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BIOLOGY

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&

IMP QUESTIONS

Course No. – BIO 111

Credits – 1+1=2

Course Title – Introductory Biology

Q.1 What do you mean by living organism? Explain the characteristics /features of living?

Ans. Living organisms is self-replicating ,evolving & self regulating system capable of responding to external stimuli.

Characteristics of living –

A] Cellular organization - Cellular organization is the component that make up the cell and how they are arranged inside it each component ,called an organelle performs a specific fuction that is vital for the cell .

B] Metabolism - The chemical processes in plant or animals that change the food into energy and help them to grow

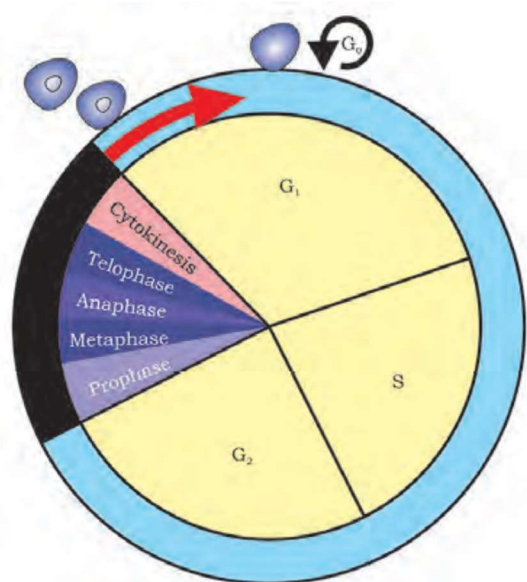
C] Growth - The gradual increase in size or number of plant or it can be defined as the irreversible change.

D] Reproduction - It can be as the biological process by which new individual organisms "off springs" are produced from their parents. There are 2 forms of reproduction sexual & asexual.

E] Response to stimuli – all living organisms need to respond to chages in the environment, although this happens in different ways the pattern of events is always the same.Plants can also respond to stimuli but the reponse is usually slower than that of animal.

Q.2 Define cell cycle , Draw neat labelled diagram of cell cycle and explain the different phases of cell cycle in brief.

Ans. The seires of sequential events or changes that occur in life of the dividing cell is known as **cell cycle**.



Cell cycle consists of two phases

Viz, 1] Interphase

2] Miotic phase

1] Interphase :- It is generally known as the DNA synthesis.

It consists of 3 sub phases

1] G₁ – Resting phase

2] S- Period of DNA replication

3] G₂- Resting phase after DNA replication

G₁ phase – It is a pre DNA replication phase, Thus this is a phase between telophase and S phase. This is the longest phase which takes 12 hours in *Vicia faba*. It is the most variable period of the cell cycle. Synthesis of the proteins and RNA takes place during this phase.

S phase – This phase comes after G₁ & takes lesser time than G₁ Phase, In *Vicia faba* it takes 6 hrs. the chromosome and DNA replication takes place during this phase.

G₂ phase – This is the post DNA replication phase and last substage of interphase. This phase also takes 12 hrs in *Vicia faba*, synthesis of protein and RNA occurs during this phase.

Cell prepares itself for entering into the mitotic phase.

2] Miotic phase - This is the most dramatic period of the cell cycle, involving a major reorganisation of virtually all components of the cell. Since the number of chromosomes in the parent and progeny cells is the same, it is also called as *Equational division*. Though for convenience mitosis has been divided into four stages of nuclear division (karyokinesis), it is very essential to understand that cell division is a progressive process and very clear-cut lines cannot be drawn between various stages.

Karyokinesis involves following four stages:

Prophase, Metaphase, Anaphase, Telophase.

Q.3 Explain in short Significance of Mitosis.

Ans. Mitosis or the equational division is usually restricted to the diploid cells only. However, in some lower plants and in some social insects haploid cells also divide by mitosis. It is very essential to understand the significance of this division in the life of an organism. Mitosis usually results in the production of diploid daughter cells with identical genetic complement. The growth of multicellular organisms is due to mitosis. Cell growth results in disturbing the ratio between the nucleus and the cytoplasm. It therefore becomes essential for the cell to divide to restore the nucleo-cytoplasmic ratio. A very significant contribution of mitosis is cell repair. The cells of the upper layer of the epidermis, cells of the lining of the gut, and blood cells are being constantly replaced. Mitotic divisions in the meristematic tissues – the apical and the lateral cambium, result in a continuous growth of plants throughout their life.

Q.4 Explain in short Significance of meiosis.

