1. Define carbohydrates and mention their compositions.

**Carbohydrates (Poly hydroxyaldehydes (or) ketones.)**

- Carbohydrates are polyhydroxyaldehydes (or) ketones.
- A carbohydrate is composed of carbon, hydrogen and oxygen in the ratio of 1:2:1 (CH₂O)n.
- They are of three types namely monosaccharides, disaccharides and polysaccharides.

2. Classify different types of monosaccharides?(M-2010)

- Depending on the number of carbon atoms they are classified into
  - **Trioses** \((C₃H₆O₃)\) – Eg: Glyceraldehydes
  - **Pentoses** \((C₅H₁₀O₅)\) – Eg: Ribose and deoxyribose.
  - **Hexoses** \((C₆H₁₂O₆)\) – Eg: glucose, fructose and galactose

3. What are polysaccharides? Give examples.

- Polysaccharides are complex form of carbohydrates.
- They are insoluble in water.
- They are formed by polymerisation of a large number of monosaccharides.
- Nature abundantly produces various types of polysaccharides.
- Several of them are structural components in the living world. eg. chitin, cellulose,
- **Starch** molecules serve as storage food materials
- **Glycogen** is found in liver and muscles.

4. List out the essential amino acids.

- The essential amino acids are
  1. Arginine
  2. Valine
  3. Histidine
  4. Isoleucine
  5. Leucine
  6. Lycine
  7. Methionine
  8. Phenylalanine
  9. Threonine
  10. Tryptophan
5. What is kwashiorkar? Mention its symptoms.
   - Kwashiorkor is a protein deficiency disease in child.
   - **Symptoms:**
     a. wastage of muscles.
     b. Oedema in Face and feet
     c. Enlarged belly

6. State the functions of lipids.
   - Lipids are important cellular constituents.
   - They are energy rich compounds.
   - They form the most important storage food in the body.
   - In our body, it serves as an insulating material.
   - Cosmetically, the presence of limited amount of fat beneath the skin adds to beauty.
   - Certain lipids produce steroidal hormones.

7. What is PUFA? Mention its significance.
   - PUFA is Poly Unsaturated Fatty Acids.
   - **Significance of PUFA:**
     a. It is capable of easier oxidative breakdown substance.
     b. Poly unsaturated fatty acids (PUFA) are favored for persons having high blood pressure and other related ailments.
     c. These fatty acids are abundant in sunflower oil and safflower oil.

8. Name the different types of Vitamins.
   - The identified vitamins are classified as A,B,C,D,E and K.
   - Of these, vitamin B and C are water soluble in nature
   - So they are called water soluble vitamins.
   - Vitamin A, D, E and K, are fat soluble vitamins.

9. Write down the expansion of IRM and IRW and their characteristic features.
   - **Expansion:-**
     - IRM-Indian Reference Man
     - IRW- Indian Reference Woman
Characteristic features:

- **IRM**: 25 years of age, 1.62 sq.mt of body surface, 55 kg body weight and remains healthy.
- **IRW**: 25 years of age, 1.4 sq.mt of body surface, 45 kg body weight and remains healthy.

10. What is Obesity?

**Obesity:**

- Obesity is the storage of excess of fat in the body.
- A level of 10% above the standard weight, for subjects of same age and sex, is considered as obesity.
- Obesity result in a significant impairment of health from a variety of diseases, like hypertension, atherosclerotic heart disease and diabetes.

11. Define BMI

- BMI refers to Body Mass Index.
- The degree of obesity is assessed by the body mass index.
- It is calculated as weight in kg divided by the square of height in meter.

\[
BMI = \frac{\text{Weight in kg}}{\text{Height in Sq.Mt}}
\]

- Normal BMI range for adult Men is 19-25.
- Normal BMI range for adult Women is 19-15.
- Men and Women having BMI values above this range are considered as obese.

12. Write down the symptoms for hypoglycemia.

**Symptoms of Fasting hypoglycemia:**

- Hunger,
- Increased heart rate,
- Tremulousness,
- Weakness,
- Nervousness and
- Sweating.

**Other symptoms of hypoglycemia:**

- Headache,
- Confusion,
13. What are chilomicrons?
- Chilomicrons are smaller fat globules.
- They are formed from the bigger fat particles by the action of bile salts during emulsification.
- It is done by bile salts of bile juice secreted by Liver
- It helps the enzyme lipase to act upon fats.

14. Name the substances used in treating the tooth decay.
- Dental amalgam (a mercury alloy)
- Cement (a composite resin that matches the colour of the tooth).
- Mixture of Gutta-percha resin and Zinc
- Bismuth oxides.

15. What are the benefits of root – canal treatment?
- Root – canal treatment is a modern dental procedure to save a tooth
- In which the pulp has died or become untreatably diseased, usually as a result of extensive dental caries.

16. What is Peptic ulcer?
- Peptic ulcer refers to an eroded area of the tissue lining in the stomach and duodenum.
- The lining of stomach or duodenum are protected from the effects of HCl by a layer of mucous.
- If the mucous layer is damaged, the acid may cause inflammation and erosion of the lining.
- It is known as peptic ulcer.

17. What is gall stone made up of?
- The Gall stones are formed by bile.
- Bile is made up of cholesterol, pigments and several salts.
- Any alteration in the composition of the bile can cause the formation of stones.
- The stones are mostly formed of cholesterol.

18. State the main symptoms for appendicitis.
- The early symptoms include
a. Sudden pain in the upper abdomen,
b. Nausea with or without vomiting.
c. Mild fever.

