OSWAAL BOOKS

LEARNING MADE SIMPLE

FOR 2019 EXAM

MAHARASHTRA HSC

SOLVED PAPER 2018

CLASS 12

BIOLOGY

Published by :

OSWAAL BOOKS

"Oswaal House" 1/11, Sahitya Kunj, M.G. Road, AGRA-282002

Ph.: 0562-2857671, 2527781

email : contact@oswaalbooks.com, **website :** www.oswaalbooks.com

LATEST SYLLABUS

Section I – BOTANY

Unit 1 : Genetics and Evolution :

Chapter 1 : Genetic Basis of Inheritance:

Mendelian inheritance. Deviations from Mendelian ratio (gene interactionincomplete dominance, co-dominance, multiple alleles **and Inheritance of blood groups), Pleiotropy, Elementary idea of polygenic inheritance.**

Chapter 2 : Gene: its nature, expression and regulation :

Modern concept of gene in brief-cistron, muton and recon. **DNA as genetic material**, structure of DNA as given by Watson and Crick's model, **DNA Packaging**, semi conservative replication of eukaryotic DNA.

RNA: General structure, types and functions. Protein Synthesis; central dogma, Transcription; Translation-Genetic Code, Gene Expression and Gene Regulation (The *Lac* operon as a typical model of gene regulation).

Unit 2 : Biotechnology and its application:

Chapter 3 : Biotechnology: Process and Application :

Genetic engineering (Recombinant DNA technology): Transposons, Plasmids, Bacteriophages; Producing Restriction Fragments, Preparing and cloning a DNA Library, Gene Amplification (PCR). Application of Biotechnology in Agriculture – BT crops. Biosafety Issues (Biopiracy and patents)

Unit 3 : Biology and Human Welfare :

Chapter 4 : Enhancement in Food Production

Plant Breeding Tissue Culture: Concept of Cellular Totipotency, Requirements of Tissue Culture (in brief), Callus Culture, Suspension Culture. Single Cell Protein. **Biofortification.**

Chapter 5 : Microbes in Human Welfare:

Microbes in Household food processing. Microbes in Industrial Production. Microbes in Sewage Treatment. Microbes in Biogas (energy) Production. Microbes as Biocontrol Agents. Microbes as Biofertilizers.

Unit 4 : Plant Physiology :

Chapter 6 : Photosynthesis

Autotrophic nutrition Site of Photosynthesis. Photosynthetic Pigments and their role. Light-Dependent Reactions (Cyclic and non-cyclic photophosphorylation) Light-Independent Reactions (C3 and C4 Pathways) Chemiosmotic hypothesis, Photorespiration, Factors affecting Photosynthesis. Law of limiting factors.

Chapter 7 : Respiration

ATP as currency of Energy Mechanism of Aerobic (Glycolysis, **TCA Cycle and Electron Transport System**) and Anaerobic Respiration**. Fermentation** Exchange of gases Amphibolic pathway. Respiratory quotient of Nutrients. Significance of Respiration.

Unit 5 : Reproduction in Organisms :

Chapter 8 : Reproduction in Plants

Modes of Reproduction (Asexual and Sexual). Asexual reproduction; uniparental modesvegetative propagation, micropropagation Sexual Reproduction: **structure of flower** Development of male gametophyte, Structure of anatropous ovule. Development of female gametophyte. Pollination: Types and Agencies. Outbreeding devices; pollen-pistil interaction. Double Fertilization: Process and Significance. Post-fertilization changes (development of endosperm and embryo, development of seed and formation of fruit) Special modes apomixis, parthenocarpy, polyembryony. Significance of seed and fruit formation.

Unit 6 : Ecology and Environment

Chapter 9 : Organisms and Environment -I : Habitat and Niche

Ecosystems: Patterns, components, productivity and decomposition, energy flow; pyramids of number, biomass, energy; nutrient cycling (carbon and phosphorous). Ecological succession,

OSWAAL BOOKS LEARNING MADE SIMPLE

Ecological servicescarbon fixation, pollination, oxygen release. Environmental issues : agrochemicals and their effects, solid waste management, Green house effect and global warming, ozone depletion, deforestation, case studies (any two).

Section II - ZOOLOGY

Unit 1 : Genetics and Evolution :

Chapter 10 : Origin and the Evolution of Life :

Origin of Life: Early Earth, Spontaneous, assembly of organic compounds, Evolution: Darwin's contribution, Modern Synthetic Theory of evolution, Biological Evidences, **Mechanism of evolution; Gene flow and genetic drift; Hardy- Weinberg principle; Adaptive radiation.** Origin and Evolution of Human being.

Chapter 11 : Chromosomal Basis of Inheritance

The Chromosomal Theory. Chromosomes. Linkage and Crossing Over. Sex-linked Inheritance (Haemophilia and colour blindness). Sex Determination in Human being, **birds, honey bee.Mendelian disorders in humans-Thalassemia. Chromosomal disorders in human: Down's syndrome, Turner's syndrome and Klinfelter's syndrome.**

Unit 2 : Biotechnology and its application:

Chapter 12 : Genetic Engineering and Genomics

DNA Finger Printing. Genomics and Human Genome Project. Biotechnological Applications in Health: Human insulin and vaccine production, Gene Therapy. **Transgenic animals.**

Unit 3 : Biology and Human Welfare

Chapter 13 : Human Health and Diseases

Concepts of Immunology: Immunity Types, **Vaccines,** Structure of Antibody, Antigen-Antibody Complex, Antigens on blood cells. Pathogens and Parasites (Amoebiasis, Malaria, Filariasis, Ascariasis, Typhoid, Pneumonia, Common cold and ring worm). Adolescence, drug and alcohol abuse. Cancer and AIDS.

