**Energy -**

How does energy move through an ecosystem? It moves from the sun to autotrophs (producer), then to heterotrophs (consumers).

Trace the path of food through the organs of the digestive system and explain what happens to the food in each organ. The teeth and tongue break food into small pieces; the esophagus pushes food down into the stomach. The stomach mixes up the food and digestive juices. Food then goes into the small intestine. The digestive nutrients are absorbed by the intestinal walls. The waste products move into the colon then expelled through the anus.

**Cellular respiration** –

What is the purpose of cellular respiration? To release energy from glucose and convert it to ATP.

What do you start with and what do you end with? C6H12O6 + O2 🡪 O2 + CO2

What is the significance of **ATP**? Energy is stored in one of its phosphate bonds.

How is energy released? When the tri-phosphate bond is broken and ATP is converted to ADP.

How many net ATP gained per glucose? 36 net (38 created but it cost 2 to start)

How are breathing and cellular respiration related? Breathing allows oxygen (that is needed for cellular respiration) to come into the body and carbon dioxide (a product of cellular respiration) to leave the body.

**Fermentation** –

What is it? An anaerobic (without oxygen) process in which glucose is converted into energy (ATP) and CO2

Is oxygen required? No

**Alcoholic** – Products? Examples? C6H12O6 (glucose) 🡪 2(CH3CH2OH) (Ethyl alcohol) + 2(CO2) (Carbon dioxide) +Energy (which is stored in ATP) Yeast does this process; Used when making bread

**Lactic acid** – Products? Examples? C6H12O6 (glucose) 🡪 2CH3CHOHCOOH (lactic acid)

**Photosynthesis** –

What is the purpose? To convert energy from sunlight into chemical energy in glucose. This is what happens in muscles when you want a burst of energy and get cramps.

What do you start with and what do you end with? CO2 (carbon dioxide) + H2O (water) 🡪 C6H12O6 (sugar) + O2 (oxygen)

How is it related to cellular respiration? This creates the glucose that is used in cellular respiration.

**Cells -**

Can you describe the difference between an animal cell and a plant cell? Animal cells do not have cell walls. Plant cells are usually rectangular, have chloroplasts and a large central vacuole

Can you describe the difference between a prokaryotic cell and an eukaryotic cell? Prokaryotic cells do not have a nucleus and do have most organelles

Describe the location (plant or animal cell) and function of the following organelles: nucleus, cell wall, cell membrane, mitochondrion, chloroplast, ribosome, smooth endoplasmic reticulum, rough endoplasmic reticulum, golgi body, lysosome, check the website <http://www.cellsalive.com/cells/cell_model.htm>

Describe what passive transport is in relation to the cell membrane. A kind of transport where molecules move from an area of higher concentration to an area of lower concentration

Describe what active transport is in relation to the cell membrane. A kind of transport where molecules move against a concentration gradient, where movement is from an area of lower concentration to an area of higher concentration.

Explain what diffusion is. The movement of molecules from an area of more concentration to an area of less concentration. It is a spontaneous process.

Explain what osmosis is. A special case of passive transport where water moves from an area where there is a low solute concentration (hypotonic solution) to an area of high solute concentration (hypertonic solution)

**MITOSIS/MEIOSIS REVIEW** -

What is the differences between asexual and sexual reproduction? Sexual reproduction involves dna from both a mother and a father. Asexual reproduction is a cell that copies itself.

Which one (mitosis or meiosis) is important to cell division? mitosis

**Cell cycle** -

**Interphase** –What occurs during interphase? Protein synthesis, the work of the cell

**Mitotic (M) phase** – what occurs during this phase? The cell replicates. You end up with two exact copies

**Mitosis** – What occurs during each stage? (**prophase, metaphase, anaphase, telophase**) check the website <http://www.biology.arizona.edu/cell_bio/tutorials/cell_cycle/cells3.html>

**Terms –** Centrosomes , spindle microtubules, chromatin, chromosome, sister chromatids, centromere online dictionary <http://www.thefreedictionary.com/Centrosomes>

**Cancer –** How are **cancer** cells different from normal cells? Their mitotic regulation doesn’t work. They reproduce very quickly

Difference between **benign** and **malignant tumors**? Benign tumors are not cancer and malignant turmors are cancerous

**Meiosis** –

What is the significance? You end up with four cells that have ½ the dna in them. These cells are the sex cells, sperm and egg.

