

Biology EOC Review

Name: _____

Period: _____

Goal 1: Learner will develop abilities necessary to do and understand scientific inquiry. 28-32%

1.01 Identify biological problems and questions that can be answered through scientific Investigations.

The Scientific Method:

1. List and describe the steps of the Scientific Method. Make sure you include **observations**, creating a testable **hypothesis**, identifying **variables**, **data**, having an **adequate sample**, & **replicating** your **findings**.
2. Why do many experiments make use of a **control group**? **Something to compare to**
3. What are the characteristics of a good experiment? **Many tests, all parts of an experiment present**
4. What is the difference between an **inference and a prediction**?
Inference = based on observations; Prediction = is a hypothesis
5. What are the differences between **hypothesis, theory and law**?
Hypothesis = educated guess; theory = based on experiments; law = proven the same over and over
6. What is the difference between an **independent and dependent** variable?
Independent variable = thing you test or change; Dependent variable = thing you measure
7. Interpret graphs. Which axis has the independent variable? Which axis has the dependent variable?
Independent variable = x axis; Dependent variable = y axis

Tools of a Biologist: Things to know about Microscopes

8. How do you **determine the magnification** of the field of view for a microscope?
Power of lens * Power of Objective = magnification
9. What happens to the **diameter** of the field of view when you change from low to high power?
Less to High magnification
10. How do you estimate the **size** of a cell or cell structure when using a microscope?
Consider magnification and original size
11. What do you adjust first on a microscope? What you then adjust when on the highest power?
1. Course Adjustment; 2. Fine adjustment

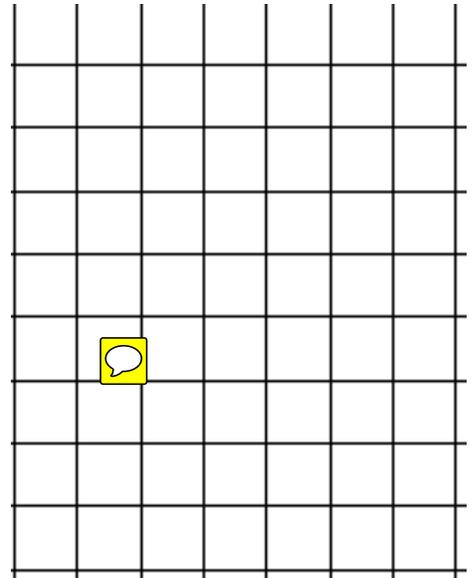
1.2 Design and conduct scientific investigations to answer biological questions.

12. You have measured the rate at which a fish breaths at various temperatures by counting the rate at which its gills open. The data is below. Graph this data.

Breathing rate Temperature

19/min 5 deg C, 25/min 10 deg C, 30/min 20 deg C, 34/min 30 deg C, 37/min 35 deg C

13. What is the **independent variable**? The **dependent variable**?
Independent = temperature; Dependent = breathing rate
14. What is the best type of graph for this data? Why?
Line = shows trends
15. What happens to breathing rate with increase in Temperature?
Increases
16. What would be a good control for this experiment?
Temperature stays the same and measure
17. How do you think the breathing rate was measured?
Breathes per minute
18. What do you think would happen if you raised the temperature even more?
Increase in breathing rate
19. Why would it be a bad idea to do this? **Could kill the fish**



1.3 Formulate and revise scientific explanations and models of biological phenomena using logic and evidence to: explain observations, make inferences and predictions, explain the relationship between evidence and explanation.

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An experiment was done that measured the Effects of Nitrates on the Growth of Algae. Growth of algae was determined by how well the water transmitted light. The less the light transmission than the greater the algae growth blocking the transmission of light.

20. Looking at the graph what conclusions can you draw about algae growth and nitrates in the water?

There is a variation of conclusions = inconclusive

21. What other data would you like to have?

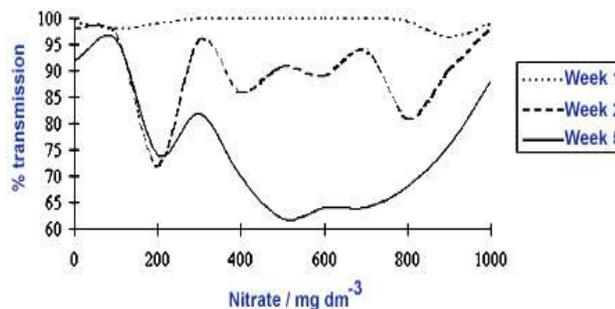
Population of bacteria w/ % transmission or nitrates

22. What would you predict would happen if this same data was gathered at the end of week 8?

Decrease in % transmission

23. Why do you think that nitrates have this effect on algae growth?

Algae is able to grow due to a need of nitrates biologically



1.4 Apply safety procedures in the laboratory and in field studies. (Recognize and avoid potential hazards, safely manipulate materials and equipment needed for scientific investigations.)

24. What kind of care must be taken when working with bacteria? Why must care be used when working with bacteria?

Cover body as to not ingest

25. What should you always wear when around chemicals in the lab (think eyeballs!) **Goggles**

26. How should broken glass be disposed of? (Aka, in what type of trash can?) **glass disposal box**

27. First thing if an accident happens in the lab, what should you do first? **TELL the teacher!**

1.5 Analyze reports of scientific investigations from an informed scientifically literate viewpoint including considerations of: appropriate sample, adequacy of experimental controls, replication of findings, and alternative interpretations of the data.

Read the following article and answer the questions. **SPINACH MAY CUT STOMACH ULCER RISK** - 5/15/2008

Vegetables rich in nitrates, such as spinach, may help to protect against stomach ulcers thanks to bacteria in the mouth, a Swedish study suggests. The work challenges earlier suggestions that a diet rich in nitrates could pose a health risk.

Joel Petersson was awarded his PhD by the University of Uppsala on May 9 for the study, which shows that rats fed on a nitrate-rich diet had a thicker layer of mucus lining their stomachs, protecting them from hydrochloric acid in gastric juice and cutting the risk of ulcers.

Petersson found that mouth bacteria play a vital part in the process. Nitrates in food are absorbed in the gut and enter the blood stream. From here they get into saliva but are reduced to nitrites by oral bacteria. After being swallowed, the nitrites are reduced to nitric oxide by stomach acid. Nitric oxide, an important signaling molecule, triggers an increase in the flow of blood to the stomach, helping to renew and thicken its mucus lining.

When Petersson gave rats an antibacterial mouthwash to kill the oral bacteria, he found they were more vulnerable to stomach ulcers. He suggests that people using these mouthwashes regularly may be at risk, especially if they are also frequent users of nonsteroidal pain killers like aspirin which can also damage the stomach lining. 'There are other much safer ways of blocking the production of the sulphur-containing compounds in the mouth if you have bad breath,' he said.

Between 60 and 80 per cent of the nitrates consumed in a normal Western diet come from vegetables, with beetroot, celery and spinach containing particularly high-levels of 1-3g per kilo.

Studies in the 1970s suggested a link between high nitrate levels in drinking water and both stomach cancer and the rare blood condition in babies, methaemoglobinaemia. 'We have since wasted millions in trying to reduce nitrate levels in drinking water when there is no real evidence to show that it is harmful to humans. If you do eat a lot of nitrate it is very easily dealt with - you just pee it out,' Petersson said.

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Nigel 'Ben' Benjamin, now a consultant in acute medicine at the Peninsula Medical School in Plymouth, UK, discovered a different protective mechanism for nitrates in the 1990s. He showed that the combination of nitric oxide and acid controlled the growth of dangerous bacteria like salmonella in the gut. 'The Swedish study has shown this further effect in animals and I would certainly expect the same mechanism to exist in the human stomach,' said Benjamin. 'This is exciting work and gives us further reasons for eating a diet that contains lots of fresh vegetables.'

John Bonner

QUESTIONS:

28. The experiment above was done on rats. Is there any reason to think that it might apply to humans?
Rats are similar both in DNA and metabolism
29. What else would you like to know about this topic before you start eating spinach every day?
Are there negative effects of eating spinach daily? Has this been tested on humans?
30. There is conflicting data from the 1970's. How do you decide what is the most scientifically accurate?
The most current would be most accurate due to improvement in technology

Famous Scientists you Should Know. Match the scientist with his or her accomplishment.

- | | |
|---|---|
| 31. Gregor Mendel B | A. I am one of the first to see the cell structure for cell division. |
| 32. Robert Hooke T | B. I found that by combining amino acids and electrical current I could create protocell |
| 33. James Watson & Francis Crick L | H. I disproved the idea of spontaneous generation by using covered and uncovered jars of rotting meat. |
| 34. Theodore Schwaan K | E. I invented the first simple light microscopes in the 1700s. |
| 35. Matthias Schleiden J | F. I am the father of genetics by from my work with pea plants. |
| 36. Charles Darwin M | T. I coined the term "cells" by looking at cork in the microscope. |
| 37. Anton van Leeuwenhoek E | P. I created the system of binomial nomenclature using Latin. |
| 38. Francesco Redi H | J. I was first to look at plant cells underneath the microscope. |
| 39. Louis Pasteur R | K. I was first to look at animal cells underneath the microscope. |
| 40. Alexander Oparin N | L. Together we determined the double helix shape of DNA. |
| 41. Stanley Miller & Harold Urey S | M. I developed the theory of natural selection and I am known as the father of evolution. |
| 42. Carolus Linnaeus P | N. I hypothesized that life originated in the early oceans. |
| 43. Jean Baptiste Lamarck Q | Q. I am the scientist who erroneously came up with the idea that traits are acquired from animals from their use or disuse. |
| 44. Rudolf Virchow A | R. I supported the idea of biogenesis by my curved flask experiment. My name is a process to keep milk fresh. |
| | S. We found that methane, ammonia, hydrogen gases from early earth charged with electricity can form amino acids. |

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Goal 2: Learner will develop an understanding of the physical, chemical and cellular basis of life.

Analyze the matter-energy relationships of living and non-living things:

1. What are the differences between **living and non-living things**: List the 8 characteristics of life:

<i>Made of Cells</i>	<i>Reproduce</i>	<i>Based upon a universal genetic code</i>	<i>Grow and develop</i>
<i>Obtain and use materials and energy</i>	<i>Respond to their environment</i>	<i>Maintain a stable internal environment</i>	<i>As a group, change over time</i>

2. What are the ways that living things get energy to live?
They have a way to break down materials called metabolism
3. What are some of the ways that living things use energy?
Photosynthesis, Cellular Respiration, Chemosynthesis
4. What are some ways that cells maintain **homeostasis**?
Sweating, Panting, Shivering, Cell Membrane
5. How do biological materials respond to **acids and bases**? What is a **buffer**?
Acids have pH less than 7; Bases have pH greater than 7. Buffers are solutions that prevent sharp changes in pH.

The chemistry of living things.

