

MODEL ANSWER PAPER

MAHARASHTRA AGRICULTURAL UNIVERSITIES EXAMINATION BOARD, SEMESTER END EXAMINATION

B. Sc. (Hons.) Agriculture/ B. Sc. (Hons.) A.B.M. /B. Tech. (Food Tech.)

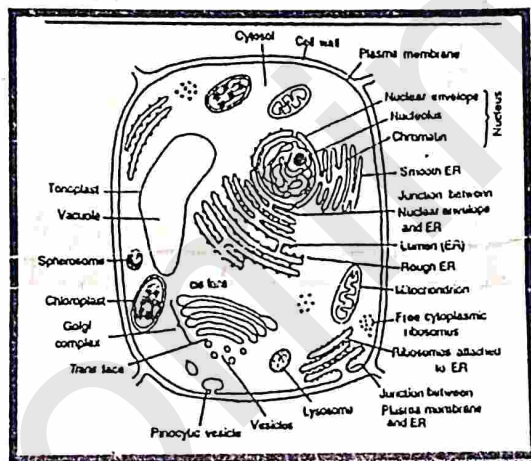
Semester	:	I (New)		Academic year	:	2019-2020
Course No.	:	BIO 111	Title	:	Introductory Biology	
Credits	:	2(1+1)				
Day & Date	:		Time	:	2hrs	Total marks : 40

SECTION "A"

Q.1	Define cell?	1
	Enlist various parts of plant cell with a diagram	3

Ans. Definition; Cell is the structural unit of all living organisms and all the living cells have structural and functional similarities.

Diagram:



Various parts of plant cell:

1. Cell wall and related structures
2. Plasma membrane
3. Cytoplasm: The cytoplasm has several distinct structures.
 - a. Endoplasmic reticulum
 - b. Golgi complex
 - c. Lysosomes
 - d. Peroxisomes
 - e. Glyoxysomes
 - f. Spherosomes
 - g. Vacuole
 - h. Centrosome
 - i. Ribosomes
 - j. Chloroplasts (Plant cells)

- k. Mitochondria
- l. Nucleus

Q.2	State Mendel's laws?	1
	Explain any one with suitable example	3

Ans. State Laws

1. Law of Segregation
2. Law of Independent Assortment

Explanation of any one law with example

1. The Law of Segregation states that when any individual produces gametes, the copies of a gene separate, so that each gamete receives only one copy. A gamete will receive one allele or the other. The direct proof of this was later found when the process of meiosis came to be known. In meiosis the paternal and maternal chromosomes get separated and the alleles with the characters are segregated into two different gametes.

Or

2. The Law of Independent Assortment, also known as "Inheritance Law", states that alleles of different genes assort independently of one another during gamete formation. While Mendel's experiments with mixing one trait always resulted in a 3:1 ratio between dominant and recessive phenotypes, his experiments with mixing two traits (dihybrid cross) showed 9:3:3:1 ratios. But the 9:3:3:1 table shows that each of the two genes are independently inherited with a 3:1 ratio. Mendel concluded that different traits are inherited independently of each other, so that there is no relation, for example, between a cat's color and tail length. This is actually only true for genes that are not linked to each other

(Explain with suitable example)

Q.3	Describe modifications of root with suitable examples	4
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Ans. Roots in some plants change their shape and structure and become modified to perform functions other than absorption and conduction of water and minerals.

- a. Modification of tap roots for food storage
 1. Conical root: e.g. Carrot
 2. Fusiform root: e.g. Radish
 3. Napiform root e.g, Beet
- b. Modification of tap root for respiration
 1. Pneumatophores e.g. *Avicennia*, *Rhizophora*

- c. Modification of adventitious root for additional mechanical support
 1. Stilt roots e.g. Maize
 2. Climbing roots e.g. Pothos (Money plant)
 3. Prop roots e.g. Banyan tree
- d. Modification of adventitious root for food storage
 1. Simple tuberous roots e.g. sweet potato
 2. Fasciculated tuberous roots e.g. Dahlia
- e. Modification of adventitious roots for absorption
 1. Parasitic or haustorial roots e.g. Cuscuta
 2. Epiphytic roots e.g. Vanda, Vanilla

Q.4	What do you mean by living organism?	1
	Explain the characteristics of living organisms	3

Ans. Definition: It is self-replicating evolving and self-regulating systems capable of responding to external stimuli.