Ans. Meiosis is the mechanism by which conservation of specific chromosome number of each species is achieved across generations in sexually reproducing organisms, even though the process, per se, paradoxically, results in reduction of chromosome number by half. It also increases the genetic variability in the population of organisms from one generation to the next. Variations are very important for the process of evolution.

Q.5 State the laws of inheritance based on Mendel's experiment and explain any one with suitable example

Ans.

- 1. Law of segregation** – It states that when a pair of alleles is brought together in hybrid [F₁] they remain together without contaminating each other and they separate or segregate from each other into a gametes in a complete and pure form during the formation of gametes .
- 2. Law of Independent assortment**- This law states that when two pair of gene enters in F₁ combination; both of them have their independent dominant effect. These genes segregate when gametes are formed but the assortment occurs randomly and freely .

***brief explanation is to be given with suitable example.**

Q.6 What is binomial nomenclature? Explain it with suitable example and give the universal rules of nomenclature.

Ans. System of nomenclature of plants and animals in which scientific name of a plant or an animal consists of two components/parts is known as binomial nomenclature.

Example :-

According to binomial nomenclature system ,the scientific name of mango is *Mangifera indica*. In this,first name denotes the name of genus and while second denotes the name of species.

Universal rules of nomenclature-

1. biological names are generally in latin and written in italics. They are Latinized or derived from latin irrespective of their origin.
2. the first word in a biological name of genus and while second denotes the name of specific epithet.
3. Both the words in the biological name ,when handwritten are separately underlined ,or printed in italics to indicate their Latin origin.

4. The first word denoting the genus starts with the capital letter while the specific epithet starts with a small letter

Q.7 Define taxonomy & Enlist various taxonomic categories and explain in brief.

Ans. It is the study of identification, nomenclature and classification of plants and animals.

Taxonomic categories:-

A)Species: It is the basic unit in classification, the number of a species are closely related, derived from a common ancestor and can interbreed to produce fertile offspring's.

B)Genus: Genus is a group of related species, which have co-related characters.

C)Family: Family is a group of related genera.

D)Order: The order includes several related families.

E)Class: Several related orders are included in a class.

F)Phylum/Division: Phylum in animals and division in plants includes related classes.

G)Kingdom: Kingdom comprises of various phyla of animals and various divisions of plants.

Q.8 Describe modifications of stem and root with suitable examples.

Ans. In order to perform certain special functions a stem undergoes various modifications which are as below.

Modifications of stem :

1] Underground stems : RHIZOMES , TUBER, BULB & CORM.

2] Sub-aerial stems : RUNNER, SUCKER, STOLON.

3] Aerial stems : TENDRILS , THORN, PHYLLOCLADE, CLADODE, BULBILS.

EXPLANATION OF EACH IS TO BE GIVEN WITH SUITABLE EXAMPLES

Q.9 Define seed .Enlist the types of seed germination and explain the factors affecting seed germination.

Ans. SEED- A mature ovule consisting of an embryonic plant together with a store food, all surrounded by protective coat.

Types of Seed germination :

1. Epigeal germination
2. Hypogeal germination
3. Viviparous germination

Factors affecting germination :

1. Abiotic Factors : LIGHT,TEMPERATURE,AERATION & SOIL TYPE
2. Biotic Factors : SEED VIABILITY,DORMANCY PERIOD

EXPLANATION OF EACH FACTOR IS TO BE GIVEN IN BRIEF

Q.10. Enlist the main theories of evolution and explain in brief

Ans. (1) Lamarckism or Theory of Inheritance of Acquired characters.

(2) Darwinism or Theory of Natural Selection.

(3) Mutation theory of De Vries.

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

1.Lamarckism or Theory of Inheritance of Acquired characters:- It is also called “Theory of inheritance of acquired characters” and was proposed by a great French naturalist, Jean Baptiste de Lamarck in 1809 A.D. in his famous book “Philosophic Zoologique”. This theory is based on the comparison between the contemporary species of his time to fossil records.

His theory is based on the inheritance of acquired characters which are defined as the changes (variations) developed in the body of an organism from normal characters, in response to the changes in environment, or in the functioning (use and disuse) of organs, in their own life time, to fulfill their new needs. Thus Lamarck stressed on adaptation as means of evolutionary modification.

(2) Darwinism or Theory of Natural Selection:- Charles Darwin (1809- 1882 A.D.), an English naturalist, was the most dominant figure among the biologists of the 19th century. He made an extensive study of nature for over 20 years, especially in 1831-1836 when he went on a voyage on the famous ship “H.M.S. Beagle” and explored South America, the Galapagos Islands and other islands.He collected the observations on animal distribution and the relationship between living and extinct animals. He found that existing living forms share similarities to varying degrees not only among themselves but also with the life forms that existed millions of years ago, some of which have become extinct.