- If a treatment is delayed the appendix may rupture and result in infection in the abdomen.
- The serious infection is called as peritonitis.
- The treatment involves the removal of appendix by surgery.

19. What is meant by hepatitis?

- Hepatitis is the inflammation of the liver.
- An acute hepatitis may happen due to variety of causes.
- Eg. viral infection, excessive alcohol consumption.

**Symptoms:**
- In early stage, the symptoms are not conspicuous.
- The Posterior symptoms include
  1. Fatigue
  2. Poor appetite,
  3. Nausea,
  4. Vomiting,
  5. Fever an discomfort in upper right side of the abdomen.

**Treatment:**
- There is no specific treatment.
- People are usually advised to take rest, and avoiding drinking of alcohol.

20. Mention the reason /causes for liver cirrhosis.

- Liver cirrhosis is an irreversible damaging of the liver tissue occurring in the late stage of severe liver disorder.
- In this condition, normal liver tissue is replaced by fibrous scar tissues.
- It may be caused due to excessive alcohol consumption or viral infection.
- It prevents the liver from functioning properly.

21. What is mean by stress fracture?

- It is a fracture occurring at a site in the bone,
- It is due to repeated minor stresses over a long period of time.
22. Define the term physiotherapy.

- Physiotherapy is the therapeutic exercise to make the limbs work normally.
- Therapeutic exercise is carried out by physiotherapists under the supervision of orthopaedic surgeon.
- The common problem at the end of fracture treatment is the wasting of muscles and stiffness of joints.
- These two problems can be rectified by physiotherapy, by gradual exercises.

23. What does the term orthopedics refer to?

- Orthopedics deals with all bone deformities occurring in children as well as adults.
- The deformities may either be congenital or acquired.
- The former is caused by developmental abnormalities (teratogenic), the latter is caused by trauma or infections or by metabolic disorders.
- The corrective measures in the management of these disorders involve physiotherapy, splinting and use of appliances, traction procedure, plaster cast and wedging, manipulation under anaesthesia, surgical and neurological examination.

24. Name the fluids in the chambers of the eye.

- Aqueous humour: It is a colourless watery fluid present between the cornea and the lens.
- Vitreous humour: It is a gelatinus mucoprotein present between the lens and the retina.
- Both Humours are transparent to light in nature.

25. Name the parts involved in altering the curvature of the lens.

- Human eye has a lens apparatus whose convexity can be adjusted for focusing near and distant objects.
- This ability of the eyes to focus objects at varying distances is called ACCOMMODATION.
- The accommodation is achieved due to suspensory ligament, ciliary muscle and ciliary body.

26. What is short sightedness?

- Myopia results if the lens curvature is too great or the entire eyeball becomes elongated.
- Light rays entering the eye are refracted more than is necessary.
Consequently light is focused in front of the retina.

The image perceived is thus blurred.

The condition is called **short-sightedness** as objects near the eye are clearer than those further away.

Myopia can be corrected by placing a concave lens in front of the eye.

### 27. How do you name the problems related to retina?

- Retinopathy is the disease of the retina, usually resulting from either diabetes mellitus or alternatively from persistent hypertension (high blood pressure).

- There are two types of retinopathy.
  1. **Diabetic retinopathy** is characterized by tiny aneurysms (balloon-like swellings) of the capillaries (tiny blood vessels) in the retina.
     New abnormal blood vessels which are fragile and bleed readily grow on the retinal surface.
  2. **Hypertensive retinopathy** is characterized by narrowing of the retinal arteries.

  Laser treatment is the remedy.

### 28. Identify two reasons for cataract.

**Cataract**

- Cataract is the opacity in the lens of the eye.

- The normal lens allows light to reach the retina when it becomes opaque and does not allow light to reach the retina, the person is unable to see clearly.

**Causes for cataract:**

- a. aging,
- b. sun light exposure,
- c. smoking,
- d. poor nutrition,
- e. eye trauma,
- f. systematic diseases like diabetes mellitus,
- g. infection and injuries and
- h. certain medications such as steroids.
- i. Sometimes German measles in pregnant mothers causes cataract in the child.

### 28. What is CLR?

**Clear Lens**

- Clear lens replacement (CLR) is an exciting option for individuals who are over 40 years of age, considering Refractive surgery to decrease dependence on glasses and contact lenses. Replacement (CLR) is an exciting option.
In essence, this procedure entails removing the natural lens of the eye and replacing it with an intraocular lens (IOL) implant.

30. What is nyctalopia?
- Nyctalopia or night blindness is caused by the deficiency of vitamin –A
- It is due to the failure of resynthesis of visual purple pigment.
- Prolonged deficiency of vitamin- A leads to degenerative changes in rods and cones and nervous layers of the retina.
- Person is unable to see in the dim light.

31. What is a pink eye?
- Pink eye or bacterial conjunctivitis is the eye infection
- In which white of the eye (sclera) become red with yellow eye discharge.

32. What is Reissner’s membrane?
- Reissner’s membrane is one the membrane found in the cochlea of the internal ear.
- It is located between the scala vestibuli and scala media of cochlea.
- It gets deflected by vibrations and inturn it disdurbas the basilar membrane.

33. Which region of brain perceives sound?
- The temporal lobe of the brain is the auditory area that receives and interpets the sound impulses.

34. Give two reasons for loss of hearing.
1. Congenital or due to middle ear fluid,
2. Serious infections, such as meningitis,
3. Head injury,
4. Listening to very loud music,( especially through headphones)
5. Repeated exposure to loud sounds like machinery.

