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SEMESTER END THEORY EXAMINATION

MODEL ANSWER

B.Sc. (Hons.) Agriculture

Semester	:	III (New)	Term	:	I	Academic Year	:	2021-22
Course No.	:	BIOCHEM-231	Title	:	Fundamentals of Plant Biochemistry and Biotechnology			
Credits	:	2 (2+1)						
Day & Date	:	11.11.2021	Time	:	2.00 Hr	Total Marks	:	80

Note : 1. Solve any eight questions from Section "A"
2. Solve any twelve questions form Section "B"
3. All question are compulsory from Section "C"
4. Draw neat diagrams wherever necessary
5. Follow the online exam mode and conduct rules given by the Universities.

SECTION "A"

(Write the answers in 5 lines. Each question carries 4 marks)(attempt any 8) 32

Q 1. Enlist various stages of micro propagation

Stage 0: This is the initial step in micro- propagation, and involves the selection and growth of stock plants for about 3 months under controlled conditions.

Stage I: In this stage, the initiation and establishment of culture in a suitable medium is achieved. Selection of appropriate explants is important.

Stage II: mainly involves multiplication of shoots or rapid embryo formation from the explant.

Stage III: This stage involves the transfer of shoots to a medium for rapid development into roots. Sometimes, the shoots are directly planted in soil to develop roots.

Stage IV: This stage involves the establishment of plantlets in soil. This is done by transferring the plantlets of stage III from the laboratory to the environment of greenhouse.

Q.2. Why meristem is free from virus?

- a. Viruses readily move in plant body through the vascular system which is absent in meristem. The alternate method of cell-to-cell movement of the virus through plasmodesmata is rather too slow to keep pace with the actively growing tip.
- b. High metabolic activity in the actively dividing meristem cells does not allow virus replication.
- c. The virus inactivating systems in the plant body has higher activity in the meristem than in any other region.
- d. High endogenous auxin level in the shoot apices may inhibit virus multiplication.

Q 3. Define biochemistry. State its importance in Agriculture.

Biochemistry: can be defined as the science concerned with study of chemical nature and chemical behavior of living things.

Importance: 1. To evaluate nutritive value of food grains 2. Development of better genotypes 3. Evaluation of nutritive value of cattle and poultry feed. 4. Inactivation of toxic and anti-nutritional factors in food grains. 5. Biochemistry of pest and disease resistance in plants. 6. Biochemical study of drought resistance in genotypes. 7. Biochemical study of sugars and nutritive values in fruits. 8. Study of biochemical changes in fruits and vegetables in post harvest management.

Q 4. Define molecular marker. Enlist different types of molecular markers

Molecular markers consist of specific molecules which show easily detectable differences among different strains of a species or among different species.

DNA based molecular markers.

These DNA based markers are differentiated in two types:

1. Non PCR based (RFLP) and
2. PCR based markers (RAPD, AFLP, SSR, SNP etc.).

Types of markers

1. Restriction fragment length polymorphism (RFLP).
2. Sequence-tagged sites (STS)
3. Expressed sequence tag markers (EST)
4. Sequence-tagged microsatellite site markers (STMS)
5. Inter simple sequence repeat markers (ISSR)
6. Randomly-amplified polymorphic DNA markers (RAPD)

Q 5. Enlist different methods of gene transfer.

A) Vector Mediated:

- 1) Agrobacterium mediated
- 2) Virus mediated

B) Non vector mediated

- 1) PEG
- 2) Calcium phosphate co precipitation
- 3) Electroporation
- 4) Biolistics
- 5) Microinjection

- 6) Macroinjection
- 7) Liposome
- 8) Silicon carbide
- 9) DNA transfer via pollen

Q 6. Define carbohydrate and classify polysaccharides with suitable examples.

Carbohydrates: Carbohydrates are aldehydes or ketonic derivatives of polyhydroxyalcohols.