He stated that every population has built in variations in their characters. From the analysis of his data of collection and from Malthus’s Essay on Population, he got the idea of struggle for existence within all the populations due to continued reproductive pressure and limited resources and that all organisms, including humans, are modified descendents of previously existing forms of life.

In 1858 A.D., Darwin was highly influenced by a short essay entitled "On the Tendency of Varieties to Depart Indefinitely from the Original Type" written by another naturalist, Alfred Russel Wallace (1812-1913) who studied biodiversity on Malayan archipelago and came to similar conclusions.

Darwin and Wallace's views about evolution were presented in the meeting of Linnean Society of London by Lyell and Hooker on July 1, 1858. Darwin's and Wallace's work was jointly published in "Proceedings of Linnean Society of London" in 1859. So it is also called Darwin-Wallace theory.

Darwin explained his theory of evolution in a book entitled "On the Origin of Species by means of Natural Selection". It was published on 24th Nov., 1859. In this theory, Charles Darwin proposed the concept of natural selection as the mechanism of evolution.

(3) Mutation theory of De Vries:- The mutation theory of evolution was proposed by a Dutch botanist, Hugo de Vries (1848-1935 A.D.) in 1901 A.D. in his book entitled "Species and Varieties, Their Origin by Mutation". He worked on evening primrose (*Oenothera lamarckiana*).

A. Experiment: Hugo de Vries cultured *O. lamarckiana* in botanical gardens at Amsterdam. The plants were allowed to self pollinate and next generation was obtained. The plants of next generation were again subjected to self pollination to obtain second generation. Process was repeated for a number of generations.

B. Observations: Majority of plants of first generation were found to be like the parental type and showed only minor variations but 837 out of 54,343 members were found to be very different in characters like flower size, shape and arrangement of buds, size of seeds etc. These markedly different plants were called primary or elementary species. A few plants of second generation were found to be still more different. Finally, a new type, much larger than the original type, called *O. gigas*, was produced. He also found the numerical chromosomal changes in the variants (e.g. with chromosome numbers 16, 20, 22, 24, 28 and 30) upto 30 (Normal diploid number is 14).

C. Conclusion:

1. The evolution is a discontinuous process and occurs by mutations (L. mutate = to change; sudden and inheritable large differences from the normal and are not connected to normal by intermediate forms). Individuals with mutations are called mutants.
2. Elementary species are produced in large number to increase chances of selection by nature.
3. Mutations are recurring so that the same mutants appear again and again. This increases the chances of their selection by nature.
4. Mutations occur in all directions so may cause gain or loss of any character.
5. Mutability is fundamentally different from fluctuations (small and directional changes). So according to mutation theory, evolution is a discontinuous and jerky process in which there is a jump from one species to another so that new species arises from pre-existing species in a single generation (macrogenesis or saltation) and not a gradual process as proposed by Lamarck and Darwin.

(4) Neo-Darwinism or Modern concept or Synthetic theory of evolution:- The detailed studies of Lamarckism, Darwinism and Mutation theory of evolution showed that no single theory is fully satisfactory.

Neo-Darwinism is a modified version of theory of Natural Selection and is a sort of reconciliation between Darwin's and de Vries theories.

Modern or synthetic theory of evolution was designated by Huxley (1942). It emphasises the importance of populations as the units of evolution and the central role of natural selection as the most important mechanism of evolution. The scientists who contributed to the outcome of Neo-Darwinism were: J.S. Huxley, R.A. Fisher and J.B.S. Haldane of England; and S. Wright, Ford, H.J. Muller and T. Dobzhansky of America.

Q.11 Write in brief on Biodiversity conservation.

Ans. Biodiversity Conservation

In situ conservation

(1) The most appropriate method to maintain species of wild animals and plants in their natural habitats. This approach includes conservation and protection of the total ecosystems and its biodiversity through a network of protected areas.

(2) The common natural habitats (protected areas) that have been set for in-situ conservation of wild animals and plants include:

- (i) National parks
- (ii) Wild life sanctuaries
- (iii) Biosphere reserves
- (iv) Several wetlands, mangroves and coral reefs. (v) Sacred grooves and lakes.

(3) Hot spot of biodiversity are those regions of rich biodiversity which have been declared sensitive due to direct or indirect interference of human activities.

(4) There are 25 terrestrial hot spots in the world including two from India.

Ex situ conservation

(1) Threatened animals and plants are taken out from their natural habitat and placed in special setting where they can be protected and given special care.