6. What element makes all things “organic?” **Carbon**

(Question 7) 2.01 Compare and contrast the structure and functions of the following organic molecules:

Macromolecules	Function	Subunits
Carbohydrates	<i>Short Term Energy</i>	<i>Glucose</i>
Proteins	<i>Makes up living tissues & organs, also used as enzymes.</i>	<i>Amino Acids</i>
Lipids	<i>Long Term Energy Storage, Protection, Insulation</i>	<i>Glycerol, 3 fatty acid chains</i>
Nucleic Acids	<i>Store Genetic Information</i>	<i>5-carbon sugar, Nitrogen base, Phosphate group.</i>

Specific Molecule	Function
Starch	<i>A macromolecule of sugar used for short term or quick energy.</i>
Cellulose	<i>A macromolecule of sugar used to make cell walls in plants.</i>
Insulin	<i>A protein used in the breakdown of sugar made by the pancreas. Without it, causes Diabetes.</i>
Glycogen	<i>Storage of excess sugar in the liver and used when glucose levels in the blood is low. (Secondary storage also called “Animal Starch.”)</i>
Glucose	<i>A molecule used to create Glycogen, sugars needed by the brain for life functions.</i>
Enzymes	<i>Proteins used to lower activation energy to cause chemical reactions to occur.</i>
Hemoglobin	<i>The protein used to bind to Oxygen to carry it in the red blood cells.</i>
Fats	<i>Long term energy storage, protection and insulation</i>
DNA	<i>Genetic code of Life used in replication & transcription.</i>
RNA	<i>Genetic code of Life used in transcription & translation.</i>

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8. Describe the following nutrient tests:

Nutrient	What is used to test for them?	Positive Test	Example of...?
Starch	<i>Iodine</i>	<i>When present, goes from brown to red.</i>	<i>Pasta</i>
Lipids	<i>Paper Bag Test</i>	<i>When present, causes a greasy stain.</i>	<i>Chips, Butter</i>
Monosaccharides	<i>Benedicts</i>	<i>When heated turns from blue to orange.</i>	<i>Milk, fruit</i>
Protein	<i>Biurets</i>	<i>When present turns blue to purple.</i>	<i>Meats, some legumes</i>

2.02 Investigate and describe the structure and function of cells including cell organelles, cell specialization, and communication among cells within an organism.

Cell theory and Organelles.

9. What does the term “membrane bound organelles mean?” What cell type are they found in? **“Tiny organs” with unique functions covered in a membrane. They are found in Eukaryotic cells only.**

10. What are the three parts of cell theory?

1. All living things are composed of cells. 2. Cells are the basic units of all living things. 3. New cells are produced from preexisting cells.

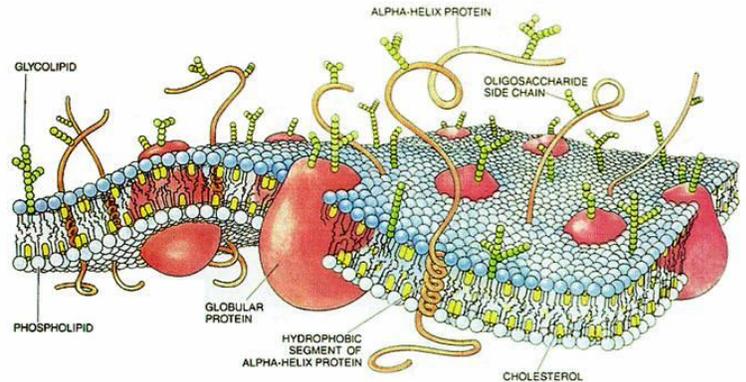
The diagram below shows many proteins and other molecules embedded in a cell membrane.

11. What is the function of the **cell membrane**?

Semi-permeable allowing some molecules in and some out of the cell.

12. What are some of the functions of these proteins and other molecules?

Proteins detect materials; channel proteins let certain substances to pass through. Cholesterol prevents the sticky phospholipid heads from sticking to one another. The hydrophilic areas attract water molecules and hydrophobic areas repel water.



13. Put the following steps for making a wet mount slide in order.

- | | |
|---|----------|
| A. Once the object is located, without moving the adjustment, change to medium power. | 1) _____ |
| B. Put the tissue on the slide. | 2) _____ |
| C. Switch to high power and bring the object into clear focus again. | 3) _____ |
| D. Add a coverslip. | 4) _____ |
| E. Place the slide on the stage of the microscope. | 5) _____ |
| F. Add a drop of water. | 6) _____ |
| G. Try to locate the object using low power and coarse adjustment. | 7) _____ |
| H. Use fine adjustment to bring the object into clear focus. | 8) _____ |

Order: B, F, D, E, G, A, C, H

14. Why must you use stain to look at certain items under the microscope?

Because certain substances/organisms are clear and need stain in order to be visible

15. Draw how the letter “e” would look as view through a microscope?

Upside down and backwards

16. Put the following in order from smallest to largest:

Cells → Tissues → Organs → Organ systems

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17. What structures produce hormones? What is the function of hormones?

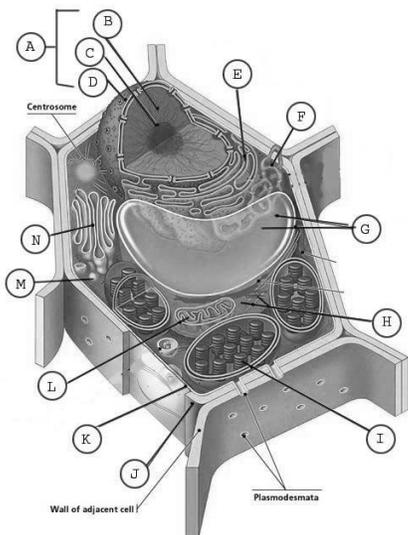
Slow acting chemical messengers released by the endocrine system. These chemical substances control growth, development and responses to the environment.

18. How do hormones travel throughout a body?

Since many hormones are lipids, they pass through cell membranes.

19. Fill in this chart. Also give the letter or number of the part as seen in the diagrams below. (Page 176-183)

Cell Part and Letter	Structure Description	Function	Letter/Number
Nucleus	Located near the center of the cell, it is large and surrounded by the ER.	Contains DNA or the molecule of heredity in the cell.	A / 6
Plasma Membrane	Surrounds the cell in animal cells, inner membrane of a plant cell.	Allows only certain molecules to pass through, the bouncer.	K / 4
Cell wall	Not found in animal cells, it surrounds the outside of plant cells.	Acts as a barrier to keep water in plant cells.	J / Not found
Mitochondria	Looks like a pea with wavy lines inside of it.	Acts as the energy production area of the cell. "Powerhouse."	L / 1
Vacuoles	A very large and empty area in a plant cell, are smaller in animal cells.	Used as storage for the cell for food, water, etc.	G / 3
Chloroplasts	Not found in Animal cells, they are circles with small stacks within them.	Used in the process of making energy (photosynthesis) for plants.	I / Not found
Ribosomes	Found as small dots located on the ER or in the cytoplasm.	Sites of proteins synthesis, they read RNA to assemble proteins.	E / 13



20. Which cell is the plant cell (left or right)? **The left cell**

21. Which structures are found **only** in the plant cell?

Cell wall, chloroplasts

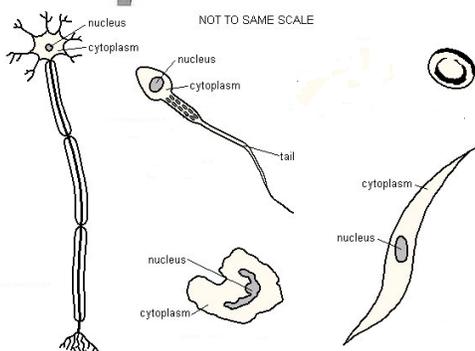
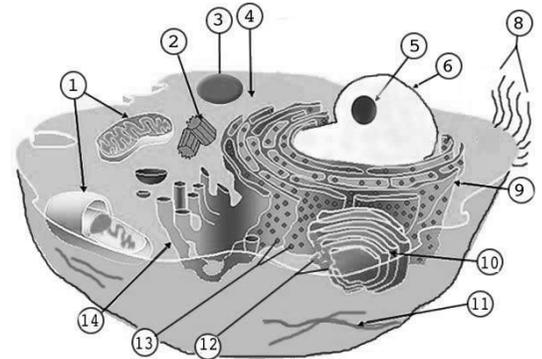
22. Which structures are found **only** in the animal cell?

Centrioles (used in cell division)

Below are a variety of cells from the human body.

23. Label these cells. (red blood cell, sperm cell, white blood cell, muscle cell, nerve cell)

Red blood = top right; sperm = center top; white blood cell = center bottom; muscle cell = right bottom; nerve cell = left



Human Body Cells

24. Which cell is adapted for movement? What structure makes this movement possible? **Sperm, Flagella**

25. What organelle is very plentiful in these cells in order to provide the energy for movement? **Muscle cells, Mitochondria**

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26. Which cell has no nucleus? What is the function of this cell?

Red blood cell, carries oxygen in the blood

27. Which cell is involved in the immune system?

White blood cell, center bottom

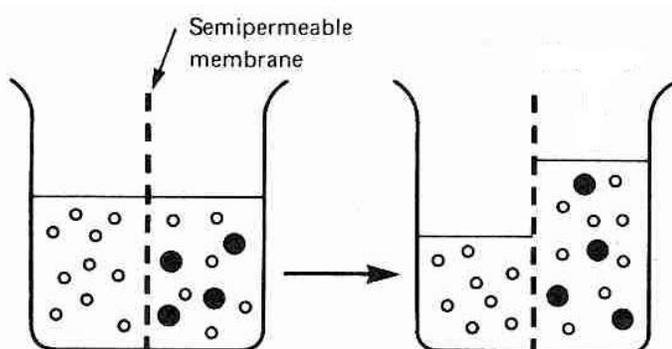
28. Which cell helps in movement of bones? What happens in these cells to make that movement possible?

Muscle cells, mitochondria

29. Which cell is adapted for transmitting messages? How do the messages get from one cell to the next?

Nerve cell, stretched out shape and neurotransmitters. Shape relates to function.

2.03 Investigate and analyze the cell as a living system including: maintenance of homeostasis, movement of materials into and out of cells, and energy use and release in biochemical reactions.



Explain what has happened in the diagram to the left.

30. Why did the large dark molecules NOT move to the left?

They are too large to pass through the semi-permeable membrane.

31. How is the semi-permeable membrane like a cell membrane?

Allows some substances through while keeps others out.

32. If the dark molecule is starch, where is the starch concentration greatest (left or right)?

Neither, Equal

33. If the white molecule is water, where is the water concentration greatest at first?

It is highest on the left

34. In osmosis, water moves from an area of _____ concentration of substrate to an area of _____ concentration of substrate. (higher/lower)

lower/higher

35. If the dark molecules could move, in what direction would they move? Why?

To the left, it is lower there.

36. In diffusion, molecules move from an area of _____ to an area of _____ concentration. (higher/lower)

higher/lower

37. Which way **water** will move in each of the following situations:

a. Salt inside the cell 65% and outside the cell 40%. **Water will move inside the cell**

b. Sugar inside the cell 27% and outside 80%. **Water will move outside the cell**

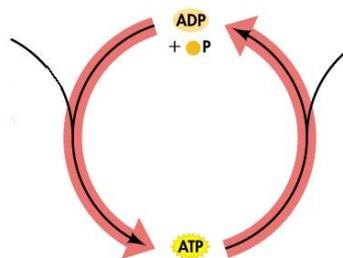
38. What is **homeostasis**? **Maintaining a balance of chemicals, fluid, etc inside of a living organism.**

39. How do cells maintain homeostasis? Consider *pH, temperature, blood glucose, water balance*

They use the cell membrane (cell wall in plants) as well as stimulus/response, buffers, hormones, cell organelles, and internal feedback loops.

