I Application Course (4th-7th grade) Full Curriculum/Topics Draft For Student-Teachers (30 Pages)

How does your body work?

- How does food affect your body?
    - What does good nutrition look like?
        - Weight/Obesity
        - Food groups
            - Fruit, Grains, Vegetable, Protein, Dairy
                - Why is it important to have a balanced meal from these groups?
                - Discuss biological breakdown of different food groups and how your body utilizes these macromolecules to make energy
                - Cellular Respiration (UPDATED)
                - Electron transport chain

            - Calorie intake
                - What is a calorie?
                    - The amount of energy present in your food and drink. The chemical definition of calorie is the energy needed to raise the temperature of 1 gram of water through 1 °C (4.1868 joules).
                        - Emma Bryce: What is a calorie?
                        - As a guide, an average man needs around 2,500kcal (10,500kJ) a day to maintain a healthy body weight.
                        - For an average woman, that figure is around 2,000kcal (8,400kJ) a day.
                        - These values can vary depending on age, size and levels of physical activity, among other factors.

Activity #1: Food labelling activity. Have students cut out and bring food labels and discuss the nutrition facts on everyday home groceries and processed food. **Essential topic covering: Better awareness on foods students eat on a day to day basis.**

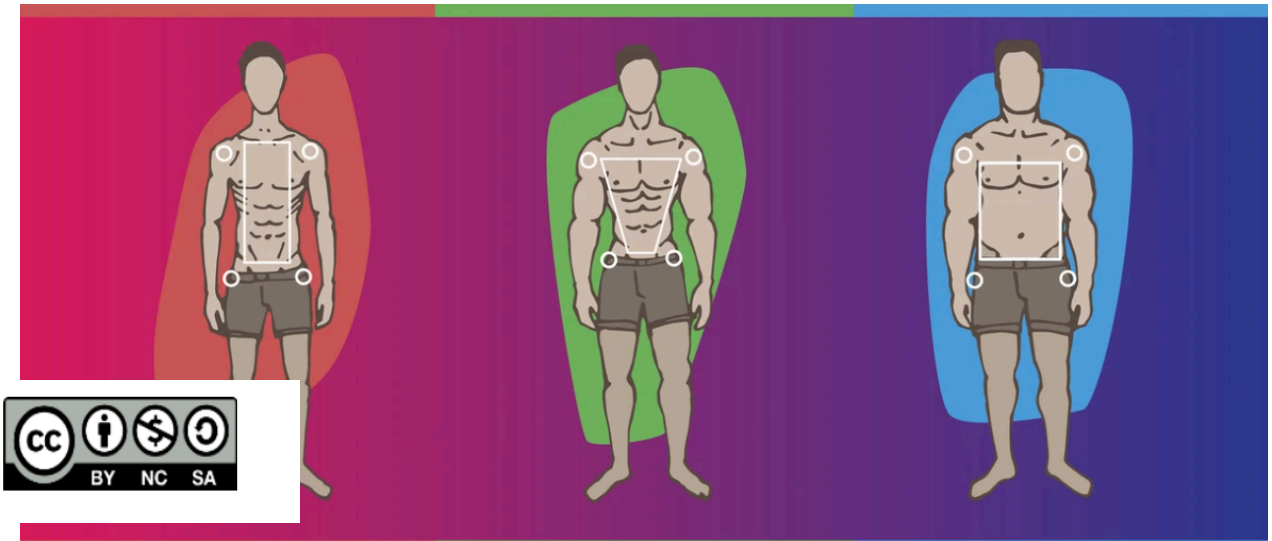
        - Why is it important to keep track of your

calorie intake as you workout?

- Helps manage your body's gains/losses and brings you better awareness of how your body's reaction to different stimuli.
- Help you make informed choices so that you can meet your weight and nutrient goals.

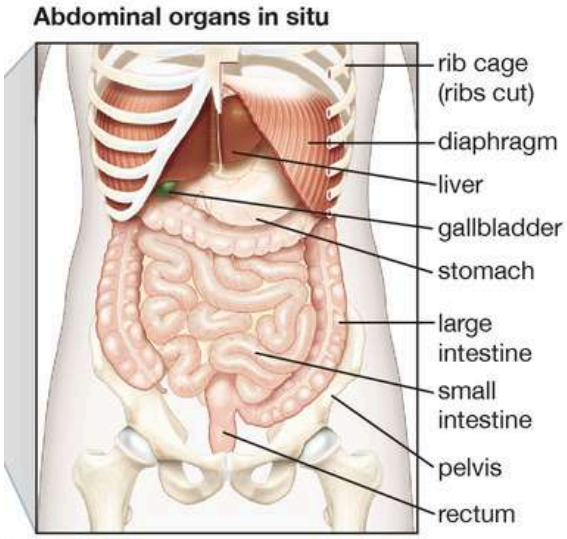
- **Activity #2: $30 a day budget to plan out your full day meal from an outside restaurant. Students will research and count calories, total fats, nutrition, carbs, and protein.**
- **Essential topic covering: Bring awareness to students to the extent to which fast/junk food can be a component of everyday life due to its low price and convenience). Idea to hit is how convenient and cheap fast food/low quality is for people.**

- How is each person different based on intakes? To what extent does one need to be cognisant your body and figure out what intake is best for you
  - Three main body types: Endomorph, Ectomorph, and Mesomorph.
  - Some body masses can gain/lose muscle easily
  - Each body type has its advantages and there is no "Standard" body.
  - Body shaming: "We are our own worst critic" Kelli Jean Drinkwater: Enough with the



fear of fat

- How does your body process food?
    - Digestive System
        - Go over each major component of the digestive system, and how they connect with each other.
            - The digestive system starts at your lips and ends at your anus. The digestive tract begins at the lips and ends at the anus. It consists of the mouth, or oral cavity, with its teeth, for grinding the food, and its tongue, which serves to knead food and mix it with saliva; the throat, or pharynx; the esophagus; the stomach; the small intestine, consisting of the duodenum, the jejunum, and the ileum; and the large intestine, consisting of the cecum, a closed-end sac connecting with the ileum, the ascending colon, the transverse colon, the descending colon, and the sigmoid colon, which terminates in the rectum. Glands contributing digestive juices include the salivary glands, the gastric glands in the stomach lining, the pancreas, and the liver and its adjuncts—the gallbladder and bile ducts. All of these organs and glands contribute to the physical and chemical breaking down of ingested food and to the eventual elimination of indigestible wastes. Their structures and functions are described step by step in this section.

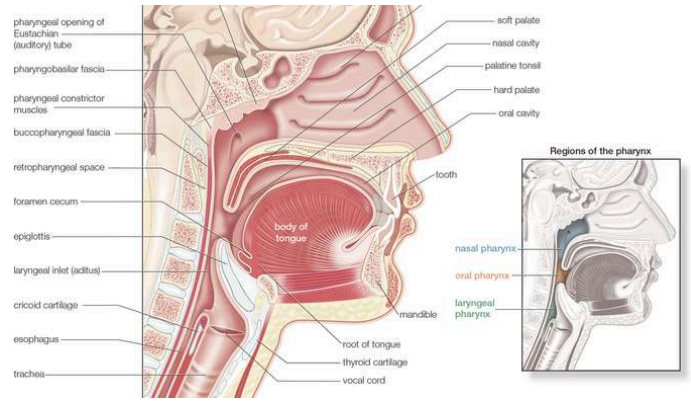


- Mouth
  - Little digestion of food actually takes place in the mouth. However, through the process of mastication, or chewing, food is prepared in the mouth for transport through the upper digestive tract into the stomach and small intestine, where the principal digestive processes take place. Chewing is the first mechanical process to which food is subjected. Movements of the lower jaw in chewing are brought about by the muscles of mastication (the masseter, the temporal, the medial and lateral pterygoids, and the buccinator). The sensitivity of the periodontal membrane that surrounds and supports the teeth, rather than the power of the muscles of mastication, determines the force of the bite. Mastication is not essential for adequate digestion. Chewing does aid digestion, however, by reducing food to small particles and mixing it with the saliva secreted by the salivary glands. The saliva lubricates and moistens dry food, while chewing distributes the saliva throughout the food mass. The movement of the tongue against the hard palate and the cheeks helps to form a rounded

mass, or bolus, of food.

- Salivary Glands
  - Food is tasted and mixed with saliva that is secreted by several sets of glands. Besides the many minute glands that secrete saliva, there are three major pairs of salivary glands: the parotid, the submandibular, and the sublingual glands. The parotid glands, the largest of the pairs, are located at the side of the face, below and in front of each ear. The parotid glands are enclosed in sheaths that limit the extent of their swelling when inflamed, as in mumps. The submandibular glands, which are rounded in shape, lie near the inner side of the lower jawbone, in front of the sternomastoid muscle (the prominent muscle of the jaw). The sublingual glands lie directly under the mucous membrane covering the floor of the mouth beneath the tongue.
- Saliva
  - Saliva dissolves some of the chewed food and acts as a lubricant, facilitating passage through the subsequent portions of the digestive tract. Saliva also contains a starch-digesting enzyme called amylase (ptyalin), which initiates the process of enzymatic hydrolysis; it splits starch (a polysaccharide containing many sugar molecules bound in a continuous chain) into molecules of the double sugar maltose. Many carnivores, such as dogs and cats, have no amylase in their saliva; therefore, their natural diet contains very little starch. Substances must be in solution for the taste buds to be stimulated; saliva provides the solvent for food materials.
- Pharynx
  - The pharynx, or throat, is the passageway leading from the mouth and nose to the esophagus and larynx. The pharynx permits the passage of swallowed solids and liquids into the

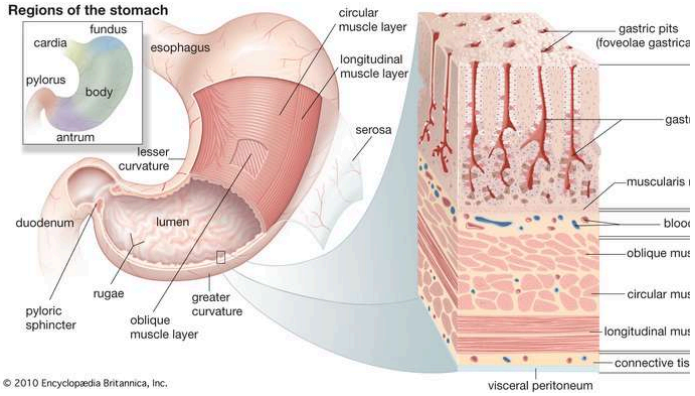
esophagus, or gullet, and conducts air to and from the trachea, or windpipe, during respiration. The pharynx also connects on either side with the cavity of the middle ear by way of the Eustachian tube and provides for equalization of air pressure on the eardrum membrane, which separates the cavity of the middle ear from the external ear canal. The pharynx has roughly the form of a flattened funnel. It is attached to the surrounding structures but is loose enough to permit gliding of the pharyngeal wall against them in the movements of swallowing. The principal muscles of the pharynx, involved in the mechanics of swallowing, are the three pharyngeal constrictors, which overlap each other slightly and form the primary musculature of the side and rear pharyngeal walls.



