ZIAUDDIN UNIVERSITY
EXAMINATION BOARD

BIOLOGY
CLASS X
Teacher Resource

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Disclaimer

The web based resources are reference materials for teachers. They have been compiled under the supervision of the Ziauddin College of Education for Ziauddin's Examination Board.

GRADE 10

Sections	Chapters	Weightage in Evaluation
Section 1 Biodiversity	Biodiversity	03 %
Section 2 Cell Biology	Enzymes Bioenergetics	12 %
Section 3 Life Processes	Homeostasis Coordination Support and Movement	20 %
Section 4 Continuity in Life	Inheritance	14 %
Section 5 Application of Biology	Biotechnology Pharmacology	08 %

SECTION 1 : BIODIVERSITY

	SUB TOPICS	STUDENT LEARNING OUTCOMES	REFERENCE MATERIAL
CHAPTER 3	Definition and Introduction of Biodiversity Aims and Principles of Classification History of Classification Systems Five-Kingdom Classification System Conservation of Biodiversity	UNDERSTSANDING Define biodiversity. Describe the basis of classification of living organisms. Explain the aims and principles of classification, keeping in view its historical background. Explain the basis for establishing 5 kingdoms. Describe the major variety of life on the planet earth. Define the concept of conservation. Explain the impact of human beings on biodiversity. Identify causes of deforestation and its effects on biodiversity. Describe some of the issues of conservation in Pakistan (especially with regard to deforestation and hunting). SKILLS Examine some living or preserved plants and animals. Classify representative animals and plants into their respective kingdoms, using data.	   
Content Overview Refer the chapter of 'Biodiversity' from Punjab Textbook 'https://pctb.punjab.gov.pk/system/files/Biology%209.pdf			

A Teacher's Guide to Biodiversity

Lesson One - What is Biodiversity and [1]How Does Organizing Life on Earth Help us Understand it?

Materials: student handout, What is biodiversity?; chalk board or equivalent on which to write data

Academic Objective: Students will understand what the word "biodiversity" means and how scientists organize life on Earth. Vocabulary: biodiversity, species, taxonomy, classification Essential question: What is biodiversity and how is it measured? Estimated Time: Approximately 30 minutes

[2]Instructions: 1. Have students read the handout, "What is biodiversity and how does it affect me and the place where I live?

Spend a few minutes discussing how much life there is on Earth as well as the three types of biodiversity (species, ecosystem and genetic). These are huge concepts so be sure that all students understand them before proceeding with the rest of the unit. Be sure and tell students that they will be measuring biodiversity in a place near their school at the end of the unit.

2. Tell students you are going to talk about how organisms are classified but first you are going to design a classification system for students in your class. Have each student share one thing that is divided into groups (e.g., library books, athletic teams, food in the grocery store, Yellow Pages, etc.). Post the responses.

Ask, Why do you think people organize things into groups? How would you begin to organize things? If you were to organize the students in this class into groups, how might you divide them? Ask volunteers to develop a system for classifying the rest of the students. When the students have this concept, tell them they are going to use one method of classification sometimes used by scientists. Make sure they understand that the characteristics they choose must be unambiguous. For example, a person either has brown eyes or not and a person is either under 5'6" or above it and a person either has on blue jeans or not.

3. H[3]ave one student think of a way of dividing the students into two groups based on one specific characteristic, but the student is not to reveal to the class what the characteristic is. After the classifier has divided the students into the two groups, ask the other students to guess the characteristic used by the classifier. What were the clues? Ask the classifier to develop a chart that reflects the class being divided into the two groups. Example: All Students - boys and girls

4. Ask another student to select a different characteristic to further divide each group. After the classifier has divided the students into the groups, ask the other students to guess the characteristic used by the classifier. What clues? Ask the classifier to continue the chart so that it reflects the two groups being divided into more groups with more specific information. Example: All Students – boys, girls - brown hair, not brown hair. Continue to repeat Step 2—only subdividing groups, not shifting people between groups—until the students are broken down into small subgroups.

You should have a chart that looks like this (remember, your students may choose different classifiers to divide the group.)

All Members of the class

Boys		Girls	
Brown hair	Not brown hair	Brown hair	Not brown hair
Glasses	No glasses	Glasses	No glasses	Glasses	No glasses	Glasses	No Glasses

4. When this classification has been completed, have students use their positions in the classification chart to identify themselves, For example, Jared is a brown-haired boy; Ashley is a not-brown-hair girl. 5. Repeat Steps 1–4, using different students to choose the characteristics. Thus, each time the system will be new.

OPTION: Have one student leave the area while the groups and subgroups are being formed. Then, ask the student to return and see if he or she can figure out how the class is organized and place him or herself in the group where he or she belongs and explain why

5. Explain that scientists use a similar kind of system to classify all life on earth and then do a standard lesson on taxonomy, the importance of using Latin names and how scientists are now using genetics to refine the "tree of life".

Lesson Two - How do Scientists Measure Biodiversity?

Materials: copies of the student handout, "What is Biodiversity and How Do Scientists Measure it?", copies of the "How Science is Done" sentence (included), four tent stakes, a large ball of twine at least 40 meters song, one meter sections of dowel rods or pvc pipe to make a lightweight square one meter on each side, a very large bag of great northern beans, flip chart for recording data outside. Advance Preparation: This activity requires some preparation. First construct a sturdy square one meter on each side using pvc pipe or dowel rods. Then, using stakes and string, mark out a ten meter square area on the school grounds near your classroom. Finally count out 1000 beans into a large container. Academic Objective: Students will understand how scientists use data to build a body of knowledge and how scientists gather data about biodiversity. Vocabulary: sampling, ground-truthing, data Essential Question: How do scientists measure biodiversity? Estimated time: 1 hour to prepare for the sampling activity, 30 minutes for the sentence activity, one class period to prepare for, and conduct the sample.

Instructions: Part I 1. Make several large font copies of the following "How Science is done" sentence, The small green tree frog looked up at the long black snake with white stripes through the sun dappled leaves of the old sycamore tree. You need enough copies of the sentence so your class can be divided into groups of about five and each group can have one copy. Cut each sentence into its component words (leave out the period) and put them in an envelope (one envelope per sentence).

2. Put the students into groups and give each group an envelope. Tell them not to open it yet. Tell students you are going to model how scientists gather data and come to conclusions. Have each group open the envelope and pull out only five words. Then have them try and make a sentence out of the words. After a few minutes, have them pull out five more words and, using all the words they have, try to build another sentence. Proceed in this way until all 25 words are used and each group has made one sentence with all the words. Be sure and tell the students that it is okay if their sentences don't make perfect sense.

3. Next have each group read their sentence out loud or write it on the board. Compare sentences. Students will note that the sentences are not necessarily all alike. Ask them to pretend they are scientists

and ask what they could do to make sure their sentences were correct? Discuss with students how the nature of science is to continue to gather data even when it is thought the correct answer is already known.

Part II 1. Scatter the beans around the 10 meter square area.

2. Take students to the marked area and ask them to tell you how many beans are in the area. (They will have to guess, of course.) Ask them how they might find out the number of beans more exactly? Listen to the various answers. Students may come up with the idea of sampling by themselves. If not, explain what sampling is and then have students toss the one square meter randomly in the ten meter square and count the beans in the smaller square each time. By averaging the number of beans in each toss, they will begin to get a more concise picture of how many beans are in the larger square.

3. Discuss with students why scientists might want to sample organisms in this way rather than trying to count each one. Explain that the BioBlitz they will do at the end of the unit is very much like a sampling activity.

4. From the student handout, discuss other ways that scientists measure biodiversity and ask why it might be important to have an internationally standardized way to classify their findings.

Lesson Three - What Does my Ecosystem Do for Me?

Materials: Copy of the handouts, “Ecoregional Survey” and “What are Ecosystems and What Services do they Provide for Us?” both included in this lesson. One coffee can and at least ten tokens for each student. Academic Objective: Students will begin to understand they live in a unique ecosystem. Vocabulary: native species, introduced species, Tragedy of the Commons Essential Question: Why are ecosystem services important? Estimated time for this lesson - about 30 minutes to take the initial survey, then several days to conduct research. Finally one class period for students to share their research on the ecoregional survey and to play the Tragedy of the Commons.

Instructions: 1. Give students a copy of the handout, “Ecosystems Services” From the Ecological Society of America, and ask them to read it through.

2. Briefly discuss what ecosystem services are and ask students to give examples of how local ecosystems provide these services. (e.g., mountain streams clean water, hummingbirds pollinate crops, insects and worms produce soil, forests create topsoil and protect us from the sun.)

3. Take the Ecoregional survey. As a pretest of the students’ knowledge, give a copy of the “Ecoregional Survey” to each student and review any unfamiliar terms, such as native species and introduced species. Then give students about 10 minutes to complete the survey. Afterward, without sharing possible answers at this point, ask the students how they think they did. Collect the completed sheets and retain them. You will give the survey again at the end of the unit to see what students have retained.

4. Divide the class into teams to complete the survey. Divide your class into teams of 2 or 3 students apiece. Give each team a clean copy of the ecoregional survey. Tell the students that the members of each team should work together over the next few days to complete the survey as accurately as possible. Explain that the students can use whatever resources they can find to answer the questions, including the resources listed on the “Resources” list, additional resources you gathered, the library, the Internet,

c[4]ommunity elders or a local naturalist. Stress that they should find the most accurate information they can and encourage them to collect drawings or pictures of the animals and plants they list.

5. Go over the survey results. Once the students have finished the survey, have them share the information they found and compare their answers to the pretest. Did students find different answers to some of the questions? (For example, how extensive was the group's list of native plants?) What sources proved to be the most helpful? Were they surprised by any of the information they found?

6. Play the Tragedy of the Commons. Materials: One coffee can and at least ten tokens for each student. Before students arrive, put three tokens in the can for each student. Seat the students in a circle and tell them you are going to pass around the coffee can and they may take out one, two or three tokens. It is

their choice and they may also choose to show their tokens or hide them. Tell them "whoever gets ten tokens, wins." (It is important that you say this phrase exactly). Also tell them there will be no talking.

Pass the can around and when it comes back to you, count the number of tokens left and add that same amount to the can. For example, if there are 40 tokens left, put forty back in. Then pass the can around again and keep doing so (each time replenishing the number of tokens still in the can) either until someone gets ten, or until you run out of tokens.

The point of the game is that if everyone just took one token on each turn, you would be constantly replenishing the "resource" and it would be sustainable. However, if most or all people take three tokens each time, the resource cannot recover and becomes "extinct". This occurrence is called the Tragedy of the Commons because those resources we all hold in common, such as water, clean air and biodiversity, are not valued as much as those things we can "own" and thus are often polluted or depleted. Have students discuss why they took three. Remind them that you said, "Whoever gets ten, wins." Not, "Whoever gets ten first, wins." [5]Talk about the fact that this game was developed in the 1960's and has been played all around the world since then. When it is played in less developed countries, people often take only one token each time. This is a good opportunity to talk about culture and its effects on the environment. Ask students how this might relate to conserving biodiversity.

Extension: Have students take photographs of some of the plants and animals they have identified then have them create a PowerPoint using the photographs and information from the eco survey. Have them share the PowerPoint with other students.