Chapter 14 : Animal Husbandry

Management of Farms and Farm Animals, Dairy, Poultry, Animal Breeding, Bee-Keeping, Fisheries. Sericulture Lac culture

Unit 4 : Human Physiology :

Chapter 15: Circulation

Blood composition and coagulation, **Blood groups.** Structure and pumping action of Heart. Blood Vessels. Pulmonary and Systemic Circulation. Heart beat and Pulse. Rhythmicity of Heart beat. **Cardiac output**, **Regulation of cardiac activity.** Blood related disorders: Hypertension, coronary artery disease, angina pectoris, and heart failure. ECG, Lymphatic System (Brief idea): **Composition of lymph and its functions.**

Chapter 16 : Excretion and osmoregulation

Modes of excretion-Ammonotelism, ureotelism, uricotelism. Excretory System. Composition and formation of urine. Role of Kidney in Osmoregulation**. Regulation of kidney function : reninangiotensin, atrial natriuretic factor, ADH and Diabetes inspidus, role of other organs in excretion.** Disorders; Kidney failure, Dialysis, Kidney stone (renal calculi). Transplantation. **Uraemia, nephritis.**

Chapter 17 : Control and Co-ordination

Nervous System Structure and functions of brain and Spinal cord, brief idea about PNS and ANS. Transmission of nerve impulse. Reflex action. Sensory receptors (eye and ear), **Sensory perception, general idea of other sense organs.** Endocrine System Endocrine glands Hormones and their functions **Mechanism of hormone action.** Hormones as messengers and regulators. Hormonal imbalance and diseases : **Common disorders (Dwarfism, Acromegaly, cretinism, goiter, exopthalmic goiter, Diabetes mellitus, Addison's disease)**

OSWAAL BOOKS
LEARNING MADE SIMPLE

...Contd.

Unit 5 : Reproduction in Organisms :

Chapter 18 : Human Reproduction

Reproductive system in male and female. Histology of testis and ovary. Reproductive cycle. Production of gametes, fertilization, implantation. Embryo development up to three germinal layers. Pregnancy, placenta, parturition and **lactation** (Elementary idea). Reproductive health-birth control, Contraception and sexually transmitted diseases.**MTP, Amniocentesis; Infertility and assisted reproductive technologies- IVF, ZIFT, GIFT (elementary idea for general awareness).**

Unit 6 : Ecology and Environment :

Chapter 19 : Organisms and Environment-II :

Population and ecological adaptations: population interactions-mutualism, competition, predation, parasitism, population attributes- growth, birth rate and death rate, age distribution. Biodiversity and its conservation- Biodiversity- concept, patterns, importance, loss. Threats to and need for biodiversity conservation, Hotspots, endangered organisms, extinction,red data book, biosphere reserves, national parks and sanctuaries. Environmental issues: air pollution and its control, water pollution and its control and radioactive waste management. (Case studies any two)

(Upgraded) Biology Practicals : Experiments

1. Dissect the given flower and display different whorls. Dissect anther and ovary to show number of chambers.
2. Study pollen germination on a slide.
3. Collect and study soil from at least two different sites and study them for texture, moisture content, pH and water holding capacity of soil. Correlate with the kinds of plants found in them.
4. Study of plant population density and **frequency** by quadrat method.
5. Prepare a temporary mount of onion root tip to study mitosis.
6. Separation of plant pigments by paper chromatography.

7 (A) To study the rate of respiration in flower buds / leaf tissue and germinating seeds.

(B) Demonstration of anaerobic respiration.

8. Study the presence of suspended particulate matter in air at the two widely different Sites.
9. Collect water from two different water bodies around you and study them for pH, clarity and presence of any living organisms.
10. To test the presence of urea and sugar in urine.
11. To test the presence of albumin and bile salts in urine.

Study/observation of the following (Spotting):

1. Study of flowers adapted to pollination by different agencies (wind, insect)
2. Study of pollen germination on stigma through a permanent slide.
3. To Study Mendelian inheritance using seeds of different colour / size of any plant.
4. Exercise on controlled pollination - Emasculation, tagging and bagging.
5. Study meiosis in onion bud cell or grass hopper testis through permanent slides.
6. Study of plants found in xerophytic and aquatic conditions with respect to their morphological adaptations.(Two plants each)
7. Study and identify stages of gamete development, i.e. T.S. of testis and T.S. ovary through permanent slides (from any mammal).
8. Study of V.S. of blastula through permanent slide.
9. To study prepared pedigree charts of genetic traits such as rolling of tongue, Blood groups, widow's peak, colour blindness.
10. To identify common disease causing organisms like *Plasmodium*, *Entamoeba*, *Ascaris* and ring worm through permanent slides or specimens. Comment on symptoms of diseases that they cause.
11. Study of animals found in xeric (desert) and aquatic conditions with respect to their morphological adaptations. (Two animals each)

❑❑

OSWAAL BOOKS
LEARNING MADE SIMPLE

Solved Paper	Maharashtra HSC Exam February 2018 Set No. J-282	Biology (56)

Time : 3 Hours **Max. Marks : 80**

General Instructions :

(i) All questions are compulsory.
(ii) Draw neat and labelled diagrams wherever necessary.
(iii) Figures to the right indicate full marks.
(iv) Answer to the questions in Section I and Section II must be written in two separate answer books.
(v) Question from Section I attempted in the answer book of Section II and vice-versa will not be assessed / not be given are credit.
(vi) Answer to every new question must be started on a new page.