35. What is a bone conduction hearing aid.
- Some people with conductive deafness especially if there is an infection or discharge in the ear canal may be given a bone conduction hearing aid.
- This type of hearing aid may be fitted to a glass frame or hair band.

36. Name the causes for noise pollution.
- **Causes for noise pollution:**
  - **Industrial source:-**
The noise dumped into the atmosphere by the industries due to the functioning of machineries.

- **Non-Industrial source:**
  
The noise associated with urban development, road, air and rail transport. Loudspeakers, radio and television stations, construction sites, neighborhoods and recreational noise levels and activities associated with urban living generally lead to increased noise levels.

37. Define permissive noise level.

- Sound is measured by several complex systems.
- The best known unit of measurement is the measurement of sound in **decibel** which is named after Sir Alfred Bell.
- The industrial noise survey of India recognized noise levels from 81dB to 120dB as permissible levels.

38. What happens during ventilation in the lungs?

- **Ventilation** is the first step in the process of pulmonary respiration.
- It is the breathing in of air with more oxygen into the lungs (inspiration).
- It is followed by expulsion of air with more of carbon-di-oxide (expiration).

39. Name the muscles involved in respiration.

- External - intercostal muscles
- Internal - intercostal muscles
- Muscles of diaphragm.

40. Write down the composition of inhaled and exhaled air.

- The composition of inhaled and exhaled air

<table>
<thead>
<tr>
<th></th>
<th>Oxygen</th>
<th>Carbon-dioxide</th>
<th>Water vapour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inhaled</td>
<td>21.0</td>
<td>0.04</td>
<td>Variable</td>
</tr>
<tr>
<td>Exhaled</td>
<td>15.7</td>
<td>3.6</td>
<td>Saturated</td>
</tr>
</tbody>
</table>

41. What is Herring - Breuer reflex?

- When the alveoli are stretched at the height of inspiration the receptors send stimuli to the expiratory center of the medulla through the vagus nerve which inhibits further inspiration.
This sequence of events is called **Herring – Breuer reflex**.

### 42. Name the microbes that cause pneumonia.

<table>
<thead>
<tr>
<th>S.No</th>
<th>Type of Pneumonia</th>
<th>Microbes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Viral pneumonia</td>
<td>Adenovirus, Respiratory syncytial virus, Coxsackie virus.</td>
</tr>
<tr>
<td>2.</td>
<td>Bacterial pneumonia</td>
<td><em>Pneumococcal pneumonia</em>.</td>
</tr>
<tr>
<td>3.</td>
<td>Mycoplasmal pneumonia</td>
<td>Mycoplasma (intermediate organism between bacterium and virus)</td>
</tr>
</tbody>
</table>

### 43. What is pleurisy?

- **Inflammation** of the pleura (the membrane lining the lungs and chest cavity) is called pleurisy.
- It is usually caused by a lung infection, such as pneumonia or a virus infection of the pleura.

### 44. What is pulse rate?

- The rhythmic expansion and contraction of an artery as blood is forced through it (pumped by the heart) is known as pulse.
- The pulse can be described in terms of its rate (number of expansion per minute) its rhythm, strength and whether the blood vessel feels hard or soft.

### 45. What is meant by myocardial infarction?

- Myocardial infarction is a coronary artery disease which involves sudden death of part of the heart muscle due to blockage in the coronary artery.
- It may cause severe unremitting chest pain.

### 46. Mention the reason for doing an angiogram.

- Angiogram is a special contrast X ray
- It can be used to detect an abnormality in a blood vessel such as a narrowing of a large diseased artery.

### 47. What is coronary angioplasty?

- Coronary angioplasty is an operation done to clear flow of blood when the coronary arteries are narrowed or blocked by fatty deposits with the help of a balloon catheter.
- Under local anesthesia, a guide wire is inserted through the femoral artery in the groin and up into the affected coronary artery.

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A balloon catheter is passed up the wire and the balloon is inflated in the narrowed area to widen it.

Sometimes, a metal tube called a stent is inserted afterward.

It keeps the artery open.

48. What is done during Echo cardiography?
- Echo cardiography is a technique that uses ultrasound waves to image the interior of heart.
- It is used to diagnose disorders of the heart and the heart valves.
- The test is usually done by using an ultrasound transducer (probe) placed on the skin of the chest directly over the heart.
- In some cases a small probe is passed down the oesophagus.

49. What is artherosclerosis?
- Atherosclerosis is narrowing of the arteries caused by plaques on their inner linings.
- These plaques are composed mainly of fats deposited from the blood stream.
- They disrupt the normal flow of blood through the affected artery.
- Atherosclerosis encourages thrombus and embolus (fragment of blood clot).
- Men are affected earlier than women because women are protected by natural oestrogen hormones.

50. How can pulse rate be calculated?
- The pulse rate is determined by counting the beats in a set period (minimum 15 to 20 seconds) and multiplying to give the beats per minute.
- The pulse rate usually corresponds to the heart rate which varies according to the person’s state of relaxation or physical activity.

51. Write down the importance of cardio pulmonary resuscitation.
- Cardio-pulmonary resuscitation is the administration of the life-saving measures of
  a). External cardiac compression massage
  b). Mouth to mouth resuscitation (Artificial respiration) to someone collapsing with Cardiac arrest (Cessation of heart beat).

52. Classify the lymphocytes of blood and mention their key function.
- Lymphocytes (20-30%) - These are smallest leucocytes.
They are more common in lymphatic tissues namely the lymph nodes, spleen, tonsils and thymus.

Lymphocytes, called **B-cells** can produce proteins called **antibodies** that can get attached to the bacteria and destroy them.