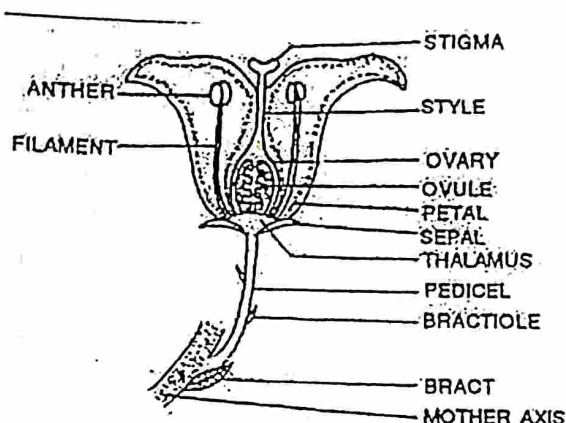
Characteristics:

- a. **Protoplasm.** All living objects contain protoplasm which is the physical basis of life and performs all the vital functions.
- b. **Life-cycle.** All living objects follow a definite life-cycle comprising birth, growth, reproduction, old age and death.
- c. **Cellular structure** A living body is composed of regular cells and is well organized in form and size, both externally and internally.
- d. **Respiration.** This is a complex vital process, resulting in breakdown of food with the release of CO₂ and considerable energy at all times and at all temperatures.
- e. **Metabolism.** Metabolic changes (constructive and destructive) are a characteristic sign of life.
- f. **Nutrition.** Nutrition through food is a regular feature in all living organisms.
- g. **Reproduction.** All living objects reproduce periodically by one or more methods for continuation of the species.
- h. **Growth.** Growth in living objects is internal, i.e. it proceeds from within the cell as a result of metabolic changes.
- i. **Movement.** Spontaneous movement is a characteristic sign of life-either movement of protoplasm or of an entire organism or of one of the organs.

Q.5	Define flower?	1
	With a neat labelled diagram describe the different parts of a typical flower.	3

Ans. Definition: Condensed and highly modified shoot specially designed for sexual reproduction, producing fruits and seeds.

Diagram:



Different parts of flower:

A typical shows following parts

1. **Pedicel** : It is the stalk of flower
2. **Thalamus** : It is an enlarged and condensed tip of pedicel
3. **Floralwhorls**

a. Accessory floral whorls

- i. **Calyx**: It is the outermost whorl made up of sepals. It is green in colour and protect the inner whorls of flower and also help in photosynthesis.
- ii. **Corolla**: It is the second whorl internal to the calyx made up of petals which are usually enlarged, delicate and bright coloured to attract the insects for pollination.

b. Essential Floral whorls

- i. **Androecium**: It is the third whorl internal to the corolla made up of male reproductive organs called stamens. Each stamen has an anther and a stalk like part called filament. Their function is to produce pollen grains.
- ii. **Gynoecium**: It is the innermost whorl made up of female reproductive organ called carpels. Each carpel is differentiated into Ovary, Style and Stigma. Their function is to produce female gamete called egg.

Q.6	Write short notes on (Any Two)	
a.	Theories of evolution	2
b.	Inflorescence	2
c.	Binomial nomenclature	2

Ans. a. Theories of evolution

1. Lamarckism or Theory of inheritance of acquired characters
2. Darwinism or Theory of natural selection
3. Mutation theory of evolution

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

b. Inflorescence

The mode of arrangement of flowers on the floral axis is called inflorescence.

Types of inflorescence: 1. Racemose 2. Cymose.

Racemose: The growth of peduncle is indefinite. The apical bud never terminates into the flower. The flower develops in acropetal succession e.g. Sunflower, Mustard, Radish etc.

Cymose: The growth of peduncle is definite. The apical terminates into the first flower. The flowers develop in basipetal succession e.g. Jasmine, Onion etc.

c. Binomial nomenclature

System of nomenclature of plants and animals in which scientific names are consist of two components or parts is known as binomial nomenclature.

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

Biological names are generally in latin language and written in italics. They are Latinized or derived from Latin irrespective of their origin.

Q.7	Differentiate between (Any Two)	
a)	Mitosis and Meiosis	2
b)	Tap root system and adventitious root system	2
c)	Dicotyledonous and monocotyledonous seed	2

Ans.

a. Mitosis and Meiosis

Mitosis	Meiosis
It takes place in somatic cells.	It takes place in reproductive cells
It involves only one nuclear division	It involves two successive divisions
Crossing over did not occur	Crossing over occurs
New cells produced are similar to each other and also to original mother cell	New cells produced are not similar
Two daughter cells are produced	Four daughter cells are produced
It helps in growth of organism	It helps in reproduction of organism

b. Tap root system and adventitious root system

Tap root system	Adventitious root system
It is produced from radical	It arises from any other parts than radical
Tap roots are always underground	It may be underground or aerial

Primary roots remains through out the life of plant	Primary roots are short lived
It has single primary roots	It has cluster of roots
It may be deep or surface feeder	It is always surface feeder
It is generally present in dicot plants	It is commonly present in monocot
E.g. Carrot, Figs , Sunflower	E.g. Maize, Sorghum etc

c. Dicotyledonous and monocotyledonous seed

Dicotyledonous seed	Monocotyledonous seed
It contains two cotyledons	It contains only one cotyledon
It is generally non endospermic	It is generally endospermic
The food is stored in fleshy cotyledon	The cotyledon is thin and food is stored in endosperm
Aleurone layer is absent	Aleurone layer is found outside the embryo
Plumule occurs in between the two cotyledons	Plumule occurs at the one end of the cotyledon
The testa and tegmen of seed coat are separated from fruit wall	The testa and pericarp are fused together
e.g. Chickpea, Pea, Groundnut etc	e.g. Jowar, Maize, Rice etc.