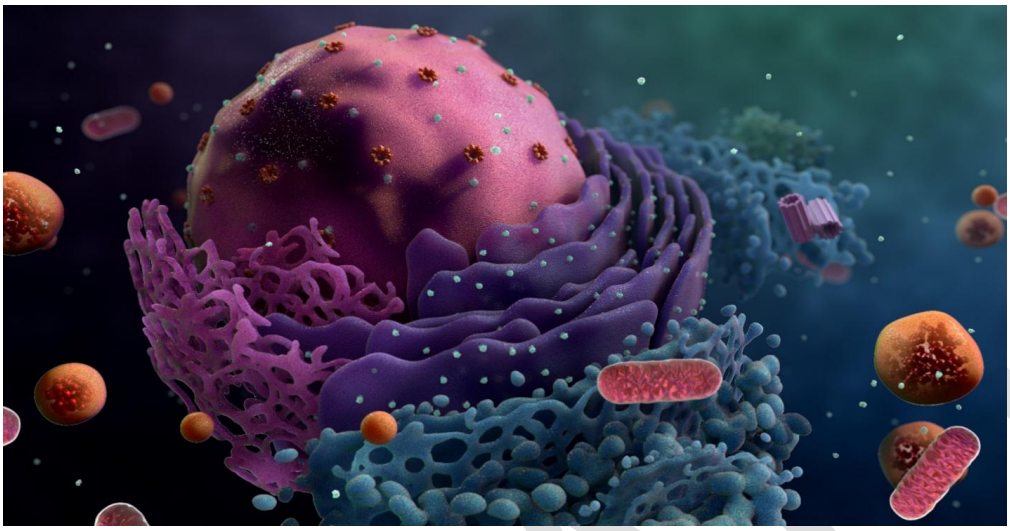
Ecoregional Survey How much do you know about where you live? 1. What major habitat type do you live in? (Temperate forest, temperate rain forest, grassland, scrubland, taiga, tundra, desert, etc…) 2. Name three native trees that live in your area. 3. Name five native edible plants that grow in your region and list in which season(s) each is available. 4. Name one poisonous plant that lives in your area. 5. Name ten native animals that live in your region. 6. Name three native animals that you can see in your area at any time of the year. 7. Name three migratory animals that visit or live in your area, and list in which season(s) you're able to see them. 8. How much average rainfall does your community get each year? 9. What is the elevation at your school? 10. Is there any old growth (more than 300 years old) forest within five miles of your school? 11. When (during what season or month) does your community normally get the most precipitation? 12. How long is the growing season in your community? 13. What is the average temperature in July? In December? 14. What are some of the natural signs in your community that show that the seasons are changing? 15. What body of water – lake, pond, stream, or river – is closest to your

school? 16. How has your area changed in the past 25 years? (Ask your parents or neighbors)

17. What types of plants and animals lived in your area 10,000 years ago? What was the climate like then? 18. What species in your area – if any – are threatened or endangered? 19. What natural events or processes influence the land around your community? How have they affected the land? (For example, have there ever been glaciers, earthquakes or volcanic eruptions in your area? Do frequent fires, high winds or flooding shape where and how things grow?) 20. What human caused events or processes influence land and biodiversity in your community? 21. Are there any

threatened ecological areas in your community? (Are any wetlands, rivers, or forests, for example, in trouble?) 22. Name a nonnative species that has created problems in your community.

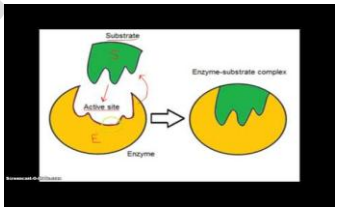
Cell Biology



It Includes

Chapter 1: Cell Structure and Function
Chapter 2: Biological Molecules
Chapter 3: Enzymes
Chapter 4: Bioenergetics

Chapter:Enzymes

Chapter	Skills	Understanding	Reference web material
Enzymes	Student will Identify the competitive and noncompetitive inhibitors from the given list of chemicals. List the diagnostic uses of enzymes.	Describe the structure of enzyme Explain the role and component parts of the active site of enzyme Explain the mechanism of enzyme action through induced fit model, comparing with lock and key model. Classify enzymes on the basis of the reaction catalyzed.	 What are enzymes?  Structure of an enzyme..  Lock and key theory https://www.slideshare.net/fatimasaleh94214/enzymes-2-30256325 Enzymes terminologies Slide share.
Chapter Overview Characteristics Of Enzymes			

Protein in nature and are formed by living cells.

May be intracellular or extra cellular.

Remains unchanged during and after the reaction.

Speed up the rate of reaction by decreasing energy of action.

Action can be alter by activators and inhibitors.

Classification Of Enzyme (On The Basis Of Structure)

Pure or Simple Enzyme consist of only protein (e.g.Amylase and Pepsin)

Apoenzyme: it's a protein part of enzyme

Conjugated or Holoenzymes: May contain a non-protein part "Prosthetic group" as well (e.g. Phosphatase and Peptidase)
Holoenzyme = Apoenzyme + Prosthetic group

Mode Of Action Of Enzymes

1- The action of enzyme depends on its chemical structure. A typical enzyme molecule, has "3D" structure.
2- Has depression or pit for substrate (to fit in) known as "Active site".
3- Any other site other than active site is called "Allosteric site"
There are two theories in respect of enzyme action, which are as follows.

Lock And Key Model

Proposed by Fischer (1898) and modified by Paul Filder and D.D Woods according to this model,

The active site of enzyme has distinct shape.

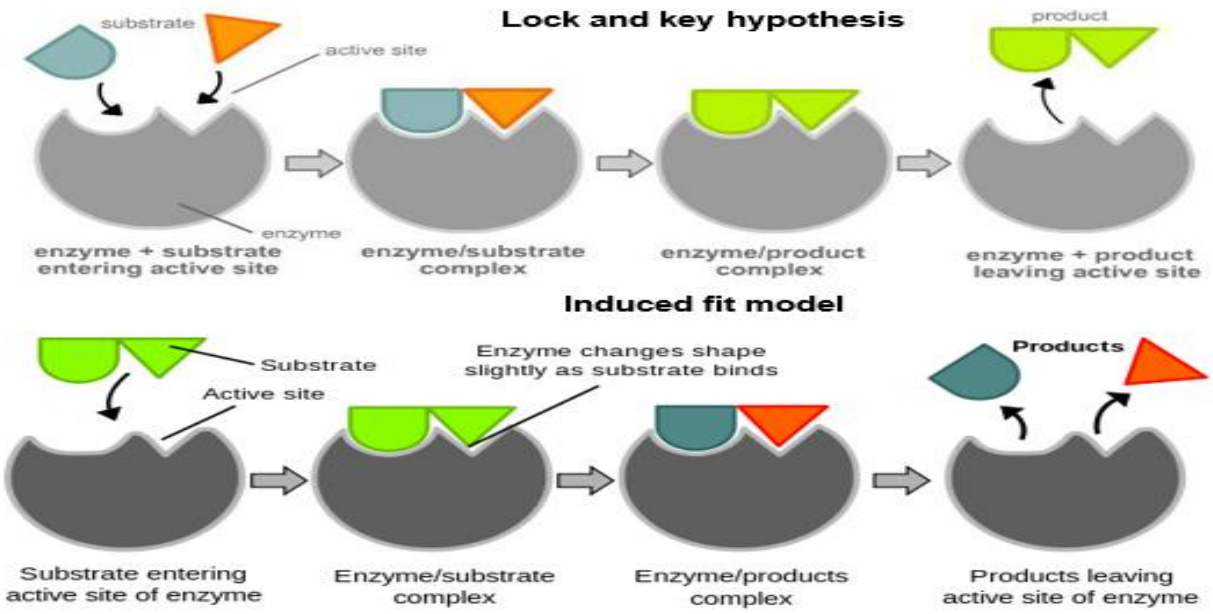
It allows few substrate to fit in (like a particular lock allows particular key to fit in)

Induce Fit Model

Proposed by koshland (1959), it states that

Enzyme binds with a substrate

This binding induce changes in enzyme structure



Factors Affecting Enzyme Activity

The activity of enzymes depend on following factors,

1. Substrate Concentration

Increases with increase in substrate concentration (up to a limit)

2. Temperature

Increases with in temperature(up to limits)

Highly active at 37˚C and destroyed at 100˚C

At 0˚C minimum activity.

3. PH

Enzymes are pH specific

4. Water

Enzyme activity is usually maximum (up to limits) but decrease after limits (dilution of enzyme)

5. Radiations

Enzymes become inactive due to radiations (including Alpha, Beta, Gamma rays).

6. Co-Enzyme And Activators

Induce the enzyme activity.

Things To Be Remember

Inhibitors : Substances which decreases the activity of enzymes.

Competitive Inhibitors

Inhibitor molecules which resemble the normal substrate molecule and compete for admission into the active site. They block the substrate from entering active site.

Non-Competitive Inhibitors

Inhibitors bind to a part of the enzymes away from the active site (Allosteric site). This binding cause change in the enzyme molecule shape and decrease in enzyme activity.

Feed Back Inhibition

Common biological control mechanism of brain in order to regulate enzyme activity.

Prosthetic Group

Non-protein part of enzyme (Co-enzyme or Co-factor)

Co-Enzyme

When prosthetic group consist of organic molecules (like FAD/NAD)

Co-Factors/Activators

When prosthetic group consist of inorganic molecules (like Ca++, Na+ etc).

Apoenzyme

Protein part of enzyme

Reference pages

https://www.britannica.com/science/enzyme/Factors-affecting-enzyme-activity

http://all-notes.blogspot.com/2012/06/class-xi-biology-enzymes.html

https://byjus.com/biology/enzymes/

https://en.wikibooks.org/wiki/Structural_Biochemistry/Enzyme/Apoenzyme_and_Holoenzyme

http://toppr.com/guides/biology/biomolecules/enzymes/

https://www.medicalnewstoday.com/articles/319704.php#how-enzymes-work

Lesson Plan

Lesson Plan Template:

General Lesson Plan

Learning Objectives: What should students know and be able to do as a result of this lesson

Students will be able to describe what an enzyme does in terms of a biological process.

Students will be able to relate a catalyst to an enzyme.

Students will be able to explain how activation energy operates when it comes to analyzing the rate of a biochemical reaction.

Students will be able to identify the role of enzymes as it acts as a catalyst in lowering the activation energy of a biochemical reaction.

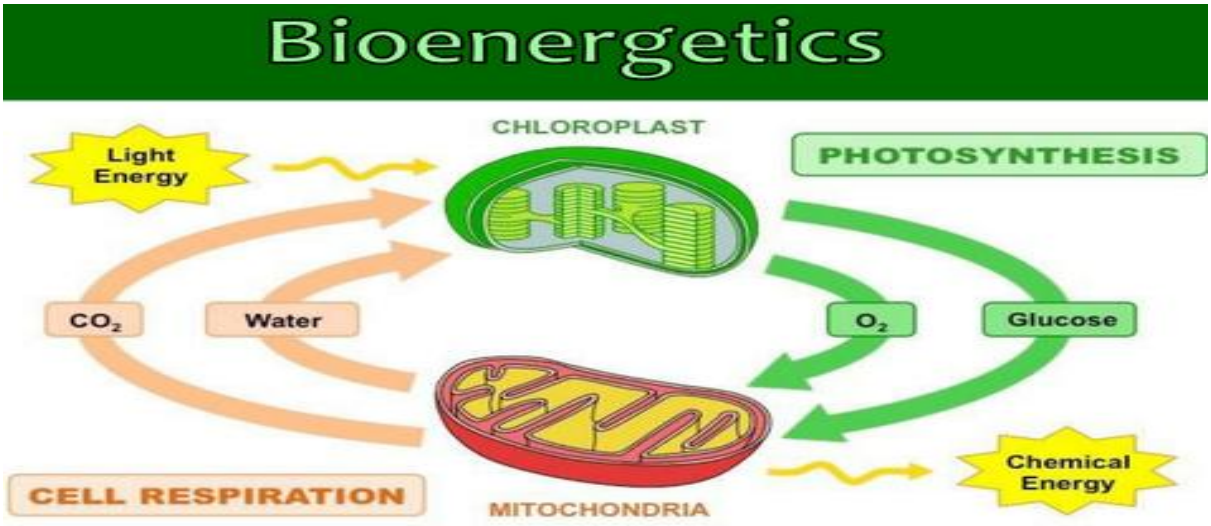
Students will be able to explain how factors such as pH and temperature affect enzyme activity.

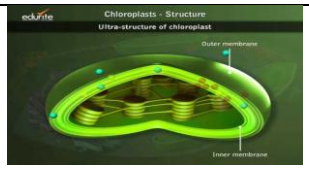
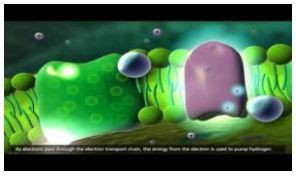
Prior Knowledge: What prior knowledge should students have for this lesson?

Students should be able to identify what an acid or a base is on a pH scale.

Students should be able to have knowledge about the structure and function of a protein so that they can relate this to how an enzyme operates.

Students should be familiar with factors such as temperature and pH that can affect biological systems, specifically, how they affect protein.


Bioenergetics
CHLOROPLAST
Light Energy
PHOTOSYNTHESIS
CO_2
Water
O_2
Glucose
Chemical Energy
CELL RESPIRATION
MITOCHONDRIA

Chapter	Skills	Understanding	Reference web material
Bioenergetics	Student will Draw the molecular structure of chlorophyll Draw the Z-Scheme for explaining the events of light-dependent reaction Develop a flow chart of explaining the events of light-independent reaction. Draw the flow chart showing the events of glycolysis and Krebs cycle.	Student will Explain the role of light in photosynthesis Identify two general kinds of photosynthetic pigments. Describe the arrangement of photosynthetic pigments in the form of photosystem I and II. Explain the calvin cycle. Describe the events of non-cyclic and cyclic photophosphorylation	 Chloroplast  Photosynthesis with its cycles  Cellular Respiration  C3, C4 and CAM plants

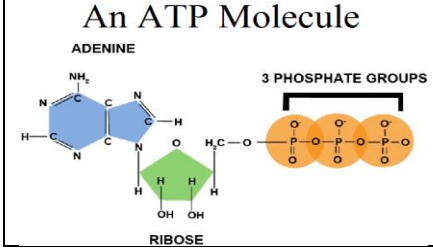
Photosynthesis

Photosynthesis is the process by which plants, some bacteria and some Protista's use the energy from sunlight to produce glucose and oxygen from carbon dioxide and water.