SECTION-I

[BOTANY]

1. Select and write the most appropriate answer from the given alternatives (along with its alphabet number) for each sub-question : [7]

(i) The phenotypic ratio of incomplete dominance is _____ .
(a) 1 : 1 **(b)** 3 : 1 **(c)** 1 : 2 : 1 **(d)** 9 : 3 : 3 : 1

(ii) Nucleoside is a nucleotide without _____.
(a) sugar **(b)** nitrogen base **(c)** hydrogen bond **(d)** phosphate group

(iii) Which of the following is white button mushroom ?
(a) *Agaricus bisporus* **(b)** *Pleurotus florida* **(c)** *Volvariella volvacea* **(d)** *Candida* species

(iv) Brown rust of wheat is caused by _____.
(a) viruses **(b)** bacteria **(c)** fungi **(d)** aphids

(v) The reaction centre of P. S. II. is _____.
(a) Chl - a, 700 **(b)** Chl - a, 680 **(c)** Chl - a, 673 **(d)** Chl - a, 650

(vi) The enzymes required for synthesis of ATP are located on _____.
(a) oxysomes **(b)** cristae **(c)** matrix **(d)** ribosomes

(vii) In a food chain, the herbivores are represented by _____.
(a) producers **(b)** primary consumers **(c)** secondary consumers **(d)** decomposers

2. (A) Answer each question in 'one' sentence only. (6)[12]

(i) What is leaching ?
(ii) Define chemoautotrophs.
(iii) Name the cell organelle in which Krebs' cycle occurs.
(iv) What is 'deforestation' ?
(v) Give the microbial sources of Vit. B_{12}.
(vi) What is primary treatment of sewage ?

(B) Sketch and label a pollen grain of angiosperms. **(2)**

(C) Attempt any two of the following : (4)

(i) Enlist the basic steps involved in recombinant DNA technology.
(ii) Give 'two' examples of microbial pesticides with their hosts.
(iii) Give the significance of respiration.
(iv) Explain energy pyramid.

3. (A) Attempt any two of the following : (6)[12]

(i) With the help of a suitable diagram describe the structure of a nucleosome.
(ii) Describe the steps of PCR technique.
(iii) Describe different steps involved in tissue culture technique.

(B) Sketch and label T.S. of a leaf showing Kranz anatomy. **(3)**

4. With the help of a neat and labelled diagram describe the development of female gametophyte of angiosperms. **[7]**

OR

Explain "the law of independent assortment" with a suitable example.

To know about more useful books for class-12 click here

SECTION-II

[ZOOLOGY]

5. Select and write the most appropriate answer from the given alternatives (along with its alphabet number) for each sub-question : **7**

(a)

(i) _____ is used for desalination of brackish water.
(a) Reverse osmosis **(b)** Ion-exchange **(c)** Adsorption **(d)** Electrodialysis

(ii) Which of the following is mesodermal in origin ?
(a) Retina **(b)** Enamel of teeth **(c)** Heart **(d)** Liver

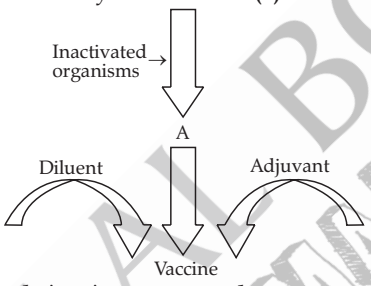
(iii) _____ is an exotic breed of cow.
(a) Gir **(b)** Sindhi **(c)** Sahiwal **(d)** Jersey

(iv) _____ maintains basic metabolic rate.
(a) Thyroxine **(b)** ADH **(c)** GH **(d)** Oxytocin

(v) Which of the following is an example of ZW - ZZ type of mechanism of sex determination ?
(a) Honey bee **(b)** Fish **(c)** Bird **(d)** Human being

(vi) Transfer of gene between populations that differ genetically from one another is called _____.
(a) Gene mutation **(b)** Gene flow **(c)** Genetic drift **(d)** Genetic recombination

(vii) In the given diagram of vaccine manufacturing process 'A' is _____.
(a) antigen **(b)** antibody **(c)** antitoxin **(d)** antibiotics



6. (A) Answer the following question in only 'one' sentence each : **(6)[12]**

(i) Longer toes and long prehensile tail indicate which adaptation ?
(ii) What does 'IUCD' indicate ?
(iii) Name the valve between left atrium and left ventricle and give its significance.
(iv) Give the use of bovine growth hormone.
(v) State any 'two' symptoms of Down's syndrome.
(vi) Mention any 'one' skeletal difference between ape and man.