40. Comparison of active and passive transport

	PASSIVE TRANSPORT	ACTIVE TRANSPORT
Requires energy?	NO	YES
Low to high concentration or high to low concentration?	High to Low	Low to High
Examples	Osmosis	Muscle pumps



Energy use and release in biochemical reactions.

41. Use the following diagram to show where energy is released and where energy is used. Also use arrows on the lines attached to the circles to indicate the direction of the energy.

42. How many phosphates? ATP? **3** ADP? **2** AMP? **1**

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43. What cellular process produces ATP?

ATP synthesis in mitochondria

44. What is ATP energy used for? Give examples.

Making proteins replicating DNA, cell responses, pumps working, muscle contraction

2.05 Investigate and analyze the bioenergetic reactions: aerobic respiration, anaerobic respiration, and photosynthesis.

45. What are the reactants and products for each of these? (Chapter 9)

Process	Reactant	Product	Example?
Photosynthesis	Water, Sunlight, Carbon Dioxide (CO₂)	Sugar & Oxygen (O₂)	Plants/Autotrophs/Producers
Cellular Respiration (Aerobic)	Sugar & Oxygen (O₂)	Water, Carbon Dioxide (CO₂), 36 ATP	Humans/Heterotrophs/Consumers
Cellular Respiration (Anaerobic)	Sugar	Carbon Dioxide (CO₂), 2ATP	Tired Muscles, yeast

46. Which reaction makes the most ATP? **Aerobic Respiration** What gas is the final electron acceptor? **Oxygen**

47. How do factors such as pH, temperature, light and food availability affect these reactions?

Extremes may decrease the effectiveness of this reaction

48. Label the following molecules in these equations (*water, glucose, oxygen, carbon dioxide, ethyl alcohol*)

(water (H₂O), glucose (C₆H₁₂O₆) oxygen (O₂), carbon dioxide (CO₂), ethyl alcohol (C₂H₅OH))



49. Which of the above reactions is photosynthesis? (*A, B or C?*) **A**

50. Which of the above reactions is fermentation (anaerobic cellular respiration)? (*A, B or C?*) **C**

51. Which of the above reactions is cellular respiration (aerobic)? (*A, B or C?*) **B**

52. Which reaction(s) requires or stores energy? **All require some form of energy, A stores it.**

53. Which reaction(s) release energy (ATP)? **All release some form of energy, mostly B and C**

54. Which reaction releases the most energy? **B because it uses oxygen**

55. Which reaction requires chlorophyll? **A, chlorophyll traps light energy for photosynthesis**

56. Which reaction requires light? **A, light is required for light dependent reaction for photosynthesis**

57. Which organisms carry out process A?

Plants, Autotrophs, and other producers (algae)

58. Which organisms carry out process B?

Most animals, heterotrophs, and consumers

59. Which organisms carry out process C?

Yeast and other anaerobic organisms

60. Which process uses chloroplasts in eukaryotes? **Process A only (Plant Cells)**

61. Which process uses mitochondria in eukaryotes? **Processes A and B (Plant and Animal Cells)**

62. Compare and contrast: **Alcoholic Fermentation and Lactic Acid Fermentation.** (# ATP, where it occurs)

Alcoholic Fermentation occurs in yeast and releases alcohol as a byproduct whereas lactic acid fermentation occurs in tired muscle cells deprived of oxygen resources. Both produce only 2 ATP.

2.4 Investigate & describe the structure & function of enzymes & explain their importance in biological systems.

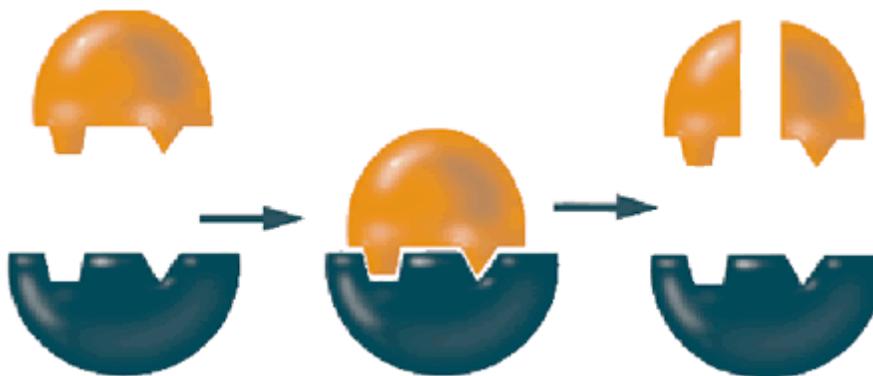
63. What is the function of enzymes in cells? (Or, what is a **catalyst**?)

Enzymes speed up chemical reactions in cells

64. Explain the importance of shape to enzyme function. "Work like **locks** and **keys**."

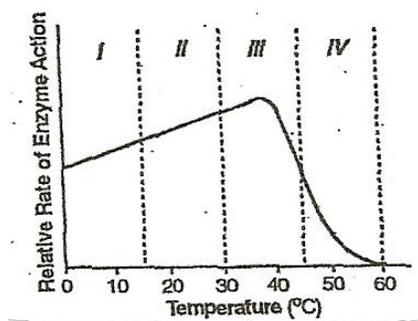
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65. Explain what determines the shape of an enzyme. It depends on the sequence of **amino acids**.
66. Explain why enzymes are specific. (That is, one enzyme per type of reaction.)
Since they work like locks and keys only one enzyme can catalyze one type of substrate.
67. Explain why enzymes can be reused over and over again.
Since enzymes are never used by the reaction, they go out and search for the same type of substrate to catalyze again.
68. How do extreme pH and temperature extremes affect enzymes? (What is **denature**?)
Extreme temperature and/or pH can cause enzymes to denature and no longer function. Denature means that an enzyme literally falls apart (breaks down their bonds) and they cannot be put back together again unless made anew by a ribosome and a piece of mRNA specific for that particular enzyme.
69. Label the picture of the following enzymatic reaction: *Substrate, Product(s), Enzyme-substrate complex, Enzyme*



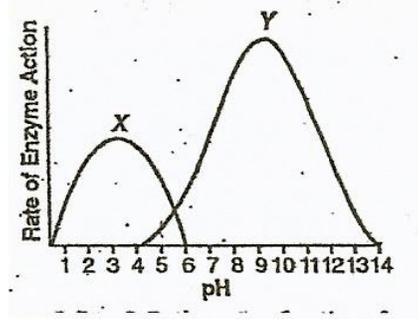
Substrate is far left top, Products far right top, enzyme substrate complex is center, enzyme (blue) is same below.

70. All (save for a few) enzymes end in what suffix? **-ase** What are some examples of enzymes? **Lactase, Helicase**



71. At what temperature is the best for this enzyme to work? **40 C**
 How can you tell? **It is where the graph peaks for enzyme reaction (III)**

72. At which numeral (I, II, III, or IV) does this particular start to denature? **IV**
 How can you tell? **The enzyme begins to denature at the end of III where the graph falls and finally drops off (fully denatures) at IV.**



73. Which enzyme (X or Y) would be used in acidic conditions? **X**
 How can you tell? **Because the enzyme works best at pH below 7. Y has no peaks whatsoever in the 0-6 range. It works best in basic conditions.**

74. What pH is the best for activity for X? **3-4** Y? **8-11**
 How can you tell? **It is where the graph peaks for their activity**

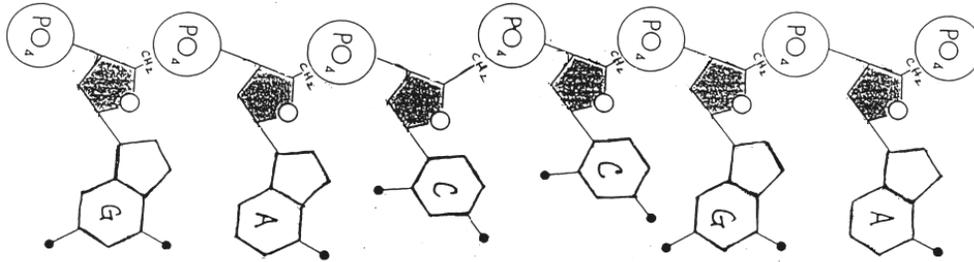
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Goal 3: Learner will develop an understanding of the continuity of life and the changes of organisms over time. 30-35%

3.01: Analyze the molecular basis of heredity including: DNA replication, Protein Synthesis (transcription and translation), and gene regulation.

1. Below is a strand of DNA. DNA in the cells exists as a double helix – what needs to be added to it to make it a double helix? Give the complementary nucleotide sequence. **CTGGCT**

2. Describe the structure of DNA. What are the black pentagons? **Deoxyribose sugars** What are the nitrogen bases? **ATGC** What weak bonds hold the complementary bases together? **Hydrogen bonds**



3. If the strand of DNA above undergoes transcription, what will the sequence of the mRNA be? **CUGGCU**

4. After translation, what would the amino acid sequence be for this section of mRNA? (read from right to left)

Leu - Ala

5. What is a **codon**? **A 3 letter triplet code used by DNA, read by ribosomes to attach tRNA and amino acids to a growing protein chain.**

		2nd base in codon				
		U	C	A	G	
1st base in codon	U	Phe Phe Leu Leu	Ser Ser Ser Ser	Tyr Tyr STOP STOP	Cys Cys STOP Trp	U C A G
	C	Leu Leu Leu Leu	Pro Pro Pro Pro	His His Gln Gln	Arg Arg Arg Arg	U C A G
	A	Ile Ile Ile Met	Thr Thr Thr Thr	Asn Asn Lys Lys	Ser Ser Arg Arg	U C A G
	G	Val Val Val Val	Ala Ala Ala Ala	Asp Asp Glu Glu	Gly Gly Gly Gly	U C A G
						3rd base in codon

6. Compare RNA and DNA in the following table.

	RNA	DNA
Sugars	Ribose	Deoxyribose
Bases	AUGC	ATGC
Strands	1 strand	2 strands
Where In Cell	Inside and Outside of the nucleus	Inside the nucleus only
Function	Sends a gene message to be translated.	Storage center for all genetic material.

