

UNIT – VII APPLIED BIOLOGY

Very Short Answer Questions

1. What are the factors constitute Dairying?

- A. a) Selection of good breeds having high yielding potential, combined with disease resistance.
- b) Proper housing with adequate water, ventilation, suitable temperature, maintenance of quantity and quality of fodder etc.

2. Mention any two advantages of Inbreeding?

- A. 1) Inbreeding increases **homozygosity**. So inbreeding is necessary to evolve a pure line animal.
- 2) It helps in the **accumulation of superior genes** and **elimination of less desirable genes**.
- 3) It increases **productivity** of inbred population.

3. Distinguish between Out – Cross and Cross – Breed?

- A. **Out Cross:** It is the off spring formed by mating of animals within the same breed, but having no ancestors on either side of pedigree for 4 – 6 generations.

A single out cross helps to overcome inbreeding depression.

Cross Breed: It is the off spring formed by a mating between superior males of one breed and superior females of another breed.

Cross breed exhibits desirable qualities of two different breeds to be combined.

4. Define the terms layer and broiler?

- A. **Layer:** The birds which are raised exclusively for the production of eggs are called layers.

Broiler: The birds which are raised only for their meat are called broilers.

5. What is apiculture?

- A. Apiculture is the maintenance of hives of honeybees for the production of honey and wax. Apiculture is an age – old cottage industry.

6. Distinguish between a drone and worker in honey bee colony?

A.

Drones	Worker Bees
1. These are fertile males. These are haploid 2. They develop from unfertilized ova by male parthenogenesis or Arrhenotoky 3. These are short lived	1. These are sterile females. They are diploid 2. They develop from fertilized eggs 3. These live for two and three months



7. Define the term Fishery?

A. **Fishery** is an industry devoted to the catching, processing for storage in freezers and selling of fish, shell fish or any other aquatic animals for human consumption.

8. Differentiate aquaculture and Pisciculture?

A.

Aquaculture	Pisciculture
Culturing of fishes and other aquatic organisms under regulated conditions to achieve better production	Culturing of exclusively fin fishes under regulated conditions to achieve better production

9. Explain the term Hypophysation?

A. Making the fishes to breed artificially to meet the demand of carp seed as called hypophysation.

10. List out any two Indian carps and two exotic carps?

A. **Indian carps:** 1) *Catla catla* (catla)
2) *Cirrhinus mrigala* (mrigal)

Exotic carps: 1) Grass carp
2) Silver carp

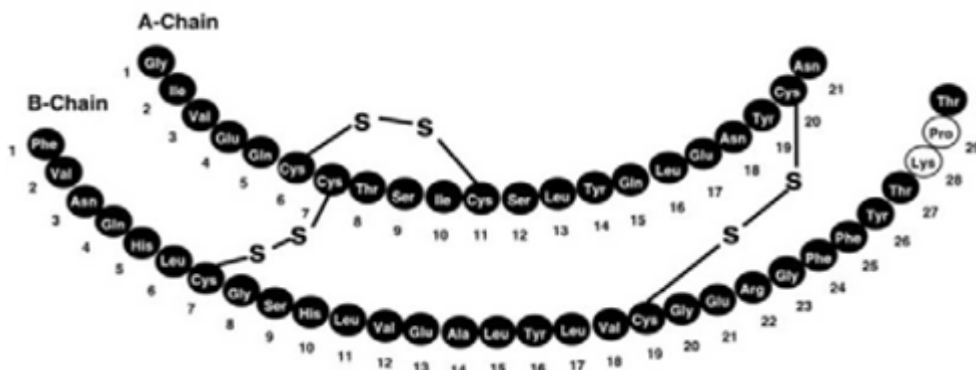
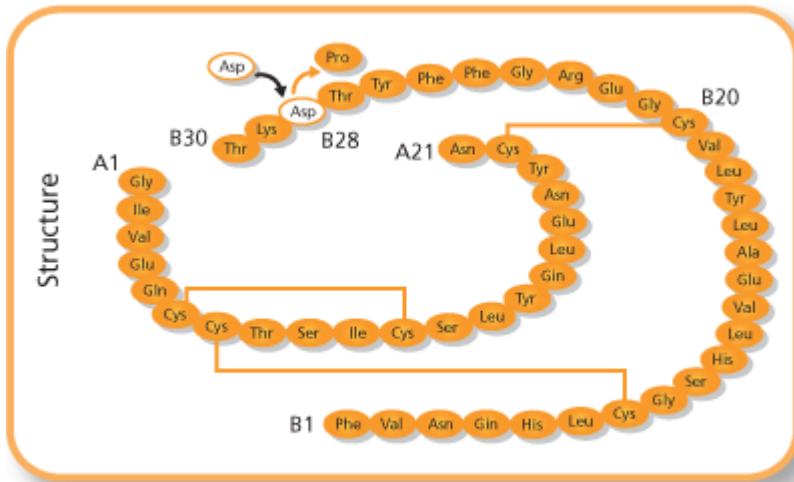
11. Mention any four fish by – products?

A. 1) Shark and cod liver oils
2) Fish guano
3) Shagreen
4) Isinglass

12. How many amino acids and polypeptide chains are present in insulin?

A. Human insulin is made up of 51 amino acids arranged in two polypeptides.
- Polypeptide chain A with 21 amino acids
- Polypeptide chain B with 30 amino acids which are held together by disulphide linkages