- Esophagus
  - The esophagus, which passes food from the pharynx to the stomach, is about 25 cm (10 inches) in length; the width varies from 1.5 to 2 cm (about 1 inch). The esophagus lies behind the trachea and heart and in front of the spinal column; it passes through the diaphragm before entering the stomach.

- **Activity #3: Saltine Cracker Test (in person and at home). Have students cut up crackers or chew it and leave the cracker in their mouth.**
- **Essential topic covering: Have students understand how the beginning of digestion of amylase works and physically use their own bodies.**

- Stomach
  - The stomach receives ingested food and liquids from the esophagus and retains them for grinding and mixing with gastric juice so that food particles are smaller and more soluble. The main functions of the stomach are to commence the digestion of carbohydrates and proteins, to convert the meal into chyme, and to discharge the chyme into the small intestine periodically as the physical and chemical condition of the mixture is rendered suitable for the next phase of digestion. The stomach is located in the left upper part of the abdomen immediately below the diaphragm. In front of the stomach are the liver, part of the diaphragm, and the anterior abdominal wall. Behind it are the pancreas, the left kidney, the left adrenal gland, the spleen, and the colon.

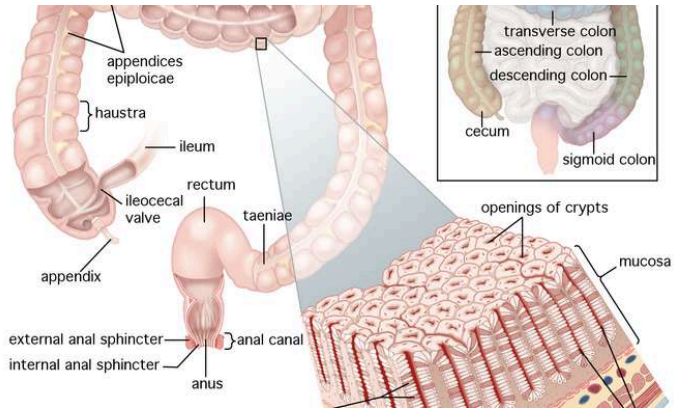


- Small Intestine
  - The small intestine is the principal

organ of the digestive tract. The primary functions of the small intestine are mixing and transporting of intraluminal contents, production of enzymes and other constituents essential for digestion, and absorption of nutrients. Most of the processes that solubilize carbohydrates, proteins, and fats and reduce them to relatively simple organic compounds occur in the small intestine.

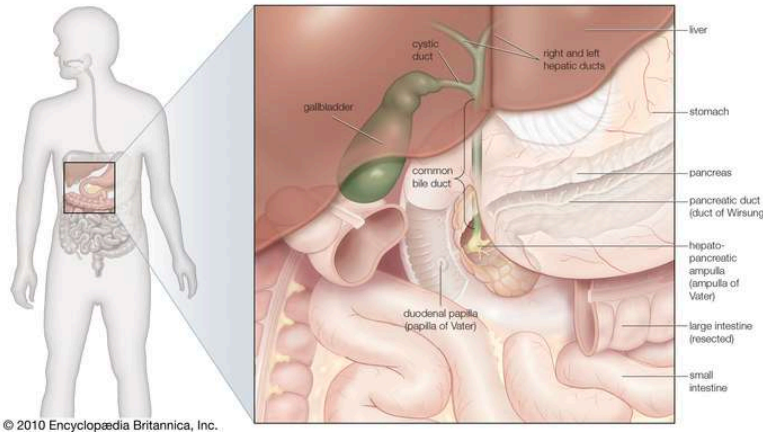
- Large Intestine
  - The large intestine, or colon, serves as a reservoir for the liquids emptied into it from the small intestine. It has a much larger diameter than the small intestine (approximately 2.5 cm, or 1 inch, as opposed to 6 cm, or 3 inches, in the large intestine), but at 150 cm (5 feet), it is less than one-quarter the length of the small intestine. The primary functions of the colon are to absorb water; to maintain osmolality, or level of solutes, of the blood by excreting and absorbing electrolytes (substances, such as sodium and chloride, that in solution take on an electrical charge) from the chyme; and to store fecal material until it can be evacuated by defecation. The large intestine also secretes mucus, which aids in lubricating the intestinal contents and facilitates their transport through the bowel. Each day approximately 1.5 to 2 litres (about 2 quarts) of chyme pass through the ileocecal valve that separates the small and large intestines. The chyme is reduced by absorption in the colon to around 150 ml (5 fluid ounces). The residual indigestible matter, together with sloughed-off mucosal cells, dead bacteria, and food residues not

digested by bacteria, constitute the feces. The colon also contains large numbers of bacteria that synthesize niacin (nicotinic acid), thiamin (vitamin B_1) and vitamin K, vitamins that are essential to several metabolic activities as well as to the function of the central nervous system.



- Liver
  - The liver is not only the largest gland in the body but also the most complex in function. The major functions of the liver are to participate in the metabolism of protein, carbohydrates, and fat; to synthesize cholesterol and bile acids; to initiate the formation of bile; to engage in the transport of bilirubin; to metabolize and transport certain drugs; and to control transport and storage of carbohydrates.
- Biliary Tract
  - The biliary tract begins with the appearance of two large ducts, the right and left hepatic ducts, at the porta hepatis, a groove that separates two lobes on the right side of the liver. Just below the porta hepatis, these 1- to 2-cm (about half-inch) ducts join to form the hepatic duct, which proceeds for another 2 to 3 cm and is joined by the cystic duct, leading from the

gallbladder. The resulting common bile duct progresses downward through the head of the pancreas.



- Pancreas
  - The pancreas is a long, narrow gland that is situated transversely across the upper abdomen, behind the stomach and the spleen. The midportion of the pancreas lies against the vertebral column, the abdominal aorta, and the inferior vena cava. The pancreas is both an exocrine (ductal) and endocrine (ductless) gland. The exocrine tissue, called acinar tissue, produces important digestive enzyme precursors that are transmitted into the small intestine, while the endocrine tissue (contained in the islets of Langerhans) produces at least two hormones (insulin and glucagon) that are important in the regulation of carbohydrate metabolism. Two other hormones produced by the pancreas, vasoactive intestinal polypeptide and somatostatin, are pivotal elements in the control of intestinal secretion and motility. Individual acinar cells have the shape of a truncated pyramid, arranged in groups around a central ductal lumen. These central ducts empty into progressively larger

intercalated and collecting ducts that eventually join the pancreatic duct (duct of Wirsung). The pancreatic duct in turn enters the hepatopancreatic ampulla (ampulla of Vater) of the duodenum, where, in about 80 percent of instances, it is joined by the common bile duct. Occasionally the junction with the common bile duct is proximal to the ampulla, and in a few cases the pancreatic duct and the common bile duct join the duodenum separately.

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- **Activity #4: Digestive Food Stomach (Touch, Feel, and Smell)**
- **https://www.stem.org.uk/resources/elibrary/resource/35396/digestive-system-experimen**

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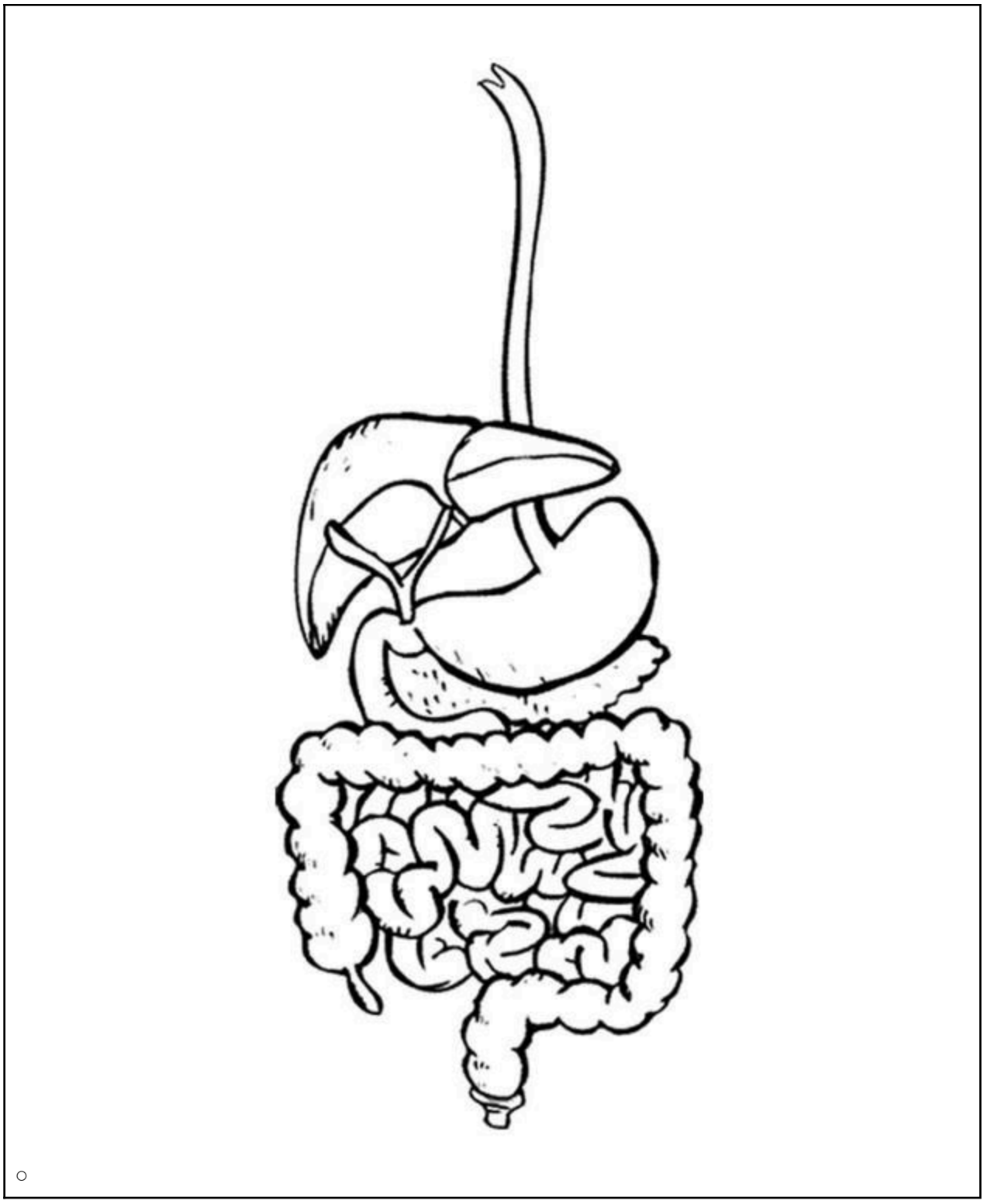
- **Activity #5: Have students draw a picture and color in the entire human digestive system**



