)

      Amylose (component of starch)

      Cellulose (structural carbohydrate in plants)

   c. Functions

      Energy Source

      Glucose in cells is the primary source of energy - fuel for cellular respiration

      Energy Storage (short term)

      Glycogen in the liver of animals

      Starch in the structures of plants

      Structural Support

      Cellulose forms cell walls in plants

      Also an important source of fiber for animals to stimulate the digestive system

   d. Food Sources

      Sugar, starches, and fiber

6. Describe the following for Lipids. (CP61, 892 / H59-60 Class Notes)
   a. Elements of which they are composed

      Carbon, Hydrogen, and Oxygen

b. Structure

A triglyceride is a lipid made up of: a glycerol and three fatty acids

c. Functions

Energy Storage (long-term)

Animals in colder climates will store more fats to use as insulation as well as energy to keep warm, Stored fats are also used to cushion vital organs

Cellular Membrane Structure

A major component of the cell membrane is the phospholipid

Building Vitamins and Hormones

These help regulate our metabolism

d. Food Sources

oils, meats, and nuts

7. Describe the following for Nucleic Acids. (CP63, 296, 892 / H60 Class Notes)

a. Elements of which they are composed

Carbon, Hydrogen, Oxygen, Nitrogen, and Phosphorus

b. Structure

Nucleic Acids are long chains of nucleotides

Nucleotides are made up of three parts

i. **Five carbon sugar**
ii. **Phosphate**
iii. **Nitrogen base**

c. Functions

Store information

d. Examples

DNA – holds genetic code for an organism

RNA – makes a copy of DNA in order to make a protein

Unit 5 – Cell Transport (CP Chapter 8 / H Chapter 5)

1. What is homeostasis? (CP19, 175 / H8)

Maintaining an internal balance

2. Why do we call the cell membrane semi-permeable (or selectively permeable)? (CP176 / H77)

The membrane allows some molecules to enter the cell and keeps others out

3. List and describe the three types of passive transport. Why are they called "passive"? (CP178-181 / H97-101)

   1. Diffusion – is the spreading out of molecules across a cell membrane until they are equally concentrated.

   2. Osmosis – diffusion of water

   3. Facilitative Diffusion – diffusion with the help of transport proteins

4. List and describe the three types of active transport. Why are they called "active"? (CP182-183 / H103-106)

   1. Protein Pumps -transport proteins that require energy to do work

   2. Endocytosis: taking bulky material into a cell by forming a vesicle

   3. Exocytosis: Forces material out of cell in bulk

5. Describe the situation and what would happen to a cell in each of the following solutions. (CP180 / H98-99)

   a. Hypotonic

      The solution has a lower concentration of solutes and a higher concentration of water than inside the cell. (Low solute; High water)

      Water moves from the solution to inside the cell): Cell Swells and bursts open (*lyse*)!

   b. Hypertonic

      The solution has a higher concentration of solutes and a lower concentration of water than inside the cell. (High solute; Low water)

      Water moves out of the cell into the solution: Cell shrivels!

   c. Isotonic

      The concentration of solutes in the solution is equal to the concentration of solutes inside the cell.

      Water moves equally in both directions and the cell remains same size! (Dynamic Equilibrium)

Unit 6 – Cell Energy (CP Chapter 9 / H Chapters 6-7)

1. What is photosynthesis? (What is the goal? Who/what can perform this process?) (CP197-198, 202-207 / H113)

The process by which plants capture energy from the sun to build carbohydrates

2. What is the formula for photosynthesis? (CP199 / H114)

   $6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$

3. What happens during the light stages of photosynthesis? (CP204-205 / H116-118)

   Convert light energy into chemical energy (ATP and NADPH)

4. What happens during the dark stages of photosynthesis? (CP206-207 / H120-121)

   Uses the ATP and NADPH from the light-dependent reactions to build glucose

5. What is cellular respiration? (What is the goal? Who/what can perform this process?) (CP208 / H131)

   Process by which mitochondria break down food molecules to produce ATP in plants and animals