**T-cells** protect us against viruses by attacking and destroying cells in which viruses are reproducing.

### 53. What are called coagulation factors?
- The clotting depends on several proteins in the plasma.
- They are called **coagulation factors**.
- Normally these factors are in an inactive state.
- After injury they are activated to produce a clot.

### 54. Differentiate embolus from thrombus.
- The formation of a thrombus or blood clot within an intact blood vessel is called **thrombosis**.
- When a portion of a thrombus clot becomes fragmented and enters the circulating blood, it is called **embolus**.
- Embolus may block a circulation to vital parts resulting in serious consequences such as stroke.

### 55. What is menstrual cycle?
- The rhythmical series of changes in the sex organs occur for about 28 days throughout the reproductive life of women from puberty to menopause (except during times of pregnancy).
- It is called the **menstrual cycle**.

### 56. What is corpus albicans?
- It is a scar like tissue.
- It is formed at the termination of menstruation.
- If there is no fertilization, the corpus luteum degenerates and converted into **corpus albicans**.

### 57. With whom does the technique of invitro fertilization adopted?
- In vitro fertilization is the technique by which the egg is fertilized outside the body.
  
  *(In vitro = outside the body, as against **in vivo** = within the body).*
This technique is being increasingly used in couples who are not able to achieve fertilization in the normal way.

It is used to develop test tube babies

LESSON - 2. MICROBIOLOGY

1. Define microbiology?
   - Microbial organisms opened up a new field of study named **Microbiology**.
   - This study deals with the form, structure, reproduction, physiology, metabolism and classification of microorganisms.
   - **Joseph Lister**: (1827 - 1912) to microbiology is the technique of “pure culture” of bacteria.
   - He found the importance of pure culture which form the suitable media for the growth of microorganisms, responsible for infections, fermentation, nitrogen fixation in soil, etc.
   - The pure culture techniques lead to developments in modern microbiology.

3. What is mean by diploid cell strain?
   - Diploid cell strains are derived by primary cell cultures from a specific tissues like lung or kidney which is of embryonic origin.
   - These diploid cells are the most employed host of choice for the production of human vaccine virus.

4. Classify different types of malaria?
   - Four different types of Malaria are recognized on the basis of period of recurrence of fever. They are
     1. Tertian, Benign Tertian or Vivax malaria, caused by **Plasmodium vivax**.
     2. Quartan Malaria caused by **Plasmodium malariae**
     3. Mild Tertian or Ovale Malaria caused by **Plasmodium ovale**
     4. Malignant Tertian or Pernicious Malaria caused by **Plasmodium falciparum**. Of the four, the malignant type is fatal.

5. What is amoebiosis?
   - Amoebiasis in man is due to the infection by the protozoan endoparasite (Sarcodina) **Entamoeba histolytica**.
It is worldwide in distribution but, its prevalence is greater in tropics and sub tropics than in temperate zones.

- The vegetative trophozoite form is pathogenic.
- The trophozoites make their way deep into the sub mucosa of the large intestinal wall by eating through the intestinal mucosa.
- The blood and the ulcer contents pour into the lumen of the intestine and pass out as bloody stool.
- This characterizes the amoebic dysentry or amoebiasis

6. What does the term “Zooanthropoxoses” refers to?
- The term *Zooanthropoxoses* refers to infections in which man is not merely an incidental host but an essential link in the life cycle of the parasite (eg., Beef and pork tapeworm).

7. Listout notable antibodies?
- Some notable antibiotics are Ampicillin, Streptomycin, Tetracyclin and Erythromycin etc.
- Some antifungal antibiotics are Griseofulvin and Imidazole etc.
- Some antiviral antibiotics are Amantidine and Cycloguanosine.
- The more promising chemotherapeutic agent for treating viral diseases is the Interferon.
- Interferons are glycoprotein molecules secreted by the leucocytes and fibroblasts.
- Some of the antitumour antibiotics are of the anthromycin group.

8. Enumerate the methods of diagnosis of AIDS.
- ELISA test (Enzyme Linked Immuno Sorbent Assay) is a sensitive preliminary blood test used to detect HIV antibodies.
- Western Blot is the confirmatory test, which is highly specific and based on specific antibodies to viral core proteins.

9. Write the characteristics of species resistance.

The characteristics of species resistance are
- The inability of the pathogen to cause the disease in the resistant species under natural conditions.
- The variation of body temperatures between different species determines or prevents the microbial infection.
Metabolic, physiological and anatomical differences between species can also affect the ability of a pathogen to cause infection.

10. Define zoonoses?
- Larval microbiology deals with human diseases caused by parasitic larvae.
- Parasitic infections which man acquires from animals are known as zoonotic infections or zoonoses.

LESSON - 3. IMMUNOLOGY

1. What is Immunology?
- The system of animal body, which protects it from various infectious agents and cancer, is called Immune system.
- A study of the immune system is known as Immunology.

2. What are the four types of infectious agents?
- Animals and human beings are continually exposed to various infectious agents like bacteria, viruses, fungi and parasites.

3. Define innate immunity?
- Innate immunity comprise all those natural defense Mechanisms with which an organism is protected from infection.
- As a strategy, innate immunity consists of various types of barriers that prevent entry of foreign agents into the body.

4. What is lysozyme?
- Lysozyme present in secretions, such as tears and saliva, digest bacterial cell walls.

5. What is phagocytosis?
- Phagocytosis is a process in which phagocytic cells engulf microbes.
- Phagocytosis is an important mechanism of innate immunity.
- It is performed by leucocytes.