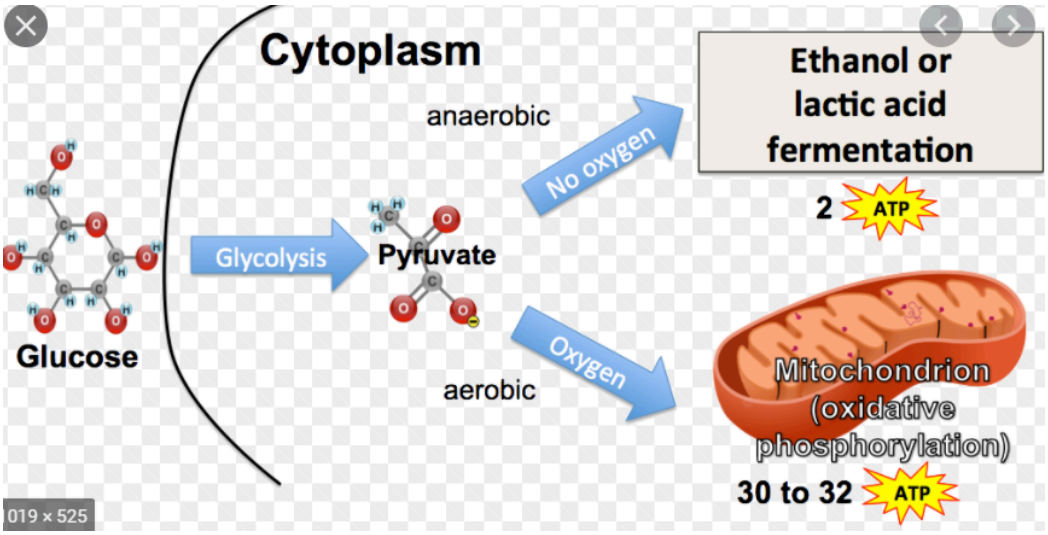
- **<u>How does exercise affect your body?</u>**
    - How do we define exercise?
    - What does a good/safe workout look like?
        - Stretches
        - Aerobic exercise (cardio),
        - Strength training (includes resistance training),
        - Balance exercises,
        - Flexibility exercises

Activity #5: Special Guest: Coach Ivan White will visit and demonstrate some exercises and exercise plans students can do at home on a daily basis.

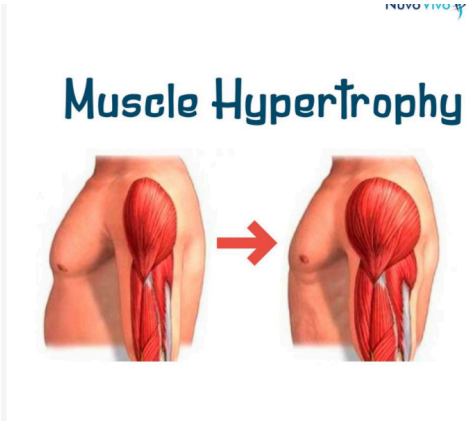
- **What are the benefits of frequent exercise?**
    - Control Weight
    - Mental Health and Mood
    - Reduce your risk of heart diseases
    - Help your body manage blood sugar and insulin levels
    - Improve your sexual health
    - The brain-changing benefits of exercise | Wendy Suzuki

Activity #6: Special Guest: Ms. Monica Lynn. Mindfulness session.
Show how exercising is not only your muscles but also your brain and focus.

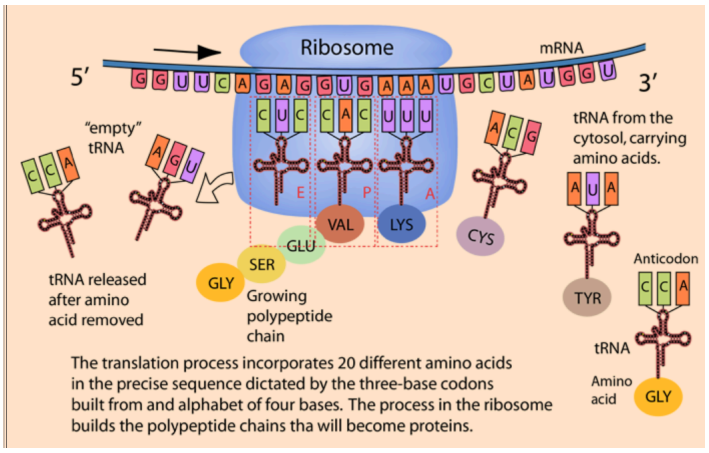
- **How do your muscles react to use?**
    - Anaerobic Respiration/ Lactic Acid Creation when muscles breakdown and rebuild to gain



- **Muscle Hypertrophy**
  - There are two types of muscular hypertrophy: myofibrillar: growth of muscle contraction parts sarcoplasmic: increased muscle glycogen storage Which type to focus on depends on your fitness goals. Myofibrillar training will help with strength and speed. Sarcoplasmic growth helps give your body more sustained energy for endurance athletic events.



- Protein Synthesis



- To gain muscle one must produce more muscle than what's being broken down

- **Supplements? Are they safe and effective?**
  - **C4 Pre-Workout:** Seen at many grocery stores, but banned in athletic sports. It is used to provide long-lasting energy, mental alertness, strength, and endurance, helping to reduce fatigue during workouts. The C4 is primarily used to increase energy and endurance. It functions as a stimulant, containing a healthy dose of caffeine and creatine which both give the body an energy boost. The reason why C4 Pre-Workouts are banned is because it contains a molecule called synephrine, which may give athletes an edge over their opponent and is classified dangerous to an athlete due to its long term health effects.
  - **Creatinine:** Creatine is the most popular of these substances, believed to enhance muscle mass and help athletes achieve bursts of strength. Creatine is a natural substance that turns into creatine phosphate in the body. Creatine phosphate helps make a substance called adenosine triphosphate (ATP). ATP provides the energy for muscle contractions. The body produces some of the creatine it uses. It also comes from protein-rich foods such as meat or fish. Although creatine is a natural substance, it hasn't been well-studied over the long term. Researchers still aren't sure what effects it might have on the body, although there is evidence that in the short term, Creatinine is safe for

high-intensity resistance training.

- **Beta-Alanine:** Beta-alanine is a non-essential amino acid that is produced naturally in the body. Beta-Alanine aids in the production of carnosine. That's a compound that plays a role in muscle endurance in high-intensity exercise. Beta-Alanine is marketed as a way to enhance sports performance and endurance. Some scientific evidence backs such uses, but the studies have been small and the results inconclusive.
- **Branched-Chain Amino Acids:** Branched-chain amino acids are essential nutrients that the body obtains from proteins found in food, especially meat, dairy products, and legumes. They include leucine, isoleucine, and valine. "Branched-chain" refers to the chemical structure of these amino acids. People use branched-chain amino acids for medicine. But there isn't enough reliable information to support these other uses.
- **Beta-hydroxy beta-methylbutyrate (HMB):** Beta-hydroxy beta-methylbutyrate (HMB), a metabolite of the essential amino acid leucine, is one of the latest dietary supplements promoted to enhance gains in strength and lean body mass associated with resistance training. Unlike anabolic hormones that induce muscle hypertrophy by increasing muscle protein synthesis, HMB is claimed to influence strength and lean body mass by acting as an anti catabolic agent, minimising protein breakdown and damage to cells that may occur with intense exercise. Of the literature reviewed relating to HMB administration during resistance training, only 2 papers are full manuscripts appearing in peer reviewed journals. The remaining 8 papers are published as abstracts only, making it difficult to critically review the research. There is clearly a need for more tightly controlled, longer duration studies to verify if HMB enhances strength and muscular hypertrophy development associated with resistance training across a range of groups, including resistance trained individuals.

- Conjugated linoleic acid (CLA)

  - **Source: www. Healthline.com and NIH.gov**
  - https://www.healthline.com/nutrition/benefits-of-bcaa
  - https://pubmed.ncbi.nlm.nih.gov/10966150/
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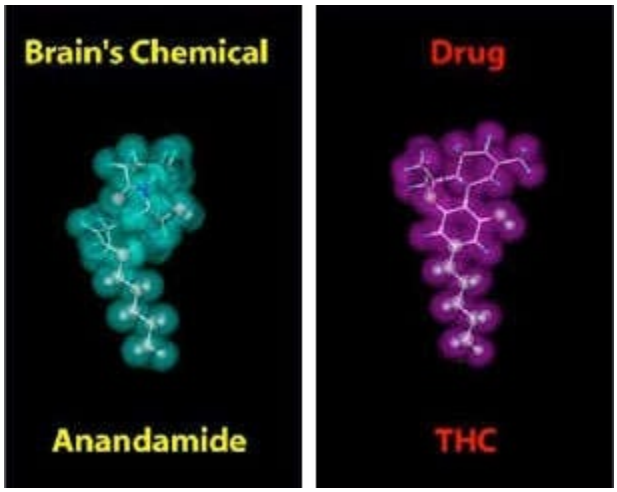
- **How does Medicine + Drugs affect your body?**
  - Educator's Guide to The Truth About Drugs
  - Drug Education Powerpoint
  - What is a drug?