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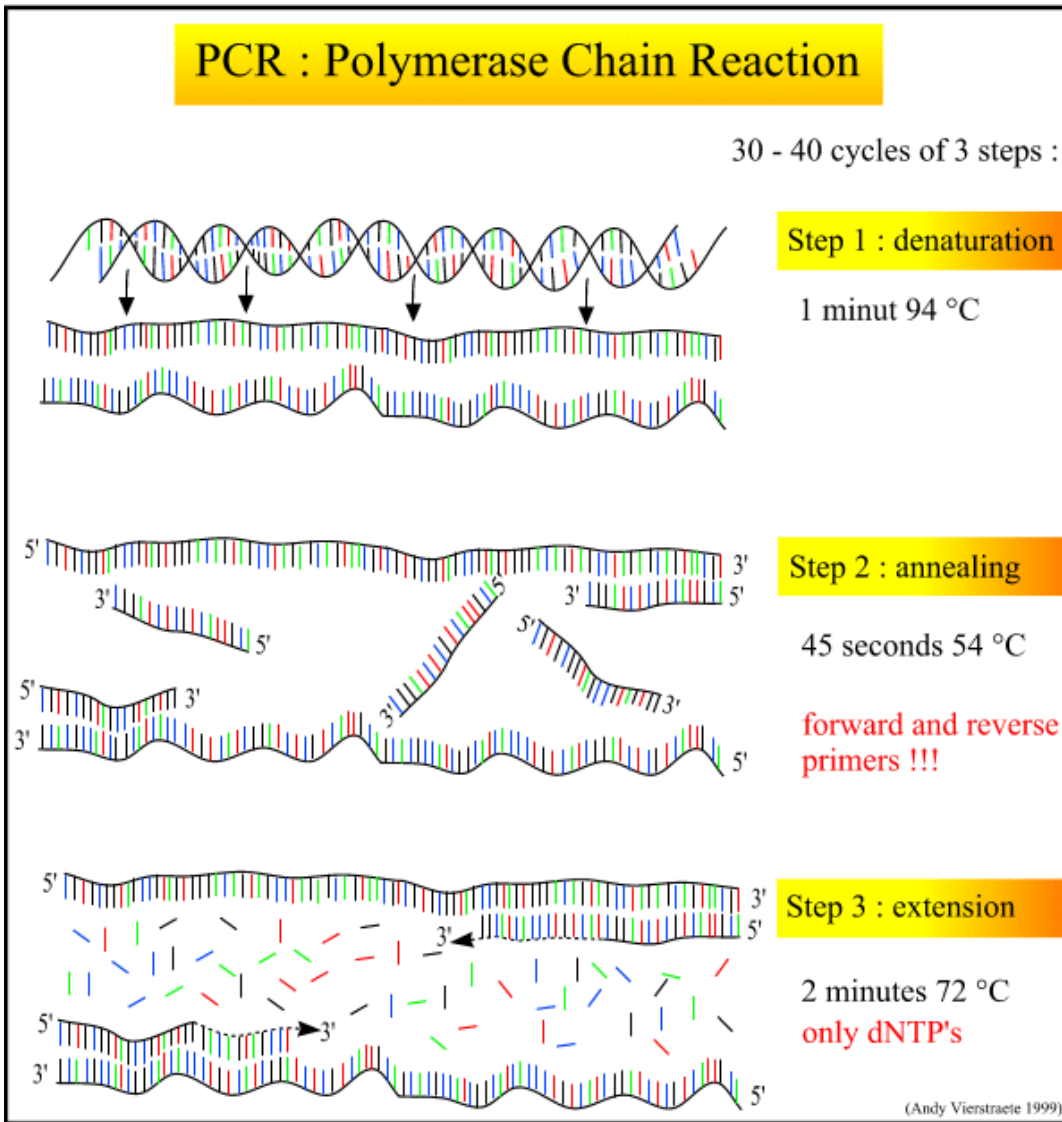


13. Define the term vaccine?

A. Vaccine is biological preparation that improves immunity to a particular disease. A vaccine typically contains live attenuated or inactivated disease causing organism. The toxins or one of the surface proteins of pathogens are also used in the preparation of vaccines.

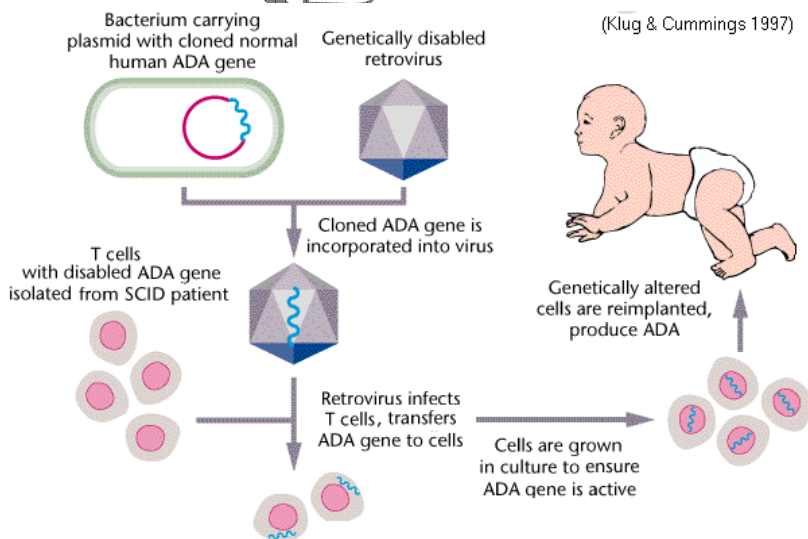
14. Mention any two features of PCR?

- A. * Very low concentration of bacteria or viruses can be detected by amplification of their nucleic acids by PCR.
- * PCR helps to detect very low amounts of DNA by amplification of the small DNA fragments.
- * PCR is now routinely used for detection of HIV in suspected cases, detection of mutations and genetic disorders.



15. What does ADA stand for? Deficiency of ADA causes which disease?

A. ADA stands for adenosine deaminase. Deficiency of adenosine deaminase (ADA) causes severe combined immune deficiency (SCID).