6. What is acquired immunity?
- The immunity that is acquired in the life time of an individual is known as acquired immunity.
- It is also called specific immunity it, is capable of recognizing and selectively eliminating specific microorganisms.
Acquired immunity is found only in vertebrates.
It supplements the protection provided by innate/natural immunity.
It is generated in response to an exposure or encounter to the microorganisms in question.

7. Differentiate cell mediated and humoral immunity?

<table>
<thead>
<tr>
<th>CELL MEDIATED IMMUNITY</th>
<th>HUMORAL IMMUNITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Cell mediated immunity is the responsibility of a subgroup of the Tcells, called cytotoxic lymphocytes.</td>
<td>1. Antibody mediated or humoral immunity involves the synthesis of specific antibody molecules called immunoglobulins by the B-types lymphocytes.</td>
</tr>
<tr>
<td>2. An activated cytotoxic lymphocyte is specific to a target cell, which has been infected and kills the target cell by a variety of mechanisms</td>
<td>2. Immunoglobulin molecule binds to the specific antigens in a lock and key fashion, forming an antigen antibody complex to fight the infection.</td>
</tr>
<tr>
<td>3. CMI is also involved in killing of cancer cells.</td>
<td>3. Humoral immunity is not involved in killing the cancer cells</td>
</tr>
</tbody>
</table>

8. Differentiate active and passive adapted immunity?

<table>
<thead>
<tr>
<th>Active immunity</th>
<th>Passive immunity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Active immunity</strong> is due to the immune response generated in the individual in question by a pathogen or vaccine.</td>
<td><strong>Passive immunity</strong> is conferred by transfer of immune products, like antibodies, etc., from an individual into a non-immune individual.</td>
</tr>
</tbody>
</table>

9. What are the immunoglobulins?
- Immunoglobulins are the specific antibody molecules synthesized by the B-type lymphocytes.
- Each immunoglobulin molecule is made up of 4 polypeptide chains.
- There are two long chains called heavy or H chains and two short chains called light or L chains.
The four polypeptide chains are held together to form a Y-shaped molecule.

10. What are the three main functions of antibodies?

The free antibodies have three main functions viz.,

1. Agglutination of particulate matter, including bacteria and viruses,
2. Opsonisation or coating over bacteria to facilitate recognition and phagocytosis by the phagocytes and
3. Neutralization of toxins released by bacteria.

11. State the functions of spleen?

1. The spleen serves as the graveyard for effete(aged) red blood cells,
2. It acts as a reserve tank and setting bed for blood and
3. It acts as a systemic filter for trapping circulating blood borne foreign particles.
   (The immunological function of the spleen is primarily directed against blood borne antigens).

12. What is an immunogen?

- The terms immunogen and antigen are often used synonymously.
- However, these terms imply two closely related entities.
- The first describes a molecule that provokes an immune response (immunogenicity) and hence is called an immunogen.
- The other describes a molecule which reacts with the antibody produced, or with the activated cellular constituents of cell mediated immunity (antigenicity), and is referred to as an antigen.

13. Define the term „antigen“?

- An antigen describes a molecule which reacts with the antibody produced, or with the activated cellular constituents of cell mediated immunity (antigenicity), and is referred to as an antigen.

14. What are haptens?

- Haptens are small well defined chemical groups such as dinitrophenol (DNP) which are not immunogenic on their own but will react with preformed antibodies.
- To make a hapten immunogenic, it must be linked to a carrier molecule which is itself immunogenic.

15. Distinguish paratope and epitope.

- The part of the antibody molecule which makes contact with then antigen is termed the paratope.
- Consequently, the part of the antigen molecule that makes contact with the paratope is called the epitope.

16. Name the five classes of immunoglobins?

- IgG (Gamma) , IgA (alpha ), IgM(mu) , IgD (delta) and IgE (epsilon)

17. Distinguish the variable and constant region in the Ig molecule?

<table>
<thead>
<tr>
<th>VARIABLE REGION</th>
<th>CONSTANT REGION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The variable (V) region or Fab region shows a wide variation in amino acid</td>
<td>1. The C region denotes constant region with unvarying amino acid sequence in</td>
</tr>
<tr>
<td>sequences in the amino or N-terminal portion of the molecule.</td>
<td>the C or COOH terminal portion of the molecule.</td>
</tr>
<tr>
<td>2. Fab region has the fragment of antigen binding site.</td>
<td>2. Fc region has the fragment of constant region.</td>
</tr>
<tr>
<td>3. Hotspots or hypervariable regions are seen.</td>
<td>3. The hotspots or hyper variable regions are not seen</td>
</tr>
</tbody>
</table>

18. Distinguish autograft and allograft?

<table>
<thead>
<tr>
<th>AUTOGRAFT</th>
<th>ALLOGRAFT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The tissue of the original donor is grafted back into the same donor.</td>
<td>1. Graft between allogenic individuals (i.e., members of the same species but of different genetic constitution)</td>
</tr>
<tr>
<td>2. Example:- skin graft from thigh to face in severely deformed case of burnt individuals (plastic surgery).</td>
<td>2. Example:- kidney transplanted from one human to another.</td>
</tr>
</tbody>
</table>
19. How does Xenograft differ from Isograft?