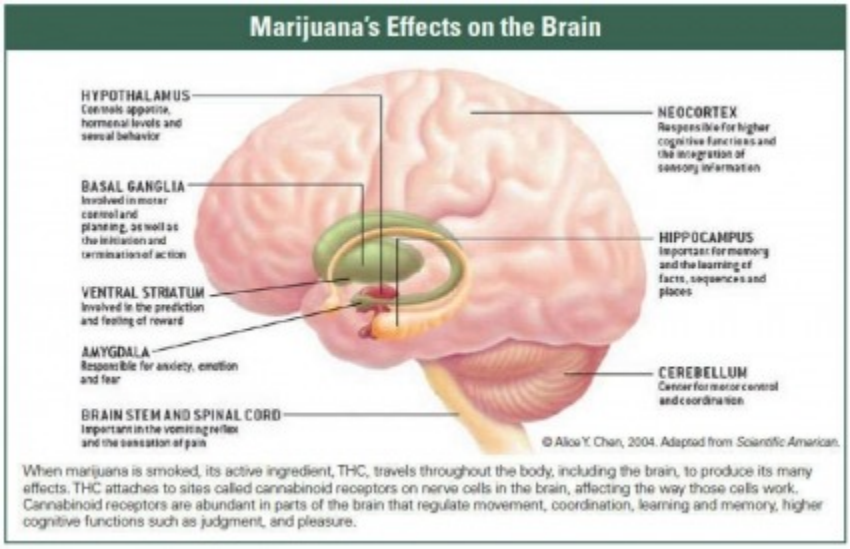
    - Why Do People Take Drugs:
      - To fit in

        - To escape or relax
        - To relieve boredom
        - To seem grown up
        - To rebel
        - To experiment
    - How do Drugs Work?
    - Drugs affect the Mind
- Marijuana
    - THC's chemical structure is similar to the brain chemical *anandamide*. Similarity in structure allows the body to recognize THC and to alter normal brain communication.
    - 

    - *Endogenous cannabinoids* such as anandamide (see figure) function as *neurotransmitters* because they send chemical messages between nerve cells (*neurons*) throughout the nervous system. They affect brain areas that influence pleasure, memory, thinking, concentration, movement, coordination, and sensory and time perception. Because of this similarity, THC is able to attach to molecules called *cannabinoid receptors* on neurons in these brain areas and activate them, disrupting various mental and physical functions and causing the effects described earlier. The neural communication network that uses these cannabinoid neurotransmitters, known as the *endocannabinoid system*, plays a critical role in the nervous system's normal functioning, so interfering with it can have profound effects.
    - For example, THC is able to alter the functioning of the hippocampus and orbitofrontal cortex, brain areas that enable a person to form new memories and shift his or her attentional focus. As a result, using marijuana causes

impaired thinking and interferes with a person's ability to learn and perform complicated tasks. THC also disrupts functioning of the cerebellum and basal ganglia, brain areas that regulate balance, posture, coordination, and reaction time. This is the reason people who have used marijuana may not be able to drive safely and may have problems playing sports or engaging in other physical activities.

- People who have taken large doses of the drug may experience an acute psychosis, which includes hallucinations, delusions, and a loss of the sense of personal identity.
- THC, acting through cannabinoid receptors, also activates the brain's reward system, which includes regions that govern the response to healthy pleasurable behaviors such as sex and eating. Like most other drugs that people misuse, THC stimulates neurons in the reward system to release the signaling chemical *dopamine* at levels higher than typically observed in response to natural rewarding stimuli. The surge of dopamine "teaches" the brain to repeat the rewarding behavior, helping account for marijuana's addictive properties.



When marijuana is smoked, its active ingredient, THC, travels throughout the body, including the brain, to produce its many effects. THC attaches to sites called cannabinoid receptors on nerve cells in the brain, affecting the way those cells work. Cannabinoid receptors are abundant in parts of the brain that regulate movement, coordination, learning and memory, higher cognitive functions such as judgment, and pleasure.

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- Alcohol
  - Alcohol acts primarily on the nerve cells within the brain. Alcohol interferes with communication between nerve cells and all other cells, suppressing the activities of

excitatory nerve pathways and increasing the activities of inhibitory nerve pathways.

- For example, University of Chicago Medical Center: Alcohol and Anesthetic Actions talks about the ability of alcohol (and inhaled anesthetics) to enhance the effects of the neurotransmitter GABA, which is an inhibitory neurotransmitter. Enhancing an inhibitor generally induces sluggishness, which matches the behavior you see in a drunk person. Alcohol not only enhances an inhibitor, it also weakens an excitatory neurotransmitter called glutamine. Dampening the effect of an excitatory neurotransmitter also produces sluggishness. Alcohol does this by interacting with the receptors on the receiving cells in these pathways.
- Alcohol affects various centers in the brain, both higher and lower order. The centers are not equally affected by the same BAC — the higher-order centers are more sensitive than the lower-order centers. As the BAC increases, more and more centers of the brain are affected.
- The order in which alcohol affects the various brain centers is as follows:
    - Cerebral cortex
    - Limbic system
    - Cerebellum
    - Hypothalamus and pituitary gland
    - Medulla (brain stem)
- Nerve cells talk to each other and to other cells (such as muscle or gland cells) by sending chemical messages. These messages are called neurotransmitters. An electrical signal travels down one nerve cell, causing it to release the neurotransmitter into a small gap between cells called the synapse. The neurotransmitter travels across the gap, binds to a protein on the receiving cell membrane called a receptor, and causes a change (electrical, chemical or mechanical) in the receiving cell. The neurotransmitter and receptor are specific to each other, like a lock and key. Neurotransmitters can either excite the receiving cell, which causes a response or inhibit the receiving cell, which prevents stimulation.
- The cerebral cortex is the highest portion of the brain. The cortex processes information from your senses, does your "thought" processing and consciousness (in combination with a structure called the basal ganglia), initiates most voluntary muscle movements and influences lower-order brain centers. In the cortex, alcohol does the following:
- Depresses the behavioral inhibitory centers: The person becomes more talkative, more self-confident and less socially inhibited.

- Slows down the processing of information from the senses: The person has trouble seeing, hearing, smelling, touching and tasting; also, the threshold for pain is raised.
- Inhibits thought processes: The person does not use good judgment or think clearly.
- These effects get more pronounced as the BAC increases. The limbic system consists of areas of the brain called the hippocampus and septal area. The limbic system controls emotions and memory. As alcohol affects this system, the person is subject to exaggerated states of emotion (anger, aggressiveness, withdrawal) and memory loss. The cerebellum coordinates the movement of muscles. The brain impulses that initiate muscle movement originate in the motor centers of the cerebral cortex and travel through the medulla and spinal cord to the muscles. As the nerve signals pass through the medulla, they are influenced by nerve impulses from the cerebellum. The cerebellum controls fine movements. For example, you can normally touch your finger to your nose in one smooth motion with your eyes closed; if your cerebellum were not functioning, the motion would be extremely shaky or jerky. As alcohol affects the cerebellum, muscle movements become uncoordinated. In addition to coordinating voluntary muscle movements, the cerebellum also coordinates the fine muscle movements involved in maintaining your balance. So, as alcohol affects the cerebellum, a person may lose their balance frequently. At this stage, this person might be described as "falling down drunk." The hypothalamus is an area of the brain that controls and influences many automatic functions of the brain through actions on the medulla, and coordinates many chemical or endocrine functions (secretions of sex, thyroid and growth hormones) through chemical and nerve impulse actions on the pituitary gland. Alcohol has two noticeable effects on the hypothalamus and pituitary gland, which influence sexual behavior and urinary excretion. Alcohol depresses the nerve centers in the hypothalamus that control sexual arousal and performance. As BAC increases, sexual behavior increases, but sexual performance declines. Excessive drinking also inhibits the pituitary secretion of anti-diuretic hormone (ADH), which acts on the kidney to reabsorb water. Alcohol acts on the hypothalamus/pituitary to reduce the circulating levels of ADH. When ADH levels drop, the kidneys do not reabsorb as much water; consequently, the kidneys produce more urine. The medulla, or brain stem,

controls or influences all of the bodily functions that are involuntary, like breathing, heart rate, temperature and consciousness. As alcohol starts to influence upper centers in the medulla, such as the reticular formation, a person will start to feel sleepy and may eventually become unconscious as BAC increases. If the BAC gets high enough to influence the breathing, heart rate and temperature centers, a person will breathe slowly or stop breathing altogether, and both blood pressure and body temperature will fall. These conditions can be fatal.

- In addition to the brain, alcohol can affect other bodily functions, including the following:
    - Irritates the linings of the stomach and intestine: This can lead to vomiting.
    - Increases blood flow to the stomach and intestines: This increases secretions by these organs, most notably stomach acid secretion.
    - Increases blood flow to the skin: This causes a person to sweat and look flushed. The sweating causes body heat to be lost, and the person's body temperature may actually fall below normal.
    - Reduces blood flow to muscles: This can lead to muscle aches, most notably when a person recovers from the alcohol (the "hangover"). All of alcohol's effects continue until the ingested alcohol is eliminated by the body.
- Long-term effects:
    - The increased activity in the liver causes cell death and hardening of the tissue (cirrhosis of the liver).
    - The brain cells in various centers die, thereby reducing the total brain mass.
    - Stomach and intestinal ulcers can form because the constant alcohol use irritates and degrades the linings of these organs.
    - Blood pressure increases as the heart compensates for the initially reduced blood pressure caused by alcohol.
    - Male sex-cell (sperm) production decreases because of decreased sex-hormone secretion from the hypothalamus/pituitary and, possibly, direct effects of alcohol on the testes.
    - Poor nutrition decreases levels of iron and vitamin B, leading to anemia.