(2) Ex situ conservation includes the following:

- (i) Sacred plants and home gardens
- (ii) Seed banks, field gene banks, cryopreservation.
- (iii) Botanical gardens, Arboreta, Zoological gardens, Aquaria.

Convention on Biodiversity:

(1) "The earth Summit" held in Rio de Janeiro in 1992 called upon all nations to take appropriate measures for conservation of biodiversity and sustainable utilization of its benefits.

(2) Second international Conference on Sustainable development held in 2002 in Johannesburg, South Africa, 190 countries pledged their commitment to achieve by 2010 a significant reduction in the current rate of biodiversity loss at global, regional and local level.

Q.12 Write short notes on types of Taxonomy.

Ans. 1. Alpha taxonomy or classical taxonomy: It is based on external morphology, origin and evolution of plants.

2. Beta taxonomy or Explorative taxonomy: Besides external morphology, it also includes internal characters' like embryological, cytological, anatomical characters etc.

3. Omega taxonomy or Encyclopaedic taxonomy: Omega taxonomy has widest scope. It is based on all the information or data available about plants.

4. Cytotaxonomy: The use of cytological characters of plants in classification or in solving taxonomic problems is called cytotaxonomy. Cytological characters constitute an important aid to plant taxonomy, especially in determining affinities at the generic and infrageneric levels.

5. Chemotaxonomy: The uses of chemical characters of plants in classification or in solving taxonomic problems is called chemotaxonomy or chemical taxonomy. It is based on the chemical constitution of plants. The fragrance and taste vary from species to species.

The basic chemical compounds used in chemotaxonomy are alkaloids, carotenoids, tannins, polysaccharide, nucleic acids, fatty acids, amino acids, aromatic compounds etc.

6. Karyotaxonomy: Based on characters of nucleus and chromosomes. Pattern of chromosomal bands (dark bands and light bands) is most specific characters.

Q.13 Write short notes on role of animals in agriculture

Ans. bhai iska to answer khud se likh le ;)

Q.14 Explain the difference between Darwinism and Neo-Darwinism

<i>Darwinism (Natural Selection)</i>	<i>Neo-Darwinism</i>
<p>(1) It is the original theory given by Charles Darwin (1859) to explain the origin of new species.</p> <p>(2) According to this theory accumulation of continuous variations causes changes in individuals to form new species.</p> <p>(3) It believes in the selection of individuals on the basis of accumulation of variation. (4) Darwinism does not believe in isolation.</p> <p>(5) It can explain the origin of new characters.</p> <p>(6) Darwinism cannot explain the persistence of certain forms in the unchanged condition.</p>	<p>(1) Neo-Darwin is a modification of the original theory of Darwin to remove its shortcomings.</p> <p>(2) Instead of continuous variations, mutations are believed to help form new species.</p> <p>(3) Variations accumulate in the gene pool and not in the individuals.</p> <p>(4) Neo-Darwinism incorporates isolation as an essential component of evolution.</p> <p>(5) The theory can explain the occurrence of unchanged forms over millions of years.</p> <p>(6) Normally only those modifications are transferred to next generation which influence germ cells or where somatic cells give rise to germ cells.</p> <p>Difference amongst Lamarckism, Darwinism and Mutation Theory</p> <p>Properties Lamarckism Darwinism Mutation Theory</p>

Q.15 Enlist the steps of chemical evolution.

Ans. A. The Chemical Evolution:

Step 1: Formation of simple molecules

Step 2: Formation of Simple organic compounds

Step 3: Formation of complex organic compounds

Step 4: Formation of nucleic acids and nucleoproteins Organic Evolution:

Step 5: Formation of Coacervates

Step 6: Formation of Primitive cell

Step 7: Origin of autotrophism

Step 8: Origin of Eukaryotic cells

Q.16 Enlist & explain the Evidences of Organic Evolution

Ans. Evidences of Organic Evolution

The following are the evidences in favour of Organic Evolution:

- (i) Evidences from Classification
- (ii) Evidences from Comparative Anatomy
 - (a) Analogy and Homology
 - (b) Vestigial organs
- (iii) Evidences from Physiology
- (iv) Evidences from Serology
- (v) Evidences from Embryology
- (vi) Evidences from Palaeontology
- (vii) Evidences from geographic distribution
- (viii) Evidences from Genetics

EXP-

1.Evidences from Classification: All the known living animals and plants have been classified into various species, genera, families, order, classes, phyla and kingdoms. The classification of a particular animal is attempted only after its extensive study.

2.Evidences from Comparative Anatomy: In all the living animals, the basic substance of life is Protoplasm. If the species had been created separately, then there should be no relationship in the various organs and systems of animals. But on the contrary, we see that large number of animals although unlike in appearance show most of the systems and organs made on the same plan. The resemblance is very close in the members of the same group.