<table>
<thead>
<tr>
<th>Xenograft: (Heterograft)</th>
<th>Isograft</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Graft between xenogenic individuals (i.e., different genetic lineage).</td>
<td>Graft between syngeneic individuals (i.e., identical genetic constitution).</td>
</tr>
<tr>
<td>2. Example: - Organ transplanted from pig to human, baboon to human.</td>
<td>2. Example: - clones or identical twins.</td>
</tr>
</tbody>
</table>

20. What are immuno suppressant drugs?

- After organ transplantation, graft rejection may occur because the antigens of the graft and host being different.
- The immune response of the host rejects the graft.
- So certain drugs called immune suppressant drugs such as cyclosporine and steroids etc suppress the immune response.
LESSON - 4. MODERN GENETICS

1. What is pedigree analysis?
   - **Pedigree analysis**: Unlike animals, controlled crosses cannot be made in human beings.
   - Hence human geneticists, resort to a scrutiny of established matings.
   - The scrutiny of established matings to obtain information about the genetic characters / traits is called **pedigree analysis**.

2. What are the clinical manifestations of Thalassemia?
   The clinical manifestations of thalassemia include
   - Decrease in the bone marrow activity,
   - Peripheral haemolysis,
   - Splenomegaly (enlarged spleen) and hepatomegaly, (enlarged liver) etc.
   - The thalassemic children die at the age of seventeen.

3. Mention any two uses of karyotyping?
   1. Karyotyping helps to identify the sex of individuals through amniocentesis.
   2. Genetic diseases in human beings can be detected by this technique.
      If a disease is detected, the medical counselling for termination of pregnancy and abortion of such foetus can be done.
   3. By characterizing the normal karyotype, the chromosomal abnormalities such as deletion, duplication, translocation, non-disjunctions and the consequent aneuploids could be detected

4. What is foreign DNA in genetic engineering?
   - Foreign DNA / Passenger DNA: It is a fragment of DNA molecule, which is to be enzymatically isolated and cloned.

5. What are cloning vectors?
   - Vectors or vehicle DNA are those DNA that can carry a foreign DNA fragment when inserted into it.
   - The vectors generally used are bacterial plasmids and bacteriophages.

6. Name the bacterial species employed in genetic engineering.
   - *Escherichia coli* has been employed as a suitable host to the above.
Alongside, with the multiplication and growth of the bacterium in the medium, copies of rDNA are also produced.

In molecular cloning, besides E.coli other microbes that have been employed include *Bacillus subtilis, Strptomyces sp., Saccharomyces cerevisiae* etc.

7. **What is called DNA segmenting?**

- DNA segmenting in genetic engineering refers to fragmenting of DNA and sequencing or mapping the DNA in terms of its nucleotide sequences.
- Chemical and enzymatic methods are available for the above.
- As a result the gene and non-compartments of DNA can be identified.

8. **What is called differentiation?**

- In the development of multicellular animals the zygote represents the progenitor cell of the future embryo.
- Multitudes of cells arise from mitotic divisions of the fertilized egg cell.
- These cells later become distinct cell types differing in form and function.
- This process is called differentiation.

9. **What is gene therapy? Name the two types of gene therapy.**

- The fact that genes can be cloned to several thousand copies through genetic engineering has given rise to an entirely novel model of therapeutic device viz., Gene therapy.
- Gene therapy involves the replacement of corrective genes in place of defective genes in human.
  
  Types of gene therapy.
  1). Somatic cell gene therapy
  2). Germ line cell gene therapy.
- Both may be employed for treating the inherited diseases.

10. **What is a data base in bioinformatics?**

- “Creating” database means a coherent collection of data with inherent meaning, used for future application.
- Database is a general repository of voluminous information or records to be processed by a programme.
LESSON - 5. ENVIRONMENTAL SCIENCE

1. Define Ecology.
   - Environment means surroundings of an object ES or ecology can defined as the study of organisms in relations to their surroundings.
   - Ecology is one of the most popular areas in the biology.

2. How does population growth differ from food production?
   - Thomas Malthus studied the nature of population growth.
   - He claimed that population was increasing faster than food production and feared global starvation.
   - He proposed that, Population grows geometrically (1, 2, 4, 8) rather than arithmetically (1, 2, 3, 4).

3. What is known as global warming?
   - Global warming refers to an average increase in the earth’s temperature, which in turn causes changes in climate.
   - During the past 4.65 billion years of its history, earth has warmed many times.
   - But at present it is facing a rapid warming mainly due to human activities.
   - The average temperature of earth is about 59°F (15°C).
   - During the last century this average has risen by about 1°F.
   - By the year 2100, it is believed that the rise would be between 2.5 and 10.4°F.
   - This will cause dramatic changes such as rise in sea level, changes in rainfall patterns, wide range of impacts on plants, wildlife and humans.

4. What are the effects of ozone depletion?
   - If the ozone is depleted more ultraviolet radiations (especially ultraviolet B (UVB) will reach the earth’s surface.
   - **Effect on plants:-** will affect crop yield and forest productivity.
   - **Effect on animals:-** will cause damage to fish larvae and other small animal
   - **Effect on human health:-** Results in non-melanoma skin cancer and melanoma, acute erythem a (sun burn), ocular abnormalities, cataract, affect immune responses.

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5. How is the sewage water treated by primary treatment method?

- For the treatment of sewage, **primary treatment** consists of mechanical filtration, screening, and settling, followed by chlorination.
- It removes 50 to 65% of the suspended solids.

6. What is bio-diversity?

- Biological diversity means the variability among living organisms from all sources including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are parts.
- It is usually considered at three different levels – genetic diversity, species diversity and ecosystem diversity.