6. What is the formula for cellular respiration? (CP208 / H132)

   $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$

7. What happens in each step of cellular respiration?

   - **Glycolysis: Breaks down glucose into two molecules of pyruvic acid** (CP208-209 / H132)
   - **Krebs Cycle (Citric Acid Cycle): Cycle in which Carbon Dioxide is released and the electron carriers NADH and FADH2 are produced** (CP210-211 / H138-139)
   - **Electron Transport Chain: Uses the electron carriers (NADH and FADH2) to pass electrons down the protein chain and slowly release energy that is used to form ATP and water molecules** (CP212 / H139)

8. What is fermentation and why would it occur? (CP212 / H133-140)

   When oxygen is not available anaerobic respiration, fermentation, can follow glycolysis in order to continue to produce energy.

9. What are the two types of fermentation and what organisms can perform them? (CP212 / H134-135)

   Lactic acid fermentation occurs in muscle cells during strenuous exercise when a lot of energy is required and oxygen is scarce (oxygen debt).

   Yeast and some bacteria cells are capable of alcoholic fermentation during which glucose is broken down to release CO_2 and ethyl alcohol.

10. What is ATP? (What is it made of? What does it do? How does it release and store energy?) (CP200 / H54)

    ATP stands for adenosine triphosphate

ATP is the molecule that supplies energy that can be used quickly and easily by cells

- **To supply cells with energy, the high energy ATP bond is broken. ADP is formed and energy is released. ATP → ADP + Phosphate + Energy**
- **Energy is used (and stored) by reattaching a phosphate group to ADP forming ATP to be used later. ADP + Phosphate + Energy → ATP**
- **Less energy is used to make ATP than is released when it is broken**

Unit 7 – Cell Cycle (CP Chapters 10, 13 / H Chapters 8, 10)

1. What are the phases of the Cell Cycle? (CP228-229 / H155)

   Interphase (G1, S, G2) and Cell division (mitosis and cytokinesis)
2. What happens in each stage of Interphase? (CP228-229 / H155)

   G1 – Gap 1 – cell is rapidly growing, performing normal duties

   S – Synthesis – a copy of each chromosome is made

   G2 – Gap 2 – cell is preparing for mitosis
3. What are the phases of Mitosis and what happens in each? (CP230-231 / H156-157)

   Prophase

   - **This is the first and longest phase in mitosis.**
   - **The nuclear envelope disappears**
   - **Chromatin coils to become visible chromosomes**
   - **The two halves of the doubled structure are called sister chromatids.**
   - **Sister chromatids are exact copies of each other and are held together by a centromere.**
   - **In animal cells, the centrioles move to opposite ends of the cell and start to form spindle fibers**

   Metaphase

   - **The second and shortest phase in mitosis**
   - **The spindle fibers attach to the centromere**
   - **The sister chromatids are then pulled to the middle of the cell and line up on the midline or equator**
   - **One sister chromatid from each pair points to one pole while the other points to the opposite pole**

   Anaphase

- **The centromeres split and the sister chromatids are pulled to opposite poles of the cell**

Telophase

- **Chromosomes uncoil**
- **Spindle is broken down**
- **Nuclear envelope reappears**
- **Cytokinesis begins**

4. What happens during cytokinesis and how is it different in plants and animals? (CP232 / H157-158)

   Cytoplasm is split forming two daughter cells each with its own nucleus and cytoplasmic organelles

   a. **In animals: a cleavage furrow is formed that pinches the two cells apart**
   b. **In plants: a cell plate forms between the two new cells to start the formation of the cell wall (this does not occur in animal cells!)**

5. How does a cell control the cell cycle? (CP234 / H158-159)

   The cycle control system is regulated at certain checkpoints

   At each checkpoint, the cell decides if it should go on with division

   a. **G1 – makes sure conditions are favorable and cell is big enough for division**
   b. **G2 – cell checks for any mistakes in the copies of DNA**
   c. **Mitosis – cell makes sure chromosomes and spindle are arranged properly**

   Specific stimuli are required to initiate cell division. Cell division in most animal cells is in the "off" position when no stimulus is present

6. What happens if a cell does not listen to the control signals and checkpoints? (CP235 / H159)

   Cancer cells are an example of cells that do not listen to the cells control system