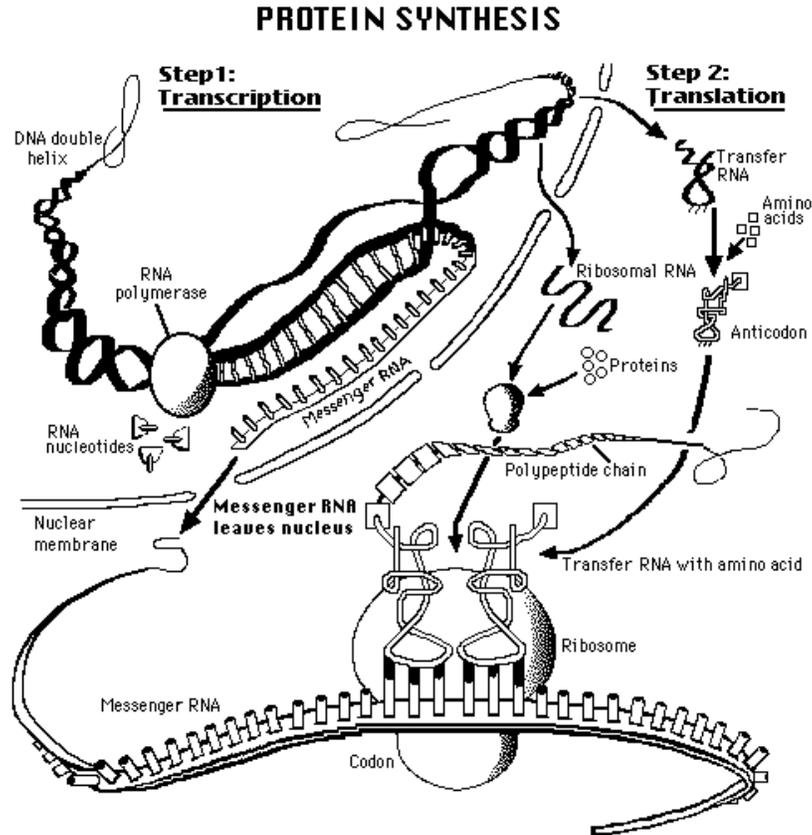
7. What kind of bond holds the amino acids together in the protein that is formed? **Peptide bonds**

8. What are the three types of RNA and what are their functions?

- 1) **mRNA – The message sent from the DNA to code for a particular protein.**
- 2) **tRNA – the transfer molecules that carry specific amino acids to be attached by ribosomes.**
- 3) **rRNA – the chemical makeup of ribosomes.**

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9. What kind of weak bonds hold the two strands of DNA together? **Hydrogen Bonds**
10. Why is it important that these bonds be weak? **They need to be weak in order for DNA to make a copy (replication) of itself when a cell divides (mitosis)**
11. Describe the process of DNA replication. What enzyme breaks apart the hydrogen bonds between bases? **DNA Helicase breaks down the (hydrogen bonds) strands apart and polymerase adds bases to the growing strand.**
How many pieces of DNA are made? **2** What does **semi-conservative** mean? **Half old strand; half new strand**



12. Describe the process of protein synthesis: What is **transcription**? **The process by which DNA makes a copy of particular gene to be transcribed into mRNA and sent out to the cytoplasm to be read by the ribosomes.**

13. What is **translation**? **The process by which mRNA is read by a ribosome which matches mRNA codons to corresponding anticodons on tRNA (and their amino acids) to create an amino acid chain that will become a future protein.**

14. What happens to DNA when a **mutation** occurs? **A particular base on a codon will not be correct, such as ACG will be ACT.**

15. How does this affect the mRNA? **When the mRNA is transcribed it will carry that mutation, Such as ACT will be UGA instead of UGC.**

16. How can this affect translation? **Depending that the mutation does not cause the wrong amino acid to be paired, it may cause no problem at all. If it does cause the**

wrong amino acid pair then the protein can suffer from partial function to no function at all.

17. How does this affect the structure and shape of the resulting protein? **The wrong amino acid sequence affects the shape and structure and hence the function of the protein.**

Cell Cycle

Look at the diagram of the cell cycle. (Page 248)

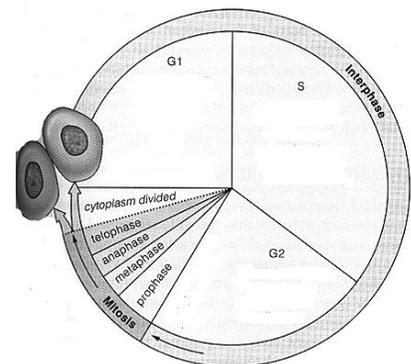
18. When does the **replication** of DNA occur? What is this phase called?

Interphase

19. What do **G1** and **G2** represent? **Interphase**

20. What stage does the cell spend most of its life in? **Interphase**
What does the cell do during this time? **Growth and Development**

21. Does mitosis include **cytokinesis** (division of the cytoplasm)? **Cytokinesis occurs after Telophase in Mitosis**



Biology EOC Review

Gene Expression and Regulation

22. What is **cancer**? What are some causes of cancer?

Cancer is caused by uncontrolled cell reproduction (mitosis) in which those cells reroute blood flow and create tumors which can spread and kill the organism. Cancer is caused by carcinogens that promote this type of behavior (smoking, bad diet, inactivity, radioactivity, etc)

3.02 Compare and contrast the characteristics of asexual and sexual reproduction.

23-24. Complete the following Chart of Mitosis and Meiosis.

	MITOSIS	MEIOSIS
Type of reproduction (Asexual or sexual)	Asexual	Sexual
Chromosome number of mother cell (1N=haploid or 2N=diploid)	2N	2N
Chromosome number of daughter cells (1N=haploid or 2N=diploid)	2N	1N
Number of cell divisions	1 cell division	2 cell divisions (I and II)
Number of cells produced	2 daughter cells	4 daughter cells
When does replication happen?	In all body (somatic) cells	Only in sex cells (Eggs and Sperm)
SOURCES OF VARIATION		
Crossing over	Never	During Prophase I
Random assortment of chromosomes	Never	YES
Gene mutations	YES	YES
Nondisjunction	YES can occur anytime	YES can occur anytime
Fertilization	NO	YES



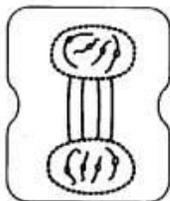
A



B



C



D



E

25. Put the following stages of mitosis (cell division) in order. Then Name them.

- 1st: **B** called **Prophase**
- 2nd: **E** called **Metaphase**
- 3rd: **A** called **Anaphase**
- 4th: **D** called **Telophase**
- 5th: **C** called **Cytokinesis**

26. How many chromosomes do humans have in their... Body cells? **46** Sex cells? **23**

27. What does **Diploid** mean? **Means that a cell has 2 homologous chromosomes**

28. What does **Haploid** mean? **Means that a cell has only 1 homologous chromosome**

29. When does crossing over occur during Meiosis? **Prophase I**

30. What is the major focus of Meiosis I? **Genetic diversity**

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31. What is the major focus of Meiosis II? **To reduce the chromosome number by half to create sex cells (eggs & sperm)**

3.03 Interpret and predict patterns of inheritance: (dominant, recessive and intermediate traits, multiple alleles, polygenic traits, sex-linked traits, independent assortment, test cross, pedigrees, and Punnett squares)

32. What does it mean when a trait is **dominant**? **It is always expressed in the organism** Letters? **T**

33. What does it mean when a trait is **recessive**? **Expressed in an organism when pair with another recessive gene** Letters? **t**

	T	t
T	TT	Tt
t	Tt	tt

34. In the Punnett square to the left, $T = tall$ and $t = short$. Give the parents genotypes.

Tt and Tt

35. Give the phenotype for the parents.

Tall and Tall.

36. What are the genotypes and phenotypes of the offspring?

TT, Tt, tt Tall and short

37. What is the genotypic ratio of the offspring?

$\frac{1}{4} TT, \frac{1}{2} Tt, \frac{1}{4} tt$

38. What is the phenotypic ratio of the offspring?

$\frac{3}{4} Tall$ and $\frac{1}{4} short$

39. What environmental factors might affect the expression of these genes for height? Explain.

Mutagens, nutrition, environment because they play a role in how genes are expressed in the offspring.

40. What does it mean if a trait is **codominant**? **Both alleles are expressed in the phenotype (physical look)**

41. Some genes experience incomplete dominance. Cross a pure breeding red flower (RR) with a pure breeding white flower (WW). Give the genotypes and phenotypes of the offspring.

Genotype: 100% RW Phenotype: 100% Pink Flowers

What type of inheritance is this? **Incomplete dominance**

42. Explain the inheritance of the following disorders:

(Autosomal dominant? Autosomal recessive? Sex-linked dominant? Sex-linked recessive?)

Sickle cell anemia: **Autosomal recessive** Cystic fibrosis: **Autosomal Recessive**

Huntington Disease: **Autosomal Dominant**

Blood type

43. If a woman with type A blood has a child with a man with type B blood and their first child has type O blood, give the genotypes of the woman and the man and do the cross. (Alleles are I^A , I^B , and i)

44. What are the odds that they will have a child with type O blood again? **$\frac{1}{4}$ or 25%**

45. What are the odds that they will have a child with homozygous type A blood? **0%**

46. What are the odds that they will have a child with type AB blood? **$\frac{1}{4}$ or 25%**

47. A blood test is done to see if one of three men is the father of a child. The child has type O blood, the mother has type A blood. Man #1 has type AB blood, Man #2 has type A blood, Man #3 has type O blood. Are there any men that can be ruled out as the father? Explain. **Man #1, because he can donate either an A or B allele, neither giving O type blood.**

48. What does it mean to have **multiple alleles**? **There are more than 2 types of alleles for a particular genotype.**

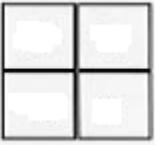
Biology EOC Review

Polygenic traits

49. What does polygenic traits mean? **Many genes (genotypes) control one particular phenotypic trait**
50. Using 3 genes (A,a and B,b and C,c) explain hair color in terms of these genes. How many phenotypes are possible?
Hair color can vary from ABC to abc, where most individuals will be towards the average.
So you will see a bell curve of possibilities, distributed over 64.

Sex Chromosomes

51. What are the sex chromosomes in males? **XY** In Females? **XX**
52. **Colorblindness & hemophilia** are sex-linked traits. What chromosome location (#) are these genes found? **#23**
53. Cross a female who is a carrier for hemophilia with a normal male. **$X^C X^c \times X^C Y$**



54. What are the odds that they will have a child with hemophilia? **1/4 or 25% (male only)**
55. What are the odds that they will have a daughter with hemophilia? **0% or none**
56. What are the odds that they will have a daughter who is a carrier for hemophilia? **1/4 or 25% chance of having a child who is a carrier and a 50% or 1/2 chance of having a daughter who is a carrier.**
57. Why are males more likely to show this type of disorder? (Who (mother/father) is likely to give them the bad gene?)
It is their mother who donates X's which carry the disease. The father donates Y's to sons which do not carry disease.

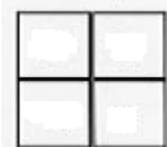


Karyotype

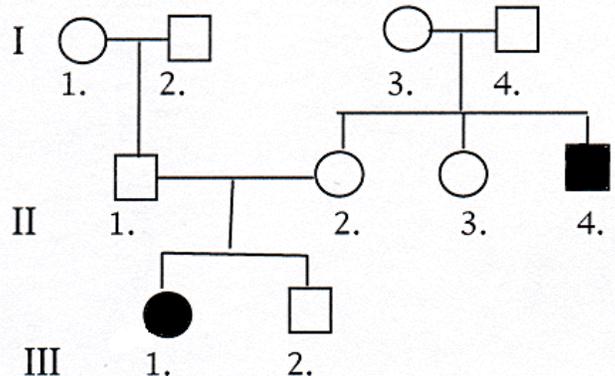
58. What is the gender of the person whose karyotype is shown to the left? **Female, because of the 2 Xs**
59. What is the disorder that this person has?
Trisomy 21 or Down Syndrome
60. What is your evidence?
There are 3 chromosomes at location #21
61. What are some of the characteristics of this type of disorder? **Mental retardation, facial abnormalities**

Pedigrees

62. What is the inheritance pattern shown by this pedigree?
Autosomal recessive
63. How do you know?
Males and females equally affected (autosomal) and it skips generations (recessive)



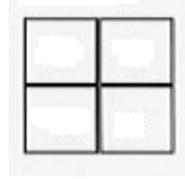
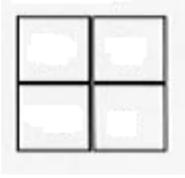
64. Using A,a, what is the genotype of person II4?
aa
65. What is the genotype of person I3?
Aa



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Test Cross

66. Describe the **test cross** that a farmer would use to determine the genotype of an animal that shows a dominant trait. Use the following Punnett squares and the letters *A* and *a* to explain your answer.