Where does it occur? It only happens in the cells that will become sex cells

What occurs in each phase of meiosis I and meiosis II? Check the website <http://www.biology.arizona.edu/cell_bio/tutorials/meiosis/main.html>

How does meiosis contribute to genetic variation? It mixes up parental dna. Also cross-over mixes up dna also

**Terms -** Homologous chromosomes, gametes, diploid, haploid, fertilization, tetrads, crossing over

What are the main differences between mitosis and meiosis?

What is the difference between end results of mitosis and meiosis?

**GENETICS REVIEW** -

**Terms -** alleles, dominant, recessive, phenotype, genotype, homozygous, heterozygous, Sex-linked traits online dictionary <http://www.thefreedictionary.com/Centrosomes>

## DNA/ PROTEIN SYNTHESIS –

**DNA** –

What is the significance? These are the genes, the genetic materials passed onto children

What are the 3 parts of **nucleotide**? Sugar (deoxyribose), phosphate and nitrogenous base (ATGC)

What are the 4 bases and which are **complementary** to each other? Adenine is complementary with Thymine and cytosine is complementary with Guanine

Which is the “backbone’ and which are the “Rungs’? The sugar and phosphate are the backbone and the bases are the rungs

**DNA replication** –

Why is it necessary? When a cell replicates the dna has to be replicated too

What is the process? The dna double helix is untwisted and opened up and a copy is made of each dna strand

If you are given a sequence of parent DNA, can you give the sequence of replicated strands? Check website <http://learn.genetics.utah.edu/content/begin/dna/builddna/>

**Protein synthesis** –

What determines genotype and

phenotype? Genotype is the actual dna and phenotype is what the trait looks like (curly hair, blue eyes, etc)

What are the similarities and differences between **RNA** and DNA? Both are nucleic acids. Both have A, G, C, T (in dna) and U (in rna)

What is the significance of RNA? mRNA is a complementary copy of dna and tRNA is the translation between nucleic acids and amino acids.

**Transcription** –

What is the significance? It is a copy of the dna

Where does it occur? It happens in the nucleus

What is the process? The dna double helix untwists and a copy is made

What is **mRNA**? This is a complementary copy of the dna molecule

What are the similarities and differences between DNA replication and transcription? In replication, an exact copy is made of the the dna to go into a cell copy. In transcription an mRNA molecule is made from dna and will be used to make protein.

Given a sequence of DNA strand, can you give the mRNA strand sequence? Check the website <http://learn.genetics.utah.edu/content/begin/dna/transcribe/>

**Translation** –

What is the significance? A protein is made

Where does it occur? In the cytoplasm of the cell, outside of the nucleus

What is the process? An mRNA molecule leaves the nucleus and goes onto a ribosome. tRNA molecules come onto a ribosome binging amino acids. The codons on the mRNA match to anticodons on tRNA which code for particular amino acids.

What does **genetic code** tell us? It codes for amino acids, which make up proteins.

What is **start codon** and **stop codons**? The start codon in mRNA bases AUG. there are three stop codons, UAA, UAG and UGA.

Do you know how to use the genetic codon table?

What is **tRNA** and its parts? Anti-codon, amino acid

How does tRNA work with mRNA? The anti codon on the tRNA matches the codon on the mRNA

**Anticodons**? **Ribosomes**?

Given a sequence of DNA or mRNA strand, can you give a tRNA sequence and/or amino acids that are coded for using a condon table? Pratice problems <http://phscscience.weebly.com/uploads/5/8/8/9/5889937/transcription_translation_summary_worksheet.pdf>

What is the significance of proteins? Proteins are large molecules that do many jobs in the body. They do most of the work in the cells – structure, function and regulation of the body’s organs.

How are genes, DNA, and proteins related? A gene is a section of DNA that codes for a particular protein.

**Mutations –**

What are they? These are changes in dna bases, either replacements or deletions or insertions of bases

What causes them? It could be because of radiation or spontaneous

What are **base substitutions** and base **deletions or insertions**? A base substitution is when one base is substituted for another one. A deletion is when a base is deleted from dna and an insertion is when a base is inserted in dna.

What is the usual outcome of each? A substitution may not have any change as the new codon may code for the same amino acid as the old codon. A deletion or insertion will cause different codons, changing the amino acids, thus changing the protein.

Which usually causes much more drastic changes and why? Insertions and deletions cause the most drastic changes because they change the codons, which change the amino acids. This makes a different protein.