

**COVENANT UNIVERSITY
NIGERIA**

*TUTORIAL KIT
OMEGA SEMESTER*

PROGRAMME: BIOCHEMISTRY

COURSE: BCH 425

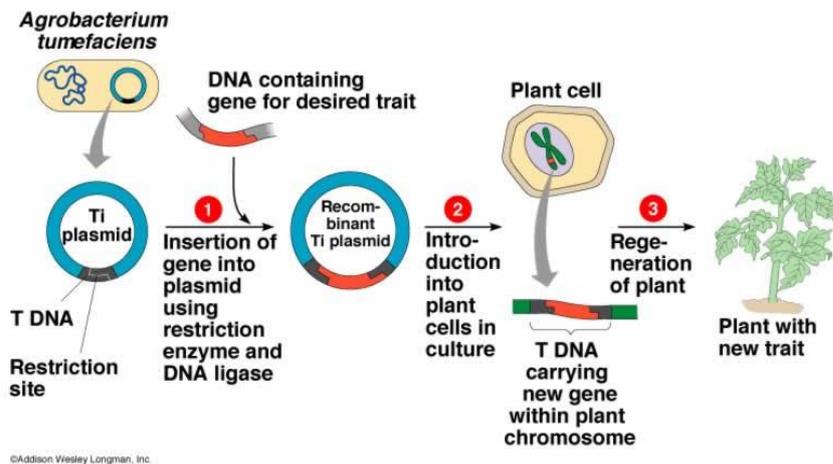
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BCH 425: Topics in Biotechnology

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1. What is genetic engineering?
Genetic engineering is a technique that makes it possible to transfer DNA sequences from one organism to another
2. What are transgenic organisms?
Organisms that contain genes from other species
3. Describe a transformation process in plants



4. What restriction endonucleases?
 - Enzymes that can clip strands of DNA crosswise at selected positions
 - Hundreds have been discovered in bacteria
 - Each has a known sequence of 4 to 10 pairs as its target
 - Can recognize and clip at palindromes
5. Describe the basic steps in PCR
 - Denaturation
 - Heat to 94°C to separate in to two strands
 - Cool to between 50°C and 65°C
 - Priming
 - Primers added in a concentration that favors binding to the complementary strand of test DNA
 - Prepares the two strands (amplicons) for synthesis
 - Extension
 - 72°C
 - DNA polymerase and nucleotides are added
 - Polymerases extend the molecule
 - The amplified DNA can then be analyzed
6. What are the characteristics of cloning vectors?
7. Characteristics of Cloning Hosts?
8. Describe several biochemical products of recombinant DNA technology
9. Give an outline of a fermentation process and hence, describe how you would isolate benzyl penicillin from culture broth.
10. Describe a laboratory procedure to determine the level of expression of a protein of interest after cloning.

BCH 428: Comparative Biochemistry

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1. Compare and contrast between the digestive systems of ruminants and non ruminants.

Ruminants are animals that regurgitate food i.e. chew the cud such as cattle, goat. Ruminant GIT has polygastric stomach made up of reticulum, rumen, omasum and abomasums. Rumen digests cellulose by help of microorganisms which releases cellulose. Reticulum stores digested food and release saliva to neutralize stomach acidity. Omasum mechanically churns food and absorbs moisture. Abomasum (true stomach) completes digestion. Large intestine/caecum is for fermentation and reabsorption. Non ruminants are herbivores that do not chew the cud such as pig, horse. Non ruminant GIT has monogastric stomach, mouth, esophagus, small intestine, large intestine and caecum. 2. 2.

2. Distinguish between the types of respiratory pigments evolved by living organisms.

3. Discuss the various evidences that formed the basis of evolution theory.

Fossils record (preserved remains of ancient organisms); Biogeography (Geographic distribution of living things); Homology (homologous body structures); Vestigial structures that have lost their function; Embryology (similarities in development of embryos); Comparative Biochemistry (DNA, ATP); Comparative genomes (genetics); Antibiotic resistance; Polymerization of amino acids to proteins; Formation of protobionts and liposomes in laboratory; Slime mold existence as single cells and colonies; Mitochondria seen in eukaryotes; Universal genetic code; Urey – Miller experiment; Central dogma of molecular biology; Self replicating property of RNA

4. Distinguish between the types of nutrition evolved by living organisms.

5. Structural differences between myoglobin and haemoglobin in vertebrates

Because myoglobin and hemoglobin each bind oxygen and they have different roles as oxygen binding proteins. One obvious difference between the two proteins is that myoglobin is a single polypeptide chain while vertebrate hemoglobins are tetrameric. **Myoglobin** - Human myoglobin has 153 amino acid residues. Hemoglobin - In human hemoglobin, the overall structure is made up of four individual polypeptide subunits

6. Explain the theories of biological, geological and biochemical evolution

7. Mention the common characteristics of the respiratory system of various organisms.

They have a large capillary network, the gas exchange surfaces are thin and moist, constant renewal of oxygen-rich fluid (air or water) to provide oxygen and remove carbon dioxide, free movement of blood within the capillary network.