In a test cross, we already know the genotype of the recessive parent (aa) based upon the recessive phenotype. If there are any recessive phenotype offspring, then the unknown parent must be heterozygous!

Mendel's Laws

67. Explain each of Mendel's Laws and explain the experiments he used to determine these laws.

1) **Law of segregation of characters** (alleles)

In most sexually reproducing organisms each adult has two copies of each gene, one from each parent. These genes are segregated from each other when gametes are formed.

2) **Law of independent assortment** (of alleles)

Genes that segregate independently from each other and do not influence each other's inheritance.

68. How does meiosis lead to segregation and independent assortment?

Meiosis allows whole chromosomes to segregate independently of each other, lending authenticity to Mendel's laws.

69. Double check your learning, solve the following genetics problem:

A brown mink crossed with a silverblue mink produced all brown offspring. When these F₁ mink were crossed among themselves they produced 47 brown animals and 15 silverblue animals (F₂ generation). Determine all the genotypes and phenotypes, and their relative ratios, in the F₁ and F₂ generations.

F1

Genotypes: 100% Bb

Phenotypes: 100% Brown Mink

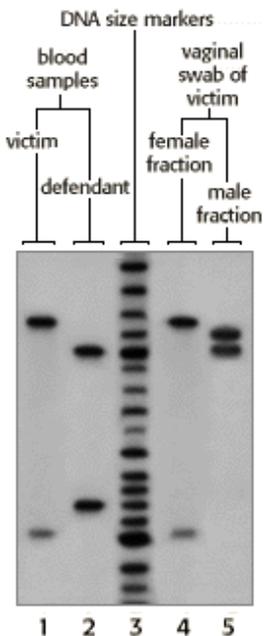
F2

Genotypes: 1/4 BB, 1/2 Bb, 1/4 bb

Phenotypes: 3/4 Brown Mink, 1/4 Silver blue mink

3.04 Assess the impacts of genomics on individuals and society (Human genome project and applications of biotechnology)

70. What were the goals of the **human genome project**? **Begun in 1990, it was a collaborate effort among scientists to sequence the human genome.**



71. How will the human genome project be useful in finding whether individuals may carry genes for genetic conditions? **This could help identify genetic disorders in couples or devise methods of gene therapy.**

72. How will the human genome project be useful in developing **gene therapies**?

In gene therapy, the absent or faulty gene is replaced by a normal, working gene.

To the left is an electrophoresis gel, showing evidence from a rape case.

73. Could the defendant be the rapist? (Y/N) **NO** Explain your answer.

The Bands do not match to the defendant.

74. Which fragments of DNA are the longest? Explain.

The longest bands are the largest base pairs digested by the restriction enzymes. They are bigger so they move more slowly across the gel. Hence, they are found towards the bottom of the gel.

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75. What other ways can **DNA fingerprinting** be useful?

DNA fingerprinting can be used to determine disease, other crimes, or in paternity cases.

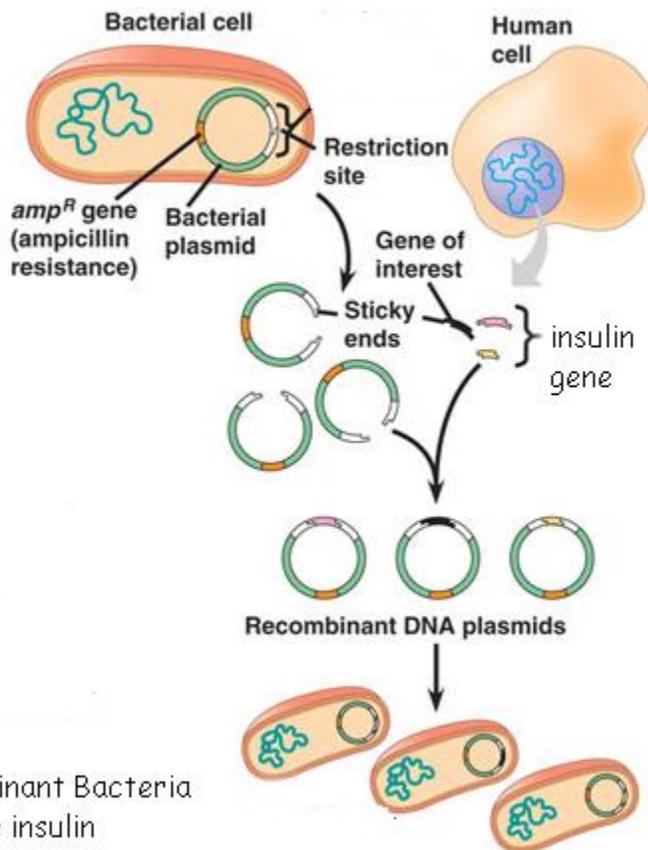
76. What is a **restriction enzyme**?

This is an enzyme used in DNA fingerprinting that cuts DNA at certain places along the DNA strand. These fragments can be measured as a function of their slow or fast movement across an electrophoretic gel.

77. Since DNA has a (+/-) charge, which way will it go in a gel? **Towards the positive end** Which type of fragments move the fastest? (Big/Small) **Smallest** Which move the slowest? (Big/Small) **Biggest**

78. How can **amniocentesis** be used to screen for genetic disorders? **This is a process in which a needle is used to extract the amniotic fluid surrounding a developing fetus in the mother's womb. It can be tested using a karyotype for a chromosomal disorder.**

Transgenic organisms & Transformation



79. Describe the process that is shown in the diagram to the left. **A bacterium has had a human gene for insulin inserted into its genome. The bacterium will use its normal processes of transcription and translation to produce the human protein of insulin.**

80. What is the value of this technology?

Scientists can harvest the insulin protein from the bacteria to use in human patients who need human insulin like diabetes patients.

81. What are some other applications of this type of technology?

Bacteria will make any type of protein inserted into their genome, so scientists can make any type of protein that is needed. (Hemoglobin, etc)

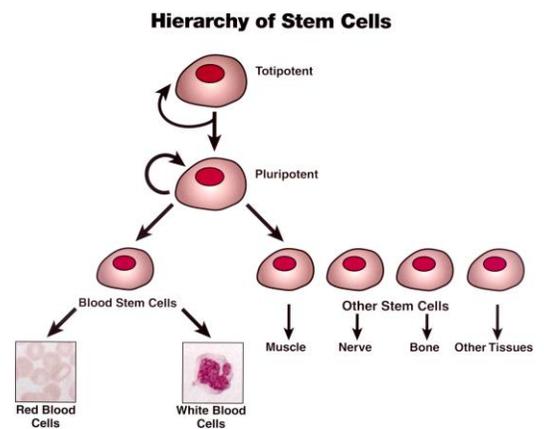
82. This process can be used to make GMO's – **genetically modified organisms**. What are some of the ethical issues surrounding this technology?

We do not know the long term effects of using this type of technology. Long term studies are not yet available.

Stem Cells

83. The diagram to the right shows how stem cells can develop into many types of different cells. What are some of the potential benefits that could come from the growing of stem cells in a laboratory?

Scientists can grow into any new cell type that has been damaged or mutated in certain individuals. People may regain brain or neural function in cells that no longer reproduce at maturity which would help in spinal cord injuries or Alzheimer's patients.



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84. What are some of the ethical issues surrounding the collection and use of stem cells?

Some stems cells are harvested from discarded or aborted embryos. But now, some stem cells can be taken from teeth or other sources.

3.05 Examine the development of the theory of evolution by natural selection including: development of the theory, the origin and history of life, fossil and biochemical evidence, mechanisms of evolution, and applications (pesticide and antibiotic resistance).

85. In the following chart, describe the role of each of the following in developing the current theory of evolution.

	Discussion of importance to evolutionary theory
Anatomical comparisons	Animals that share common characteristics in bone structure may have had some form of common ancestry.
Patterns in fossil evidence	Ancient organisms adapted and responded to their environment by inheritable characteristics depending on the type of environment.
Ideas about inheritance Of acquired characteristics	Belief that animals inherited characteristics based upon their use and disuse of traits which is not true, but raised the issue of how they were they passed on?
Biochemical comparisons (DNA and proteins)	By directly comparing DNA and proteins, scientists can determine when animals diverged from one another as well as compare their evolutionary relationships.
The role of sexual reproduction	Animals that sexually reproduced had more success (fitness) in a changing environment. Why was this?
The role of geographic isolation	When animals are separated geographically, major adaptations occurred. Why?
The importance of the environment	A constant theme in whether or not animals survived or went extinct was their natural environment. How did this shape how animals survived then and today?

86. What is a **vestigial structure**? Name a few in humans. **A structure that is no longer useful to an organism, but may have been used by ancestors. Vestigial structures in humans include the coccyx (tail bone), ear muscles, appendix, and goose bumps from getting scared.**

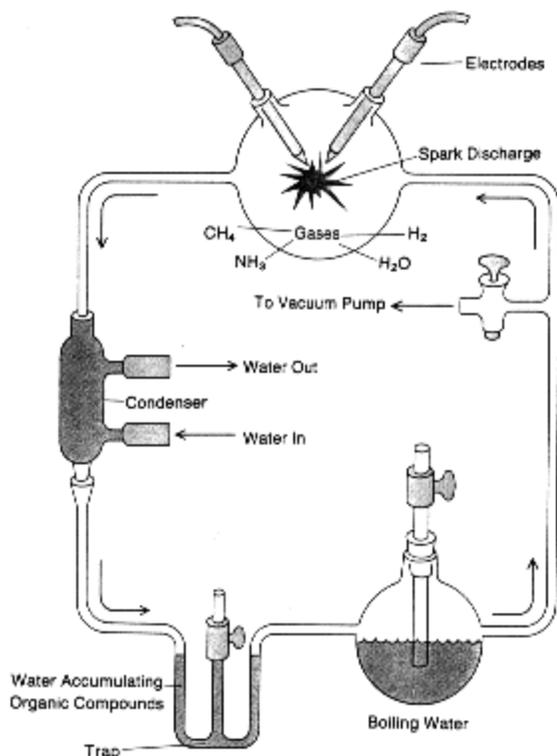
87. What are some of the ideas on the origins of life? (a.k.a. where and when did it form?) **Life likely formed in the Earth's oceans where it was constant and safe from the toxic, oxygen deprived atmosphere and harsh land conditions. As cyanobacteria produced oxygen and the climate changed that the oceans dried up (not totally!), animals and plants began to move the land environment and develop complexity from simple carbon molecules to amino acids, protocells and cells.**