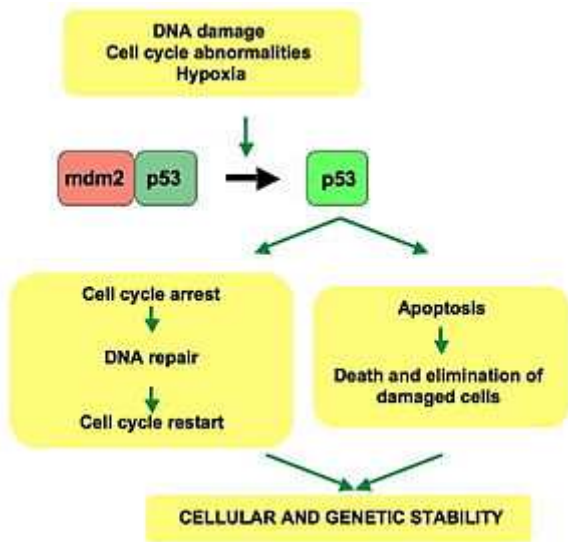


16. Define the term Transgenic animal?

A. Animals that have their own genome and had their DNA manipulated to possess and express an extra or foreign gene is known as transgenic animals.

17. What is popularly called “Guardian angel of cell genome”?

A. The protein p53 is a tumor suppressor protein, which plays an important role with reference to the “G1 check point”. In the regulation of cell division cycle it guards the integrity of the DNA. So it is called guardian angel of cell genome.



18. List out any four features of cancer cells?

- A. * Loss of contact inhibition
- * Reduced intra cellular adhesion
- * Immortalization
- * Loss of anchorage dependence

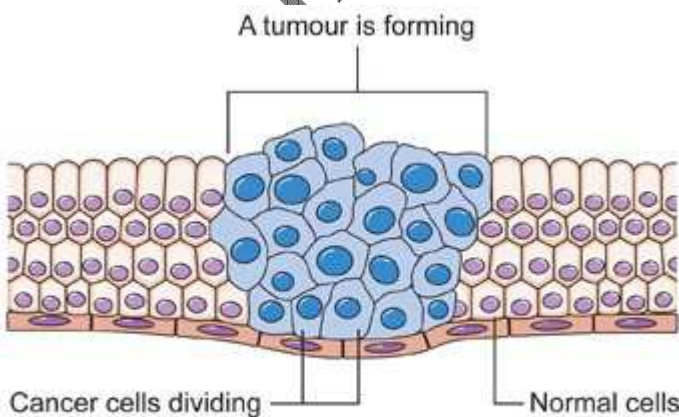


Diagram showing how cancer cells keep on reproducing to form a tumour
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19. How do we obtain radiographs?

- A. A beam of X – rays is produced by an X – ray generator and is projected on the body parts. X – Rays that pass through the body parts are recorded on a photographic film. Photographs developed using X – rays are known as radiographs.

20. What is tomogram?

- A. Tomogram is a recorded image formed by computed tomography which shows the 3 – D cross sectional pictures of the part of the body and displays the picture on the screen.

21. MRI scan is harmless. Justify?

- A. MRI does not use ionizing radiation, as involved in X – rays, and is generally safe and harmless procedure.

22. What is Electrocardiography and what are the normal components of ECG?

- A. Electrocardiography is a commonly used, non invasive procedure for recording electrical changes in the heart.

Normal components of ECG: (i) Waves, (ii) Intervals, (iii) Segments, (iv) Complexes.

23. What does Prolonged P – R interval indicate?

- A. Prolonged P – R interval indicates delay in conduction of impulses from S – A node to the A – V node.

P – R interval is prolonged in bradycardia.

24. Differentiate between primary and secondary antibodies?

- A.

Primary Antibodies	Secondary Antibodies
1. These antibodies are formed against the specific antigen	1. These antibodies are formed against the foreign primary antibody
2. These antibodies reacts with the antigens of interest	2. These antibodies react with the primary antibodies

25. Which substances in a sample are detected by direct and indirect ELISA respectively?

- A. 1) Direct ELISA – used to detect antigens present in the sample
2) Indirect ELISA – used to detect antibodies present in the sample

Short Answer Questions

1. What are the various methods employed in animal breeding to improve livestock?

A. Animal breeding is the method of mating closely related individuals.

There are broadly two methods in animal breeding. (1) In breeding, (2) Out breeding

1) In Breeding: When crossing is done between animals of the same breed it is called in breeding. In breeding is of two types. (a) Close breeding, (b) Line breeding

a) Close Breeding: Close breeding is mating between male parent and female off spring and / or female with male off spring.

b) Line Breeding: Line breeding is the selective breeding of animals for a desired feature by mating them within a closely related line. It leads to upgrading of a desired commercial character.

2) Out Breeding: Out breeding is the breeding of the unrelated animals. Out breeding is of three types. (a) Out crossing, (b) Cross breeding, (c) Inter- specific hybridization.

a) Out – Crossing: Mating of animals within the same breed, but having no common ancestors on either side of pedigree for 4 – 6 generations. The off spring of such mating is known as an out – cross

b) Cross – Breeding: In this method, superior males of one breed are mated with superior females of another breed. The off spring of such a mating is said to be a cross breed.

c) Inter-specific Hybridization: In this method, male and female animals of two different related species are mated. The progeny may combine desirable features of both the parents and is different from both the parents.

2. Define the term breed. What are the objectives of animal breeding?

A. **Breed:** A breed is a group of animals related by descent and similar in most characters such as general appearance, size, configuration and features with other members of the same species.

Jersey and Brown Swiss are example of foreign breeds of cattle. These two varieties of cattle have the ability to produce abundant quantities of milk. This milk is very nutritious with high protein content.

Objectives of Animal Breeding:

1. To produce disease resistant animals
2. Increase in the quality and quantity of milk, meat, wool, etc
3. Fast growth rate
4. Enhanced productive life by improving the genetic merit of livestock
5. Early maturity
6. Economy of feed

3. Explain the role of animal husbandry in human welfare?

- A. Animal husbandry deals with the scientific management of livestock. It includes various aspects such as feeding, breeding and control diseases to raise the population of livestock. Animal husbandry usually includes buffaloes, cows, pigs, horses, cattle, sheep, camels, goats, poultry, fish, etc which are useful for humans in various ways.
- These animals are managed for production of commercially important products such as milk, meat, wool, egg, honey, silk, etc. The increase in human population has increased the demand of these products. Hence it is necessary to improve the management of livestock scientifically.