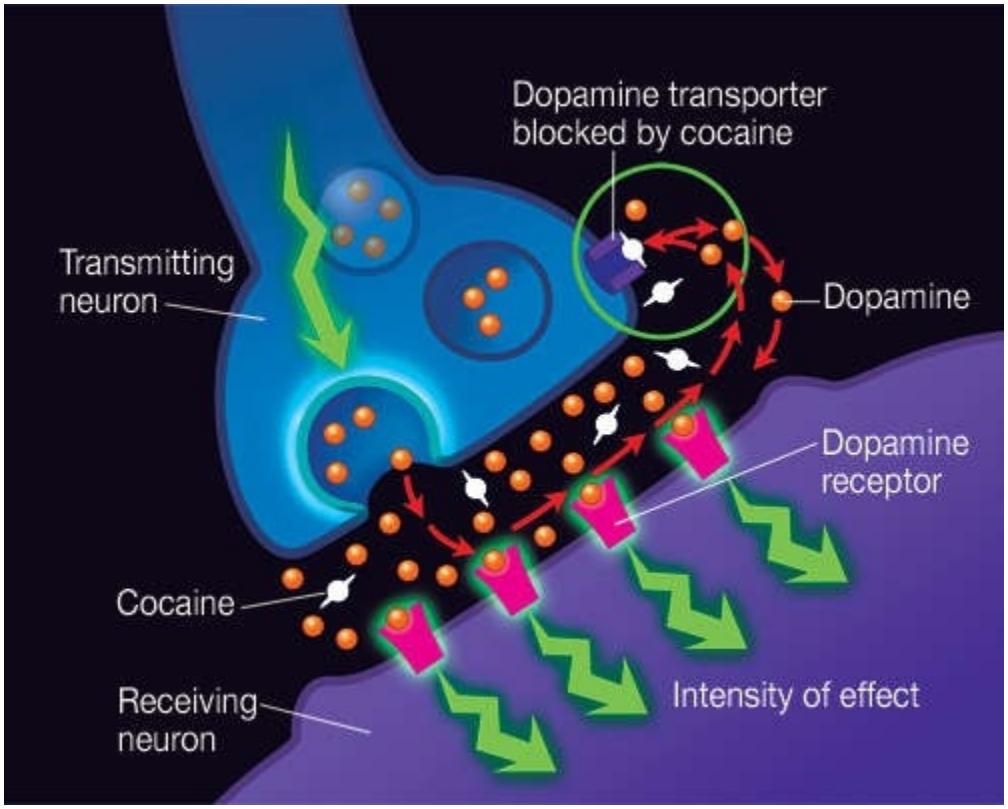
        - Because alcoholics lose balance and fall more often, they suffer more often from bruises and broken bones; this is especially true as they get older.
        - Finally, alcohol abuse and dependence cause emotional and social problems. Because alcohol affects emotional centers in the limbic system, alcoholics can become anxious, depressed, and even suicidal. The emotional and physical effects of alcohol can contribute to marital and family problems, including domestic violence, as well as work-related problems, such as excessive absences and poor performance.
- Ecstasy
- Heroin
    - When heroin enters the brain, it is converted to morphine and binds rapidly to opioid receptors.11 People who use heroin typically report feeling a surge of pleasurable sensation—a "rush." The intensity of the rush is a function of how much drug is taken and how rapidly the drug enters the brain and binds to the opioid receptors. With heroin, the rush is usually accompanied by a warm flushing of the skin, dry mouth, and a heavy feeling in the extremities. Nausea, vomiting, and severe itching may also occur. After the initial effects, users usually will be drowsy for several hours; mental function is clouded; heart function slows; and breathing is also severely slowed, sometimes enough to be life-threatening. Slowed breathing can also lead to coma and permanent brain damage.Repeated heroin use changes the physical structure13 and physiology of the brain, creating long-term imbalances in neuronal and hormonal systems that are not easily reversed.14,15 Studies have shown some deterioration of the brain's white matter due to heroin use, which may affect decision-making abilities, the ability to regulate behavior, and responses to stressful situations.16-18 Heroin also produces profound degrees of tolerance and physical dependence. Tolerance occurs when more and more of the drug is required to achieve the same effects. With physical dependence, the body adapts to the presence of the drug, and withdrawal symptoms occur if use is reduced abruptly.
    - Withdrawal may occur within a few hours after the last

time the drug is taken. Symptoms of withdrawal include restlessness, muscle and bone pain, insomnia, diarrhea, vomiting, cold flashes with goose bumps ("cold turkey"), and leg movements. Major withdrawal symptoms peak between 24–48 hours after the last dose of heroin and subside after about a week. However, some people have shown persistent withdrawal signs for many months. Finally, repeated heroin use often results in heroin use disorder—a chronic relapsing disease that goes beyond physical dependence and is characterized by uncontrollable drug-seeking, no matter the consequences. Heroin is extremely addictive no matter how it is administered, although routes of administration that allow it to reach the brain the fastest (i.e., injection and smoking) increase the risk of developing heroin use disorder. Once a person has heroin use disorder, seeking and using the drug becomes their primary purpose in life.

- Cocaine
  - The brain's *mesolimbic dopamine system*, its reward pathway, is stimulated by all types of reinforcing stimuli, such as food, sex, and many drugs of abuse, including cocaine.8 This pathway originates in a region of [1]the midbrain called the ventral tegmental area and extends to the nucleus accumbens, one of the brain's key reward areas.8 Besides reward, this circuit also regulates emotions and motivation.
  - In the normal communication process, dopamine is released by a neuron into the synapse (the small gap between two neurons), where it binds to specialized proteins called *dopamine receptors* on the neighboring neuron. By this process, dopamine acts as a chemical messenger, carrying a signal from neuron to neuron. Another specialized protein called a *transporter* removes dopamine from the synapse to be recycled for further use.8
  - Drugs of abuse can interfere with this normal communication process. For example, cocaine acts by binding to the dopamine transporter, blocking the removal of dopamine from the synapse. Dopamine then accumulates in the synapse to produce an amplified signal

1

to the receiving neurons. This is what causes the euphoria commonly experienced immediately after taking the drug

- 

  - Meth (Methamphetamine)
    -
  - LSD
  - Xanax (Alprazolam)
    - The drug industry of today is a colossal money-making industry, with plenty of prescription drugs originally manufactured for the benefit of humanity. One of these drugs is rather well known–Alprazolam. It is a part of a class of molecules named benzodiazepines– first discovered by none other than Dr. Leo Sternbach in 1955. All benzodiazepines share a few similarities: they contain both benzine and diazepine rings in their molecular structures. These special rings allow them to be labeled as “psychoactive drugs”– drugs that affect the human body as well as the psyche. Used to treat panic disorders and anxiety, alprazolam is usually ingested into the body as pills, with an assortment of

pills to choose from. Although created for good intentions, the misuse rate for this drug is particularly high, causing the brain to be chemically dependent on this drug, and inevitably be addicted. Due to this unfortunate fact, the Drug Enforcement Administration has placed Alprazolam on Schedule IV under the Controlled Substances Act.

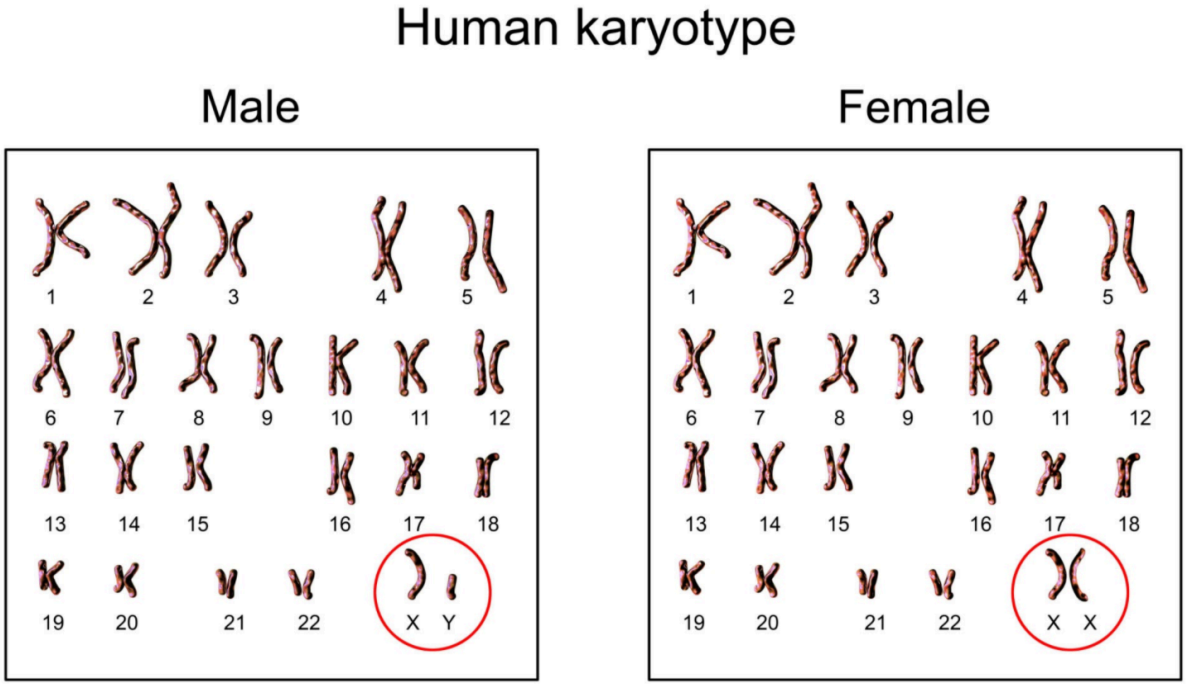
- The chemical properties also play a huge role in the molecule. Alprazolam is a type of fast acting, short duration benzodiazepine which acts as tranquilizers and sometimes used to treat anxiety and panic. Although it increases the production and effectiveness of a neurochemical called GABA, responsible for calming stress, it is also more toxic than most other benzodiazepines and has many effects if there is continued abuse of the substance. If one has too much, the brain becomes ineffective at producing GABA and it will be less able to overcome stress and anxiety naturally. In addition, there will be more confusion, an inability to think clearly, racing thoughts, excessive and erratic risk-taking behavior, and periods of severe depression with and without suicidal thoughts because the brain's chemistry is off balance.