88. Discuss the steps in Darwin's theory of evolution by natural selection.

- 1) Populations of organisms have many genetic variations. Where do these come from? **Inherited genes seen fit by those best suited to the environment who could find food and a mate to pass those on to their offspring.**
- 2) Organisms could reproduce exponentially but they don't. Why not? What are they restricted by? **No, they are restricted by food availability, space and mate selections. The best suited to the environment will survive & reproduce.**
- 3) Genetic variations lead to different adaptations. What are **adaptations**? **Any inherited characteristic that increases an organism's chance of survival.**
- 4) Some adaptations have better survival value in certain environments. What does this mean? **Some adaptations (based upon genotypic mutations) are not favorable for that particular environment. They are not selected for and that particular organism dies and does not pass on that particular adaptation to their offspring.**

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- 5) Those organisms with adaptations that better fit them to an environment will survive, reproduce and pass on their genes. What does it mean to be “fit” to an environment? **The ability of an individual to survive and reproduce in their particular environment.**
89. Compare and contrast **convergent** and **divergent** evolution. **Convergent evolution is when two generally unrelated species in different areas adopt similar adaptations based upon a common environment. Divergent evolution is when animals diverge from each other then they geographically adopt different areas and must take on different characteristics as adaptations in order to survive, becoming more different than one another.**
90. Describe how a population of bacteria can become resistant to an antibiotic (or an insect to a pesticide) using the steps listed above. How is this a direct way to observe evolution? **Bacteria that have natural mutations to survive a particular insect or pesticide have new space and resources to survive and reproduce creating a new generation resistant to that particular obstacle.**
91. What happens when pesticides and antibiotics are used and how does it relate to evolution? **When one particular antibiotic is used frequently, populations evolve (see question 99) a natural immunity to it. This is the exact theory of Darwin’s survival of the fittest.**
92. What did Louis Pasteur contribute to our understanding of the origins of life? **Louis Pasteur described through his curved flask experiment that life cannot come simply from air but through other living things, such as molecules that we cannot see (microorganisms).**



Explain Miller and Urey's hypothesis.

93. Why did Miller and Urey put those particular gases into their experiment? **They were found in the early Earth's atmosphere where life would have likely started.**
94. What type of organic molecules did they find? **Amino acids**
95. What is the significance of their experiments? **Amino acids are the monomers or building blocks of proteins that make up organisms or life.**
96. What gas would enter the atmosphere as a result of these autotrophs appearing. (VERY IMPORTANT!) **Oxygen**

Goal 4: Learner will develop an understanding of the unity and diversity of life. 25-30%

4.01 Analyze the classification of organisms according to their evolutionary relationships. (Historical development and changing nature of classification systems, similarities and differences between eukaryotic and prokaryotic organisms, similarities and differences among the eukaryotic kingdoms, classifying organisms using a key)

1. Why is the current classification system continually undergoing change? **Due to new DNA evidence and amino acid similarities from living and extinct organisms. Study behavior These are now used to disclose common ancestry.**
2. What are the three **domains** proposed above the kingdom level? **Bacteria, Archaea, and Eukarya**

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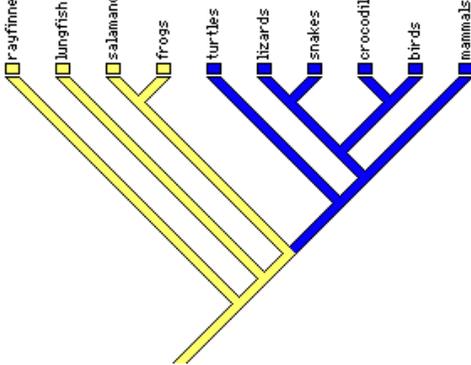
3. What is the current seven-level classification system? (DKPCOFGS)

Domain, Kingdom, Phylum, Class, Order, Family, Genus & Species

4. What is **binomial nomenclature**? **A two-name naming system based in Latin to identify a single organism.**

5. How do you write a “scientific name?” **All in italics or underlined with the Genus FIRST LETTER capitalized and the species in lowercase.**

6. What is a **cladogram**? What are **derived characters**? **A cladogram is a diagram that shows the evolutionary relationships among a group of organisms. Derived characters are characteristics that appear in recent parts of a lineage but NOT in its older members.**



7. DNA and biochemical analysis, embryology, and morphology used to classify organisms. They try to determine a “common **ancestry.**”

8. To the left is a **phylogenetic tree** of some organisms. According to this tree, which pairs of organisms are most closely related?
Any pairs of animals closest on the tree

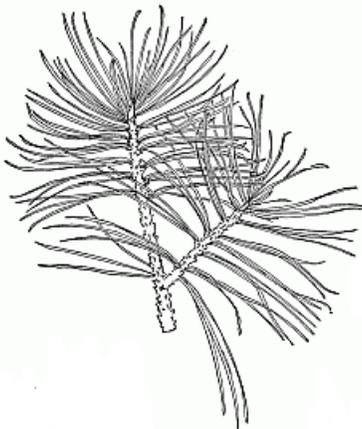
9. Which organism is most closely related to the rayfined fish?
lungfish

10. Which organisms are the mammals most closely related to?

Birds

11. Fill in the following chart with the characteristics of the various kingdoms.

	Archaea	Eubacteria	Protista	Fungi	Plantae	Animalia
Eukaryotic or prokaryotic	Prok	Prok	Euk	Euk	Euk	Euk
Multicellular or single-celled	Single	Single	Both	Both	Multi	Multi
Sexual or asexual reproduction	Asexual	Asexual	Both	Both	Both	Both
Autotrophic or heterotrophic	Both	Both	Both	Hetero	Auto	Hetero
Aerobic or anaerobic	AN	AE	AE	AE	AE	AE
Cell walls or no cell walls	Yes	Yes	Maybe	Yes	Yes	No



Use the following key to identify the tree branch to the left.

1. a. leaf is needle-like....go to 2
b. leaf is broad..... go to 5
2. a. needles are shortgo to 3
b. needles are long.....go to 4
3. a. underside of needles green...hemlock
b. underside of needles silver ..balsam
4. a. 3 needles in bundle...pitch pine
b. 5 needles in bundle....white pine
5. a. edge of leaf round...go to 6
b. edge of leaf serrated...go to 7
6. a. minty odor..... wintergreen
b. no minty odor.....laurel

12. What am I?
Pitch Pine

4.02 Analyze the processes by which organisms representative of the following groups accomplish essential life functions including...

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13, 14, 15. Fill in the charts below showing how various groups of organisms accomplish the life functions listed.
Annelid worms, Insects, Amphibians, Mammals, Gymnosperms, Angiosperms, Non-vascular Plants

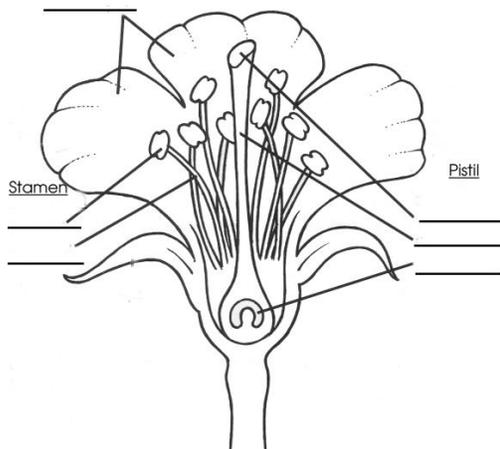
	Protists	Annelids	Insects
Transport of materials	<i>diffusion</i>	CLOSED CIRCULATORY True coelom	Open circulatory TRUE COELOM
Excretion		Digestive-anus Nitrogen-nephridia	Malpighian tubules
Respiration		Gas exchange through moist skin	Tracheal tubes
Regulation		Brain and nerve cords ganglia	Brain and nerve cords ganglia
Nutrition		Heterotrophic-filter feeder to predators	Heterotrophic
Reproduction		External fertilization and separate sexes	Sexual INTERNAL FERTILIZATION
Growth and development			Metamorphosis
	Amphibians	Mammals	
Transport of materials	Cardiovascular system	Cardiovascular system	
Excretion	Cloaca, KIDNEY	Kidneys, anus, cloaca	
Respiration	Occurs through skin and gills LUNGS	lungs	
Regulation	ectothermic	endothermic	
Nutrition	Filter feeders, herbivores, carnivores	heterotrophic	
Reproduction	External ferti	INTERNAL FERT.	
Growth and development	Metamorphosis	Placental FOR MOST SPECIES	

	Non-vascular Plants	Gymnosperms	Angiosperms
Transport of materials	Osmosis	Xylem and phloem	Xylem and phloem
Excretion	N/A	N/A	N/A
Respiration			
Regulation			
Nutrition		ROOTS FOR MINERALS	ROOTS FOR MINERALS
Reproduction	SEXUAL	SEXUAL/ NAKED SEED	SEXUAL/ SEED IN FRUIT
Growth and development			ENDOSPERM OR COTYLEDON PROVIDE FOOD

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16. Compare the following two types of cells.

	Prokaryotic	Eukaryotic
Membrane-bound organelles	NO	YES
Ribosomes	YES	YES
Types of chromosomes	Loose	Found in a nucleus
Size	Small	Large



4.3 Assess, describe and explain adaptations affecting survival and reproductive success (structural adaptations in plants and animals, disease-causing viruses and microorganisms, co-evolution)

17. Label the following parts on the flower and give their functions:

Stigma, style, ovary, petal, sepal, anther, filament

Stigma – Female part of the flower – captures pollen

Style – Female part of the flower – transmits pollen to ovary

Petal – Nonsexual part of the flower – attracts pollinators

Sepal – Nonsexual part of the flower – protects petals

Anther – Male part of the flower – attaches pollen granules

Filament – Male part of the flower – stalk that supports pollen

Ovary- Contains OVULE WHICH CONTAINS Egg Cells

Viruses:

18. For the following diseases, give the agent and the symptoms.

	Type of pathogen	Symptoms of Disease
HIV	Virus	Suppressed Immune system due to failure of T-helper cells.
Influenza	Virus	Body aches, fever, sore throat, nasal congestion, headache. Cough, fatigue
Smallpox	Virus	High fever, fatigue, head and back aches, rash
Streptococcus (Strep Throat)	Bacteria	Fever. Sore throat, swollen glands

4.04 Analyze and explain the interactive role of internal and external factors in health and disease (genetics, immune response, nutrition, parasites, and toxins)

19. Explain the relationship between sickle cell anemia and malaria.

In a heterozygous form, the sickle cell gene provides resistance to malaria.

20. Explain the relationship between lung and mouth cancer and tobacco use.

The tobacco is a carcinogen that can lead to uncontrolled cell growth

21. Explain the relationship between skin cancer, vitamin D, folic acid and sun exposure.

Sun burns destroy folic acid in the skin which helps prevent cancer. The skin needs sun to make Vitamin D.

22. Explain the relationship between diabetes, diet/exercise, and genetics.

Potential for diabetes can be genetic and good diet and exercise can help maintain healthy blood glucose levels.