(B) Sketch and label structure of Antibody. **(2)**

(C) Attempt any two of the following : **(4)**

(i) Name the causative organism of 'typhoid' and draw its diagram.
(ii) State the economic importance of 'lac culture'.
(iii) 'All organisms produce more young ones'. Comment.
(iv) Describe 'agranulocytes' with the help of diagrams.

7. (A) Attempt any two of the following : **(6)[9]**

(i) Define parasitism and give any 'two' types with suitable example of each.
(ii) Describe the structure of chromosomes with a suitable diagram.
(iii) Define 'genomics'. Give any 'two' applications of it.

(B) Sketch and label Malphigian body. **(3)**

8. Describe the histology of 'human testis'. Write a note on human sperm. **(7)**

OR

With the help of a neat and labelled diagram describe the anatomy of 'human eye'. Explain the mechanism of vision.

■■

Answers

SECTION-I

[BOTANY]

1. (i) (c) 1 : 2 : 1
(ii) (d) Phosphate group
(iii) (a) *Agaricus bisporus*
(iv) (c) Fungi
(v) (b) Chloropyll-*a*, 680
(vi) (b) Cristae
(vii) (b) Primary consumers

2. (A) (i) Leaching is the natural process by which water soluble substances such as calcium, fertilizer, pesticides etc. are washed out from soil or wastes. These leached out chemicals causes water pollution. **2**

To know about more useful books for class-12 click here

(ii) Chemoautotrophs are cells that create their own energy and biological materials from inorganic chemicals. They feed on chemicals that are good electron donors, such as hydrogen sulphide sulphur or iron and derive energy for their life functions. **2**

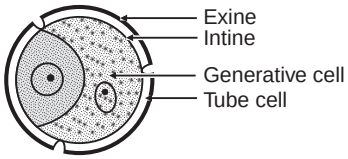
(iii) The Kreb's occurs in the mitochondrial matrix. **2**

(iv) Deforestation is the removal of a forest or stand of trees where the land is thereafter converted to a non-forest use.

(v) Pseudomonas *denitrificans* is the microbial source of vitamin B12 under aerobic conditions. **2**

(vi) Primary treatment of sewage is the physical removal of particles. It involves removal of floating debris by sequential filtration and removal of the grit by sedimentation. **2**

(B) Diagram of Pollen Grain of Angiosperm :



Two-celled pollen grain

(C) (i) Steps Involved in rDNA Technology are : **2**

(a) Identifying the donor cell and isolating its DNA.
(b) Fragmenting the DNA using 'molecular scissors' (restriction enzymes).
(c) Screening the fragmented DNA for the desired gene.
(d) Inserting the desired DNA fragment into a cloning vector to produce the recombinant DNA.
(e) Introducing the recombinant vector organism in the desired host cell.
(f) Culturing the recombinant cells to obtain multiple copies of the desired DNA fragment.
(g) These DNA fragments are then used to transform desired host cells where the expression of the gene is desired.

(ii) Microbial Pesticides and their host range : **3**

	Pathogen	Host Range
1.	*Bacillus Thuringiensis* (Bt)	Caterpillars (larvae of moths and butter flies), larvae of Aedes, black flies, some adult beetles, wax moths etc.
2.	*Beauveria bassiana*	Aphids, mealy bugs, mites, white flies etc.

(iii) Significance of Respiration are :

(a) Respiration provides energy for the biosynthesis of cellular materials such as carbohydrates, proteins, fats, lipids, vitamins, pigments, etc.

(b) It is also a source of energy for cell division, growth, repairs and replacement of worn out parts, movements, locomotion, etc.

(c) Various intermediates of Krebs cycle are used as building blocks for synthesis of other complex compounds.

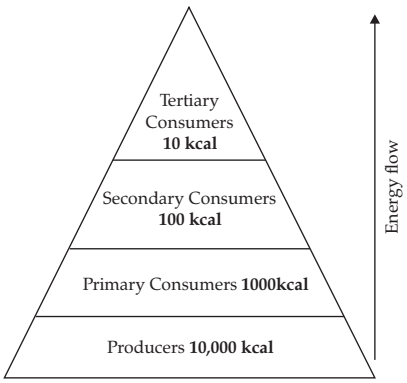
(d) Coupled with photosynthesis, it helps to maintain the balance between CO_2 and O_2 in the atmosphere.

(e) Anaerobic respiration is used in the various industries such as dairies, bakeries, distilleries, leather industries, paper industries etc. It is used in the commercial production of alcohol, organic acids, vitamins, antibiotics.

(f) Energy of respiration is also used to convert insoluble substances into soluble form. **(Any three) 3**

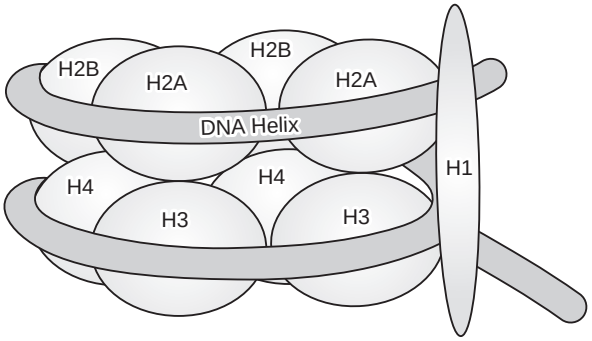
(iv) An energy pyramid is a graphical model of energy flow in a community. The different levels represent different groups of organism that might compose a food chain. Producers bring energy from non-living sources into the community. Energy decreases as you move through the trophic levels from the bottom to the top of the pyramid.