- Oxycodone:
  - Oxycodone, just like most other opioids, binds to three main types of receptors in the body. These receptors are called Mu receptors, Kappa receptors, and Delta receptors. Oxycodone binds to these receptors, forms bonds, and activates them, kind of like a keybinding and attaching to a click
  - Once Oxycodone"Clicks" into the receptors, it begins to inhibit Adenylyl-cyclase (which is an enzyme that catalyzes adenosine triphosphate (ATP) A.K.A. energy into cAMP (cyclic adenosine monophosphate). cAMP is an intracellular messenger that transports these hormones, such as adrenaline to these receptors in the body.

- Once Oxycodone binds to its receptors it hyperpolarizes neurons in the brain. Hyperpolarization inhibits action potentials from forming in neurons. Action potential occurs when an impulse is being sent from a neuron to another neuron. Inhibiting these action potentials means that impulses such as pain cannot be sent to the appropriate part of the body. So initially, these specific pain neurotransmitters will never be transferred from the brain and cease to exist.
- The reason why Oxycodone binds so well with its receptors is because of how similar it is structurally to many common Endorphins/Neurotransmitters such as Adrenaline, Serotonin, and Dopamine. So in simple terms: Oxycodone is hacking the system and tricking the respectors into thinking it's a normal endorphin in the body.

    - Drugs Biology:
    - How is a bad drug different from a good drug?
    - Why can frequent intake of drugs harm you?

- **How do you get your traits**
    - Why are certain features about us hereditary?
        - **Autosomal chromosomes:** We humans inherit 22 autosomal (numered) chromosomes (eg from our mother and 22 autosomal chromosomes from our father. As a result, certain features (such as hair texture, nose shape, skin color, eye shape, and lip thickness) can resemble our parents very closely to our parents.



- **<u>Sex chromosomes:</u>** Your sex (at birth) is resembled by the 23rd pair of chromosomes. Women have one X given by their mother and one X given by their father, while men have one X given by their mother and one Y chromosome given by the father. Women can pass either X chromosome to their children (Male or female) while men will pass their single chromosome off to their daughter (that they received from their mother).
- **<u>Blood Type:</u>** Blood types are determined by the presence or absence of certain antigens – substances that can trigger an immune response if they are foreign to the body. Since some antigens can trigger a patient's immune system to attack the transfused blood, safe blood transfusions depend on careful blood typing and cross-matching. Do you know what blood type is safe for you if you need a transfusion? There are four major blood groups determined by the presence or absence of two antigens – A and B – on the surface of red blood cells. In addition to the A and B antigens, there is a protein called the Rh factor, which can be either present (+) or absent (–), creating the 8 most common blood types (A+, A-, B+, B-, O+, O-, AB+, AB-).
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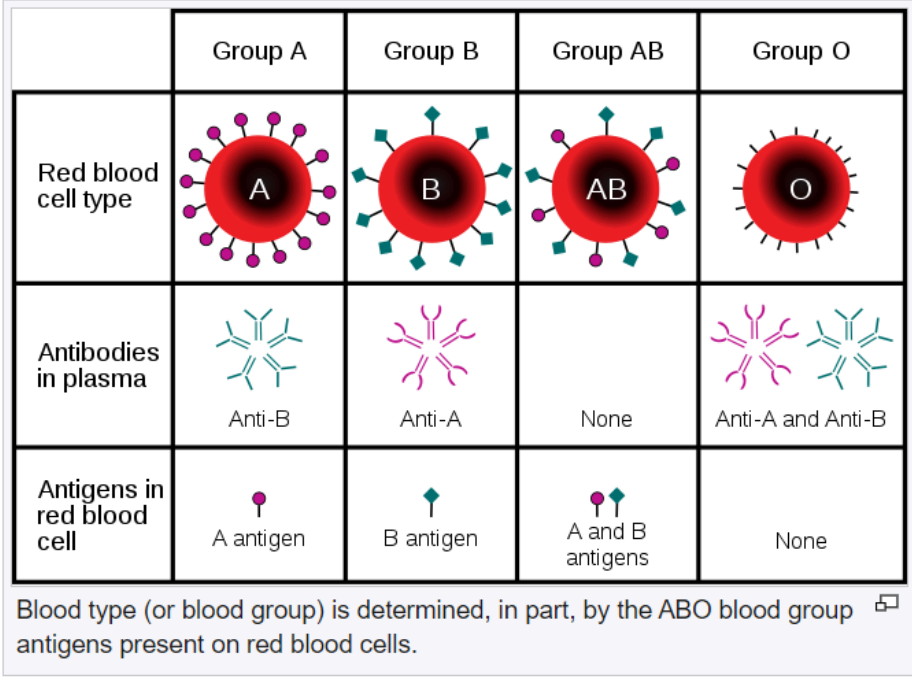


Blood type (or blood group) is determined, in part, by the ABO blood group antigens present on red blood cells.

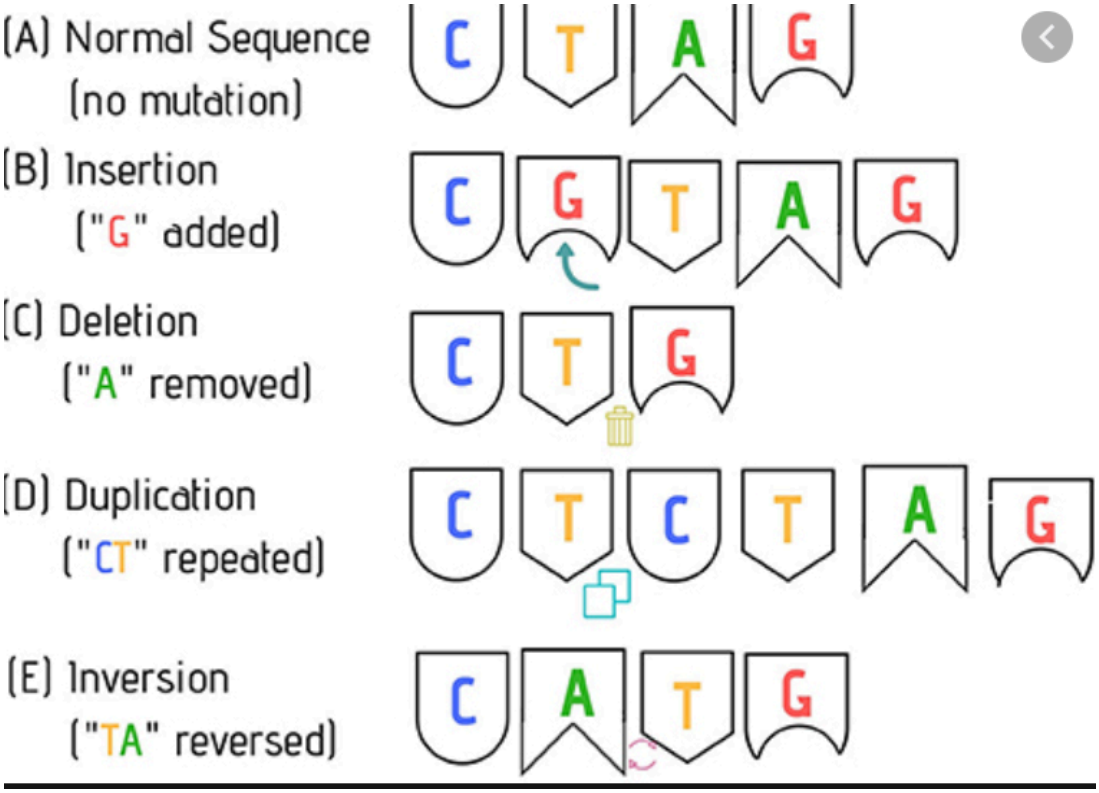
- **Activity #1:** Blood Type predictor. Students will prick their hand and draw a drop of blood. Students will use blood to determine their blood type

- **Mutations**: How did humans become humans? This is through evolution and evolution happens through mutations. Our chromosome is made up of approximately three billion nucleotides. Every now and then during our lives, certain nucleotides can have intertions, deletions, duplications, and inversions of nucleotides. These mutations can happen due to increased radiation or consumptions of certain chemicals While some are harmless and don't change much (or even anything) of our DNA, some can be harmful and change entire phenotypes and gene expression of us and offspring. While this may sound crazy, if it weren't for these mutations,w e would not be who we are today.

Activity #2:
Genetic Zoo Nursery (Online Game): In this game, you will learn about genetics. A zookeeper has mixed up children and parents in the zoo. It's your job to use genetic information to place children with the correct parents. Many traits are inherited, so you will use

clues to match parents with children. Study each genetic report carefully to make sure you can get these children back to their parents. Good luck!