23. Explain the relationship between PKU and diet.

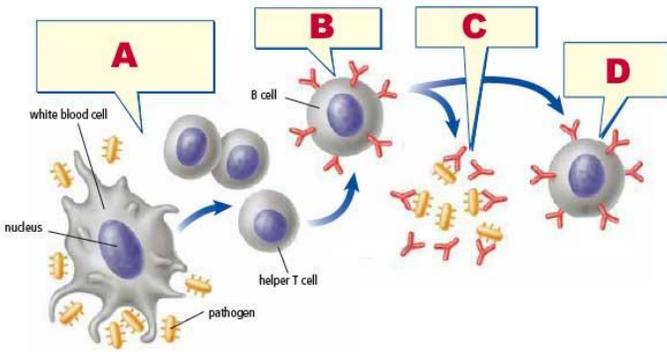
A person with PKU must be on a low phenylalanine diet to make up for the lack of enzyme production that breaks it down. This is an inherited genetic disease.

Immune Response

24. What are some of the **non-specific first lines** of defense? **Mucus, Skin**

25. What are some of the **non-specific second lines** of defense? **Inflammatory response, white blood cells**

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26. What do B cells produce?

Plasma cells and memory B cells

27. What is happening at letter C?

Antibodies are attacking the pathogens

28. What is the function of **helper T-cells**?

They activate killer T cells and produce memory T cells

29. What is the function of **killer T-cells**?

Track down and kill pathogens

30. What is the function of **suppressor T-cells**?

Shut down killer T cells when the job is done

31. What kind of cells are produced at letter D that keep you from becoming re-infected? (**Secondary infection?**)

Memory B cells

32. Explain what **vaccines** do to the immune system.

They induce the body's development of antibodies

33. Are antibiotics used against viruses? What is used against viruses?

No, they only work against bacteria. You need anti-viral meds against viruses.

Environmental Toxins

34. Explain the effects on human health of:

Lead: **Increased blood pressure, anemia, brain and kidney damage, Low IQ**

Mercury: **Brain Damage, blindness, seizures**

4.05 Analyze the broad patterns of animal behavior as adaptations to the environment.

35. What is a **stimulus**? What is a **response**?

Stimulus- any kind of signal that carries information that can be detected. Response – a reaction to a stimulus

36. Why is it important that organisms are able to respond to their environment and surroundings?

Allows for interaction with the environment and increased fitness

37. What are some ways that animals **communicate**?

Visual signals, chemical signals, sound signals, language, pheromones

38. What is **habituation**? Why is it good for the animal and evolution as a whole?

The process by which animals decrease or stop response to repetitive stimulus that neither rewards or harms.

Decreases use of unnecessary expense of energy.

39. What is **imprinting**? Why is this important?

Recognizing and following the first thing a baby sees to move. It keeps young animals close to their mothers

40. Complete the following Chart of Animal Behavior.

Type of Behavior	Explanation of Behavior	Survival Value of Behavior
Suckling	This is when an organism is born knowing how to 'suckle' or obtain milk from its mother.	Allows for newborns to get nutrition
Insects moving away or toward light	Positive Phototaxis and Negative Phototaxis	Feeding and protection
Migration	This is when organisms move from one place to another periodically, generally in response to temperature or food availability.	Maintaining food source/ GOOD BREEDING
Estivation	This is when an organism goes dormant for a long period of time to escape hot temperatures.	Surviving extreme conditions (hot)

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Hibernation	This is when an organism goes dormant for a long period of time to escape cold temperatures.	Surviving extreme conditions (cold)
Habituation	This is when an organism learns to ignore a stimulus because it is repetitive and is not providing any valuable information.	Conservation of energy
Imprinting	This instinctive behavior is when some baby bird species will follow the first moving object they see, usually the mother.	Keeps newborn close to mother for food and protection
Classical conditioning	Any time an animal learns to make a connection between a certain behavior and a given reward or punishment.	Allows animal to make beneficial choices
Trial and error	When faced with two choices, an organism can learn to choose the option with the best reward.	same
Communication using pheromones	Chemical signals	Increases fitness through mating
Courtship dances	When an individual performs some ritual – either sounds, visual display, pheromones, etc. – in order to attract a mate.	same
Territoriality	This is when an organism will defend or mark a defined living space.	Decreases competition

41. Which of the above behaviors are innate (or instinct)?

Suckling, Moving Towards/Away from Light, Migration, Hibernation, Estivation, Imprinting, Communication with Pheromones, Courtship Dances, Territoriality

42. Which of the above behaviors are learned?

Classical Conditioning, Habituation, and Trial and Error

43. Which of the above behaviors are social?

Courtship and territoriality and some migration

Goal 5: Learner will develop an understanding of the ecological relationships among organisms. 15-20%
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5.01 Investigate and analyze the interrelationships among organisms, populations, communities, and ecosystems (techniques of field ecology, abiotic and biotic factors, carrying capacity)

1. How do organisms, species, populations, communities, ecosystems and biomes relate to each other?

All are levels of living things; biomes are the most general (parts of the biosphere) and organisms are the most specific. Ecosystem includes both biotic and abiotic factors while community just includes the living organisms that interact. Populations are individuals of the same species found in the same area while organisms are individuals

2. What is an organism's **habitat**? What is its **niche**?

Habitat is an organism's address: where it lives while the niche is its job: how the organism makes a living and is adapted to its environment

3. In the following chart, explain the symbiotic relationships.

Relationship	Definition	Example
Mutualism	++; two individuals help each other	Algae and fungus in lichen Flower and bee in pollination
Commensalism	+0; one individual benefits and the other neither gains nor loses	Spanish moss epiphyte on live oak tree
Parasitism	+--; one benefits (parasite) and the other is hurt (host)	Tick sucking blood from human

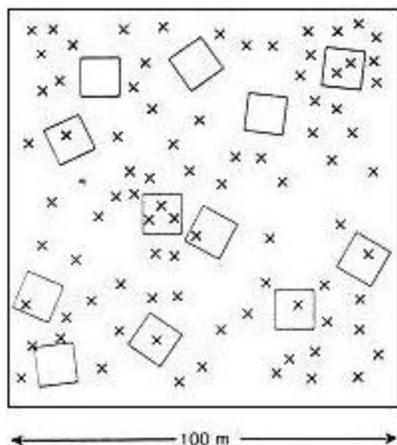
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Predator-Prey Relationships

4. In the graph below, which organism is the prey? **Hare** Which is the predator? **Fox**
5. Which population increases (or falls) first and why? **Hare; few predators to control population**
6. Which population increases (or falls) second and why? **Foxes; takes a while for there to be enough food for foxes to have lots of babies**
7. Why are **predator/prey relationships** important in an ecosystem? (Consider population dynamics in your answer.)
The predators help regulate the prey population so the prey does not eat up or destroy all of the vegetation. Also some prey may be parasites on other organisms so the predators keep them from becoming too much of a problem.



Sampling techniques



Assume that the diagram to the left shows populations of pine trees in an area. The area is too large for a scientist to count every tree.

8. How can the scientist use sampling to get a good estimate of the number of pine trees per 10,000 square meters. **Count the population in the individual squares and multiply the total area sampled by the total area to sampled area ratio.**
9. Assume that each small plot (square) is 10 m x 10 m. Estimate the population size of the whole area. **11 trees in 12 plots: average 11 trees/12 plots = 1 tree/plot (=0.91666 no calculator on EOC!) 1 tree to 100 m squared is x to 10,000 m squared = 100 trees (91.666666 or 92 trees)**
10. How could the same process (above) be used to estimate species diversity?
Record the number of individuals of each species in each sample plot
11. How could the same process be used to discover changes in the environment over time?
Record the number of individuals of each species in each sample plot every year, five years, or other period of time
12. What is **carrying capacity**?
The number of individuals of a population and given area or environment can sustain over a period of time. (Shown by logistic or S curve)
13. What are density **dependent limiting factors**? What are **density independent limiting factors**?
Dependent limiting factors are determined by the number of individuals present in the area: examples-predators would be density dependent as would disease. Independent limiting factors are not determined by the number of individuals present in an area example: temperature or pH

Biotic and Abiotic Factors

14. List at least 3 **biotic factors** in an environment.
Number of shade trees, disease organisms, predators, density of prey organisms, number of pollinators

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15. List at least 3 **abiotic factors** in an environment.

PH, temperature, salinity, light, rainfall, soil type

16. Give an example of how biotic & abiotic factors act together to limit population growth and affect carrying capacity.

Annual rainfall can determine the biomass potential of the producers in a region, thus limiting the rate of reproduction

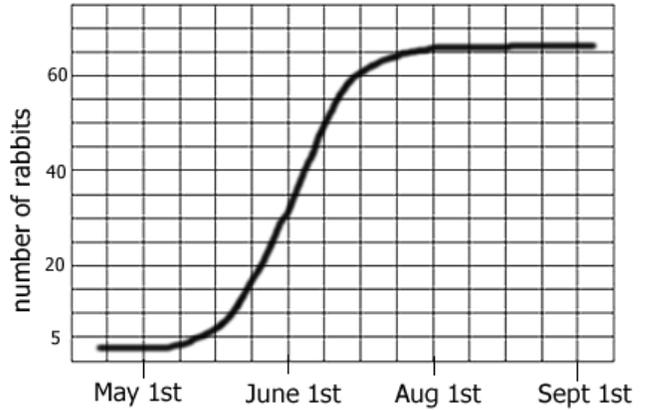
Graph 1: Rabbits Over Time

17. What kind of growth curve is shown by the graph to the right? **Logistic; "S" Curve**

18. What is the carrying capacity for rabbits?

66

19. During what month were rabbits in exponential growth? **May**



Graph 2: Mexico and US

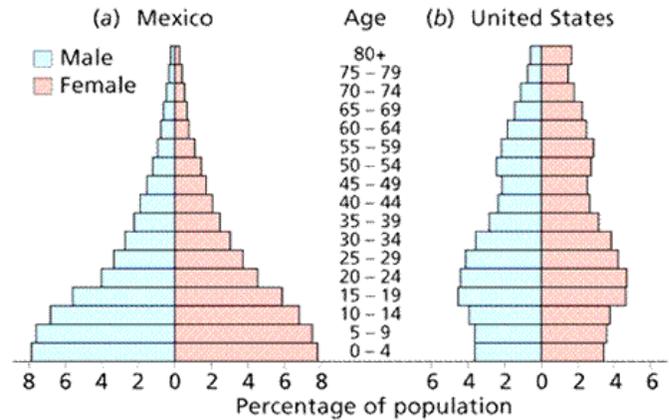
20. In Mexico, what percentage of the population is between 0-4 years of age? **16%**