This glucose can be converted into pyruvate which releases adenosine triphosphate (ATP) by cellular respiration.

carbon dioxide + water $\xrightarrow[\text{chlorophyll}]{\text{sunlight}}$ glucose + oxygen

The conversion of usable sunlight energy into chemical energy is associated with the action of the green pigment chlorophyll.



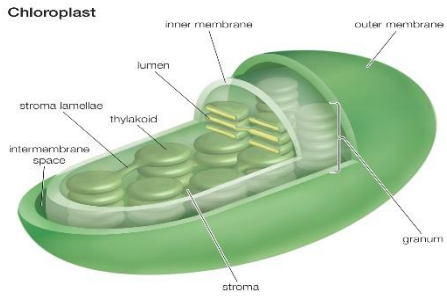
ATP (Adenosine tri phosphate)

Adenosine triphosphate, or ATP, is the principal molecule for storing and transferring energy in cells. It is often referred to as the energy currency

of the cell and can be compared to storing money in a bank

Molecular Structure

Adenosine triphosphate (ATP) is comprised of the molecule adenosine bound to three phosphate groups. Adenosine is a nucleoside consisting of the nitrogenous base adenine and the five-carbon sugar ribose



What is Chlorophyll?

The role of chlorophyll in photosynthesis is vital.

Chlorophyll, which resides in the chloroplasts of plants, is the green pigment that is necessary in order for plants to convert carbon dioxide and water, using sunlight, into oxygen and glucose. During photosynthesis, chlorophyll captures the sun's rays and creates sugary carbohydrates or energy, which allows the plant to grow.

Role of light in Photosynthesis

During photosynthesis, plants trap light energy with their leaves. Plants use the energy of the sun to change water and carbon dioxide into a sugar called glucose.

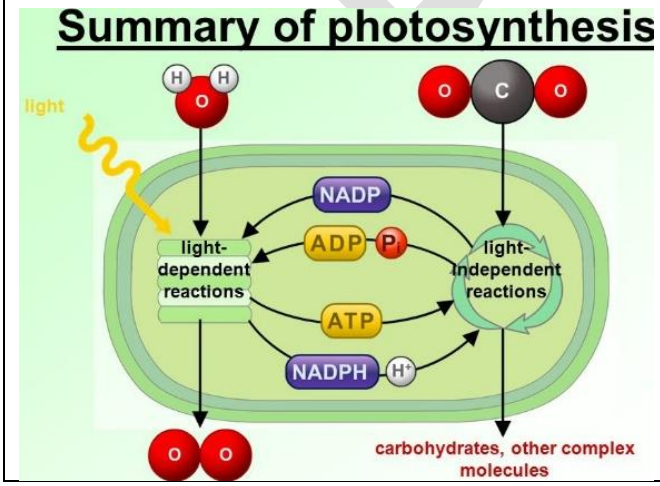
Role of Water in Photosynthesis

At a fundamental level, water provides electrons to replace those removed from chlorophyll in photosystem II.

Also, water produces oxygen as well as reduces NADP to NADPH (required in the Calvin cycle) by liberating H+ ions.

Role of Carbon dioxidein Photosynthesis

Carbon dioxide, in its ionic form bicarbonate, has a regulating function in the splitting of water in photosynthesis.



The photosynthetic process

The reactions of plant photosynthesis are divided into those that require the presence of sunlight and those that do not.

Both types of reactions take place in chloroplasts:

light-dependent reactions in the thylakoid

Light-independent reactions in the stroma.

Light-dependent reactions (also called light

reactions): When a photon of light hits the reaction center, a pigment molecule such as chlorophyll releases an electron.

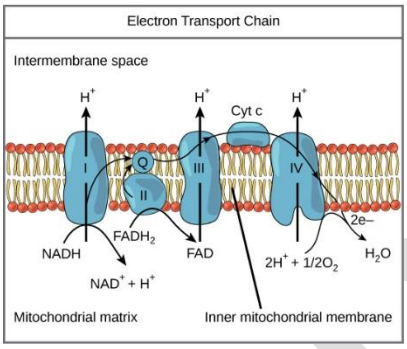
The released electron manages to escape by traveling through an electron transport chain, which generates the energy needed to produce ATP (adenosine triphosphate, a source of chemical energy for cells) and NADPH. The "electron hole" in the original chlorophyll pigment is filled by taking an electron from water. As a result, oxygen is released into the atmosphere.

Light-independent reactions (also called dark reactions and known as the Calvin cycle): Light reactions produce ATP and NADPH, which are the rich energy sources that drive dark reactions. Three chemical reaction steps make up the Calvin cycle:

Carbon fixation, reduction and regeneration.

These reactions use water and catalysts..

Electron Transport Chain



The electron transport chain is a series of electron transporters embedded in the inner mitochondrial membrane that shuttles electrons from NADH and $FADH_2$ to molecular oxygen. In the process, protons are pumped from the mitochondrial matrix to the inter

Membrane space, and oxygen is reduced to form water.

The common feature of all electron transport chains is the presence of a proton pump to create a proton gradient across a membrane.

Cellular Respiration

Cellular respiration is a metabolic pathway that breaks down glucose and produces ATP. The stages of cellular respiration include glycolysis, pyruvate oxidation, the citric acid or Krebs cycle, and oxidative phosphorylation.

Aerobic respiration

Aerobic respiration requires oxygen (O_2) in order to create ATP, it is the preferred method of pyruvate breakdown in glycolysis and requires that pyruvate enter the mitochondria in order to be fully oxidized by the Krebs cycle. The products of this process are carbon dioxide and water.

Anaerobic respiration

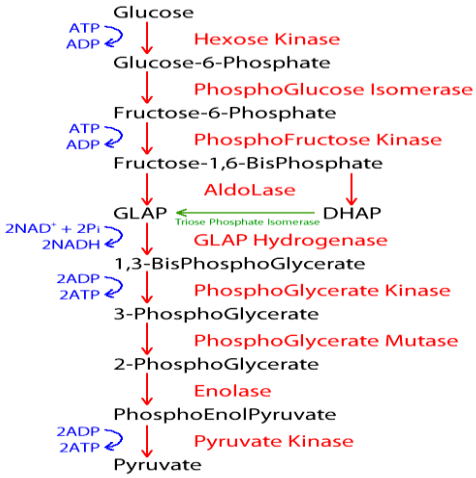
Its used by some microorganisms in which neither oxygen (aerobic respiration) nor pyruvate derivatives (fermentation) is the final electron acceptor.

Steps of cellular respiration

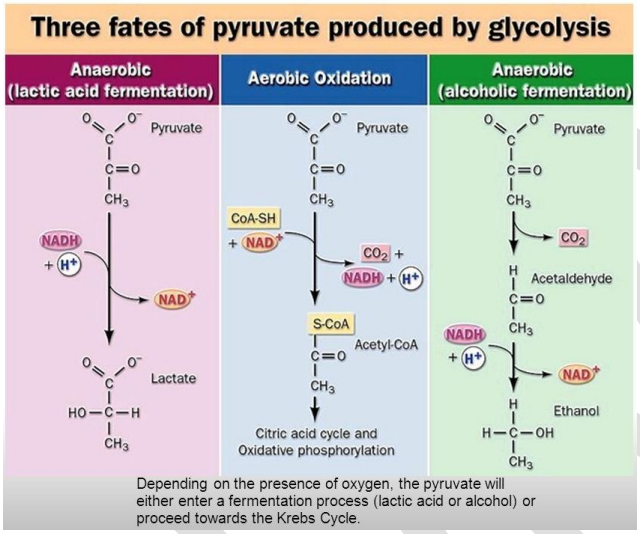
To see how a glucose molecule is converted into carbon dioxide and how its energy is harvested as ATP and NADH /FADH2in one of your body's cells, let's walk step by step through the four stages of cellular

respiration.

Glycolysis. In glycolysis, glucose—a six-carbon sugar—undergoes a series of chemical transformations. In the end, it gets converted into two molecules of pyruvate, a three-carbon organic molecule. In these reactions, ATP is made, and NAD+ is converted to NADH.



Simplified Glycolysis diagram. Molecule names contain extra capitals to illustrate components. 21/02/2010 followchemistry.wordpress.com



Depending on the presence of oxygen, the pyruvate will either enter a fermentation process (lactic acid or alcohol) or proceed towards the Krebs Cycle.

Pyruvate oxidation. Each pyruvate from glycolysis goes into the mitochondrial matrix—the innermost compartment of mitochondria. There, it's converted into a two-carbon molecule bound to Coenzyme A, known as acetyl CoA.

Citric acid cycle.

The acetyl CoA made in the last step combines with a four-carbon molecule and goes through a cycle of reactions, ultimately regenerating the four-carbon starting molecule..

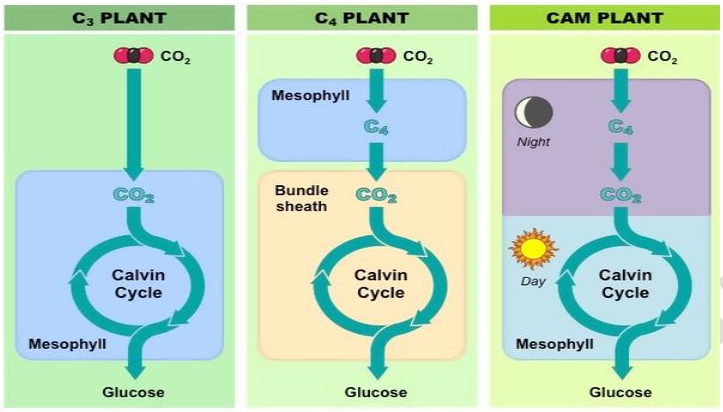
Oxidative phosphorylation. As electrons move down the chain, energy is released and used to pump protons out of the matrix, forming a gradient. Protons flow back into the matrix through an enzyme called ATP synthase, making ATP.

Glycolysis can take place without oxygen in a process called fermentation.

Photorespiration.

PhotorespirationRespiration refers to the metabolism of oxygen and the release of carbon dioxide.

Photorespiration is a wasteful pathway that occurs when the Calvin cycle enzyme rubisco acts on oxygen rather than carbon dioxide.



The majority of plants are C3plants, which have no special features to combat photorespiration.

C4plants minimize photorespiration by separating initial CO2 fixation and the Calvin cycle in space, performing these steps in different cell types.

Crassulacean acid metabolism (CAM) plants minimize photorespiration and save water by separating these steps in time, between night and day.

Reference pages

https://www.khanacademy.org/science/biology/cellular-respiration-and-fermentation/overview-of-cellular-respiration-steps/a/steps-of-cellular-respiration

https://www.britannica.com/science/photosynthesis/Energy-efficiency-of-photosynthesis

https://www.nature.com/scitable/definition/atp-318/

https://courses.lumenlearning.com/boundless-biology/chapter/atp-adenosine-triphosphate/

https://www.rsc.org/Education/Teachers/Resources/cfb/Photosynthesis.htm

https://www.office.com.pk/ch11-bioenergetics-11th-class-premedical-notes-biology-new-course-fbise-2016-17/

https://www.sciencedirect.com/topics/earth-and-planetary-sciences/bioenergetics

https://www.khanacademy.org/science/biology/cellular-respiration-and-fermentation/overview-of-cellular-respiration-steps/a/steps-of-cellular-respiration

LESSON CONTENT

Lesson Plan Template:

General Lesson Plan

Learning Objectives: What should students know and be able to do as a result of this lesson?

Students will relate the role of ATP to energy transfer within the cell.

Students will explain the importance of ATP as an energy carrying molecule.

Prior Knowledge: What prior knowledge should students have for this lesson?

A basic understanding of a eukaryotic cell and its organelles is ideal but not required.

Students should have a basic understanding of energy.

Guiding Questions: What are the guiding questions for this lesson?

What is energy and what are the different types of energy?

How is energy transformed within a cell?

Teaching Phase: How will the teacher present the concept or skill to students?

The teacher will introduce the ATP/ADP cycle by using the Prezi "The Body's Energy Currency" by Tim Hartwich. Students should take notes during the presentation and will need to refer to them during the activities that follow.