7. How are DNA, genes, and chromosomes related to one another? (CP224-225 / Class Notes)

   DNA → genes → chromosomes

8. Describe the structure of DNA. (CP296 / H197)

   DNA is a polymer made up of a chain of nucleotides

   Each nucleotide has three parts:

   a. **simple sugar (deoxyribose)**
   b. **phosphate group**
   c. **Nitrogen base (adenine, guanine, thymine, or cytosine)**

9. Describe DNA Replication. (CP300-303 / H200)
    a. **DNA is un zipped and unwound by the enzyme helicase**
    b. **The enzyme Polymerase attaches and reads the DNA**
    c. **DNA nucleotides find their compliments on each side of the DNA strand**
    d. **New bases keep attaching until two identical molecules of DNA are completed.**
    e. **Mitosis would then follow where each daughter cell would be given matching copies of the original DNA**
10. Describe the structure of RNA. Name its three parts. (CP305 / H205)

    RNA (ribonucleic acid) has three parts:
    a. **Simple sugar (ribose)**
    b. **Phosphate group**
    c. **Nitrogen base (adenine, cytosine, guanine, and uracil)**
        i. **There is no thymine in RNA – it is replaced with uracil**
11. Describe the process of Transcription and the type of RNA involved. (CP304-307 / H206)
    - **Copying the portion of DNA that carries the code for a protein is called transcription.**
    - **A portion of DNA that codes for a specific protein is unwound**
    - **RNA nucleotides find their compliment**

      DNA - ATTGCTCCG

      RNA - UAACGAGGC
    - **The RNA strand (mRNA) releases from the DNA strand**
    - **mRNA strand is edited and released from the nucleus**
12. Describe the process of Translation and the types of RNA involved. (CP308-309 / H208-209)
    - **Amino acids are brought to the ribosome by tRNA**
    - **There are 20 different tRNA molecules, one for each type of amino acid**
    - **tRNA anticodons find their compliment codon on the mRNA**

      mRNA codons – UAA CGA GGC

      tRNA atnicodons – AUU GCU CCG
    - **Peptide bonds forms between the amino acids forming a polypeptide**
    - **Translation stops when a stop codon is reached**
13. How do the nitrogen bases differ between DNA and RNA? (CP305 / H205)

    DNA had Thymine and RNA has Uracil

End of Course Review KEY

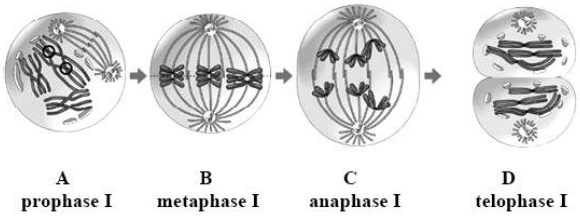
Review sheet

Biology I Name: _____

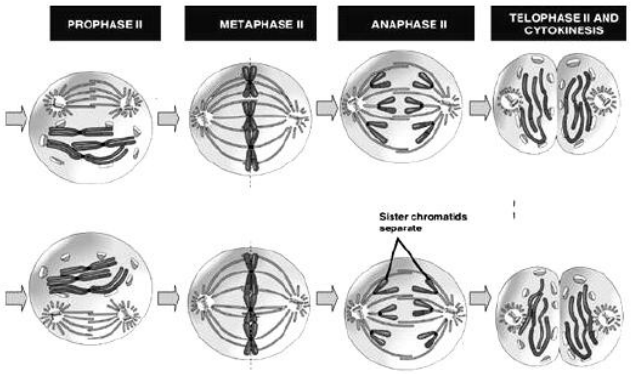
Unit 8 – Meiosis & Heredity (CP Chapter 11-12 / H Chapters 8, 10)

1. How many chromosomes do humans have? How many are autosomes? How many are sex chromosomes? (CP248-249 / H152-153)
   23 pairs of chromosomes: 22 pairs of autosomes, 1 set of sex chromosomes
2. How many chromosomes would a gamete have? (CP249, 257 / H153)
   23 total chromosomes (half the number of a somatic cell)
3. List and describe what happens in the steps of Meiosis. (CP250 / H161)