7. Write the characteristics of a bioreserve?

- Bioreserve is a land and/or coastal/marine area in which people are an integral component, and which is managed for objectives, ranging from complete protection to intensive yet sustainable production.
- It is a regional centre for monitoring, research, education and training on natural and managed ecosystems.
- It is a place where government decision makers, scientists, managers and local people cooperate in developing a model programme for managing land and water to meet human needs while conserving natural processes and biological resources.
- Finally, each biosphere reserve is a symbol of voluntary cooperation and use resources for the well being of people everywhere.

8. List out the names of bioreserves of India.

- Marine biosphere reserve - Gulf of Mannar Biosphere Reserve
- Hill Biosphere Reserve - Nilgiri biosphere reserve

9. What is known as geothermal energy?

- Geothermal is fast emerging as a significant source of electricity is several is land nations, mainly in the Indian oceans and the pacific regions.
- Geothermal plants make use of naturally heated stream drawn to the surface through a series of bore holes in lotus

10. What are the advantages of solar energy?

**Advantages of solar energy:**

(a) Solar energy is a kind of universal, decentralized and non-polluting energy
(b) It helps considerably in maintaining the ecological balance through the process of photosynthesis and green house effect.
(c) It has none of the disadvantages found in the combustion of fossil fuels such as coal, oil or gas.

11. What is known as relative poverty?
- A condition of having fewer resources or less income than others within a society or country when compared to worldwide averages is known as the relative poverty.

12. What is meant by seeding of clouds?
- Seeding clouds with dry ice or potassium iodide particles sometimes can initiate rain if water laden clouds and conditions that favor precipitation are present.
LESSON - 6. APPLIED BIOLOGY

1. What is meant by dairy operations?
   - Dairy operation consists of proper maintenance of cattle, the collection of milk, processing the milk, and its by products.
   - Dairying is the production and marketing of milk and its products.

2. How are cattles classified?

<table>
<thead>
<tr>
<th>Dairy purpose</th>
<th>Dual purpose</th>
<th>Draught purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cows are high milk</td>
<td>cows are meant for milk and bullocks</td>
<td>bullocks are good draught animals while the cows are poor milk yielders.</td>
</tr>
<tr>
<td>Yielders, with extended Lactation.</td>
<td>are meant of Draught.</td>
<td></td>
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<tr>
<td></td>
<td></td>
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</tr>
<tr>
<td>2. Sindhi</td>
<td>2. Ongole</td>
<td>2. Kangayam</td>
</tr>
<tr>
<td>5. Karan Swiss</td>
<td></td>
<td>5. Hallikar</td>
</tr>
</tbody>
</table>

3. Compare the udder of Sindhi with kangayam.
   - The udder is large with medium sized teats.
   - The animals are Docile and quiet.
   - Bullocks are steady workers, suited for road and field work.

4. How are dual purpose breeds helpful for mankind.
   - This breed of cattle is meant for both milk yield and draught works.
   - The cows are fairly good milkers and the bullocks are sturdy and are useful in draught works like ploughing the field, transport, cart pulling etc.
   - Important examples are Hariana and Ongole.

5. Write down the origin and distribution of the cattle kangayam.

   Origin and distribution:
It originated from Kangayam divisions of Dharapuram taluk of Coimbatore district in Tamilnadu.

The breed is also found in Udumalapet, Palladam, Pollachi and in other parts of South India.

6. How will you identify a healthy cattle?
- Cattle are subjected to a large number of diseases.
- Cattle in normal health appear bright, alert and active in their movements with a shiny coat.
- They also enjoy normal appetite and sleep.
- Cattle in ill health appear dull, restless and change posture frequently with a drop in milk yield.

7. Mention the bacterial disease of cattle and its symptoms.
- The bacterial diseases are **anthrax**, **haemorrhagic septicemia**, **mas-titis** and **tuberculosis**.
- The viral diseases are **cow pox**, **foot and mouth diseases** and **rinderpest**.

8. What are the control measures of cow pox?
- Segregation of affected animal,
- Giving sloppy food for swallowing and digestion,
- Fomenting udder with warm disinfectant solution,
- Giving saline laxative and diuretics,
- Treating lesions with mild antiseptic Ointment.
- Cow shed should be kept clean.

9. What is the first aid given to cattle for constipation?
- Feeding jaggery along with lime water, few days prior to calving and giving soft nutritious and easily digestible food for a few days after calving prevents milk fever.
- Cleaning the udder with warm cloth and preventing infection from the floor.
- Pumping clean air into the udder and massaging are other measures to be adopted.

10. List of the different types of diseases in cattle.
- Contagious diseases
- Non-contagious diseases
The bacterial diseases are **anthrax**, **haemorrhagic septicemia**, **mastitis** and **tuberculosis**.

The viral diseases are **cow pox**, **foot and mouth diseases** and **rinderpest**.

11. **Define draught breeds.**
   - These breeds are exclusively meant for pulling carts, ploughing fields etc.
   - They are well-built and the skin is well stretched.
   - The bulls are used for draught works.
   - The cows are poor milkers.
   - Important Indian draught breeds are Amrithamahal, Kangayam, Malvi, Hallikar etc.

12. **What are the advantages of artificial insemination?**
   - It helps to eliminate the need for maintenance of herd sire, permits long distance transport of semen by air, avoids spreading of genital diseases, and increase the rate of conception.
   - Further this method helps better recording, permits use of semen from injured and old bulls and provides a chance of detecting any genital abnormalities or pathological infection and inflammation in cows.

13. **What is artificial insemination?**
   - Artificial insemination is the deposition of male reproductive cells (spermatozoa) in the female reproductive tract by Mechanical means rather than by natural mating.
   - The semen is collected from the male by artificial means.
   - The semen is inseminated into the female by placing a portion of it either in a collected or in a diluted form into the cervix of the uterus by mechanical methods at the proper time and under most hygienic condition.