The energy pyramid is used in energy transfer from one organism to another along the food chain. The energy pyramid is always upright and vertical. It depicts that energy is minimum at the highest trophic level and is maximum at the lowest level.

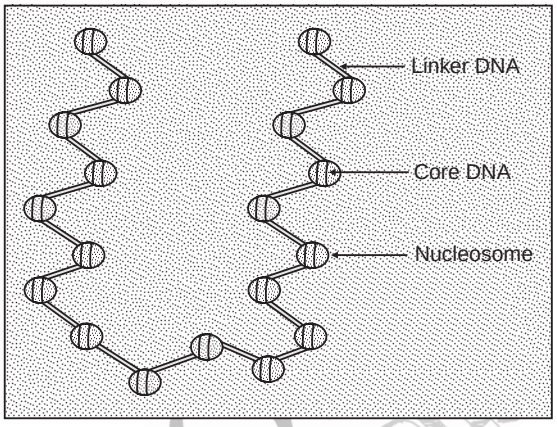


To know about more useful books for class-12 click here

3. (A) (i) Diagram of a Nucleosome :



(A) Nucleosome



(B) Beads on string

Explanation :

Nucleosome is a small dark staining body present in the nucleus of an eukaryotic cell which is located in the chromatin network and appears as beads on string of chromatin fibres under an electron microscope. Each nucleosome is formed of DNA which is negatively charged and histone octamer which is positively charged. Eight molecules of histone get organized to form histone octamer.

Under the electron microscope, nucleus shows chromatin network. The nuleosomes in chromatin are seen as 'beads-on-string'. Adjacent nucleosomes are linked with small segments of DNA called linker DNA; of about 54 bp. Thus the string is DNA which is 2 nm or 20A in diameter. This beads-on-string structure gets condensed into nucleosome fiber which is 10 nm. (100Å) in diameter. Each nucleosome contains 200 bp of DNA helix. Nucleosome and solenoid fibers are characteristic of nucleus at interphase. **1 + 2**

(ii) Steps of PCR Technique :

The three steps of PCR Technique are :

(a) **Heat denaturation :** This step involves heating of DNA at about 91°C. The heating breaks the hydrogen bonds to make ssDNA. The DNA molecule with more G–C pairs, need higher temperature.

(b) **Annealing :** It is pairing of primers to the ssDNA segment. The primers have to be designed as per the requirement. This step requires temperature at about 55°C.

(c) **Polymerisation :** The temperature is raised to 72°C. The Taq Polymerase adds NTPs behind the primer on the ssDNA. **1 + 1 + 1**

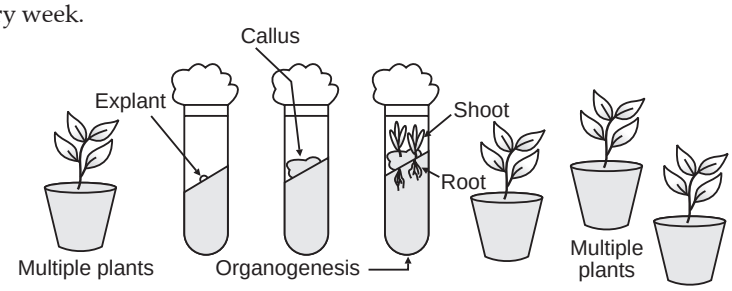
(iii) Different Steps Of Tissue Culture are :

(a) **Explant culture :** Proper explant is excised from the plant which may be a cell, tissue or a piece of plant organ. Generally parenchyma tissue or meristem is used as explants. It is sterilized properly and placed on solid nutrient medium. The cells from explant absorb nutrients and start multiplying.

(b) **Callus formation and its culture :** The callus is unorganized mass of cells produced due to growth of the explant. It has thin walled living parenchyma cells. It develops due to proliferation of cells from explants. All the cells of callus are identical as they are produced by mitosis only.

(c) **Organogenesis :** Growth hormones like auxins and cytokinins in proper proportion are provided to the callus to induce formation of organs. If auxins are more, roots are formed (rhizogenesis) and if the cytokinins are in more quantity then the shoot system begins to develop (caulogenesis).

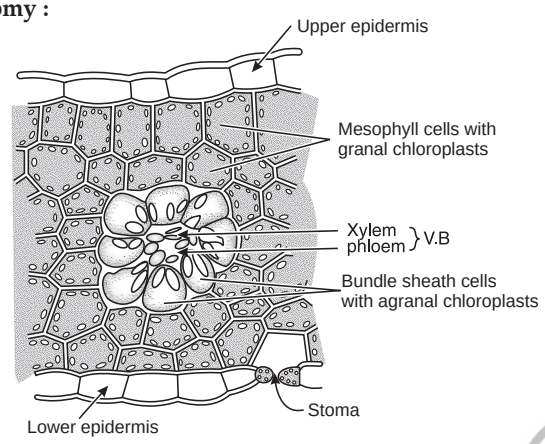
(d) **Formation of cell or suspension culture :** For the formation of cell or suspension culture, the callus can be transferred to liquid nutrient medium and it is agitated. Due to this, the cells from callus get separated. This cell culture is to be agitated constantly at 100-250 rpm. The agitation serves the purpose of aeration, mixing of medium and prevents the aggregation of cells. The suspension culture shows high proportion of single isolated cells and also small clumps of cells. It grows much faster than callus culture and need to be sub-cultured every week.