Meiosis I



Meiosis II



- **Interphase - DNA is replicated, Chromosomes are not yet visible, Proteins and RNA are synthesized, Cell is preparing for Meiosis**
- **Prophase I - Chromosomes become visible, Nuclear envelope disappears, Spindle forms, Homologous chromosomes pair up to form a tetrad, Crossing over occurs**
- **Metaphase I - Spindle fibers attach to centromeres, Homologous chromosome pairs line up along the equator of the cell**
- **Anaphase I - Homologous chromosomes separate and head to opposite ends of the cell**
- **Telophase I - Spindle is broken down, Chromosomes uncoil, Cytoplasm divides into two cells**
- **Prophase II - Chromosomes become visible, Spindle forms, If nuclear envelope reformed during Telophase I, it breaks down now**
- **Metaphase II - Sister chromatids line up along the equator of the cell in random order**
- **Anaphase II - The centromeres split and sister chromatids head to opposite poles of the cell**
- **Telophase II - Nuclei reform, Spindle breaks down, Chromosomes uncoil, Cytoplasm divides into four haploid cells**

4. What is crossing over and when does it occur? (CP253 / H162)

Homologous chromosomes (one pair of sister chromatids from the mother and one from the father) pair up to form a tetrad

The tetrad pairs up so tightly that crossing over occurs

Nonsister chromatids wind around each other and genetic material may be exchanged

5. What is the Law of Segregation? (CP273 / H177)

   If an organism has two different alleles for a trait, that organism can make two different types of gametes. Tt plant can produce T gametes and t gametes

6. What is the Law of Independent Assortment? (CP254 / H177-178)

   The inheritance of alleles for one trait is not affected by the inheritance of alleles for a different trait if the genes are on different chromosomes.

7. What is the difference between an organism's genotype and phenotype? (CP274 / H180)

   Genotype – what the genetic combination of the organism is

   Phenotype – what the physical traits of the organism are

8. Black fur (B) is dominant to white fur (b) in rabbits. For the following crosses, show a Punnett square and the possible genotypes and phenotypes for their offspring. (CP277 / H182-183)

   a. A heterozygous black rabbit with a white rabbit

   Genotype: 50%Bb 50% bb

   Phenotype: 50% Black 50% white

	B	**b**
B	**Bb**	**bb**
B	**Bb**	**bb**

9. Black fur (B) is dominant to white fur (b) in rabbits. Long ears (L) are dominant over short ears (l). For the following crosses, show a Punnett square and the possible genotypes and phenotypes for their offspring. (CP275 / H185-186)

   a. Two rabbits heterozygous for both fur color and ear length

   Genotype: 1BBLL: 2BBll; 1BBll: 2BbLL: 4BbLl; 2Bbll; 1bbLL; 2bbLl: 1bbll

   Phenotype:

   9 Black fur Long ears

   3 Black fur Short ears

   3 White fur Long ears

   1 White fur Short ears

	BL	**Bl**	**bL**	**bl**
BL	**BBLL**	**BBLl**	**BbLL**	**BbLl**
Bl	**BBLl**	**BBll**	**BbLl**	**Bbll**
bL	**BbLL**	**BbLl**	**bbLL**	**bbLl**
bl	**BbLl**	**Bbll**	**bbLl**	**bbll**

b. A homozygous black fur, long eared rabbit with a white, short eared rabbit

Genotype:

All BbLl

Phenotype:

All Black fur Long ears:

	BL	**BL**	**BL**	**BL**
bl	**BbLl**	**BbLl**	**BbLl**	**BbLl**
bl	**BbLl**	**BbLl**	**BbLl**	**BbLl**
bl	**BbLl**	**BbLl**	**BbLl**	**BbLl**
bl	**BbLl**	**BbLl**	**BbLl**	**BbLl**

10. Hemophilia is a sex-linked trait. The trait for hemophilia is reccesive (h) to the normal allele (H). For the following crosses, show a Punnett square and the possible genotypes and phenotypes for their offspring. (CP280 / H237)

a. A father with hemophilia crossed with a normal mother who is a carrier for the disease