21. In the US? **7%**

22. Which population is growing the fastest?

Mexico

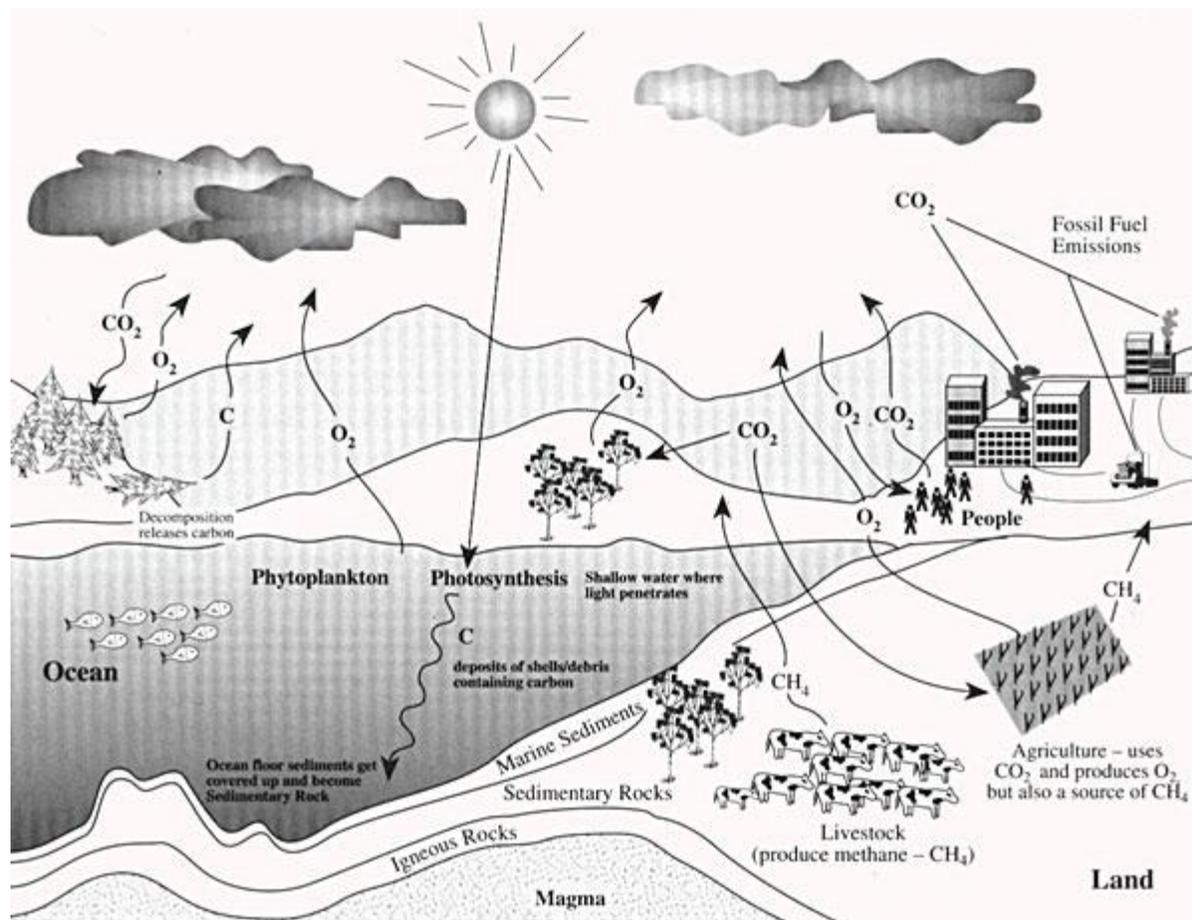
23. Which age group has the smallest number in both countries? **Mexico 80+; US 75-80**



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5.02 Analyze the flow of energy and the cycling of matter in the ecosystem (relationship of the carbon cycle to photosynthesis and respiration and trophic levels – direction and efficiency of energy transfer).

Carbon cycle Diagram



24. Which process(es) put carbon dioxide into the atmosphere? **Respiration**
25. Which process(es) take carbon dioxide out of the atmosphere? **Photosynthesis**
26. How does photosynthesis and cell respiration relate to Carbon cycle?
Photosynthesis removes carbon dioxide from the air and respiration adds it to the air. The products of one are the reactants of the other.
27. Explain the **Greenhouse Effect** in relationship to carbon dioxide in the atmosphere.
Increase of carbon dioxide prevents infrared light (heat) from leaving the atmosphere. This raises the earth's temperature just like glass in a greenhouse traps heat and keeps the greenhouse warm.
28. What effect might increased atmospheric carbon dioxide have on the environment?
Increased trapping of heat and thus higher temperatures. Some plant species may grow faster with more carbon dioxide.
29. How do **bacteria** play a role in the Carbon Cycle?
Bacteria can do all parts of the carbon cycle: photosynthesis, respiration and decomposition.

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Food Webs

30. What are the **producers** in this food web?

Blossoms, nuts, bark, leaves

31. What are the **primary consumers** (herbivores) in this food web?

Bees, mice, deer, rabbit, insects

32. What are the **secondary consumers** in this food web?

Bear, wolf, fox, toad, skunk, birds

33. What are the **highest level consumers** in this food web?

Bear

34. How does energy move through a food web?

10% moves through each trophic level

35. How does matter move through a food web?

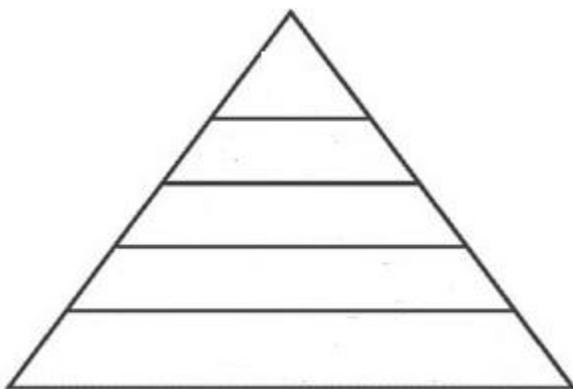
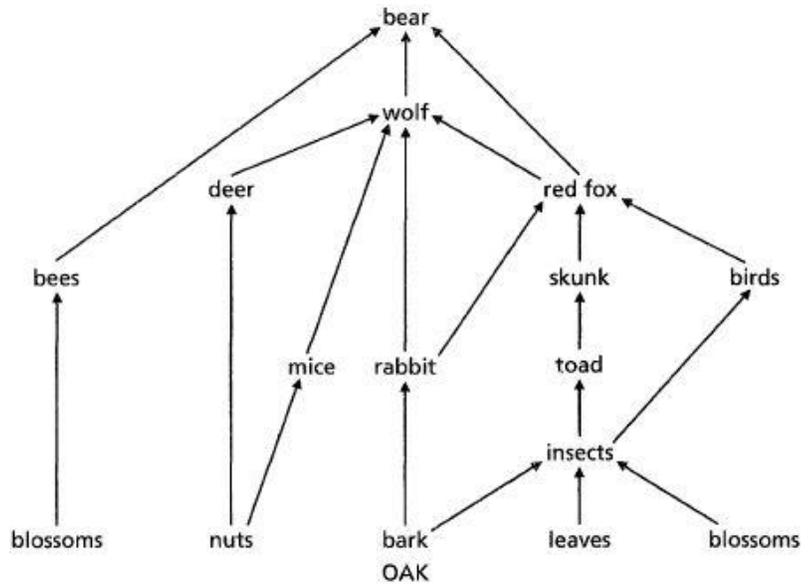
Same as 40

36. What is a **food chain**? Give an example of one from this food web.

A series of steps in which organisms transfer energy by eating and being eaten

37. Create an energy pyramid from the food chain:

leaves → insects → birds → red fox → bear



38. Where is the most energy in this pyramid?

Bottom: plants, producers

39. Where is the least energy in this pyramid?

Top: bear, 4th level consumer

40. What happens to energy as it moves through the food chain/web?
Most is "lost" as waste heat about 10% at each level is converted into biomass or available energy (food)

41. Assume there are 10,000 kcal of energy in the leaves? Estimate the amount of energy in each of the other levels of the energy pyramid.
10, 000; 1000; 100; 10; 1; 0.1 kcal

42. What percent of energy is lost? **90%**

43. How much is passed on? **10%**

44. What is the ultimate source of energy for this food web? THE **SUN!**

5.03 Assess human population and its impact on local ecosystems and global environments (historic and potential changes in population, factors associated with those changes, climate change, resource use, sustainable practices/stewardship).

45. What are the effects of **bioaccumulation (biomagnification)** of pesticides on a food web?

At bottom of food web poison is at low concentration and may cause no damage but as it builds up in the higher level organisms it may make top level consumers sick; sterile or even dead.

46. Why do some species become resistant to pesticides?

A random mutation occurs or a virus transfers a gene to a different species. Individuals with this mutation are not killed and pass on the resistant gene to their offspring.

47. What are some pros and the cons of biocontrols as alternatives to pesticides?

Less harmful to the environment; only kill the targeted pest; since are living species once introduced they reproduce themselves

Con: takes time to discover the biocontrol; some take longer to take effect

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48. Explain the effect each of the following may have on the environment.

Factor	Effect on Environment
Population Size	Contributes to the consumption of resources and destruction of ecosystem
Population Density	Effects intraspecies competition, overconsumption, etc.
Resource Use	Limits population size
Acid Rain	Destroys producers, changes pH in waters and soils, harms biotic factors of the ecosystem
Habitat Destruction	Destroys natural resources, increases rate of erosion, decreases biodiversity.
Introduced non-native species	Reproduces rapidly, due to having no predators evolved in new location. Can
Pesticide use	Kills off primary consumers in the food chain; poisons ground water.
Deforestation	Cuts down trees

49. What is the role of **carbon emissions** and other emissions as causes of global warming?

Carbon dioxide is a greenhouse gas that can increase global warming. Methane produced by bacteria in livestock and from land fills is another greenhouse gas.

50. What are some possible effects of **global warming**?

Spread of tropical diseases to temperate zones; extinction of species; more variation in weather; erosion of beaches; rise of sea level; decrease crop yield; melting of permafrost; open arctic ocean; longer growing periods

51. What are some ways that carbon production can be decreased?

Plant more trees/ reduce deforestation. Use less fossil fuels.

52. What effect do **volcanoes** have on the atmosphere?

Release of ash, particulates and sulfur dioxide can reduce the light the hits the earth surface and make the earth colder. Release of large amounts of methane and carbon dioxide can trap heat and warm the atmosphere. Also make great colorful sunsets!

53. What are some examples of sustainable practices and stewardship that can protect the environment?

Reduce, recycle, reuse! Use renewable energy resources. Create green buffers near streams. Conserve energy. Use public transportation. Use chemicals and materials that don't create dangerous wastes.

54. What is an **invasive or non-native species**? How can they cause negative effects on an ecosystem?

Example: Kudzu

Non-native is a species from some other geographic location. Invasive is a species that lacks natural biotic or abiotic factors that can control the population.

Problems: cause native species to go extinct; damage crops; carry disease; damage landscaping or property

Human Population Growth

55. Compare and contrast: **Linear Growth, Logistic Growth, and Exponential Growth.**

Linear Growth – growth at steady rate, equal slope with an increasing trend

Logistic Growth – S curve, starts off exponential and then levels off (carrying capacity) due to limiting factors

Exponential Growth – J curve,

What type of growth is related to human population? **Exponential**

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56. How did the rise of human **agriculture** create a significant impact on the Earth? What kind of technology was used to feed the growing human population?

Agriculture allowed the human population to increase. Many natural ecosystems were destroyed and species became extinct to create farm land. Pesticides entered the food chain and fertilizers and soil erosion damaged aquatic systems.

The Green Revolution: new varieties of crops with better yield but need more pesticides, irrigation and fertilizer. More recently genetically engineered crops that are resistant to disease or pesticides or have higher yield.

57. What is the effect of resources (which are limited) on unlimited human population growth?

Population may grow faster than food supplies or resources for fuel and industry. When resources become more scarce more people may starve, have more diseases or go to war over resources.

58. What factors influence human birth and death rates?

Medical care, access to food, age of pregnancy, access to education and birth control, disease organisms, pollution, war, and many others