4. List out the various steps involved in MOET?

- A. The following are the steps involved in Multiple Ovulation and Embryo Transfer (MOET):
- * A cow is administered hormones, with FSH like activity
 - * This includes follicular maturation and super ovulation
 - * In super ovulation instead of one egg, which they produce per cycle, they produce 6 – 8 eggs
 - * The cow is either mated with elite bull or artificially inseminated
 - * The embryos are at 8 – 32 called stages are recovered non – surgically and transferred to surrogate mother, when the embryo develops into complete animal

Now the genetic mother is ready for another round of super ovulation. This technology is in use for cattle, sheep, rabbits, buffaloes, etc to produce high yielding ones.

5. Write short notes on controlled breeding experiments?

A. Controlled breeding experiments are carried out using artificial insemination and multiple ovulation and embryo transfer technology.

* In this technique the semen is collected from superior bulls. This semen can be used immediately or can be frozen and used later period. It can be transported in a frozen form to place where a female is housed.

* Meanwhile a cow or animal is administered hormones, with FSH like activity

* These hormones induces follicular maturation and super ovulation

* Now the cow is artificially inseminated for fertilization

* The embryos are at 8 – 32 celled stages are recovered non – surgically and transferred to surrogate mother uterus for further development.

This technology is used for cattle, sheep, rabbits, buffaloes, etc. By using this method we can produce high milk and meat yielding animals and also control the venereal diseases.

6. Explain the important components of poultry management?

A. **Important components of poultry management:**

* **Selection of disease free and suitable breeds:** The selected breeds should be disease free and get acclimatized to a wide range of climatic conditions.

E.g.: In India hybrid layers – BV 300, Hyline, Poona – Pearls, etc, Broiler strains – Hubbard, Vencobb, etc

* **Feed Management:** Balanced diet is must to maximize the yield. Brooder, chick mash, grower mash, pre-layer mash and layer mash are fed to layers at different stages. Likewise pre starter mash, starter mash and finish mash are the feed given to broilers. Safe water should be supplied through waterers at all times.

* **Health care:** Vaccination against viral diseases and using antibodies for both bacterial and fungal diseases.

* In addition to the above hygiene, proper and safe farm conditions ensure better produce.

7. Discuss in brief about 'Avian Flu'?

A. Avian Flu or bird Flu is an important disease affecting poultry birds and man.

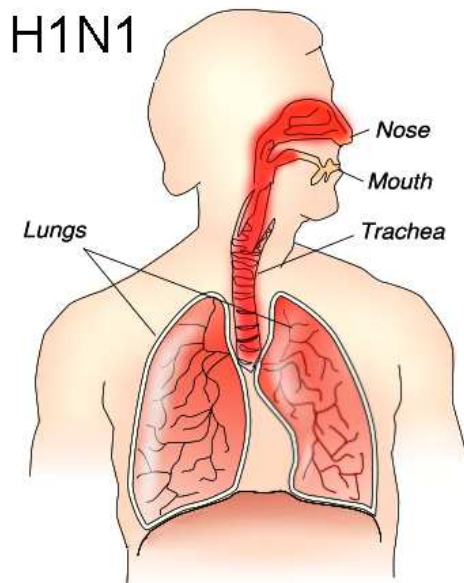
Causative organism: Avian Flu or Bird Flu is caused by an "Avian Flu virus" the H5NI. The virus that causes the bird infection infects humans too. It is a pandemic disease.

Mode of Infection: Infection may be spread simply by touching contaminated surfaces. Birds infected by this type of influenza, continue to release the virus as in their faeces and saliva for as long as 10 days.

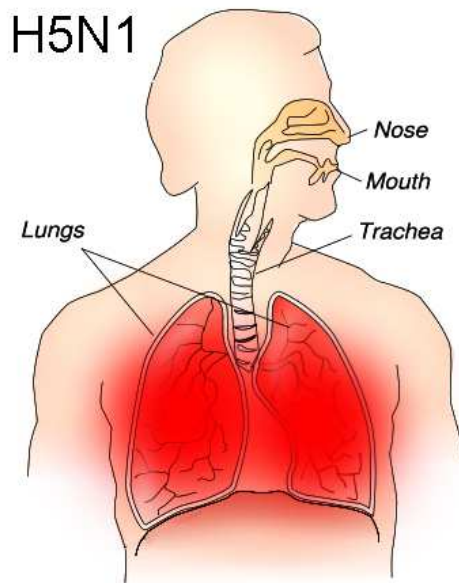
Symptoms: In humans it causes typical – flu – like symptoms; include cough, diarrhea, difficulty in breathing, fever, headache, malaise, muscle aches and sore throat.

Prevention:

- * Avoiding consumption of under cooked chicken
- * People who work for poultry birds should use protective clothing and special breathing masks
- * Complete culling of infected flock by burying or burning them



Easily spread
Rarely fatal



Spreads slowly
Often fatal

8. Explain in brief about Queen Bee?

- A.
- * Queen Bee is the largest individual in the colony
 - * It is a fertile diploid female, one per bee hive and the egg layer of the colony
 - * She lives for about five years and her only function is to lay eggs

- * The queen bee during its nuptial flight receives sperms from a drone and stores in the spermatheca and lays two types of eggs, the fertilized and unfertilized
- * All fertilized eggs develop into females
- * All the larvae developing from the fertilized eggs are fed with the royal jelly for first four days only. Afterwards royal jelly is fed only to the bee that is bound to develop into next queen, whereas the other larvae fed on bee bread become workers

9. Honey bees are economically important – Justify?

- A. * Honeybees are economically important insects in the world. Because honeybee products like honey, wax, propolis and bee venom have more economic importance.
- * Honey – It is a rich source of fructose, glucose, water minerals and vitamins
 - * Bee's wax – It is used in the preparation of cosmetics, polishes of various kinds and candles
 - * Propolis – Propolis is used in the treatment of inflammation and superficial burns
 - * Bee's venom – Which is extracted from the sting of worker bees is used in the treatment of rheumatoid arthritis
- Pollination – Bees are the pollinators of our crop plants such as sunflower, brassica, apple and pear

10. What are the various factors required for Bee keeping?

- A. Bee keeping or apiculture is the maintenance of hives of honeybees for the production of honey and wax.