Steps in plant tissue culture (callus culture) **3**

To know about more useful books for class-12 click here

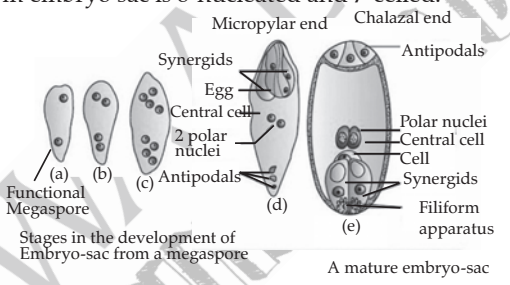
(B) Leaf showing Kranz Anatomy :



T.S. of leaf showing Kranz anatomy **1 (for diagram) + 2 (for labelling)**

4. Development of female gametophyte :

- The functional megaspore undergoes a mitotic division forming 2-nucleate embryo sac.
- Two successive mitotic divisions in each of these two nuclei result in the formation of an 8-nucleate embryo sac.
- Cell wall formation starts at the eight - nucleate stage, resulting in the formation of a typical female gametophyte.
- Three cells *i.e.*, 2-synergids and 1 egg cell are grouped together at the micropylar end to form the egg apparatus.
- Three cells are grouped together at the chalazal end and are called antipodal cells. The remaining two move to the centre and are called polar nuclei.
- Thus, a typical angiosperm embryo sac is 8-nucleated and 7-celled.



OR **5 + 2**

Law of Independent Assortment :

'Law of independent assortment' states that when the two homozygous parents differing in two pairs of contrasting traits are crossed, the inheritance of one pair is independent of the other. For example, when a pea plant of yellow round seed is crossed with a green wrinkled seed, 9 pea plants bearing yellow round seeds, 3 pea plants bearing yellow wrinkled seeds, 3 pea plants bearing green round seeds and 1 pea plant bearing green wrinkled seeds are produced in F_2 generation.

Phenotypes of parents	Yellow round	Green wrinkled
Genotype	YYRR	yyrr
Gametes	YR	yr
F_1 generation	Yy Rr (Yellow round)	
On selfing F_1 generation	Yy Rr	Yy Rr
Gametes	YR Yr yR yr	YR Yr yR yr

F_2 generation

♀ \ ♂	YR	Yr	yR	yr
YR	YYRR Yellow Round	YYRr Yellow Round	YyRR Yellow Round	YyRr Yellow Round
Yr	YYRr Yellow Round	YYrr Yellow Wrinkled	YyRr Yellow Round	Yyrr Yellow Wrinkled
yR	YyRR Yellow Round	YyRr Yellow Round	yyRR Green Round	yyRr Green Round
Yr	YyRr Yellow Round	Yyrr Yellow Wrinkled	yyRr Green Round	YYrr Green Wrinkled

To know about more useful books for class-12 click here

Looking at the above results, it is obvious that the character of yellow colour of the seed is nowhere linked with the round shape of the seed, and vice versa. This is due to the fact that in the above cross, the two pairs of characters segregate independently implying independent assortment of characters. **7**

SECTION-II

[ZOOLOGY]

1. (i) (a) Reverse osmosis
(ii) (c) Heart
(iii) (d) Jersey
(iv) (a) Thyroxine
(v) (c) Birds
(vi) (b) Gene flow
(vii) (a) Antigen

6. (A) (i) Longer toes and long prehensile tail indicate arboreal adaptation. **2**

(ii) IUCD indicates Intra Uterine Contraceptive Devices. **2**

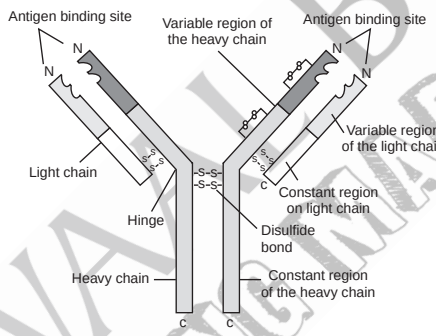
(iii) The valve between left atrium and left ventricle is known as mitral valve or bicuspid valve. It allows blood to flow from left atrium to left ventricle but not in reverse direction. **2**

(iv) Bovine growth hormone triggers nutrients to increase growth in young cattle and lactation in dairy cows. It leads to increase in milk production. **2**

(v) (a) Decreased or poor muscle tone.
(b) Short neck with excess skin at the back of the neck. **1 + 1**