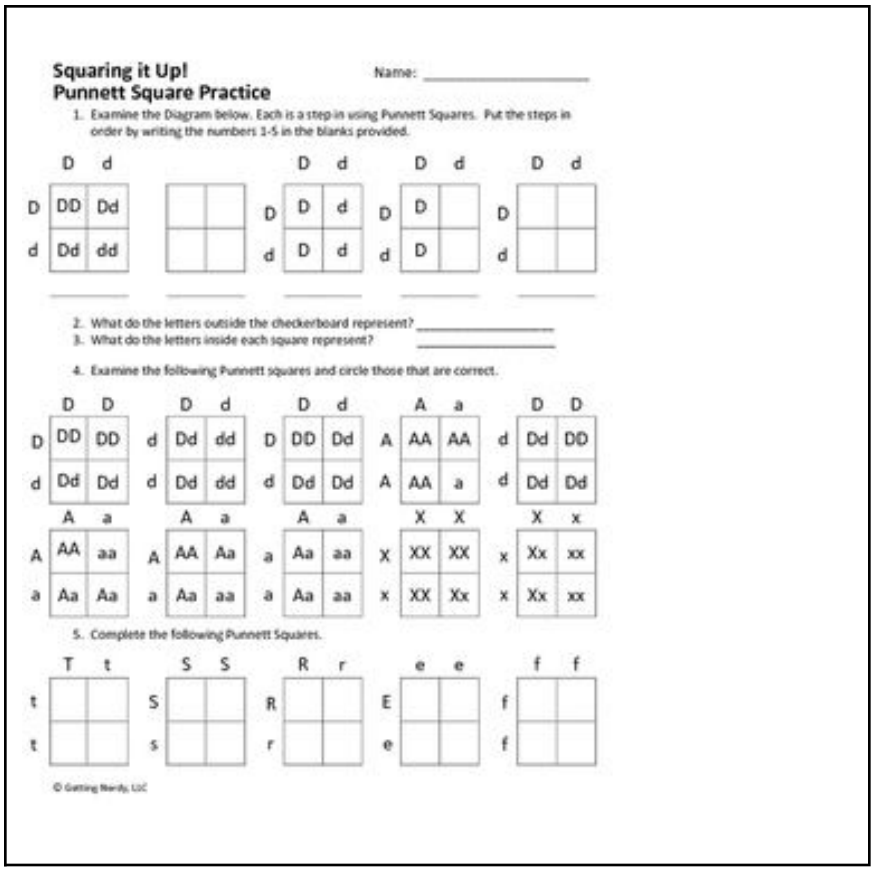
https://www.legendsoflearning.com/learning-objectives/genes-and-traits/



- **Natural Selection/Darwin's Theory of Evolution:** The focus of nature selected certain mutations as advantageous. Those who had the mutations would have increased fitness in a society and be more likely to spread that gene, while those who do not have those mutations will be more likely to lose their genes through failure to reproduce. This is happening even today among a multitude of species.

- How did you get your genes?
  - How can you calculate your genes with the Punnett Square?
    - https://www.youtube.com/watch?v=PyP_5EgQBmE

Activity #3: Have students draw punnett squares for certain features as practice.



Squaring it Up!
Punnett Square Practice

Name: _____

1. Examine the Diagram below. Each is a step in using Punnett Squares. Put the steps in order by writing the numbers 1-5 in the blanks provided.

	D	d
D	DD	Dd
d	Dd	dd

	D	d
D	D	d
d	D	d

	D	
D	D	
d	D	

D		
d		

_____ _____ _____ _____

2. What do the letters outside the checkerboard represent? _____
3. What do the letters inside each square represent? _____

4. Examine the following Punnett squares and circle those that are correct.

	D	D
D	DD	DD
d	Dd	Dd

	D	d
d	Dd	dd
d	Dd	dd

	D	d
D	DD	Dd
d	Dd	Dd

	A	a
A	AA	AA
A	AA	a

	D	D
d	Dd	DD
d	Dd	Dd

	A	a
A	AA	aa
a	Aa	Aa

	A	a
A	AA	Aa
a	Aa	aa

	A	a
a	Aa	aa
a	Aa	aa

	X	X
X	XX	XX
x	XX	Xx

	X	x
x	Xx	xx
x	Xx	xx

5. Complete the following Punnett Squares.

	T	t
t		
t		

	S	S
S		
s		

	R	r
R		
r		

	e	e
E		
e		

	f	f
f		
f		

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- **<u>Opt. How can you measure how well your body is doing? - EMT stuff</u>**
  - Blood pressure:
    - **<u>How To Take A Blood Pressure</u>**
    - To determine a patient's blood pressure, the EMT needs a properly sized blood pressure (BP) cuff. Adult cuffs should have a width of one-third to one-half the circumference of the limb. Pediatric cuffs should have a width of about two-thirds of the upper arm. Using a BP cuff that is too big gives a false low reading. Cuffs that are too small yield a false high reading.

    - **Auscultation**: The blood pressure cuff should be placed on the patient's arm an inch or so above the elbow. Air is pumped into the bladder that inflates and temporarily halts arterial blood flow. The stethoscope is then placed over the patient's brachial artery. When the pressure in the cuff is released and falls below the internal systolic pressure, blood flow resumes and produces sounds. When the pressure in the cuff falls below the internal diastolic pressure, blood flow remains continuous and the sounds disappear completely. Pressure is measured in millimeters of mercury (mmHg).

    - **Palpation**: An alternative method of determining blood pressure is by palpation. No stethoscope is needed. This method can be used if

there is too much ambient noise to auscultate the pulse sounds, like in the back of an ambulance enroute to the hospital. To “palp” a BP, the EMT locates a radial pulse with two fingers prior to pumping up the cuff. The cuff is then inflated until the pulse is no longer felt. The EMT should note the point on the gauge where this occurs and continue to inflate the cuff 30 mmHg beyond this point. The cuff should then be slowly deflated, and the EMT should note the reading at which the radial pulse returns, i.e., where it can be felt again. This results in a reading of about 10 mmHg lower than the systolic pressure determined by auscultation. Palpating a blood pressure has a disadvantage in that the diastolic pressure cannot be determined. Palpation should be used only when auscultation is not possible. High blood pressure is called hypertension. For an adult, this is usually defined as a systolic pressure that persists above 140 mmHg or a diastolic pressure that persists above 90 mmHg. Hypertension may be a sign of a possible illness (such as renal disease), injury (such as traumatic brain injury), exertion, anxiety, or even fright.

- Low blood pressure is called hypotension and causes poor perfusion to the cells. There must be an adequate pressure for oxygen and carbon dioxide exchange to occur between the capillaries and cells. A decreased blood pressure is a late sign of shock that occurs when the body can no longer compensate.

- Blood pressure varies among individuals. The accepted rule for “normal” systolic blood pressure for adults up to 40 years of age is the patient’s age plus 100 for a male, and the patient’s age plus 90 for a female. Thus a “normal” systolic BP for a 25-year old female would be approximately 115 mmHg. Children’s “normal” systolic blood pressures are estimated with the formula: 80 + 2 times the child’s age. It is now advised that EMTs not take blood pressures on children under the age of three, (although some providers still believe it is important to practice).
-

BLOOD PRESSURE CATEGORY	SYSTOLIC mm Hg (upper number)		DIASTOLIC mm Hg (lower number)
NORMAL	LESS THAN 120	and	LESS THAN 80
ELEVATED	120 – 129	and	LESS THAN 80
HIGH BLOOD PRESSURE (HYPERTENSION) STAGE 1	130 – 139	or	80 – 89
HIGH BLOOD PRESSURE (HYPERTENSION) STAGE 2	140 OR HIGHER	or	90 OR HIGHER
HYPERTENSIVE CRISIS (consult your doctor immediately)	HIGHER THAN 180	and/or	HIGHER THAN 120

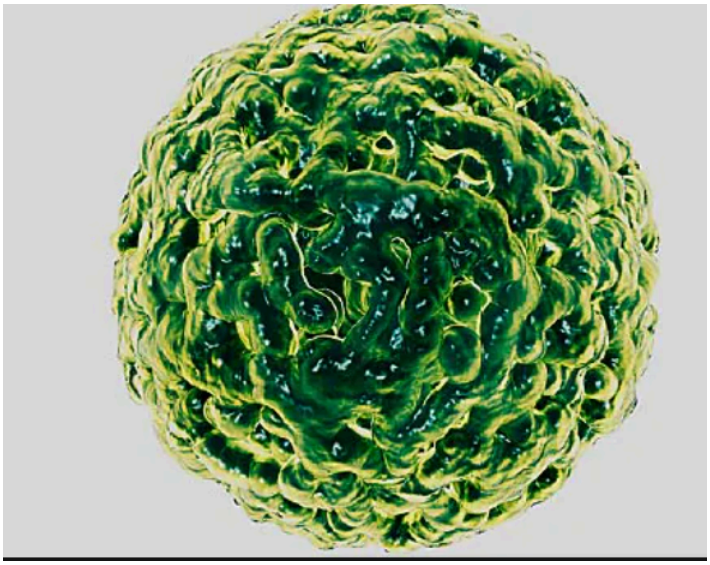
    - Oxygen Saturation:
        - Oxygen saturation is the fraction of oxygen-saturated hemoglobin relative to total hemoglobin in the blood. The human body requires and regulates a very precise and specific balance of oxygen in the blood. Normal arterial blood oxygen saturation levels in humans are 95–100 percent.
    - Height/Weight:
        - No person is made the same: People come in different sizes and shapes (it's a natural part of human diversity). But it is important to get nutrition and check in with your physician to ensure your body is growing healthy.
    - CPR
        - Cardiopulmonary resuscitation is an emergency procedure that combines chest compressions often with artificial ventilation in an effort to manually preserve intact brain function until further measures are taken to restore spontaneous blood circulation and breathing in a person who is in cardiac arrest.
        - https://www.youtube.com/watch?v=-NodDRTsV88
Activity: CPR practice with a dummy.
    -

- **<u>Food Safety</u>**
    - Food Poisoning:
        - How does it occur?
            - Foodborne illness can be caused by eating contaminated food. Infectious organisms — including bacteria, viruses

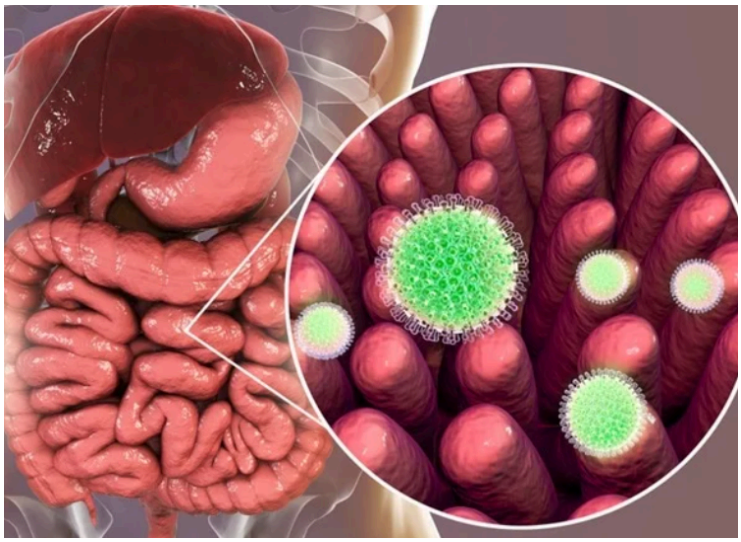
and parasites — or their toxins are the most common causes of food poisoning
    - Food poisoning symptoms may include cramping, nausea, vomiting, or diarrhea.
- What diseases are responsible?
    - Norovirus.
    - Campylobacter.
    - Clostridium perfringens.
    - Staphylococcus aureus.
    - Salmonella.
    - E-Coli
- How can I prevent it?
    - **Clean:** Wash your hands for 20+ seconds with soap and water before handling raw food. Clean work surfaces before, during, and after preparing food. Germs can survive in many places around your kitchen, including your hands, utensils, cutting boards, and countertops for days (great way to spread toxins too)
    - **Separate:** Separate raw meat, poultry, seafood, and eggs from ready-to-eat foods. Use separate cutting boards and keep raw meat away from other foods in your shopping cart and refrigerator.
    - **Cook Right:** Cook food to the right internal temperature to kill harmful bacteria. Use a food thermometer. Chillexternal icon Keep your refrigerator 40°F or below. Refrigerate leftovers within 2 hours of cooking (or within 1 hour if food is exposed to a temperature above 90°F, like in a hot car). Follow food temperature regulations (eg Cook roasts and steaks to at least 145 F. Whole poultry should be cooked to 165 F for doneness. Cook ground beef (hamburger) to at least 160 F. Ground chicken or turkey should be cooked to 165 F.)
- What can I do if I feel that I have food poisoning:
    - Most food poisoning is mild and resolves without treatment. Ensuring adequate hydration and electrolytes as it's the most important aspect of treatment. Take plenty of rest and clean surfaces often.