Factors required for successful Bee keeping:

1. Knowledge of nature and habits of honeybees
2. Selection of suitable location for keeping the beehives
3. Raising a hive with the help of a queen and small group of worker bees
4. Management of beehives during different seasons
5. Knowledge of handling procedures and collection of honey and bee wax

11. Fisheries have carved a niche in Indian economy. Explain?

- A. Fisheries have carved a niche in Indian economy, as fisheries have more economic importance.

As Food: Fish meat, in general is a good source of proteins, vitamins, minerals and rich in iodine. Tunas, shrimps and crabs are not only edible but also have export value.

By Products:

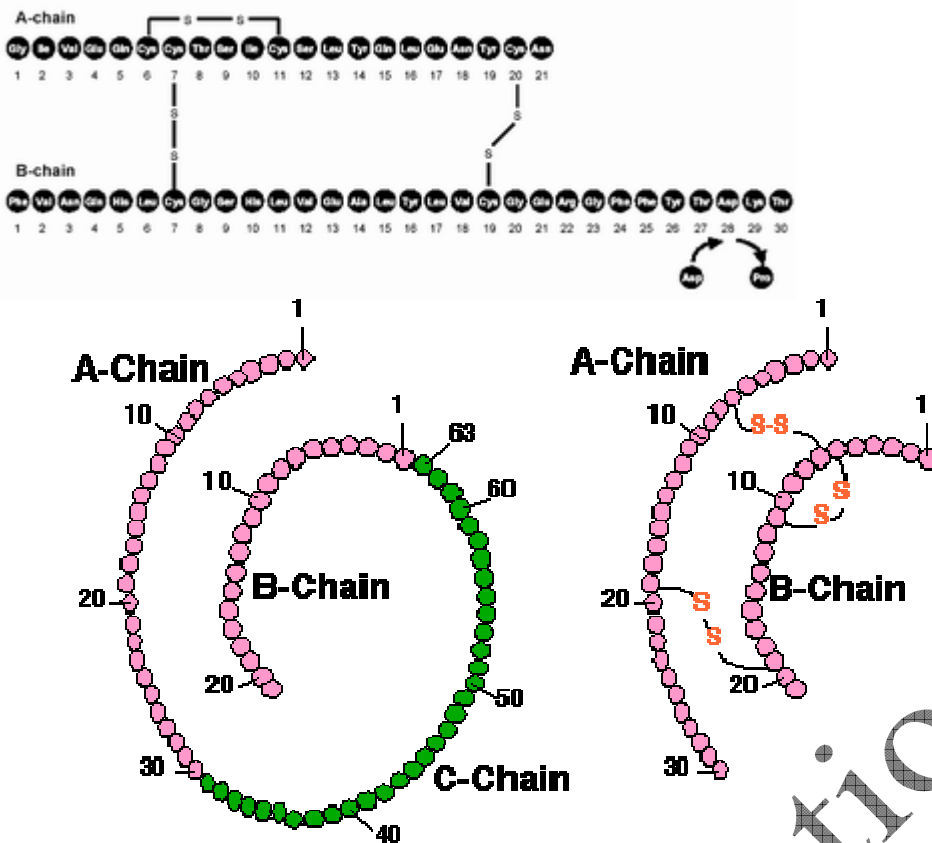
1. Shark and Cod liver oils – are good source of vitamins A and D
Oils from Sardine and Salmon – are good source of Omega 3 – fatty acids
2. Fish guano from Scarp fish – used as fertilizer
3. Shagreen – dried skin of shark which used as abrasive and
4. Isinglass – used in clarification of wines

12. Explain in brief structure of insulin?

A. Insulin is a poly peptide hormone produced by the β cells of islets of langerhans of pancreas. It is the first protein produced by recombinant DNA technology.

Structure of Insulin: Human insulin is made up of 51 amino acids arranged in two polypeptide chains. The chain 'A' has 21 amino acids while chain 'B' has 30 amino acids. Both are held together by two inter chain disulphide bridges, connecting A_7 to B_7 and A_{20} to B_{19} . In addition, there is an intra chain disulphide link in chain A between the amino acids 6 and 12.

In mammals, including humans, insulin is synthesized as a pro – hormone, which contains as extra stretch called the 'c' peptide. This 'c' peptide is not present in the mature insulin and is removed during maturation into insulin.



13. Define vaccine and discuss about types of vaccines?

A. A vaccine is a biological preparation that improves immunity to a particular disease. A vaccine typically contains inactive or attenuated disease causing microorganisms. The toxin or one of the surface proteins of the micro organisms are also used in preparing vaccines.

Types of Vaccines:

1) Attenuated whole agent Vaccines: They contain disabled line micro organisms. Mostly they are antiviral.

E.g.: Vaccines against Yellow fever, measles, rubella and mumps and the bacterial disease such as typhoid.

2) Inactivated whole Agent Vaccines: They contain killed microbes.

E.g.: Vaccines against influenza, cholera, hepatitis A, rabies, etc.

3) Toxoids: They contain toxoids which are inactivated exotoxins of certain microbes.

E.g.: The vaccines against diphtheria and tetanus.