3.Evidences from Physiology: Various types of chemical tests exhibit many basic similarities in physiological and chemical properties that show a physiological relationship among animals.

4.Evidences from Serology: This is a method by which the reactions of blood serum are observed. From the blood are also extracted the crystals of Oxyhaemoglobin. The structure differs in different vertebrates, but in a definite order. The reaction is nearly identical in man and anthropoid monkeys, but slightly less identical with other mammals.

5.Evidences from Embryology: With the exception of a few, every multi-cellular animal originates from a zygote. The development from zygote to adult shows many similarities in various organisms. The development is termed as ontogeny

6.Evidences from Palaeontology: The study of fossils and their interpretation forms one of the great evidences of evolution. An Italian scientist, Leonardo da Vinci, was the first person to recognize their importance and said they were either remains of organisms or their impressions on some sort of clay or rock.

7.Evidences from geographic distribution: If the study of horizontal distribution of animals on the face of this earth is made, it would be seen that animals are not evenly distributed. Two

identical places with the same climate and vegetation may not have same sort of animal fauna

8.Evidences from Genetics: Johan Gregor Mendel in 1866 published his work on experimental breeding. He bred two individuals differing in certain well-defined characters, and observed the ratio in which various contrasting parental characters appeared in successive generations.

Q.17 WRITE SHORT NOTES ON STUDY OF FAMILIES {Plant Systematics}

1.Cruciferae (Brassicaceae)

2.Papilionaceae (Fabaceae)

3.Poaceae (Gramineae)

Ans. Please refer page no. 59 of BIO-111 notes by YOGESH CHAUDHARI

Q.18 Distinguish between the following :-

1.Recemose & Cymose inflorescence

2.Dicotlydonae & Monocotlydone

3.Mitosis & meiosis

Ans .

1.Recemose & Cymose inflorescence

1. Recemose inflorescence	Cymose inflorescence	2
Growing point of the peduncle is not utilized in the production of a flower.	Growing point of the peduncle is utilized in the production of flower.	
Recemose inflorescence has indefinite growth	Cymose inflorescence has definite growth	
Flowers are produced in acropetal succession i.e older flowers towards the base and younger flowers are towards the apex.	Flowers are produced in basipetal succession i.e older flowers towards the apex and younger flowers are towards the base.	
e.g. Caesalpinia, Brassica etc.	e.g. Clerodendron, Jasmine etc.	

2. Dicotyledonae & Monocotyledonae

2. Dicotyledonae	Monocotyledonae	2
Members belonging to the class dicotyledonae referred to as dicotyledonae	Members belonging to the class monocotyledonae referred to as monocotyledonae.	
The seeds of dicotyledons contains two cotyledons	The seeds of monocotyledons contains single cotyledons	
Root system is tap root system which is differentiated into primary, secondary and tertiary roots.	Root system is of fibrous or adventitious type.	
Leaves show reticulate venation	Leaves show parallel venation	
Stem is generally branched	Stem is generally unbranched	
Flowers are generally large, tetramerous or pentamerous	Flowers are generally small, non-conspicuous and trimerous.	

3. Mitosis & meiosis

3. Mitosis	Meiosis	2
Consist of one nuclear division	Consist of two nuclear division	
One cell cycle results in production of two daughter cells	One cell cycle results in formation of four daughter cells.	
The chromosome number of daughter cells is the same as that of mother cell	Daughter cells contains half the chromosome number of mother cell	
Daughter cells are identical with mother cell in structure and chromosome	Daughter cells are different from mother cell in chromosome number and	

composition.	composition
Mitosis occurs in somatic tissues	It occurs in reproductive tissues.
Total DNA of nucleus replicates during S phase	99.7% DNA replicates during S phase and remaining 0.3% during zygotene stage
There is no pairing between homologous chromosomes	Homologous chromosomes pair during pachytene.

SECTION "B"

Q. 11 Fill in the blanks.

- 1) (i) A taxonomic group of closely related genera is known as **family**. 1
- 2) (ii) The mode of arrangement of leaves on the stem and the branch is known as **phyllotaxy**. 1
- 3) (iii) The term 'classification' was coined by **A. P. de Candolle**. 1
- 4) (iv) **Crossing over** is the most important event during prophase - I. 1

Q. 12 Define the following terms

1. **Division:** Category composed of related classes. 1
2. **Synonym:** Single species is described under different names by different authors. 1
3. **Placentation:** Mode of arrangement of ovules on the placenta within the ovary. 1
4. **Inflorescence:** The reproductive axis/ peduncle bearing a group of similar 1