Students will then be placed into groups of 2 or 3 using any technique that the teacher prefers.

In continuing with the theme that ATP is like currency, the students will make a paper wallet using directions from Instructables. The wallet will represent ADP. Each student will make their own Enhance your instruction on photosynthesis with a Study.com lesson. You will find directions for an experiment that will give your students hands-on experience observing, documenting and discussing the process of photosynthesis.

Lesson plan

Learning Objectives

After this lesson, students will be able to:

Explain the process of photosynthesis

List the three components necessary for photosynthesis to take place

List the products of photosynthesis

Compare the leaves of a plant that has all the components needed for photosynthesis to one that has a component missing

Length

The first part of this lesson will take 45 minutes to one hour.

The second part of this lesson will take 30-45 minutes after the 5-day experiment has concluded.

Curriculum Standards

Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.

Lesson Plan

https://study.com/academy/popular/photosynthesis-lesson-plan.html

https://www.mcgill.ca/sciedchantier7/resources/sample-lesson-plans/photosynthesis

SECTION 3 : LIFE PROCESSES

HOMEOSTASIS

SUPPORT AND MOVEMENT

NERVOUS COORDINATION

Theme	Chapter	SLOs
SECTION 3: LIFE PROCESSES	COORDINATION	UNDERSTSANDING *Student will:* Explain what coordination means. Identify the two main types of coordination in living organisms, i.e., Nervous and Hormonal (chemical). Differentiate between the modes of coordination i.e., electrical in case of nervous and chemical in case of hormonal. Identify the main organs responsible for coordination and control. State that receptors receive stimuli and transmit information to effectors through CNS.

		Label the diagram of human brain. Explain the function of these parts of brain; cerebrum, cerebellum, pituitary gland, thalamus, hypothalamus, medulla oblongata. Differentiate between the cross sectional views of brain and spinal cord, with reference to white and grey matter. Define neuron and describe the structure of a general neuron. Define reflex action and reflex arc. Name the three types of neuron involved in reflex action. Trace the path of a nervous impulse in case of a reflex action. Describe the structure of human auditory and visual receptors. Describe the pupil reflex in dim and bright light. State how short and long sightedness can be treated. Associate the role of Vitamin A with vision and effects of its deficiency on retina. Explain the role of ear and eye in maintenance of homeostasis through balance and accommodation. Relate the contribution of Ibn-al-Haitham and Al-Ibn-Isa with knowledge about the structure of eye and treatment of various ophthalmic diseases. Define the terms; hormone and endocrine system. Outline the parts of endocrine system; major glands of this system (Pituitary, Thyroid, Pancreas, Adrenal, Gonads) and names of their respective hormone. Describe the term “Negative feedback” with reference to Insulin and glucagon. Explain how adrenaline may be involved in exercise and emergency conditions and use gained knowledge to apply

		to different hormones. SKILLS *Student will:* Compare the two types of coordination in tabular form. Record the difference in quickness of response of the two types of coordination (by asking a student to say a few words in front of the class and observe the change in heartbeat). Analyze why plants (like sunflower) have a very slow response to stimuli. Visualize nervous and hormonal coordination by comparing electrical transmission in wires with the transmission of nerve impulse in neurons and by comparing convection currents in liquids to the hormonal transmission in blood. Perform an experiment in which a scale held at its lower end between the thumb and index finger is allowed to fall and then recording the time taken to catch it again. Identify different parts and draw a labeled diagram of the longitudinal section of the eye of sheep or bull. Perform an experiment in which the shin muscle of a frog is made to contract in a Petri dish filled with methylene blue and using 12 V DC current. Check the vision of a friend to diagnose whether he/she is suffering from long or shortsightedness. Perform an experiment in which one student flashes a spotlight into the eye of another and record the time taken for the eye to contract its pupil. Compare the BGC (blood glucose concentration) of healthy person with a patient suffering from Diabetes mellitus. *(Data/ graph to be given in the textbook)*

OVERVIEW OF THE CHAPTER:

For proper functioning of the body of organisms, it is therefore, necessary that various organ and system work only when required, do their exact type of job and also should not overdo or under do their jobs. When more than one organ is associated with an activity all the organs should operate in a sequence for the successful accomplishment of that particular function. All these attributes of physiology can be achieved when the body works as one unit, in which its different organs and systems cooperate and work in harmony with each other, i.e. its diverse functions are coordinated. Their coordination can ensure the profitable existence of the organisms. Animal's co-ordination is produced by the two systems;nervous system and the endocrine system. Both control systems include: receptors, which detect stimuli, the coordination centre, such as the brain, spinal cord or pancreas, which receives and processes information from receptors around the body and the effectors that bring about responses,

The nervous system enables humans to react to their surroundings and to coordinate their behaviour. It comprises of central nervous system and peripheral nervous systemthat consists of millions of neurons and uses electrical impulses to communicate very quickly. There are three types of neurons; sensory, relay and motor. Different types of neurons work together in a single reflex action, an automatic and rapid response to a stimulus, which minimizes any damage to the body from potentially harmful conditions, such as touching something hot.The pathway of reflex action iscalled reflex arc.

The central nervous system (CNS) is the part of the nervous system consisting of the brain and spinal cord. The CNS is so named because it integrates the received information and coordinates and influences the activity of all parts of the bodies. The CNS is composed of white and gray matter.This can also be seen macroscopically on tissues of brain and spinal cord.

The endocrine system consists of a series of glands that produce chemical substances known as hormones.Hormones e chemical messengers that must bind to a receptor in order to send their signal. They are secreted into the bloodstream and travel throughout the body, affecting any cells that contain receptors for them. Also, hormones are slower to take effect and tend to be longer lasting.

Hormones can influence behaviour, and behaviour can sometimes influence hormone concentrations. Hormones regulate behaviors such as aggression, mating, and parenting of individuals. Hormones are involved in regulating all sorts of bodily functions, and they are ultimately controlled through interactions between the hypothalamus (in the central nervous system) and the pituitary gland (in the endocrine system). Imbalances in hormones are related to a number of disorders.

REFERENCE MATERIAL:

SINDH TEXT BOOK BOARD (STBB) FOR IX-X

AVAILABLE RESOURCES ON INTERNET:

http://www.gcestudybuddy.com/5-google-conversation-element/coordination-and-response

http://www.gcestudybuddy.com/5-google-conversation-element/human-eye

https://www.bbc.co.uk/bitesize/guides/z2nkv9q/revision/1

https://www.eimacs.com/gogsatstatics/download/sense%20organs%20the%20eye.pdf

https://www.asu.edu/courses/pgs461/Reflexes%20Arcs_PGS%20461.pdf

http://www.biologydiscussion.com/chemical-coordination/chemical-co-ordination-and-regulation-of-human-endocrine-system/5071

https://owlcation.com/stem/How-does-the-ear-help-to-balance-the-body

TEACHER RESOURCE:

LESSON PLANS / NOTES:

http://www.mediafire.com/file/pa05kbxqcoy2q85/Topic_11-_Coordination_and_Response.pdf/file

https://www.jagranjosh.com/general-knowledge/control-and-coordination-in-humans-1459848431-1

https://www.excellup.com/classten/scienceten/controlcoordination.aspx

https://www.it.iitb.ac.in/~vijaya/oscarteam/dokuwiki/media/chemical_coordination_in_animals.pdf

https://www.gneet.com/aipmt_jee_notes/Chemical%20co-ordination%20and%20integration.pdf

https://www.britannica.com/science/ear/Transmission-of-sound-waves-through-the-outer-and-middle-ear

https://biodifferences.com/difference-between-myopia-short-sightedness-and-hyperopia-long-sightedness.html

https://www.soinc.org/sites/default/files/uploaded_files/3-17_NERVOUS_HANDOUT.pdf

https://sharemylesson.com/teaching-resource/nervous-system-152742

https://sharemylesson.com/teaching-resource/nervous-system-174578

VIDEO:
Human Nervous System
https://www.youtube.com/watch?v=oHgg4S9xIiA
Anatomy and Physiology of Human Brain
https://www.youtube.com/watch?v=HieUJTLaOZY
https://www.youtube.com/watch?v=kMKc8nfPATI (Bozeman Science)
Endocrine Glands
https://www.khanacademy.org/science/high-school-biology/hs-human-body-systems/hs-the-nervous-and-endocrine-systems/v/intro-to-the-endocrine-system
https://www.youtube.com/watch?v=gfjTBaMF8pY
Reflex Action And Reflex Arc
https://www.youtube.com/watch?v=DFuKhBI5STc
Cross sectional views of brain and spinal cord, with reference to white and grey matter.
https://www.youtube.com/watch?v=ZZQzMeFoZY0
Anatomy of eye and pupil reflex in dim and bright light.
https://www.youtube.com/watch?v=Uk0U16uZpPA
ASSESSMENT ITEMS:
https://www.khanacademy.org/test-prep/mcat/organ-systems/biological-basis-of-behavior-the-nervous-system/e/nervous-system-questions
http://highered.mheducation.com/sites/0072421975/student_view0/chapter17/multiple_choice_quiz.html
https://www.mcqlearn.com/grade10/biology/coordination-and-control-multiple-choice-questions-answers.php

Homeostasis

Theme	Chapter	SLOs
SECTION 3: LIFE PROCESSES	HOMEOSTASIS	UNDERSTSANDING Define homeostasis and describe its importance. Describe the mechanisms / adaptations in plants for the excretion / storage of CO_2, H_2O, O_2, latex, resins and gums. Explain osmotic adjustments in plants. State skin, lungs and kidneys as the major organs involved in homeostasis. Explain the role of skin in regulating body temperature. Describe how lungs keep the carbon dioxide concentration down to certain level. Explain that kidneys control the blood composition.

		Identify the different organs of urinary system. Relate the structure of kidney with its function. State that nephron is the excretory unit of kidney. Locate the different parts of nephrons and relate them with their function. State that main role of kidney in urine formation. Describe that urine formation involves three processes i.e. filtration, reabsorption and secretion. Explain that kidney plays an important role in osmoregulation. SKILLS Hypothesize why the dogs hang their tongues out and pant? Predict about the functioning of body without a kidney. Relate too much sugar intake by a diabetic with the functioning of kidney. Examine the structure of kidney (sheep kidney / model). Trace the movement of a molecule of urea from blood to urethra using a flow chart diagram.

OVERVIEW of the Chapter:

Homeostasis is a dynamic equilibrium that is maintained in body tissues and organs. It is dynamic because it is constantly adjusting to the changes that the systems of an organism encounter. It is an equilibrium because body functions are kept within a normal range, with some fluctuations around a set point. A change in the internal or external environment is called a stimulus and is detected by a receptor; the response of the system is to adjust the activities of the system.Elimination of toxic and waste products from the body is called excretion. Organisms like animals have an advanced and specialized system for excretion. But plants lack a well-developed excretory system like that in animals. They do not have special organs for excretion. Thus, excretion in plants is not so complex.

The cellular respiration, photosynthesis, and other metabolic reactions produce a lot of excretory products in plants. Carbon dioxide, excess water produced during respiration and nitrogenous compounds produced during protein

metabolism are the major excretory products in plants.

Plants produce two gaseous waste products i.e. oxygen during photosynthesis and carbon dioxide during respiration. Excretion of gaseous waste in plants takes place through stomatal pores on leaves. Oxygen released during photosynthesis is used for respiration while carbon dioxide released during respiration is used for photosynthesis.

Other than gaseous wastes, metabolism in plants also generates organic by-products. These wastes are stored in different forms in different parts. The gums, oils, latex, resins, etc. are some waste products stored in plant parts like barks, stems, leaves, etc. Eventually, plants shed off these parts.

In animals, when a change occurs in an environment, adjustment must be made so that the internal environment of the body and cells remains stable. The receptor that senses the change in the environment is part of a feedback mechanism. The stimulus—temperature, glucose, or calcium levels—is detected by the receptor. The receptor sends information to a control center, often the brain, which relays appropriate signals to an effector organ that is able to cause an appropriate change, either up or down, depending on the information the sensor was sending.

The human excretory system functions to remove waste from the body through the skin as sweat, the lungs in the form of exhaled carbon dioxide, and through the urinary system in the form of urine. The kidneys are a pair of bean-shaped structures that are located just below the liver in the body cavity. Each of the kidneys contains more than a million tiny units called nephrons that filter blood containing the metabolic wastes from cells. All the blood in the human body is filtered about 60 times a day by the kidneys. The nephrons remove wastes, concentrate them, and form urine through three basic processes filtration, reabsorption and secretion. From nephrons urine passes to the ureter then to urinary bladder where urine stores for sometimes and then excreted through urethra.