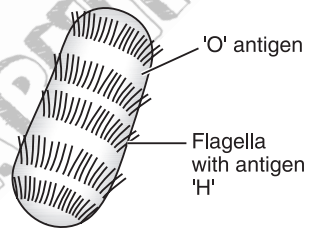
(vi) In Man, rib cage has been flattened from front to back, so that chest centre of gravity is as closer to the spine. This minimizes the tendency to fall forward and improves balance.
In Apes, the chest is flattened from the sides. This creates a deeper chest. **2**

(B) Structure of Antibody :



(C) (i) The causative organism of typhoid is *Salmonella typhi*. **2**

Diagram of Salmonella Typhi :



(ii) Economic Importance of Lac Culture : **1 + 1**

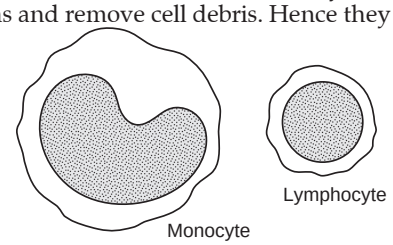
- Lac is used in preparing a bangles
- Lac is used in preparation of toys.
- Lac is used in the preparation of inks and polishes.
- Lac is used in wood work and for making ornamental things.
- Lac is used in process of silvering the back of mirror.
- Lac cultivation has its roots in India and Bangladesh and is a major source of economy to the local population. **(Any four) ½ × 4**

(iii) All living things have the ability to produce their own kind. This is called reproduction. Some animals lays eggs which hatch into young ones. They are called oviparous. For example, birds, lizards, frogs, fish, snakes and insects. Some animals give birth to young ones. They are called viviparous. For example, human beings cows, dogs and snakes. Plants also produce seeds which germinate to form new plants. For example, plants like grain, maize, lady finger, mango and coconut grow from their seeds. **2**

(iv) A granulocytes show absence of granules in the cytoplasm and nucleus is not lobed. They are of two types- lymphocytes and monocytes.
Lymphocytes : Lymphocytes show large round nucleus. They constitute about 25-33% of total WBCs. They produce antibodies and are responsible for immune response of the body.
Monocytes : Monocytes are the largest of all WBCs and show large kidney-shaped nucleus. They constitute about 3-9% of total WBCs.

To know about more useful books for class-12 click here

They are phagocytic in function. At the site of infection monocytes enlarge and differentiate into macrophages which engulf micro-organisms and remove cell debris. Hence they are called scavengers.



7. (A) (i) **Parasitism :** It is a relationship between two species in which one benefits at the expense of other. **1 + 1**

Types of Parasitism :

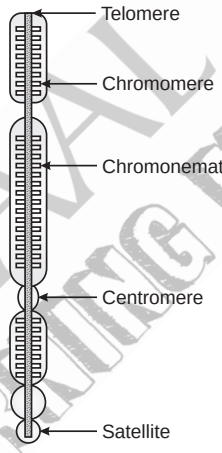
(a) **Ectoparasites :** Parasites living on the surface of the host are called ectoparasites. *eg.* flea, mosquito, lice etc.

(b) **Endoparasites :** Parasites seen in the interior of the host body are called endoparasites *eg*. Flatworms, tapeworm etc. Endoparasites are of two types, intercellular and intracellular. Intercellular endoparasites inhabit intercellular spaces whereas intracellular endoparasites live within the cells of the host body.

1 + 1 + 1

(ii) A chromosome has two identical halves called sister chromatids. Each chromatid is in turn made up of sub-chromatids called chromonemata. The chromatids lie side by side and area held together at one point is called the centromere. The centromere is also called the primary constriction. During cell division, the spindle fibres are attached at the centromere. Besides, the primary constrictions, additional narrow areas called secondary constriction are present. Some of the secondary constrictions are called nuclear organizers because they are necessary for formation of nucleolus. The tip of the chromosome is called telomere. The surface of a chromosome bears number of small swellings called chromomeres.

Diagram of Chromosome :



Structure of a Chromosome **2 + 1 (For diagram)**

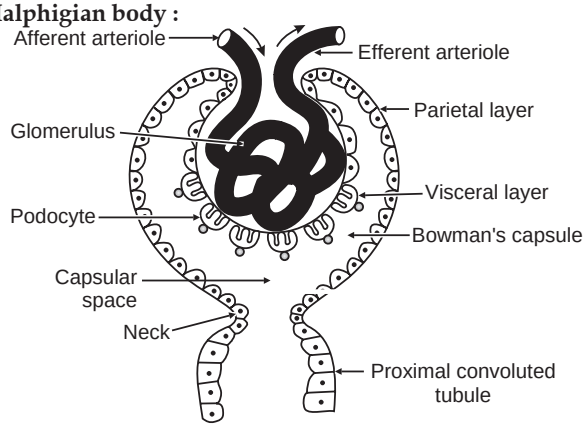
(iii) Genomics is the study of genes and genomes by using DNA sequencing and related analysis.

Applications of Genome :

(a) **Gene Therapy :** It is a method to correct a gene defect diagnosed in a child / embryo. Here genes are inserted into a person's cells and tissues to treat a hereditary disease.