14. Write in brief the types of gene therapy?

A. Gene therapy is the insertion of genes into an individual's cells and tissues to treat a genetic disorder.

There are two approaches to achieve gene Therapy:

1) Somatic line therapy

2) Germ line gene therapy

1) Somatic Line Therapy: In this type of therapy, functional genes are introduced into somatic cells of a patient. The approach is to correct a disease phenotype by treating defect in somatic cells in the affected person. The changes effected in this type of gene therapy are non – inheritable.

Somatic line therapy is of two Types:

a) **Ex – vivo gene Therapy:** In which the cell are collected from patient, modified outside the body and then transplanted back. **E.g.:** SCID

b) **In – vivo gene therapy:** In this therapy, the genes are changed in cells, while they are still inside the body. **E.g.:** Cystic fibrosis

2) Germ Line Gene Therapy: In this type of therapy, functional genes are introduced into sperms or ova and are thus integrated into their genomes. Therefore the changes or modifications become heritable. Due to various technical and ethical reasons, the germ line gene therapy remained at infant stage.

15. List out any four salient features of cancer cells?

A. **Salient features of cancer cells:**

* **Loss of contact inhibition:** Normal cells in a culture stop growing when their plasma membranes come into contact with one another. This inhibition of growth after contact is called contact inhibition. Cancer cells lose their property.

* **Reduced intracellular adhesion:** When normal cells growing in medium, the cells are joined by intracellular adhesion proteins called cadherins. They are missing in cancer cells.

* **Immortalisation:** Normal cell culture does not survive indefinitely. They undergo apoptosis where as cancer cells do not undergo apoptosis.

* **Loss of anchorage dependence:** Most normal cells must be attached to a rigid substratum in order to grow cancer cells can grow even when they are not attached to the substratum.

* **Increased growth of blood vessels:** When tumors grow in size diffusion of oxygen and nutrients become restricted and so tumors resort to attracting more blood vessels from their surrounding matrix.

16. Explain the different types of cancers?

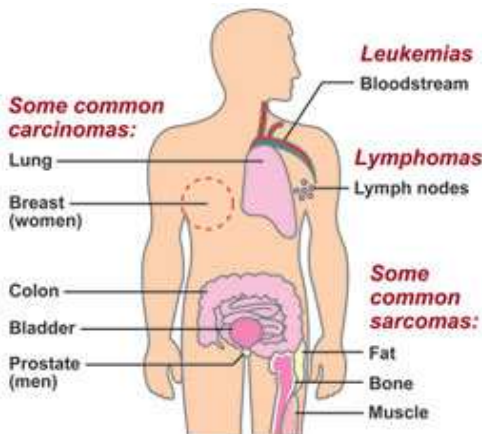
A. Based on the origin cancers are classified into:

1) **Carcinomas:** These are malignant tumor of epithelial cells. They are originating from the epithelial tissues of skin, lining of the respiratory, digestive, urinary and genital systems or cells from various glands breast and nervous tissue, etc. 85% of cancers are carcinomas.

2) **Sarcomas:** These are malignant tumors of connective tissues or organs that originate from mesoderm. About 2% of tumors are sarcomas.

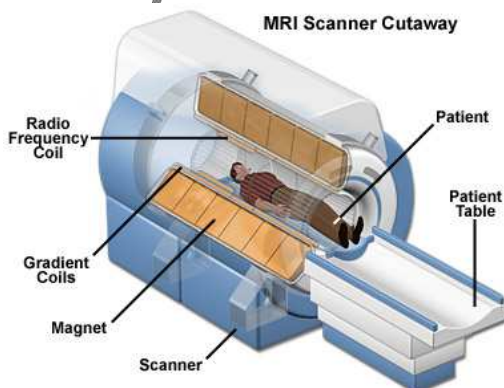
3) **Leukemias:** These are malignant tumors of stem cells of hematopoietic tissues, resulting in unrestrained production of WBC. They are liquid tumors. About 4% of cancers are Leukemias.

4) **Lymphomas:** These are malignant tumors of secondary lymphoid organs like spleen and lymph nodes. About 4% of cancers are Lymphomas.



Artwork originally created for the National Cancer Institute. Reprinted with permission of the artist, Jeanne Kelly, © 2004.

17. Write about the procedure involved in MRI?



A. MRI scan is a diagnostic radiology technique that uses magnetism, radio waves and a computer to produce images of body components.

Procedure: MRI scanner is giant circular magnetic tube

- * The patient is placed on a movable bed that is inserted into the magnet.
- * Human body is mainly composed of water which contains two protons.
- * The magnet creates a strong magnetic field that makes this proton align with the direction of the magnetic field.
- * A second radio frequency electromagnetic field is then turned on or for a brief period. The protons absorb some energy from these radio waves.
- * When this second radio frequency emitted field is turned off, the protons release energy at a radio frequency which can be detected by the MRI scanner.
- * Different types of tissues emit different quanta of energy. Abnormal tissues such as tumors can be detected because the protons in different types of tissues return to their equilibrium state at different rates.
- * Tissues of bone with less water content look different in MRI, and pathological tissues also can be detected.

The information received is processed by computer and generated an image.

18. Write briefly about different waves and intervals in an ECG?

A. ECG (electrocardiography) is commonly used, non – invasive procedure for recording electrical changes in the heart.

The graphic record which is called an electrocardiogram shows the series of waves that occur during each cardiac cycle.