8. Describe comparatively, the respiratory system of animals

9. Mention the process by which respiration occurs in animals.

1) cutaneous diffusion (earthworm and some amphibians), 2) by thin tubes called tracheae (some insects), 3) by gills, the respiratory system of fish and 4) by diffusion through the lungs, respiratory organs present in amphibians, reptiles, birds and mammals

10. Discuss the differences in the digestion of macromolecules in ruminants and non- ruminants.

11. Describe the characteristics of respiratory pigments.

They are high molecular weight (10^5 to nearly 10^7 D) conjugated proteins, These proteins are conjugated with other organic molecules or metal ions (Fe^{2+} or Cu^{2+}), Conjugation with these metal ions determine the colour produced by these complexes. These pigments are usually oxygenated during the transport of oxygen, this is necessary because of low solubility of O_2 in aqueous solution. These pigments allow transport of molecular oxygen, pickup of O_2 at sites of high O_2 tension and deposition at sites of low O_2 tension. They allow blood to carry a much greater quantity of O_2 and also allow quick removal of O_2 from respiratory surfaces, thus maintaining a concentration gradient down which O_2 can diffuse.

12. Compare the *de novo* fatty acid synthesis between ruminants and non ruminants.

13. Mention the types of respiratory pigments found in the animal kingdom.

Haemoglobins (intra- or extracellular), Chlorocruorins (exclusively extracellular), Haemocyanins (exclusively extracellular), Haemerythrins (exclusively intracellular)

14. Discuss the metabolism and distribution of N-bases in mammals.

15. Write exclusively on the excretion of nitrogen in mammals and any other three organisms.

The excretion of nitrogenous waste from animals is important because if allowed to build up, it can prove toxic. The nitrogen is obtained from the metabolism of dietary protein.

Animals excrete three main nitrogen products, ammonia, urea and uric acid as well as some minor nitrogen excretory products, including trimethylamine oxide, guanine, creatine, creatinine and amino acids. In molluscs and in mammals other than primates, uric acid is oxidized by **urate oxidase** to *allantoin* and excreted. In bony fishes (teleosts), uric acid degradation proceeds through yet another step wherein allantoin is hydrolyzed to *allantoic acid* by **allantoinase** before excretion.

16. Describe the pathway for the synthesis of pyrimidine nucleotides and Succinctly differentiate between the bases and sugars in the nucleotides.

17. Describe various diseases associated with nitrogen excretion and metabolism.

Uric acid and urate salts are rather insoluble in water and tend to precipitate from solution if produced in excess. The most common symptom of gout is arthritic pain in the joints as a result of urate deposition in cartilaginous tissue. The joint of the big toe is particularly susceptible. Urate crystals may also appear as kidney stones and lead to painful obstruction of the urinary tract.

Hyperuricemia, chronic elevation of blood uric acid levels,

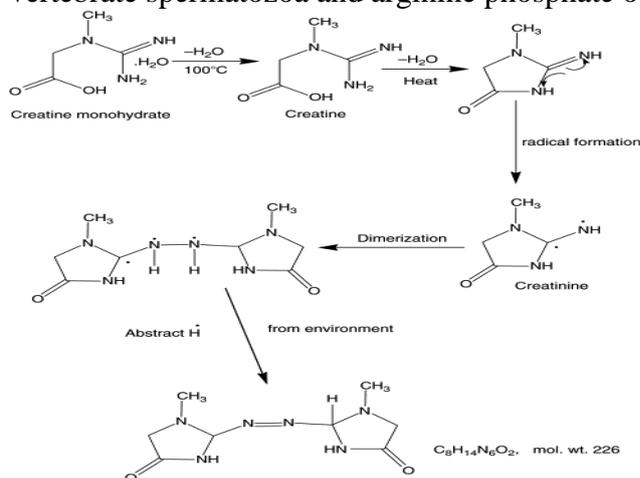
Kidney stones

Lesch-Nyhan syndrome: deficiency of HGPRT [increased production of uric acid. Lesch-Nyhan Syndrome: HGPRT Deficiency Leads to Severe Clinical Disorder

18. Compare and contrast between nucleosides and nucleotides.

19. Explain the metabolism and distribution of phosphagens

Phosphagens are phosphoguanidine compound which is high energy compounds that act as storage forms of high energy phosphate compounds and include creatine phosphate occurring in vertebrate spermatozoa and arginine phosphate occurring in invertebrate muscle.



20. Discuss the important properties and the biological significance of nucleic acids and Compare the different strategies for eliminating waste ammonia in organisms.