(b) **Transgenic animals :** These are the animals whose genome has been altered by introduction of an extra (forcing) gene by manipulation. eg Transgenic rats, rabbits, pigs, sheep, cows and fish. **1 + 1 + 1**

(B) **Structure of a Malphigian body :**



To know about more useful books for class-12 click here

8. Histology of Testis :

- The transverse section of a testes shows the presence of seminiferous tubules lined by cuboidal germinal epithelial cells.
- One or several highly convoluted seminiferous tubules form a lobule of the testis.
- It bears numerous stages of spermatogenesis like spermatogonia, primary and secondary spermatocyte, spermatids and sperms.
- There are large pyramidal cells, called sertoli cells between germinal cells. These sertoli cells provide nourishment to the developing sperm till maturation.
- Between the seminiferous tubules, there are clusters of polygonal cells known as interstitial cells or Leydig cells. Leydig cells secrete male sex hormone testosterone or androgen.

Note on Human Sperm :

Human Sperm : Human sperm is a microscopic, elongated haploid motile male gamete. It consists of :

(a) Head : Head is oval shaped and consists of a haploid nucleus and a cap like acrosome. Acrosome is formed from Golgi complex. It contains lytic enzymes that help in fertilization.

(b) Neck : Behind the head is a neck containing proximal and distal centrioles.

(c) Middle piece : It is composed of axial filament surrounded by mitochondria and cytoplasm. Mitochondria produce energy for the sperm motility.

(d) Tail : It consists of a central axial filament. The sperm moves in fluid medium and female genital tract by the undulating movement of the tail. **4 + 3**

Structure of Human Eye :

Anatomy of Human eye : Human eye is nearly a spherical structure. Its wall is formed of three layers- sclera, choroid and retina.

(i) Outer layer : It is composed of sclera and cornea.

(a) Sclera : It is an opaque tissue that is usually known as white of the eye. It is composed of a dense connective tissue. It protects the inner structure and helps to maintain rigidity of the ball.

(b) Cornea : It is a transparent anterior portion of eye that lacks blood vessels and is nourished by lymph from the nearby area. It is slightly bulged forward and helps in focusing light rays with the help of lens. Conjunctiva (a transparent covering) protects cornea.

(ii) Middle layer : It is vascular in nature and contains choroid, ciliary body, and iris.

(a) Choroid : It is highly vascular middle layer that lies next to the sclera. It contains numerous blood vessels that provide nutrients and oxygen to the retina and other tissues. It also contains melanocytes which produces melanin.

(b) Ciliary body : The choroid layer is thin over posterior region and gets thickened in the anterior portion to form ciliary body. It contains blood vessels, ciliary muscles, and ciliary processes.

(c) Iris : At the junction of sclera and cornea, the ciliary body continues forward to form thin coloured partition called iris. It is the visible coloured portion of eye. Iris has a central opening called pupil.

(d) Pupil : It is the small aperture in the iris that regulates the amount of light entering the eye.

(e) Lens : The eye contains a transparent, biconvex, and elastic structure just behind the iris, known as lens. The lens is held in position by suspensory ligaments attached to the ciliary body.

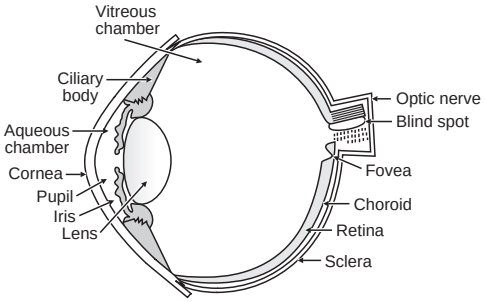
- The lens divides the eye ball into two chambers – an anterior aqueous and posterior vitreous chamber.
- The aqueous chamber lies between the cornea and lens. It is filled with aqueous humor, secreted by the ciliary body. It nourishes the cornea and lens.
- The vitreous chamber lies between the lens and the retina. It is filled with vitreous humor.
- Both the fluids help in maintaining the form of eyeball and in focusing the light rays.

(iii) Inner most layer : Retina is the innermost layer. It contains three layers of cells: inner ganglion cells, middle bipolar cells, and outermost photoreceptor cells.

(a) Photoreceptor layer : It is the outermost layer of neurons and consists of rods and cones. The cones are responsible for day light vision and color vision while rods function in dim light.

(b) Bipolar cell layer : These are the cells that synapse with the photoreceptors. Bipolar cells transmit an impulse to the ganglion cells.

(c) Ganglionic cell layer : It is the innermost layer, which give rise to optic nerve fibre. Optic fibre forms optic nerve in each eye and is connected with the brain. The photoreceptor cells are absent in this region. Hence, it is known as the blind spot. At the posterior part, lateral to blind spot, there is a pigmented spot called macula lutea. This spot has a shallow depression at its middle known as fovea. Fovea has only cone cells. They are devoid of rod cells. Hence, fovea is the place of most distinct vision.



Mechanism of Vision :

(a) A photoreceptor cell is composed of a protein called opsin and an aldehyde of vitamin-A called retinal.

(b) When light rays are focused on the retina through cornea, it leads to the dissociation of retinal from opsin protein. This changes the structure of opsin.

(c) As the structure of opsin changes, the permeability of membrane changes, generating a potential difference in the cells.

(d) This generates an action potential in the ganglionic cells and is transmitted to the visual cortex of the brain via optic nerves.

(e) In the cortex region of brain, the impulses are analysed and image is recognized based on the earlier memory and experience on the retina. **4 + 3**

■■

To know about more useful books for class-12 click here