14. **Define out breeding.**
   - Out breeding is mating of less closely related or unrelated animals.
   - The individuals involved do not have a common ancestor in the preceding 4-6 generations.

15. **Define cross breeding.**
   - Cross breeding is mating of animals of different breeds.
   - It is valuable as a means of introducing desirable characters into new breed in which they have not existed formerly.

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The cross breeds” exhibit increased growth and vigour by the blend of desirable dominant genes from two breeds in the first generation.

16. Compare the bullocks of Sindhi, Ongole and Kangayam.
- Sindhi Bullocks are steady workers, suited for road and field work.
- Ongole Bullocks are powerful and suitable for cart and road work but are not fast.
- Kangayam bulls are excellent type for hard work.

17. Define breed?
- A breed is a group of animals of a species which has for a long period been breed among themselves.
- The members of the breed have closely resembling Characters and these characters are hereditarily transmissible to young ones.
LESSON - 7. THEORIES OF EVOLUTION

1. State the theory of Lamarck?
   - The theory of evolution as proposed by Lamarck is popularly known as the „theory of inheritance of acquired characters”.
   - According to this theory modifications or changes acquired during the life time of an organism can automatically be transmitted to succeeding generations.

2. Define the law of use and disuse?
   - According to this law, constant use of an organ changes its efficiency and makes that organ to increase in size with better development.
   - Similarly if an organ is not used for a long time, it might lead to reduction in efficiency and size of that organ.
   - The development of hand muscles of a blacksmith and thigh muscles in the legs of an experienced runner were quoted as examples.

3. Quote the facts of neo-lamarckism?
   - The neo-Lamarckians were of the opinion that „adaptions” are universal in nature.
   - An adaptation happens through causal relationship of structure, function and environment.
   - Due to changes in the environment, habits and life style of organism gets altered.
   - Thus gradually the organism acquires new structures.
   - The newly obtained character gradually becomes an inheritable trait.
   - This opinion and argument is a modified form of Lamarckism.
   - These ideas stressed direct action of environment on organisms.

4. Define the germ plasm theory?
   - This lead to the formulation of the „Germplasm theory” which states that ‘any change to the somatoplasm will not have an influence over the germplasm’.

5. State the view of Mc Dougall?
   - McDougall (1938) tried to prove that learning is an acquired character that can be inherited.
   - He did his experiments on rats.
6. What is meant by “survival of the fittest”?

- While all living organisms face the struggle for existence, certain organisms possessing adequate modifications are able to escape and survive.
- Such modifications are due to inherent variations.
- Hence favourable variations make an animal or a plant to be successful in life.
- They survive as fittest organisms in an environment which gets altered frequently.

7. Mention any two objections to Darwinism?

1. Darwin could not explain the origin and cause for variations while insisting their importance in progressive evolution.
2. He overemphasized the importance of the „fittest” organisms.
   During later periods it has been suggested that „fit” and fitter forms can also exist along with the fittest.
3. As the principle of inheritance as explained in the later years were not available during Darwin’s time.
   Hence he believed in the theory of „pangenesis” According to this concept from every organ in the body very minute such replicate structures will originate.
   Later they are transferred to the gonads for transmission to future generations.
4. “Over-specialization” as in Irish deer and its consequent harmful effect on animals had not been accounted for by Darwin.

8. Mention the significance of neo-Darwinism?

- The neo-Darwinians differentiated the germplasm from somatoplasm and proposed the „germplasm concept”.
- They also believed that characters are due to certain factors called the determinants that control the development.
- The neo-Darwinism concept was incomplete and erroneous.
- It lacked in an understanding of genetics as it is known in later periods.

9. State the modern synthetic theory?

- The basic concept of modern synthetic theory was provided by Th. Dobzhansky in his book titled “Genetics and the Origin of species” (1937)

They are

1. Gene mutations,
2. Chromosomal aberrations,
3. Genetic recombinations,
4. Natural selection and
5. Reproductive isolation.

10. What is meant by “gene pool”?
   - The collection of genes in a population is referred to as the „gene pool‟.
   - Mutations enrich the gene pool with new modified genes.
   - A large scale accumulation of such genes will lead to evolutionary modifications.
   - A gene pool comprises a diverse form of a gene combining and recombining by the process of sexual reproduction.

11. Name two books that explain the basic concepts of evolution?
   - Genetics and the Origin of species - Dobzhansky (1937)

12. What is meant by chromosomal aberration?
   - During the process of meiosis one or more chromosomes may break.
   - Such broken fragments of chromosomes may be subjected to several modified organizations.
   - Any such changes in the chromosomal structure is called chromosomal aberrations

13. State the law of genetic drift?
   - This theory was developed by Sewall Wright in 1930.
   - It is concerned with the gene frequency of a reproducing small population.
   - In a small population not all the alleles which are representatives of that species may be present.
   - Thus the process of inheritance is in violation of Hardy-Weinberg law.
   - In such a small population a chance event may increase the frequency of a character that has little adaptive value.
Any may differ from that found in the main population. Deviation may even lead to speciation or formation of a new species, this is known as genetic drift.

14. What is a species?
- A species may be defined as “a group of organisms that are reproductively isolated from other such groups”.
- Thus the maintenance of a species as a distinct group is due to several isolating mechanisms.

15. Define founder principle?
- When a small group of individuals due to genetic drift become founders of a new population, the phenomenon is termed as „founder principle”.
- The new population often has genotype frequencies different from the parent population.