REFERENCE MATERIAL:

SINDH TEXT BOOK BOARD (STBB) FOR IX - X

AVAILABLE RESOURCES ON INTERNET:

https://www.bbc.co.uk/bitesize/guides/z4khvcw/revision/1

http://www.gcestudybuddy.com/5-google-conversation-element/homeostasis

https://www.britannica.com/science/excretion/General-features-of-excretory-structures-and-functions

http://www.biologydiscussion.com/essay/excretion-in-animals-humans-and-plants-with-diagram/1570

https://www2.estrellamountain.edu/faculty/farabee/biobk/BioBookEXCRET.html

TEACHER RESOURCE:

LESSON PLANS / NOTES:

http://www.mediafire.com/file/pm5w7rhd0xlwasd/Topic_10-Homeostasis.pdf/file

https://edurev.in/studytube/Detailed-Chapter-Notes-Excretion-In-Plant-and-Animals-Class-10-Science/87f1ef76-1158-4362-b8b1-01d4626393fc_t

http://quiznext.in/study-material/learning_material/ICSE-7-Biology/Excretion-in-Animals-and-Plants/excretion-in-animals-and-plants/

https://sharemylesson.com/teaching-resource/homeostasis-154137

https://www.cpalms.org/Public/PreviewResourceLesson/Preview/28527

VIDEO:

Thermoregulation in animals

https://www.youtube.com/watch?v=NJEBfl_LKno

Anatomy and Physiology of Kidney

https://www.khanacademy.org/science/biology/human-biology/kidney-nephron/v/the-kidney-and-nephron

Human Urinary System & Formation of Urine

https://www.youtube.com/watch?v=H2VkW9L5QSU

https://www.youtube.com/watch?v=EhnRhfFLyOg

Excretion in Plants

https://www.youtube.com/watch?v=s44RQi_P7kQ

Excretory Organs in Man

https://www.youtube.com/watch?v=tPXHpNwxSBU

Support and Movement

Theme	Chapter	SLOs
SECTION 3: LIFE PROCESSES	SUPPORT AND MOVEMENT	UNDERSTSANDING *Student will:* Define skeleton and differentiate between cartilage and bone. Describe the role of skeleton in support and movement. Explain that skeleton system is actually a dynamic, living tissue that is capable of growth, adapts to stress and repairs itself after injury. Describe the main components of the axial skeleton and the appendicular skeleton. Describe the contribution of ViSalius in describing the bones and muscles in human. Differentiate between moveable joints and immovable joints. State the role of ligaments and tendons. Describe the location and movement of hinge joints. Identify ball-n-socket joints in human body. Define antagonism. Describe the action of flexors and extensors as a pair of opposing muscles selecting biceps and triceps as example. Describe the effect of by deficiency of calcium on bones and relate this deficiency with osteoporosis. Discuss the causes, symptoms, and treatment of arthritis. Relate the onset of arthritis with age and weight-bearing joints.

		SKILLS *Student will:* Identify and draw labeled diagrams of different bones of the axial and appendicular skeleton from real specimen models or charts. Describe the movement of various human joints through observation of models. Describe the movement of various human joints through observation of models. Investigate the nature of bone (by putting three pieces of rib bone of lamb in water, NaOH and dilute HCl).

OVERVIEW of the Chapter:

Support and movement in man is carried out with the help of the skeleton and muscles. The human skeletonis an endoskeleton that serves as a framework for the body. This framework consists of many individual bones and cartilages. There also are bands of fibrous connective tissue—the ligaments and the tendons—in intimate relationship with the parts of the skeleton.

The human skeleton, like that of other vertebrates, consists of two principal subdivisions, each with origins distinct from the others and each presenting certain individual features. These are Axial skeleton consists of the skull, the backbone (vertebral column), and the ribs. The backbone supports the ribs which are also attached to the breastbone or sternum.Appendicular skeleton consists of shoulder girdle (pectoral girdles), hips (pelvic girdles) and the bones of arms (humerus, radius & ulna), legs (femur, tibia & fibula), hands and feet.

The muscular system is an organ system that permits movement of the body, maintains posture and circulates blood throughout the body. The muscular systems in vertebrates are controlled through the nervous system. Together with the skeletal system, it forms the musculoskeletal system, which is responsible for movement of the human body.Muscles transfer force to bones through tendons. They move our bones and associated body parts by pulling on them – this process is called muscle contraction.

However, muscle contraction cannot act to push the bone back into its original position, and because of this, muscles work in 'antagonistic muscle pairs'. One muscle of the pair contracts to move the body part, the other

muscle in the pair then contracts to return the body part back to the original position. Muscles that work like this are called antagonistic pairs.

Osteoporosis is a condition in which the bones become less dense and more likely to fracture. Fractures from osteoporosis can result in significant pain and disability. Risk factors for developing osteoporosis include: low calcium intake and lack of physical activity.

Arthritis means joint inflammation, but the term is used to describe around 200 conditions that affect joints, the tissues that surround the joint, and other connective tissue. Arthritis is more common among adults aged 65 years or older, but it can affect weight-bearing joints of people of all ages, including children.

REFERENCE MATERIAL:

SINDH TEXT BOOK BOARD (STBB) FOR IX- X

AVAILABLE RESOURCES ON INTERNET:

https://www.britannica.com/science/human-skeleton

https://www.livescience.com/22537-skeletal-system.html

https://biodifferences.com/difference-between-bones-and-cartilage.html

https://www.khanacademy.org/science/high-school-biology/hs-human-body-systems/hs-the-musculoskeletal-system/v/ligaments-tendons-and-joints

https://www.bones.nih.gov/health-info/bone/osteoporosis/conditions-behaviors/osteoporosis-arthritis

https://www.bbc.co.uk/bitesize/guides/zpkr82p/revision/4

TEACHER RESOURCE:

LESSON PLANS / NOTES:

http://www.mediafire.com/file/7axi3jc84o1zjxp/Topic_12Support%2C_movement_and_locomotion.pdf/file

https://opentextbc.ca/anatomyandphysiology/chapter/7-1-divisions-of-the-skeletal-system/

https://www.thoughtco.com/types-of-joints-in-the-body-4173736

https://sharemylesson.com/teaching-resource/bones-and-things-144019

https://sharemylesson.com/teaching-resource/muscles-locomotion-247580

VIDEO:

Human Skeletal System

https://www.youtube.com/watch?v=J8x6tZI2hVI

Importance of bones

https://www.youtube.com/watch?v=rDGqkMHPDqE

Human Muscular System

https://www.youtube.com/watch?v=21bgO104QVU

https://www.youtube.com/watch?v=vr6U4NzVMj8

Antagonist Muscles

https://www.youtube.com/watch?v=QXPcWWyKJb8

ASSESSMENT ITEMS:

https://www.mcqlearn.com/grade10/biology/support-and-movement-multiple-choice-questions-answers.php

http://www.northridge.k12.oh.us/userfiles/130/Classes/235/Open%20note%20test.doc

Section04: Continuity of life

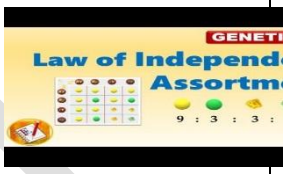
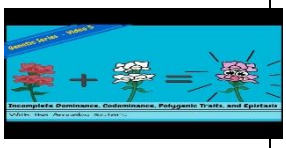
It Includes

Chapter : Inheritance

Chapter : Chromosomes and DNA

Chapter: Evolution

Chapter :Inheritance

Chapter	Skills	Understanding	Reference web material
Inheritance	Student will: • Hypothesize that in a dihybrid inheritance pattern of color and texture of pea seed, the two traits are not inter dependent. • Solve at least 4 genetic problems, to illustrate the law of independent assortment. • Build a thematic chart for the blood groups of his/her class fellows and identify the antigens present in blood • Differentiate between autosomes and sex chromosomes from the karyotype	Student will: • Associate inheritance with the laws of Mendel. • Explain the law of independent assortment, using a suitable example. • Differentiate between incomplete dominance and co-dominance. • Name the various human blood group systems. • Associate multiple alleles with the ABO blood group system. • Associate the positive and negative blood groups with the presence and absence of Rh factor. • Explain the terms; polygenic and epistasis.	 Genetics  Law of independent assortment  Incomplete dominance and Codominance https://www2.palomar.edu/anthro/mendel/glossary.htm Important terminologies related to genetics

Father of Genetics

Gregor Mendel, through his work on pea plants, discovered the fundamental laws of inheritance.. Mendel's Laws of Heredity are usually stated as:

1) The Law of Segregation: Each inherited trait is defined by a gene pair. Parental genes are randomly separated to the sex cells so that sex cells contain only one gene of the pair. Offspring therefore inherit one genetic allele from each parent when sex cells unite in fertilization.

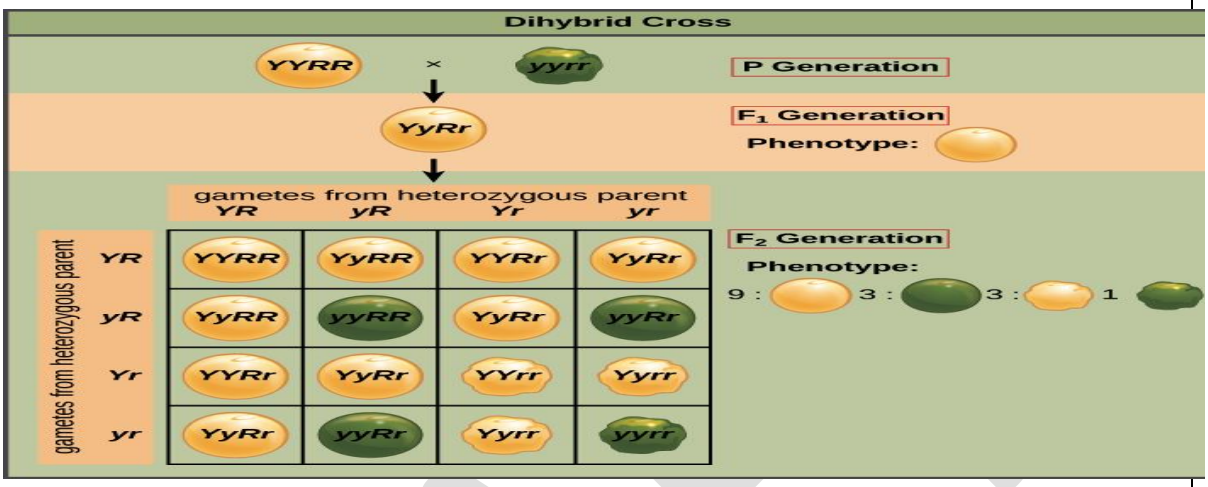
2) The Law of Independent Assortment: Genes for different traits are sorted separately from one another so that the inheritance of one trait is not dependent on the inheritance of another.

3) The Law of Dominance: An organism with alternate forms of a gene will express the for

What is the law of independent assortment?

Mendel's law of independent assortment states that the alleles of two (or more) different genes get sorted into gametes independently of one another.

In other words, the allele a gamete receives for one gene does not influence the allele received for another gene.Example: Pea color and pea shape genes



Polygenic inheritance occurs when one characteristic is controlled by two or more genes. Often the genes are large in quantity but small in effect. Examples of human polygenic inheritance are height, skin color, eye color and weigh

Incomplete dominance is a form of intermediate inheritance in which one allele for a specific trait is not completely expressed over its paired allele.

Codominance

Codominance occurs when two versions, or “alleles,” of the same gene are present in a living thing, and both are expressed.

Epistasis

Epistasis is the interaction between genes that influences a phenotype. Genes can either mask each other so that one is considered “dominant” or they can combine to produce a new trait. It is the conditional relationship between two genes that can determine a single phenotype of some traits.

Multiple alleles

Three or more alternative forms of a gene (alleles) that can occupy the same locus..

ABO blood group system

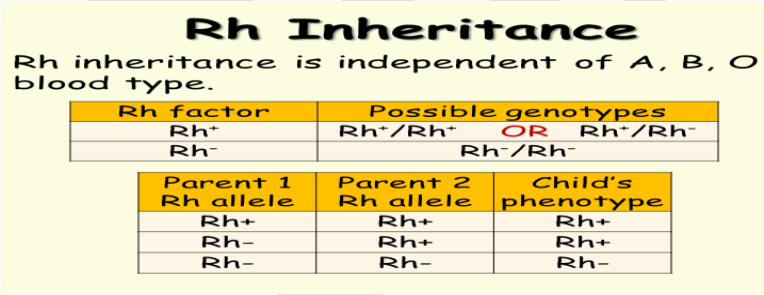
The ABO blood group system is determined by the ABO gene, which is found on chromosome 9. The four ABO blood groups, A, B, AB and O, arise from inheriting one or more of the alternative

forms of this gene (or alleles) namely A, B or O.Genetic Combinations of ABO Blood Groups

Blood group	Possible genes	Parental blood groups	Child's blood group
A	AA or AO	O and O	O
B	BB or BO	O and A	O or A
AB	AB	O and B	O or B
O	OO	O and AB	A or B
		A and A	A or O
		A and B	O or A or B or AB
		A and AB	A or B or AB

The Rh factor

The Rh factor genetic information is also inherited from our parents, but it is inherited independently of the ABO blood type alleles. There are 2 different alleles for the Rh factor known as Rh+ and Rh-.