Females: 50% Normal, 50% hemophilia

Males: 50% Normal, 50% hemophilia

	X^h	Y
X^H	X^HX^h	X^HY
X^h	X^hX^h	X^hY

b. A hemophiliac mother and a normal father

Females: 100% Normal

Males: 100% hemophilia

	X^H	Y
X^h	X^HX^h	X^hY
X^h	X^HX^h	X^hY

11. For the following crosses, show a Punnett square and the possible genotypes and phenotypes for their offspring. (Class Notes / H943)

a. A man with type O blood and a female with type AB

Phenotype: 50% Type A, 50% Type B

	i	**i**
I^A	I^Ai	I^Ai
I^B	I^Bi	I^Bi

b. A man with type B blood (whose mother is type O) and a woman with type AB

Phenotype:

25% Type A, 50% Type B, 25% Type AB

	I^B	**i**
I^A	$I^A\ I^B$	I^Ai
I^B	$I^B\ I^B$	I^Bi

12. What does it mean if traits show incomplete dominance? Codominance? (CP282-283 / H184, 244)
    Incomplete dominance is a condition in which one allele is not completely dominant over another. The phenotype expressed is somewhere between the two possible parent phenotypes. Codominance is where heterozygous alleles can be expressed equally.
13. How do you read a pedigree? What do the symbols mean? (CP280 / H241)
    A pedigree is a chart to show an inheritance pattern (trait, disease, disorder) within a family through multiple generations. Males are square and females are circle. Symbols that are filled in are affected/have the trait.
14. What is nondisjunction? What are some possible outcomes of nondisjunction? (CP324 / H239)
    Nondisjunctin is when homologous chromosomes do not separate properly during meiosis. This can lead to a gamete with an extra copy of a chromosome or no copy at all. Possible outcomes are monosomy (missing one chromosome) or trisomy (having an extra chromosome).

Unit 9 – Evolution & Classification (CP Chapter 16-19 / H Chapters 14-17)

1. What is biological evolution? (CP375 / H297)
   The change in inherited traits in a species over time
2. What is adaptation and how does it play a role in the survival of a species? (CP381 / H12, 300)
   The development of an ability that is helpful for survival
3. What is meant by the phrase "survival of the fittest"? (Class Notes / H301)
   Darwin's process of natural selection, the best adapted to their environment will be most successful
4. Biological Evolution concepts:
   a. Hardy-Weinberg Principle (CP405 / H320)
      Genetic Equilibrium - When there is no change in allele frequencies in a species
   b. Speciation (CP387, 411-414 / H326)
      The evolutionary process by which new biological species arise
   c. Patterns of evolution
      i. Gradualism (CP389 / H320)
         Gradual changes of a species in over long periods of time
      ii. Punctuated equilibrium (CP389 / H330)

Periods of abrupt changes in a species after long periods of little change within the species over time

iii. Divergent evolution (Class Notes / H309)

A number of different species diverge (split-off) from a common ancestor. When, over many generations, organisms evolve a variety of characteristics which allow them to survive in different niches.

iv. Convergent evolution (CP388 / H309)

Evolution among different groups of organisms living in similar environments produce species that are similar in appearance and behavior.

v. Coevolution (CP388 / H310)

When two or more species living in close proximity change in response to each other. The evolution of one species may affect the evolution of the other.

vi. Extinction (CP414 / H322, 442)

The elimination of a species often occurring when a species cannot adapt to a change in its environment.

d. Anatomy

i. Homologous structures (CP384 / H305)

Structures in different species with common evolutionary origin

ii. Vestigial structures (Class Notes / H306)

Structures that have no function in the organism but may have had a use in an ancestor

e. Embryology (CP383 / H306)

Study of embryonic development of organisms

f. Biochemistry – DNA similarities (CP384 / H306)

Study of the chemical processes of organisms

g. Paleontology – fossil records (CP382 / H302-303)

Study of prehistoric life

h. Phylogenetic Tree (CP428 / H307, 341)

The relationship of different organisms believed to have a common ancestor

i. Classification (CP1062-1063 / H347-350)

i. Three Domains - Bacteria, Archaea, and Eukarya

ii. Six kingdoms - Eubacteria, Archaebacteria, Protista, Fungi, Plantae, and Animalia