The normal ECG consists of (i) Waves, (ii) Intervals, (iii) Segments, (iv) Complexes

i) Waves:

- * The waves in a normal record are named P, Q, R, S and T in that order
- * A typical ECG tracing of a normal heartbeat consists of (I) a 'P' wave, (II) a 'QRS complex of wave' and (III) a 'T' wave
 - * **P wave:** It represents the atrial systole and shows that the impulse is passing through atria. The duration of P wave is 0.1 sec
 - * **QRS complex of wave:** It represents ventricular systole. Q wave is small negative, R – wave is tall positive and S wave is a negative wave. Its duration is 0.08 to 0.1 sec

* **T wave:** It represents the ventricular repolarization. It is a positive wave; its duration is 0.2 sec

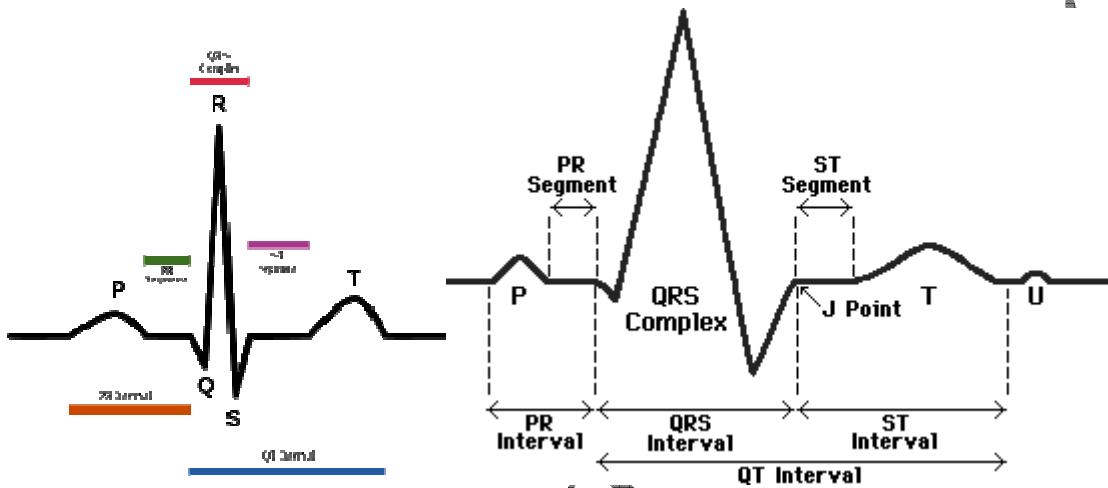
ii) Intervals:

P – R intervals: P – R intervals is the interval between the onset of P wave and the onset of Q wave. P – R interval is normally 0.12 – 0.2 sec

Q – T intervals: The interval between the onset of Q wave and the end of the T – wave. It represents the electrical activity in muscle of the ventricles. It lasts for about 0.4 seconds

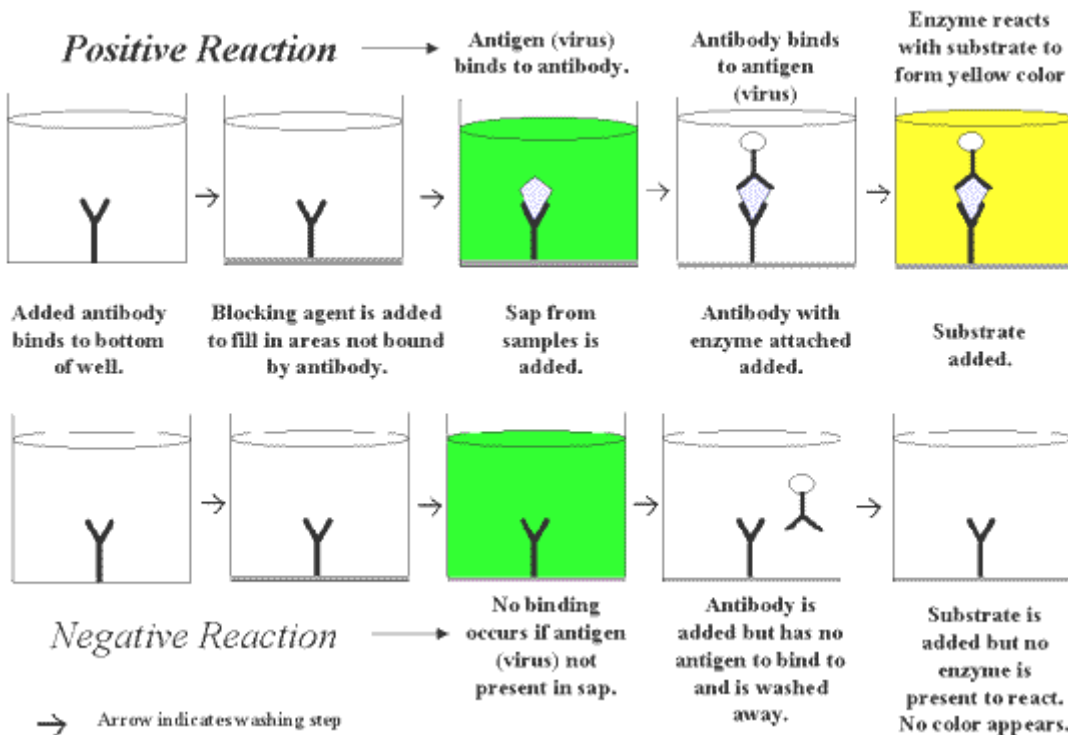
R – R intervals: It signifies the duration of one cardiac cycle and lasts for about 0.8 sec

Segments: S – T segment is the time period between the end of the ‘S’ wave and the onset of the T – wave. It is an isoelectric or zero voltage periods



19. Discuss briefly the process of indirect ELISA?

A. Enzyme linked immunosorbent assay is a tool of clinical immunology to detect, antigens or antibodies in a given sample. ELISA is of two types (1) Direct ELISA, (2) Indirect ELISA.



* **Indirect Elisa:** It is used to detect antibodies present in the serum of the patient of given sample.

Indirect ELISA

- 1 Antigen/sample is added to plate.
- 2 Blocking buffer is added to block remaining protein-binding sites.
- 3 Next a suitable **primary antibody** is added.
- 4 A suitable **secondary antibody – HRPO conjugate** is then added which recognizes and binds to the primary antibody.
- 5 TMB substrate (*Leinco Prod. No. T118*) is added and is converted by HRPO to detectable form.