The most common X-linked recessive disorders

Red-green color blindness, a very common trait in humans and frequently used to explain X-linked disorders. Between seven and ten percent of men and 0.49% to 1% of women are affected. Its commonness may be explained by its relatively benign nature. It is also known as daltonism.

Hemophilia A, a blood clotting disorder caused by a mutation of the Factor VIII gene and leading to a deficiency of Factor VIII. It was once thought to be the "royal disease" found in the descendants of Queen Victoria.

Hemophilia B, also known as Christmas Disease, a blood clotting disorder caused by a mutation of the Factor IX gene and leading to a deficiency of Factor IX. It is rarer than hemophilia A.

Glucose-6-phosphate dehydrogenase deficiency, which causes no immune hemolytic anemia in

response to a number of causes, most commonly infection or exposure to certain medications, chemicals, or foods. Commonly known as "favism", as it can be triggered by chemicals existing naturally in broad (or fava) beans.

Reference pages

https://www.khanacademy.org/science/high-school-biology/hs-classical-genetics/hs-non-mendelian-inheritance/a/multiple-alleles-incomplete-dominance-and-codominance

https://biologydictionary.net/incomplete-dominance/

http://www.dnaftb.org/1/bio.html

https://www.khanacademy.org/science/high-school-biology/hs-classical-genetics/hs-introduction-to-heredity/a/the-law-of-independent-assortment

http://www.biology.arizona.edu/human_bio/problem_sets/blood_types/rh_factor.html

https://transfusion.com.au/blood_basics/blood_groups/inheritance_patterns

Lesson Plan

LEARNING OBJECTIVES

Use the probability or forked line method to calculate the chance of any particular genotype arising from a genetic cross

KEY TAKEAWAYS

Key Points

Mendel's law of independent assortment states that genes do not influence each other with regard to the sorting of alleles into gametes; every possible combination of alleles for every gene is equally likely to occur.

The calculation of any particular genotypic combination of more than one gene is, therefore, the probability of the desired genotype at the first locus multiplied by the probability of the desired genotype at the other loci.

The forked line method can be used to calculate the chances of all possible genotypic combinations from a cross, while the probability method can be used to calculate the chance of any one particular genotype that might result from that cross.

Key Terms

independent assortment: separate genes for separate traits are passed independently of one another from parents to offspring

Describe how recombination can separate linked genes

Key Points

Two genes close together on the same chromosome tend to be inherited together and are said to be linked.

Linked genes can be separated by recombination in which homologous chromosomes exchange genetic information during meiosis; this results in parental, or non-recombinant genotypes, as well as a smaller proportion of recombinant genotypes.

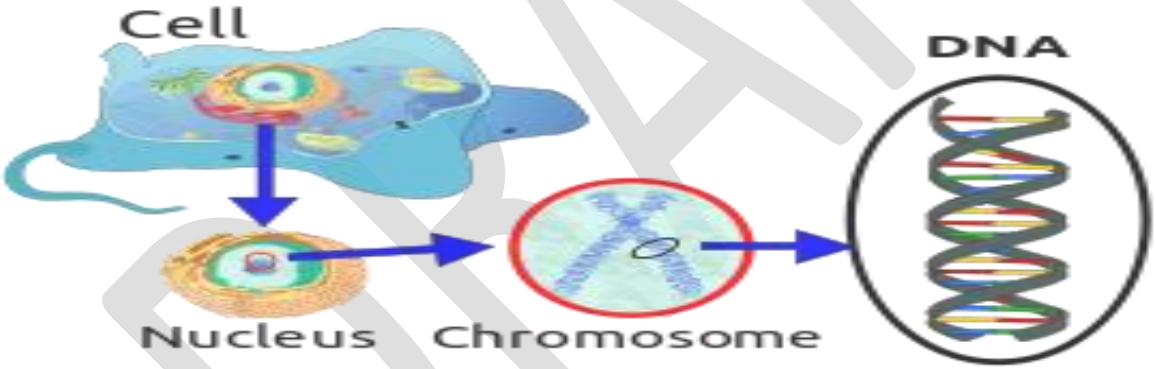
Geneticists can use the amount of recombination between genes to estimate the distance between them on a chromosome.

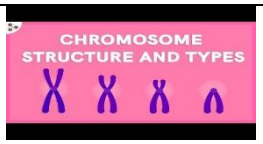
Key Terms

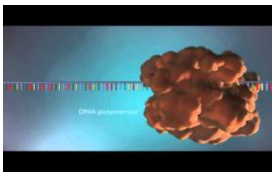
linkage: the property of genes of being inherited together

Recombination: the formation of genetic combinations in offspring that are not present in the parents.

Chromosomes and DNA



Chapter	Student learning outcomes	Understanding	Reference web material
Chromosomes and DNA	Student will: • Make a list of all the proteins that have been studied or referred to till now. • Interpret how many types of t-RNA molecules are necessary for a living cell, if the genetic code	Student will: • Describe the three models proposed about the mechanism of DNA replication. • Describe the central dogma of gene expression. • Define gene and	 Chromosomes  DNA

	is a triplet code. • Make a list of some commonly occurring minor mutations in humans	genetic code. • Explain the mechanism of transcription • Define mutation and identify various sources of mutation. • Describe the symptoms, causes and possible available treatments of some of the gene mutations (Sickle cell anemia, Phenylketonuria)	 DNA to Protein  DNA Replication

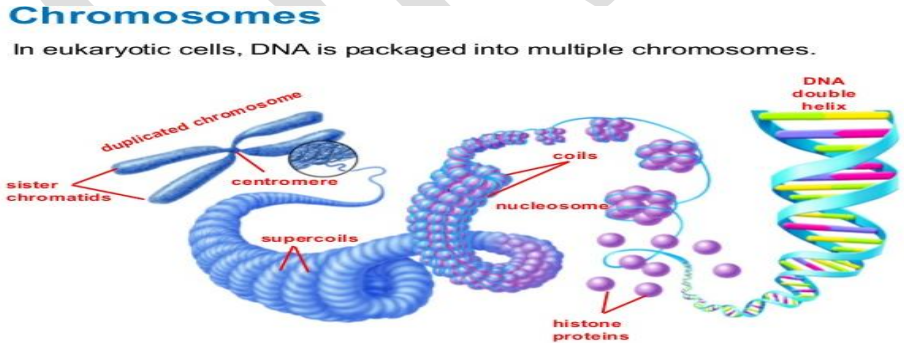
Chapter Review

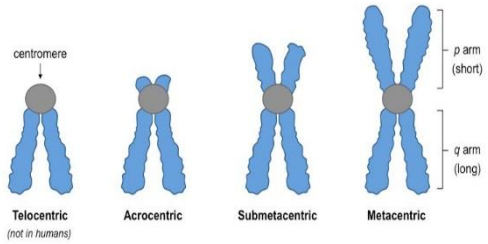
What is a chromosome?

In the nucleus of each cell, the DNA molecule is packaged into thread-like structures called chromosomes. Each chromosome is made up of DNA tightly coiled many times around proteins called histones that support its structure.

Structure of Chromosome

In eukaryotic cells, chromosomes are composed of single molecule of DNA with many copies of five types of histones.





Types OF Chromosomes

Metacentric – centromere is in middle, meaning both arms are of comparable length.

Sub metacentric – centromere off-centre, leading to

shorter p arm relative to q arm

Acrocentric – centromere severely off-set from centre, leading to much shorter p arm.

Telocentric – centromere found at end of chromosome, meaning no p arm exists. (chromosome not found in humans)

Definition of Autosomes

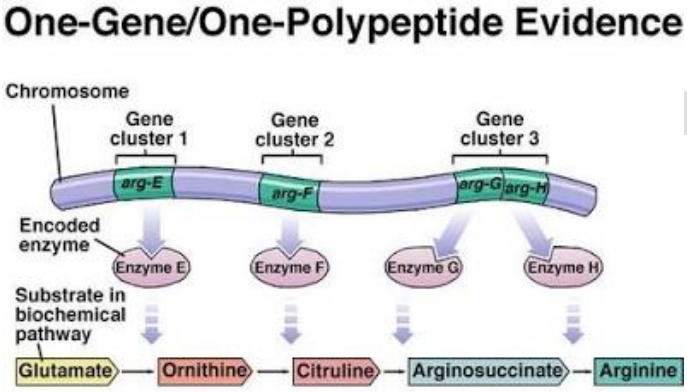
The non-sex chromosomes present in organisms are the autosomes. In humans, there are 22 sets of autosomes

Definition of Sex Chromosomes

Such chromosomes that play a vital role in determining the gender or sex of humans or other species of animals are known as sex chromosome. These are named 'X' and 'Y' by scientists.

In humans out of the 23 pairs of chromosomes, one pair is sex chromosomes, and other 22 pairs are the autosomes.

The One Gene One Enzyme Hypothesis



The one gene, one enzyme hypothesis is the idea that each gene encodes a single enzyme. Today, we know that this idea is generally (but not exactly) correct.

Role Of Types Of RNA In Protein Synthesis

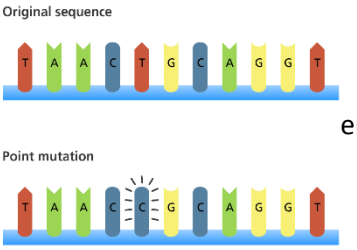
The three roles of RNA in protein synthesis.

Messenger RNA (mRNA) is translated into protein by the joint action of transfer RNA (tRNA) and the ribosome. Messenger RNA (mRNA) carries the genetic information copied from DNA in the form of a series of three-base code "words," each of which specifies a particular amino acid.

Transfer RNA (tRNA) is the key to deciphering the code words in mRNA. Each type of amino acid has its own type of tRNA .

Ribosomal RNA (rRNA) associates with a set of proteins to form ribosomes. These complex structures, which physically move along an mRNA molecule, catalyze the assembly of amino acids into protein chains.

What is a mutation?



A mutation is a change that occurs in our DNA sequence, either due to mistakes when the DNA is copied or as the result of environmental factors such as UV light and cigarette smoke.

Over a lifetime our DNA? can undergo changes or 'Mutations?' in the sequence of bases? A, C, G and T.

Mutations can occur during DNA replication? if errors are made and not corrected in time.

Diseases caused by gene mutation

Some well-known inherited genetic disorders include

Cystic Fibrosis

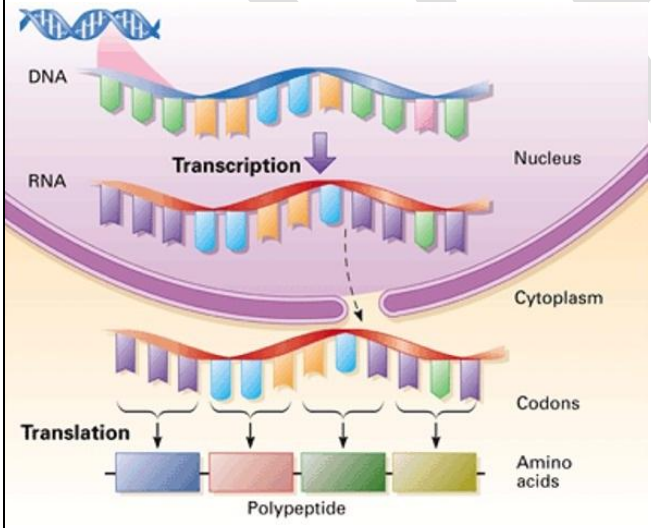
Sickle Cell Anemia

Tay-Sachs Disease

Phenylketonuria and color-blindness.

What is gene expression?

Gene expression is the process by which the instructions in our DNA are converted into a functional product, such as a protein.



There are two key steps involved in making a protein, transcription and translation.