Classification of polysaccharides with examples

1. Homopolysaccharides- on hydrolysis gives single monosaccharide units.

- i) Pentosans- contains pentoses ($C_5H_8O_4$)
- ii) Hexosans- contains hexoses ($C_6H_{10}O_5$) subdivided into
 - a) Glucosans- Polymer of glucose e.g. starch, glycogen.
 - b) Fructosans- Polymer of fructose e.g. inulin.
 - c) Galactans- Polymer of galactose e.g. Galactan.
 - d) Mannans- Polymer of mannose e.g. Mannans.

2. Heteropolysaccharides- on hydrolysis gives different types of monosaccharide units

- a) Gum- consists of arabinose, rhamnose, galactose and gluconic acid.
- b) Agar- The sulphuric acid esters of galactans consists of galactose, galactouronic acid.
- c) Pectins- Fundamental unit is pectic acid, consists of arabinose, galactose,

galactouronic acid.

Q.7 State the various biomolecules of life and describe their properties

Biomolecules of Life: Water, Carbohydrates, Proteins, Lipids, Nucleic Acids, Enzymes etc

Properties:

1. Most of them are organic compounds.
 2. Many of them are asymmetric
 3. Functional group determines their characteristics.
 4. They have specific shape and dimensions
 5. Building block molecules have simple structure
- Macromolecules are made of building block molecules

Q. 8 Differentiate between reducing and non-reducing sugar.

Reducing sugar

1. Carbohydrates with a free aldehyde (at C-1) or a free ketone (at C-2) group
2. They are in hemiacetal or hemiketal form.
3. Do exhibit mutarotation.
4. Do form osazones with phenyl hydrazine
5. Examples- Glucose, Fructose, Lactose, Maltose, Cellobiose

Non-reducing sugar

1. Aldehyde or ketone group is not free but instead utilized in bound formation.
2. They are in acetal or ketal form
3. Do not exhibit mutarotation.
4. Do not form osazones.
5. Examples- Sucrose, Glycogen, Inulin

Q. 9 What are nucleic acid and differentiate between RNA and DNA

Nucleic acids: Nucleic acids are the polynucleotides having high molecular weight. The monomeric unit of which is nucleotide.

Difference between RNA and DNA

Component	RNA	DNA
1) Acid	Phosphoric acid	Phosphoric acid
2) Pentose sugar	D-ribose	D-2-Deoxribose
3) Nitrogen base		
a) Purines	Adenine	Adenine
GaunineGaunine		
b) Pyrimidine	Cytosine	Thymine
	Uracil	Cytosine
d) Stand	Single stranded	Double stranded

Q. 10 Describe in brief how somatic hybrid is different from cybrid.

Somatic hybridization is a process which involves *in vitro* fusion of isolated protoplasts to form a hybrid cell and its subsequent development to form a hybrid plant. Such hybrid plants are called somatic hybrids.

The cytoplasmic hybrids where the nucleus is derived from only one parent and the cytoplasmic is derived from both the parents are referred to as cybrids. The phenomenon of formation of cybrids is regarded as cybridization. Genetically cybrids are hybrids only for cytoplasmic traits.

SECTION "B"

(Write answers in one sentence only. Each question carries 2 marks, attempt any 12 only))

Q 11. Answer in one sentence / Do as directed

a) Give Scientific contribution of Murashige and Skoog.

Ans: Developed widely used plant tissue culture media and popularly known as MS Media

b) Give Scientific Contribution of Skoog & Miller

Ans: Skoog and Miller (1957) demonstrated for the first time that a ratio of auxin and cytokinin can control the root, shoot and callus formation.

c) Give Scientific contribution of Maheshwari and Guha

Ans: Production of first haploid

d) Define hardening?

Ans: The process by which in vitro grown plantlets transferred or bring into open environment for acclimatization is known as hardening

e) What is rhizogenesis?

Ans: Rhizogenesis is a type of organogenesis by which only adventitious root formation takes place in the callus tissue

f) Define heredity?