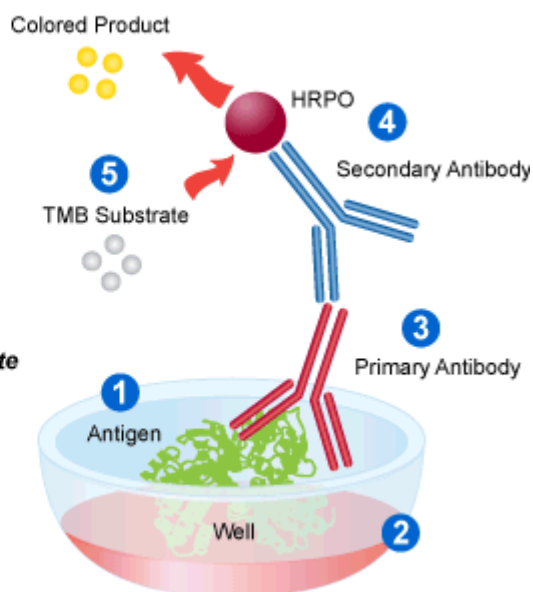


Diagram 1: Illustration of Indirect ELISA method.

Protocol:

- * A known antigen is added to the well, which absorbed on the surface of well
- * Patients antiserum is added to AG coated well
- * Allows reacting antibodies present in the serum with the antigen, coated on the surface of the well
- * Washed the well to remove the any unbound free antibodies present in the well

* Enzyme linked antihuman serum globulins are added. They bind to the antibody which is already bound to the antigen

* Washed it to remove excess antibodies present in the well

* Enzyme substrate is added and the reaction produces a visible colour change which can be measured by a Spectrophotometer

If there are no antibodies (i.e., anti HIB antibodies in the serum sample, there is no binding of primary antibodies to the antigens and so enzyme linked secondary antibodies do not bind to the primary antibodies. There cannot be any enzymatic reaction and so no colour change is observed the test is said to be negative

20. Write short note on EEG?

A. Electro encephalography is the process of recording the electrical activity of the brain with help of an EEG machine and some electrodes placed all over the scalp.

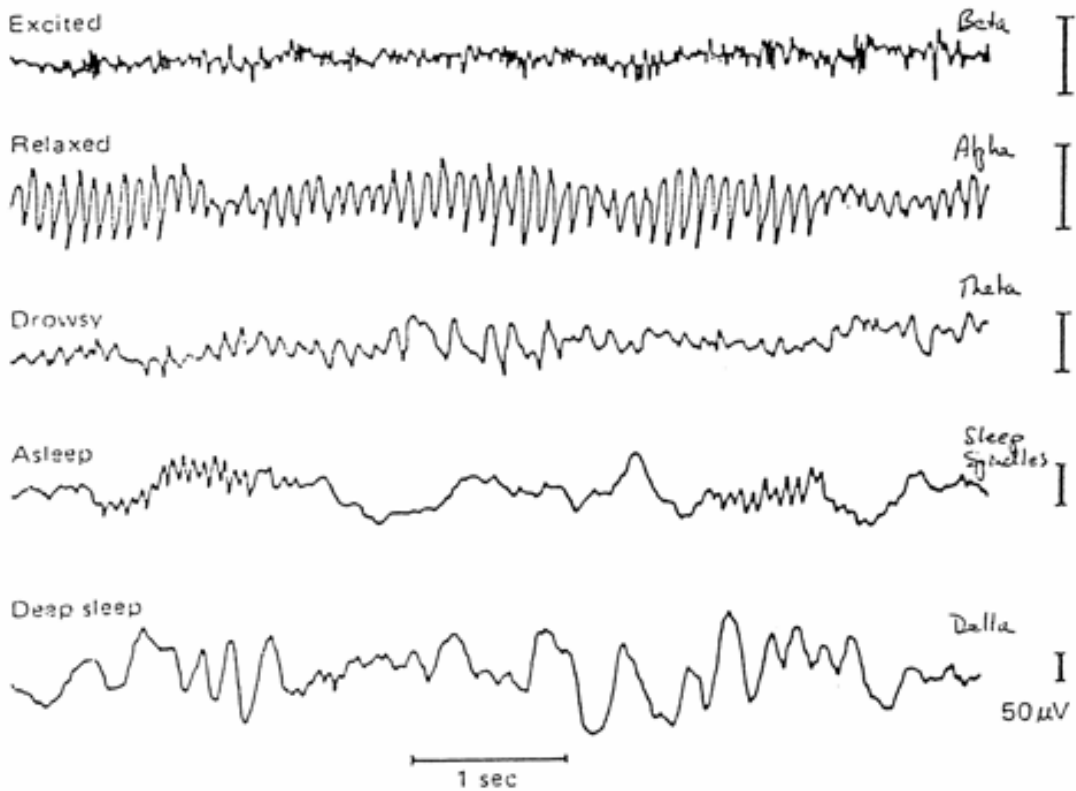
* The waves recorded by an EEG consist of synchronized waves which are common in normal healthy people and, in certain neurological conditions the waves are desynchronized. The wave pattern can be broadly classified into alpha, beta, delta and theta wave pattern.

Alpha Waves: They are rhythmical 8–13 cycles/sec . This type of wave pattern is seen in persons who are drowsy or sleepy with closed eyes.

Beta Waves: These waves occur at a high frequency of 13–40 cycles/sec their amplitude is low. There are desynchronized waves recorded in person who are mentally very active and tense.

Delta Waves: Their frequency is quite low, i.e., less than 3 cycles/sec . They have high amplitude. They are common in early childhood in awoken condition. In adults, they occur in deep sleep, epilepsy, mental depression, etc.

Theta Waves: Their frequency is between 4 and 7 cycles/sec . These waves are common in children of less than 5 years of age and emotional stress in adults.



Uses:

- * EEG is useful tool in diagnosing neurological and sleep disorders
- * The diagnostic application of EEG is the diagnosis of epilepsy
- * EEG is also useful in the diagnosis of coma and brain death.