Transcription

Transcription is when the DNA in a gene is copied to produce an RNA Transcript called RNA (mRNA). This is carried out by an enzyme called RNA polymerase

Translation

Translation occurs after the messenger RNA (mRNA) has carried the transcribed 'message' from the DNA to protein-making factories in the cell, called ribosomes

Reference Pages

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https://biodifferences.com/difference-between-autosomes-and-sex-chromosomes.html

https://embryo.asu.edu/pages/george-w-beadles-one-gene-one-enzyme-hypothesis

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Lesson Plan

Lesson Plan of DNA, Genes and Chromosomes

Students' Learning Outcomes

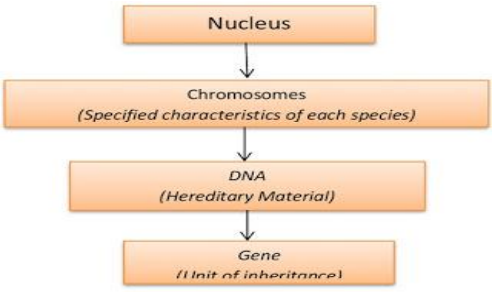
- *Describe the relationship between DNA, Gene and Chromosome.*
- *Explain How DNA is copied and made.*

Information for Teachers

- *Deoxyribonucleic acid(DNA): the chemical, existing at the center of the cells of living things, that reins*

structure and purpose of each cell and transports genetic information during reproduction

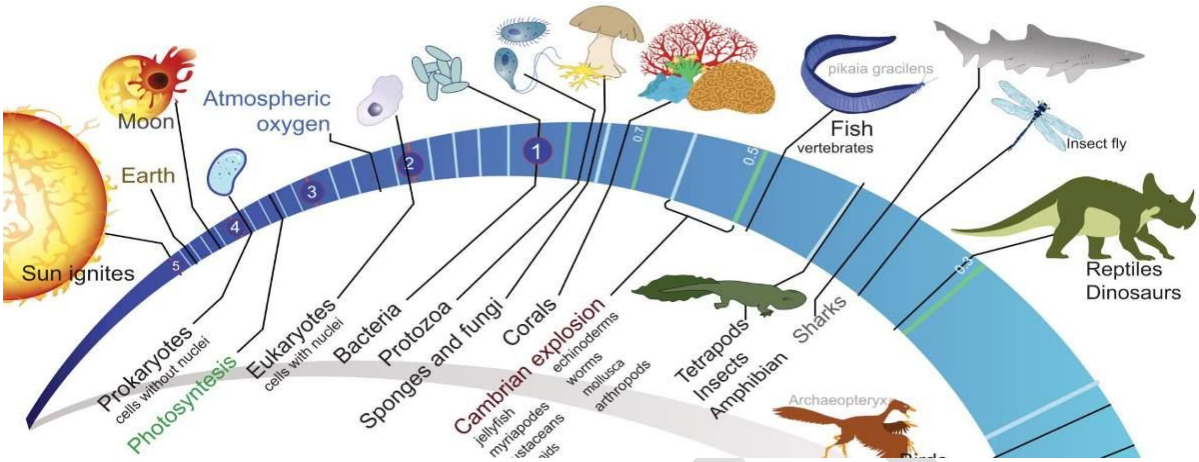
- *Chromosomes are small thread like structure found in the nucleus of the cell which controls the characteristics of living organisms.*
- *DNA is called the hereditary material because it is capable of self-replication and is transferred from one generation to another.*
- *Genes are the unit of inheritance and these are the short lengths of DNA in chromosomes.*
- *A unit of heredity that is shifted from a parent to children and is held to regulate some characteristic of the children.*



Material / Resources

A chart or model showing DNA, Gene and Chromosomes, A chart showing the process of replication of DNA

Evolution



Chapter	Skills	Understanding	Reference web material
Evolution	Student will: • List the vestigial structures found in man and categorize them in homologous or analogous structures. • Describe and analyze examples of technology that have extended or modified the scientific understanding of evolution	Student will: • Justify Lamarck as an early proponent of evolution. • Describe the theory of inheritance of acquired characters, as proposed by Lamarck. • Outline the steps of the evolution of the giraffe, as illustrated in Lamarckism. • State the drawbacks in Lamarckism. • Explain the theory of natural selection as proposed by Darwin.	 Homologous and analogous organs  Darwin theory  Evidence for evolution

Chapter review

In biology, Evolution is the change in the characteristics of a species over several generations and relies on the process of natural selection. The theory of evolution is based on the idea that all species are related and gradually change over time.

So main theories of evolution are:

(I) Lamarckism or Theory of Inheritance of Acquired characters.

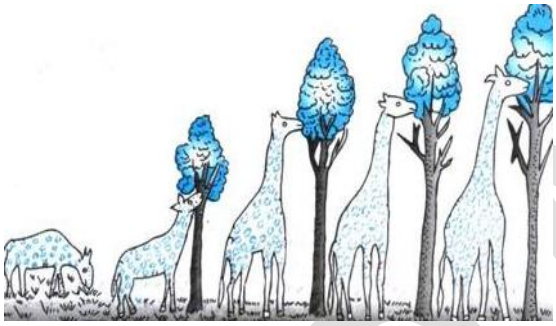
(II) Darwinism or Theory of Natural Selection.

(III) Mutation theory of DeVries.

(IV) Neo-Darwinism or Modern concept or Synthetic theory of evolution

Lamarckism:

It is also called "Theory of inheritance of acquired characters" and was proposed by a great French naturalist, Jean Baptiste de Lamarck in 1809 A.D.



Summary of four postulates of Lamarckism:

1. Living organisms or their component parts tend to increase in size.

2. Production of new organ is resulted from a new need.

3. Continued use of an organ makes it more developed, while disuse of an organ results in degeneration.

4. Acquired characters (or modifications) developed by individuals during their own lifetime are inheritable and accumulate over a period of time resulting a new species.

Darwinism (Theory of Natural Selection):

Introduction:

Charles Darwin made an extensive study of nature for over 20 years, especially in 1831-1836 when he went on a voyage on the famous ship "H.M.S. Beagle"

He collected the observations on animal distribution and the relationship between living and extinct animals.

Darwin explained his theory of evolution in a book entitled "On the Origin of Species by means of Natural Selection".

Main postulates of Darwinism are:

1. Geometric increase.

2. Limited food and space.

3. Struggle for existence.

4. Variations.

5. Natural selection or Survival of the fittest.

6. Inheritance of useful variations.

7. Speciation.

1. Geometric increase:

According to Darwinism, the populations tend to multiply geometrically and the reproductive powers of living organisms (biotic potential) are much more than required to maintain their number e.g.,

2. Limited food and space:

Darwinism states that though a population tends to increase geometrically, the food increases only arithmetically. So two main limiting factors on the tremendous increase of a population are: limited food and space which together form the major part of carrying capacity of environment. 3. 3.Struggle for existence:

Due to rapid multiplication of populations but limited food and space, there starts an everlasting competition between individuals having similar requirements.

4. Variations:

Variation is the law of nature. According to this law of nature, no two individuals except identical (monozygotic) twins are identical.

5. Natural selection or Survival of the fittest:

Darwin stated that if the man can produce such a large number of new species/varieties with limited resources and in short period of time by artificial selection, then natural selection could account for this large biodiversity by considerable modifications of species with the help of unlimited resources available over long span of time.

6. Inheritance of useful variations:

Darwin believed that the selected individuals pass their useful continuous variations to their offspring so that they are born fit to the changed environment.

7. Speciation:

According to Darwinism, useful variations appear in every generation and are inherited from one generation to another.

D. Evidences against Darwinism:

Darwinism is not able to explain:

1. The inheritance of small variations in those organs which can be of use only when fully formed e.g. wing of a bird. Such organs will be of no use in incipient or underdeveloped stage.

2. Inheritance of vestigial organs.

3. Inheritance of over-specialized organs e.g. antlers in deer and tusks in elephants.

4. Presence of neuter flowers and sterility of hybrids.

5. Did not differentiate between somatic and germinal variations.

6. He did not explain the causes of the variations and the mode of transmission of variations.

Mutation Theory of Evolution:

The mutation theory of evolution was proposed by a Dutch botanist, Hugo de Vries (1848-1935 A.D.)

1. The evolution is a discontinuous process and occurs by mutations (L. mutate = to change; sudden and inheritable large differences from the normal and are not connected to normal by intermediate forms). Individuals with mutations are called mutants.

2. Elementary species are produced in large number to increase chances of selection by nature.

3. Mutations are recurring so that the same mutants appear again and again. This increases the chances of their selection by nature.

4. Mutations occur in all directions so may cause gain or loss of any character.

Evidences in favour of Mutation theory:

1. Appearance of a short-legged sheep variety, Ancon sheep (Fig. 7.39), from long-legged parents in a single generation in 1791 A.D.

3. De Vries observations have been experimentally confirmed by McDougal and Shull in America and Gates in England.

4. It can explain the inheritance of vestigial and over-specialized organs.

Evidences against Mutation theory:

1. It is not able to explain the phenomena of mimicry and protective colouration.

2. Rate of mutation is very low, i.e. one per million or one per several million genes.

3. Oenothera lamarckiana is a hybrid plant and contains anamolous type of chromosome behaviour.

4. Chromosomal numerical changes as reported by de Vries are unstable.

5. Mutations are incapable of introducing new genes and alleles into a gene pool.

IV. Neo-Darwinism or Modern Concept or Synthetic Theory of Evolution:

A. Postulates of Neo-Darwinism:

1. Genetic Variability:

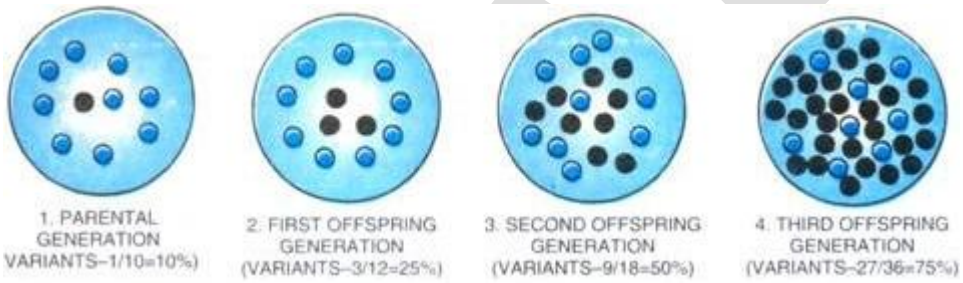
Variability is an opposing force to heredity and is essential for evolution as the variations form the raw material for evolution.

Numerical chromosomal mutations:

Gene mutations (Point mutations):

2. Natural Selection:

Natural selection of Neo- Darwinism differs from that of Darwinism that it does not operate through "survival of the fittest" but operates through differential reproduction and comparative reproductive success.

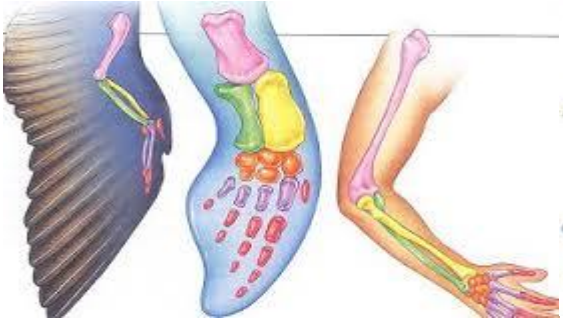


3. Reproductive isolation:

Any factor which reduces the chances of interbreeding between the related groups of living organisms is called an isolating mechanism. Reproductive isolation is must so as to allow the accumulation of variations leading to speciation by preventing hybridization.

Evidence in support of organic evolution

An important evidence in favour of organic evolution is the occurrence of homologous and vestigial organs.



Homologous organ

Analogous organ

Homologous organs are those which have the common origin and are built on the same fundamental pattern but they perform different functions and have different appearances Vestigial organs in animals are those having no function now, in them, but had important functions in their ancestors.

Analogous organs are quite different in fundamental structure and embryo

Evidence in support of organic evolution

1. Paleontological Evidences (Evidences from Fossil Record):

From the fossil records it has been concluded that evolution has taken place from simple to complex in a gradual manner.

Example : Archaeopteryx (Archae — primitive, old, pteryx = wing):

It was found in the rocks of the Jurassic period. Archaeopteryx lithographic was discovered in 1861.This fossil is placed in the British Museum, London. It displays the characters of both the reptiles and birds.

2. Evidences from Comparative Anatomy and Morphology:

There are similarities and differences among organisms of today and those existed years ago. These evidences are as follows.

(i) Organ Systems:

The different systems of animal body are similar in many groups of organisms, e.g., nervous system, blood vascular system, respiratory system, excretory system, etc.