Ans: It is the science which deals with the transfer of characteristics or traits from one generation (parents) to the next generation (daughter) is known as heredity.

g) Define protein

Ans: Protein is a nitrogen containing polymeric compound made of different amino acids

h) What is lipids

Ans: Lipid is an ester of glycerol and fatty acid or triglyceride of fatty acids

i) Who has introduced the term Biochemistry

Ans: Carl Newberg

j) Who is considered as the Father of Biochemistry

Ans: Antoin Lavoisier

k) Who is known as Father of Enzymology

Ans: J. B. Sumner

l) State the example of invert sugar

Ans Sucrose or Cane sugar

m) What is amylose content is starch

Ans 10-20 %

n) What is the example of keto hexose

Ans Fructose

SECTION "C"

24

Q.12 Attempt all MCQ questions and all carries 1 marks each

- 1 Genetic codons are always -----
 - a) Singlet
 - b) Doublet
 - c) **Triplet**
 - d) Quadruplets
- 2 PCR is invented by -----
 - a) Friedrich Miesceher
 - b) Carl Newberg
 - c) **KaryMullies**
 - d) J. B. Sumner
- 3 DNA was first isolated by -----
 - a) Watson and Crick
 - b) **Friedrich Miescher**
 - c) J. B. Sumner
 - d) None of these
- 4 Co-dominant DNA molecular marker is -----
 - a) RAPD
 - b) ISSR
 - c) **SSR**
 - d) AFLP
- 5 The important tools used in rDNA technology include -----
 - a) Enzymes for DNA manipulation
 - b) Vectors
 - c) Expression hosts
 - d) **All of these**
- 6 The tool for cutting DNA molecules is/are -----
 - a) **Restriction endonucleases**
 - b) Ligases
 - c) Both a and b
 - d) None of these
- 7 Plasmids DNA is -----

- a) Self-replicating
c) Circular
b) Double stranded
d) All of these

8 Taq polymerase is-----
a) **Thermostable**
c) Thermoliable
b) Thermounstable
d) None of these

9 Enzymes cut DNA at specific locations based on the nucleotide sequence are known as --
-
a) **Restriction enzymes**
c) Nucleases
b) DNA ligase
d) None of these

10 Flavr-Savr™ is the GM variety of -----
a) Potato
c) Cotton
b) **Tomato**
d) Brinjal

11 Commonly used plant tissue culture media for in vitro micropropagation of Banana is ----
a) Woody plant media
c) Gamborg's B-5
b) White Media
d) **MS Media**

12 Plant tissue culture technique used to overcome embryo abortion in distant hybridization is known as -----
a) **Embryo rescue**
c) Suspension culture
b) DH
d) None of these

13 The optimum pH of plant tissue culture media is -----
a) 5.0
c) 7.0
b) **5.8**
d) 7.8

14 Ethylene is known as -----
a) Callus inducing hormone
c) **Fruit ripening hormone**
b) Root inducing hormone.
d) Shoot inducing hormone

15 For solidification of plant tissue culture media , ----- is added
a) Coconut water
b) Sucrose

- c) Gelatine d) Agar-agar

16 The chemical covalent bond present in DNA molecule is known as -----

a) Peptide bond b) Glycosidic bond

c) Ketodonic bond d) **Phosphodiester bond**

17 Southern blot is a method used to check for the presence of -----

a) **DNA** b) RNA

c) Protein d) None of these

18 Inherent ability of a cell to give rise to a whole or complete plant is known as -----

a) Proliferation b) **Totipotency**

c) Rejuvenation d) None of these

19 Plant cells without cell walls is called as -----

a) Hybrid b) Karyoplast

c) **Protoplast** d) Cybrid

20 Chemical used for doubling the chromosome -----

a) Ethidium bromide b) Sodiumazide

c) **Colchicine** d) EMS

21 The variation or differences caused due to tissue culture is known as

a) Phenotypic variation b) Genotypic variation

c) Environmental variation d) **Somaclonal variation**

22 Which cell organelles help in protein synthesis ?

a) Mitochondria b) **Ribosomes**

c) Lysosomes d) Centrosomes

23 The natural genetic engineer is

a) **Agrobacterium tumefaciens** b) Bacillus subtilis

c) E. coli d) None of these

24 Which of the following favors high rate of rooting in plant tissue culture

a) Cytokinin b) **Auxin**

c) GA3

d) Ethelele

agromind.in