Q.8	Define taxonomy?	1
	Describe in brief various taxonomic categories	3

Ans. Definition: This deals with the description and identification of plants, and their classification into various natural groups according to the resemblances and differences in their morphological characteristics.

Taxonomic categories:

- Species:** It is the basic unit of classification. The members of a species are closely related
- Genus:** It is a group of related species which have a co related characters
- Family :** It is a group of related genera
- Order:** It includes several related families
- Class:** Several related orders are included in a class
- Phylum/Division:** Phylum in animals and division in plants includes related classes
- Kingdom:** It comprises of various phyla of animals and various divisions of plants.

Q.9 Describe in brief plant family fabaceae

4

Ans. Fabaceae family was earlier called as Papillionoideae, which is a sub family of Leguminosae.

1. Vegetative characters:

Root :Tap root with numerous lateral roots. Being leguminous root nodules are developed on roots that help fix atmospheric nitrogen

Stem: Erect or climber

Leaves: Alternate, pinnately compound or simple, leaf base pulvinate, stipulate, venation reticulate.

2. Floral characters

Inflorescence : Racemose type

Flower : Bisexual, zygomorphic

Calyx : Five sepals, gamosepalous, imbricate aestivation

Corolla: Five petals, polypetalous, papilionaceous, vexillary aestivation

Androecium : Ten stamens, diadelphous, antherditheous

Gynoecium: Ovary superior, mono carpellary, unilocular with many ovules, marginal placentation , single style.

3. Floral Formula :

Floral formula : $\% K_{(5)} C_{1+2(2)} A_{(9)+1} \underline{G}_1$

4. Economic importance:

- It is observed that many plants belonging to family fabaceae are sources of pulses (gram, pigeonpea, mungbean)
- Edible oil (Soybean, Groundnut)
- Dye (Indigofera) and fibres (Sunhemp), fodder (Sesbania trifolium), ornamentals (lupin) Medicine (Muliathi)

Q.10	Define seed germination?	1
	Explain in brief its types with suitable example	3

Ans. **Definition:** The process by which the dormant embryo wakes up and begins to grow is known as seed germination.

Types of seed germination:

Epigeal Germination: . In some seeds such as bean, gourd, tamarind, castor, cotton, etc., the cotyledons are seen to be pushed upwards by the rapid elongation of the hypocotyl i.e. the portion of the axis lying immediately below the cotyledons. Germination of this kind is said to be Epigeal germination

Hypogeal Germination: In other seeds such as gram, pea, mango, litchi, jack, groundnut, etc., the cotyledons are seen to remain in the soil or just on its surface. In such cases the epicotyl, i.e. the portion of the axis lying immediately above the cotyledons, elongates and

pushes the plumule upwards. The cotyledons do not turn green, but gradually dry up and fall off. Germination of this kind is said to be hypogeal

Vivipary Germination: Many plants growing in saltlakes and sea-coasts show a special type of germination of their seeds, known as vivipary. The seed germinates inside the fruit while still attached to the parent tree and nourished by it. The radicle elongates, swells in the lower part and gets stouter. Ultimately the seedling separates from the parent plant due to its increasing weight, and falling vertically becomes embedded in the soft mud below. The radicle presses into the soil, and quickly lateral roots are formed for proper anchorage. E.g. Rhizophora, Sonneratia, Heritiera etc.

SECTION "B"

Q.11	Define the following terms	4
	i) Crossing over	ii) Perianth
	iii) Phyllotaxy	iv) Eugenics

Ans :

- Crossing over:** Exchange of genetic material between non sister chromatids of homologous chromosomes is called crossing over.
- Perianth:** When calyx and corolla are not differentiated but together form one set of whorl called perianth.
- Phyllotaxy:** Mode of arrangement of leaves on the stem and its branches is called phyllotaxy
- Eugenics:** Study of human genes is called eugenics.

Q.12	a)	Fill in the blanks	4
	i)	Xylem is a water conducting tissue in plants.	
	ii)	A series of changes or sequential events which occur regularly in a dividing cell is called as Cell cycle	
	iii)	A flower without pedicel is called sessile flower	
	iv)	The stilt roots occur in Maize/Sugarcane crop.	

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