- What is the difference between the Stomach Flu and Food Poisoning:
    - Most of the symptoms are the same between the stomach flu and food poisoning, but the stomach flu is caused by viruses and are unable to be treated by antibiotics (Viral gastroenteritis).
        - Norwalk (Norovirus): Norovirus is a very contagious virus that causes vomiting and diarrhea. People of all ages can get infected and sick with norovirus. Norovirus spreads easily! People with norovirus

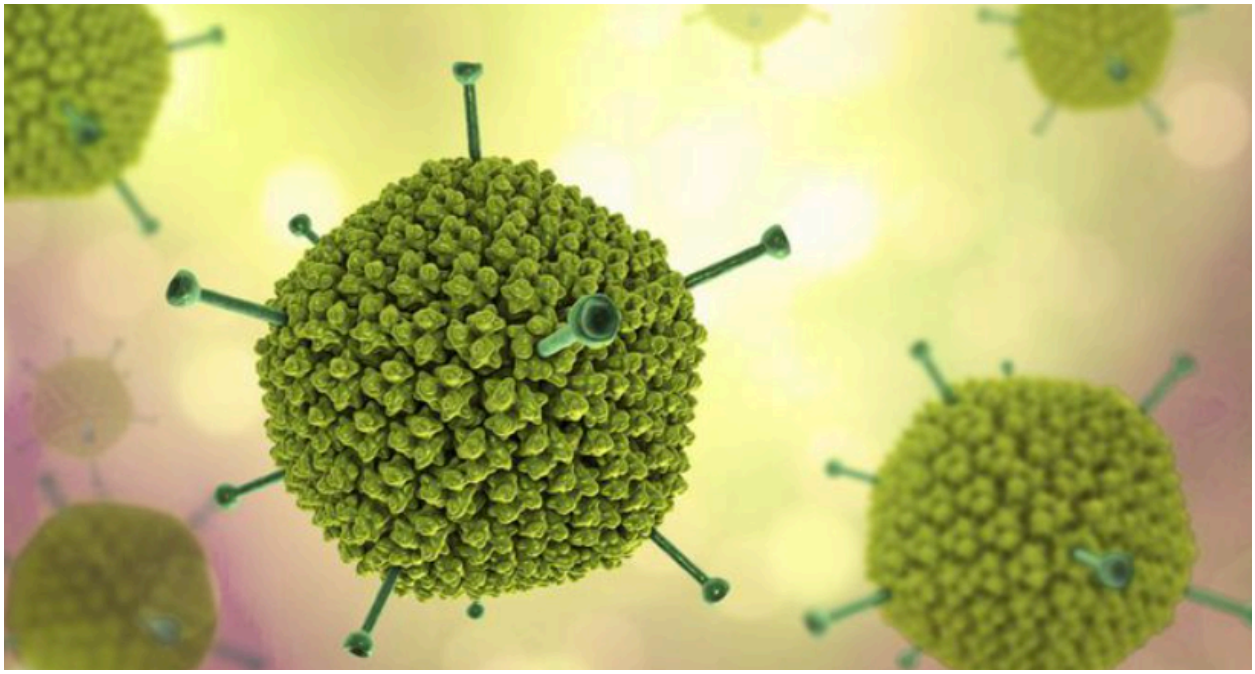
illness can shed billions of norovirus particles. And only a few virus particles can make other people sick.



- Rotavirus: Rotavirus is a genus of double-stranded RNA viruses in the family Reoviridae. Rotaviruses are the most common cause of diarrhoeal disease among infants and young children. Nearly every child in the world is infected with a rotavirus at least once by the age of five.



- Adenovirus:Adenoviruses are common viruses that cause a range of illnesses. One particular strand is responsible for diarrhea and vomiting it through raw meat and cross contamination.



- <u>Safe Tips for Eating out:</u>
  - Go to places that have a lot of movement (e.g. customers) and eat certain foods that are well known to that restaurant.
  - Prevent eating refrigerated food (made to order/ready to eat is almost always the safect)
  - Drink Bottled water instead of tap water
  - Avoid cold-cuts, shellfish/ raw fish, unpasteurized dairy, and cold vegetables
  - Inspect health department grade or rating * if available
  - Wash hands or use sanitizer before eating.

Daily Energizer Games:

1. “Prrr” and “pukutu”

This classroom game is more suited for the little kids. Ask everyone to imagine two birds. One named “prrr” and the other named “Pukutu”. If you call out “prrr”, the students need to stand on their toes and move their elbows out sideways. When you call out “Pukutu”, the students have to stay still and may not move. If a student moves, he is disqualified. This student may distract the other students.

2. Buzz

Ask the group to stand up and to form a circle. Everyone takes turns saying a number starting with 1, 2, 3 and so on. Of course, there is a catch. At every number with a 4 in it or a multiple of 4, that person needs to say BUZZ instead of the number. The next person just continues the series as normal.

For example: 1 - 2 - 3 - ***buzz*** *- 5 - 6 - 7 -* ***buzz*** *- 9 - 10 - 11 -* ***buzz*** *- 13 -* ***buzz*** *- 15 -* ***buzz*** *- 17 - ...*

You can choose any number that might be relevant and replace the *buzz* with another word. This game is great when teaching the time tables, or teaching how hard it is to do two things at the same time (thinking while listening for your turn).

3. Body letters

Split your class into small groups (4-5 students per group). Each group has to think of an acronym about what they have learned so

far. The acronym can't be longer than the number of people in the group. If there are 4 people in a group, the acronym will only have 4 letters.

When they found an acronym the groups have to use their bodies to spell the letters. Other groups have to discuss what the letters stand for.

Afterwards, you write the words on a paper. You pass them around the classroom and refer to them in the rest of your lesson. With this energizer, you can see what your students remembered and give your students a tool to fall back on.

4. Pink toe

The teacher calls out a colour and a body part. Students must find an object in the room that has that colour and then touch the object with the selected body part. For example, if the teacher calls out "red nose", students need to find an object that is red and touch it with their nose. The teacher continues calling colours and body parts.

5. Sports gallery

"Sports gallery" is a very intensive example of an energizer. The teacher calls out different sports skills. The students have to mimic them for at least 10 seconds. After a while the teacher speeds up the tempo. A few sports skills the teacher can call out:

- Shooting a jump shot
- Juggling a soccer ball
- Dancing like a ballerina
- Batting a baseball
- Swinging a golf club
- Downhill skiing
- Serving a tennis ball
- Shooting an arrow
- etc.

6. Lie to me

This energizer is a fun way to get to know your students better. Not just the basics, like where they live or if they have a brother, but real stories and anecdotes.

The students have to tell 3 facts about their life. Something that happened to them. Two of them should be true, and one should be a lie. The other students have to find out which one is the lie. You'll be surprised what kind of crazy things can actually happen! (Or how good your students can lie!)

7. Keyword music roulette

The teacher makes cards with a keyword on it. The keywords refer to the lesson (you can also use the 'Randomness widget' from BookWidgets instead of cards). The students go sit in small groups with a tablet or a computer. You, or one of your students, picks a card. The groups have to find a song title that mentions the keyword. The group that finds it first, may play their song on the iPad.

This energizer connects keywords to songs. Students will remember your lesson every time they hear the song or they will remember your keywords by thinking back about that song.

8. Get on that chair

For this classroom game, students need to be flexible and balanced. For every student, the teacher places a chair. All the chairs should be lined up in a single line. Every student has to stand on a chair. Then, the teacher asks them to go stand in a certain order. *For example: "I want you to organize yourselves from young to old."* The students now have to

change places without touching the ground.

With this energizer, the students get to know each other better in an interactive way. The teacher can give other orders like: *"from tall to small." or "from A to Z."* Every time the students have to change their positions without pushing someone off the chairs. If you want to make it more challenging, you can set a time limit.

9. Likeable Lucie

Students think of an adjective to describe themselves. The adjective must suit the student and must also start with the first letter of their name.

The students have to memorize every name. The first student just says his name, but the second and the rest of the students have to name the previous names before saying their name. The last students will have to do the hard work.

For example: 1. Likeable Lucie - 2. Likeable Lucie and Precious Petra - 3. Likeable Lucie, Precious Petra and Tiny Tom

10. Countdown

Students have to count from 1 to 20. There is one rule though: there is no particular order. Students have to yell the consecutive number whenever they want. But when two students yell a number at the same time, you have to start counting from 1 again. Wonder how long it will take until you reach 20?

11. Be unique

This classroom game is about being unique and about getting to know

each other better. Everyone stands in a circle. Every student has to say something unique about themselves. *For example: "I have four brothers."* If another student also has four brothers, the students who shared the 'not-so-unique' aspect has to sit down. The goal is to stand as long as possible and therefore to share very special things about yourself that no one else typifies.