(ii) Homologous organs:

(iii) Analogous Organs:

(iv) Vestigial Organs:

3.Embryological Evidences (Evidences from Embryology):

These evidences are based on the comparative study of the embryos of various animals.

(i) Similarity in Early Development:

(ii) Resemblance among Vertebrate Embryos:

(iii) Resemblances among Invertebrate Larvae:

(vii) Development of Vertebrate Organs:

4. Bio geographical Evidences (Evidences from Biogeography):

Biogeography is the study of distribution of animals and plants on this earth. The evidences of evolution based on biogeography are called bio geographical evidences. Pangaea (Gr. all earth).

5. Evidences from Biochemistry and Comparative Physiology:

Living beings exhibit a large degree of similarity in chemical constitution, biochemical reactions and body functions. They provide a number of evidences of common ancestry and evolution of different groups of organisms.

Reference Pages

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Lesson Plan

Evolution is essential to our curriculum and to scientific literacy. Imagine teaching social science without teaching history; students would lack perspective on events going on today. Similarly, to understand the big picture of biology, students need to understand life on Earth in terms of its history and its future — the changing life forms and ecosystems that have arisen and changed over billions of years, as well as the mechanisms that have brought about those changes.

The *Understanding Evolution* project aims to help instructors develop student understanding of:

Basic evolutionary patterns and processes

Evolutionary theory's ability to explain phenomena across the many sub disciplines of biology

The many applications of evolutionary theory, both in solving real world problems and in scientific research

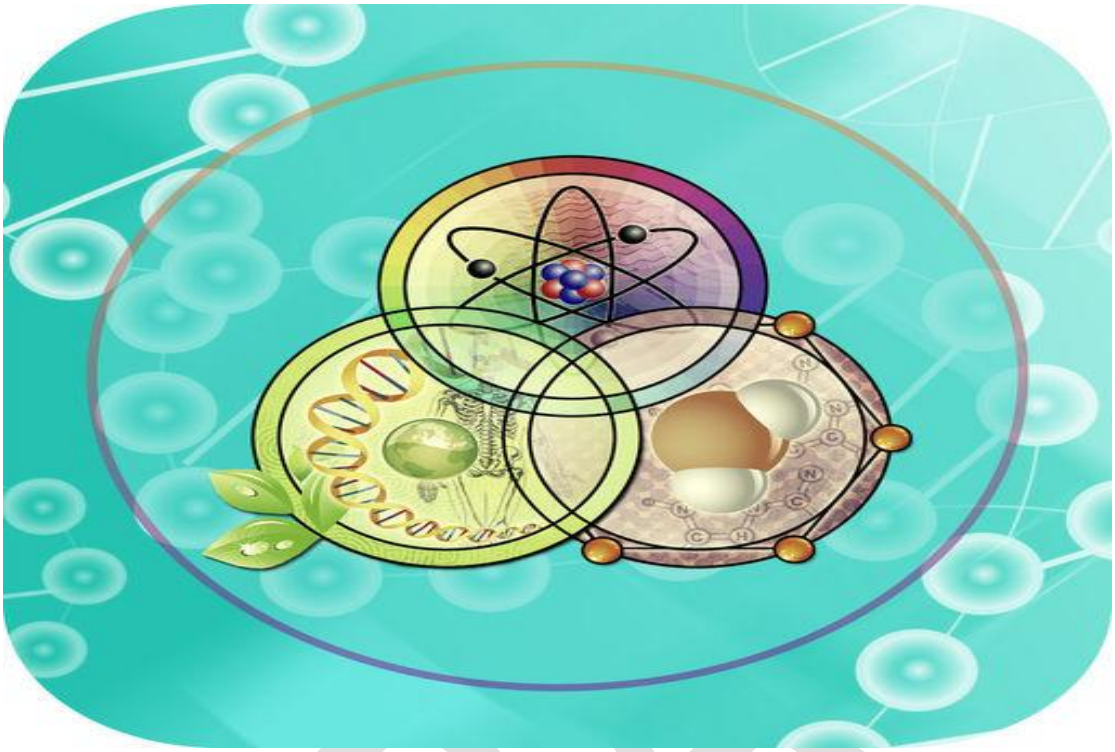
The evidence supporting evolutionary theory

As is true of any subject, to teach evolution successfully, teachers need to be prepared with a conceptual understanding of the topic and with effective curricular strategies. Teachers that develop a depth of knowledge beyond what is actually expected of students will be able to confidently adjust instruction in response to students' needs and inquiries. This is particularly true in the teaching of evolution, where students' questions can be numerous and challenging

http://www.xtec.cat/monografics/cirel/pla_le/aberdeen/jaume_casado/Lesson_plans.pdf

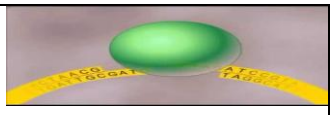
SECTION 5: APPLICATION OF BIOLOGY

Application of biology



iotechnology

Chapter	Skills	Understanding	Reference web material
Biotechnology	Student will: Describe the application of polymerase reaction. State the	Student will: • Describe the terms of genome analysis, genome map and genetic markers. • Explain tissue	 Biotechnology

	importance and limitation of DNA analysis.	culture and differentiate between the organ culture and cell culture • State the objectives of the production of transgenic bacteria, transgenic plants and transgenic animals. • Define gene cloning and state the steps in gene cloning. • Describe the techniques of gene cloning through recombinant DNA technology	 DNA cloning  DNA Replication  Tissue Culture

Chapter review

Genetic engineering,

It is also called genetic modificationor genetic manipulation, is the direct manipulation of an organism's genes using biotechnology.

It is a set of technologies used to change the genetic makeup of cells, including the transfer of genes within and across species boundaries to produce improved or novel organisms.

Genetic engineering is accomplished in three basic steps. These are

(1) The isolation of DNA fragments from a donor organism;

(2) The insertion of an isolated donor DNA fragment into a vector genome .

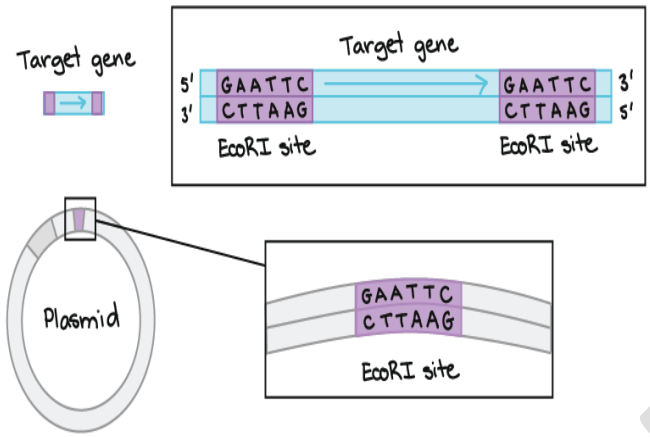
(3) The growth of a recombinant vector in an appropriate host.

Recombinant DNA

(rDNA) molecules are DNA molecules formed by laboratory methods of genetic recombination (such as molecular cloning) to bring together genetic material from multiple sources, creating sequences that would not otherwise be found in the genome.

Recombinant DNA is the general name for a piece of DNA that has been created by combining at least two strands.

Restriction enzymes are DNA-cutting enzymes. Each enzyme recognizes one or a few target sequences and cuts DNA at or near those sequences.



DNA ligase is a DNA-joining enzyme. If two pieces of DNA have matching ends, ligase can link themto form a single, unbroken molecule of DNA.

Insertion of rDNA into host

Transformation

Bacteria can take up foreign DNA in a process called transformation.

Transformation is a key step in DNA cloning. It occurs after restriction digest and ligation and transfers newly made plasmids to bacteria.

DNA Cloning

Transformation and selection of bacteria are key steps in DNA cloning.

DNA cloning is the process of making many copies of a specific piece of DNA, such as a gene. The copies are often made in bacteria.

After a ligation, the next step is to transfer the DNA into bacteria in a process called transformation.

Specially prepared bacteria are mixed with DNA (e.g., from a ligation).

The bacteria are given a heat shock, which causes some of them to take up a plasmid.

Application Of Genetic Engineering

Genetic engineering has applications in medicine, research, industry and agriculture and can be used on a wide range of plants, animals and microorganisms.

In medicine, genetic engineering has been used to mass-produce insulin, human growth hormones, follistim (for treating infertility), human albumin, vaccines, and many other drugs.

In research, organisms are genetically engineered to discover the functions of certain genes.

Industrial applications include transforming microorganisms such as bacteria or yeast, or insect mammalian cells with a gene coding for a useful protein.

Genetic engineering is also used in agriculture to create genetically-modified crops or genetically-modified organisms.

Cloning:

Cloning is the process of producing genetically identical individuals of an organism either naturally or artificially.

Cloning in biotechnology refers to the process of creating clones of organisms or copies of cells or DNA fragments.

Transgenic Animals

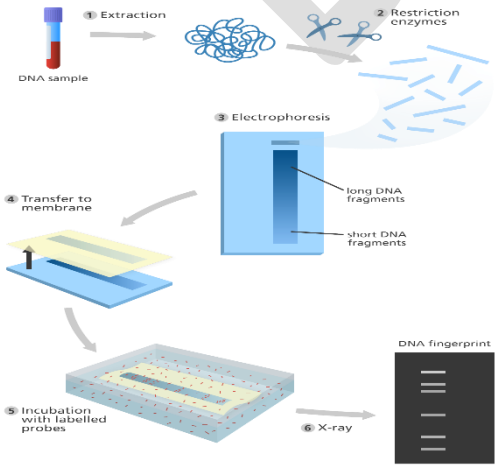
The production of transgenic livestock has the opportunity to significantly improve human health, enhance nutrition, protect the environment, increase animal welfare, and decrease livestock disease.

Transgenic Plants are the ones, whose DNA is modified using genetic engineering techniques. The aim is to introduce a new trait to the plant which does not occur naturally in the species.

Genetically Modified Bacteria were the first organisms to be modified in the laboratory, due to their simple genetics. These organisms are now used for several purposes, and are particularly important in producing large amounts of pure human proteins for use in medicine

DNA Sequencing

It isthe process of determining the nucleic acid sequence – the order of nucleotides in DNA. It includes any method or technology that is used to determine the order of the four bases: adenine, guanine, cytosine, and thymine



DNA Fingerprinting

It is a laboratory technique used to establish a link between biological evidence and a suspect in a criminal investigation. A DNA sample taken from a crime scene is compared with a DNA sample from a suspect. If the two DNA profiles are a match, then the evidence came from that suspect.

A Genomic Library

It is a collection of the total genomic DNA from a single organism. The DNA is stored in a population of identical vectors, each containing a different insert of DNA.

What is called tissue culture?

Plant tissue culture is a collection of techniques used to maintain or grow plant cells, tissues or organs under sterile conditions on a nutrient culture medium of known composition.

Plant tissue culture is widely used to produce clones of a plant in a method known as micro propagation

Reference pages

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https://www.google.com/search?rlz=1C1GCEA_enPK880PK880&sxsrf=ACYBGNTAGbllrEh-cH7j6la54EBr_n6tcg%3A1577456850956&ei=0hQGXqffOcWelwSy0YnYDw&q=dna+fingerprinting&oq=DNA+f&gs_l=psy-ab.1.0.0i273l2j0i67l5j0l3.41129.47560..49076...0.3..0.430.1423.2-2j0j2.....0....1..gws-wiz.....0i71j0i7i10i30j0i8i7i10i30j0i13i5i10i30j0i10.3m5n-LI65mI

https://www.khanacademy.org/science/biology/biotech-dna-technology/dna-cloning-tutorial/a/bacterial-transformation-selection

https://www.tandfonline.com/doi/abs/10.1080/00207238008737419

https://www.nature.com/scitable/knowledge/library/transgenic-animals-in-agriculture-105646080/

https://www.britannica.com/science/recombinant-DNA-technology

https://www.biologyexams4u.com/2013/10/steps-in-recombinant-dna-technology.html#.XgYvJVVKjIU

https://www.britannica.com/science/genetic-engineering

https://en.wikipedia.org/wiki/Genetically_modified_bacteria

Lesson Plan

Get your budding scientists thinking with this lesson plan that examines genetic engineering. Students will watch a video to learn what genetic engineering is and see examples. Follow up with an activity to solidify facts

Learning Objectives

After this lesson, students will be able to:

define 'genetic engineering'

explain the process of genetic engineering

describe applications of genetic engineering

debate genetic engineering

Length:

1 - 1.5 hours

Materials

Access to internet for research

Key Vocabulary

Genetic engineering

Recombinant DNA

Genetically-modified organism, GMO

Host organism

Vector

Plasmid

Curriculum Standards

Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.

Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.