Time: 3 Hours **Total Marks: 75**

Note: Draw figures and flow charts wherever applicable.

Q1		**Attempt all multiple-choice questions (MCQ)**	**20M**
	1.	Which defines a codon?	**1 M**
	a	Protein that begins transcription by breaking apart H bonds	
	b	A free-floating base that attaches to an open DNA strand	
	c	The genetic code word of three bases on mRNA that specify one amino acid	
	d	The strong bond between two complementary nitrogen bases	
	2.	mRNA binds to the small ribosomal subunit during	**1 M**
	a	Initiation	
	b	Elongation	
	c	Termination	
	d	Translation	
	3.	Which of the following is not an application of tissue culture	**1 M**
	a	Rapid Clonal Propagation	
	b	Soma clonal Variations	
	c	Embryo rescue	
	d	Transgenic plants	
	4.	Region of DNA where RNA polymerase binds and transcription begins	**1 M**
	a	Transcription factors	
	b	RNA polymerase	
	c	TATA box	
	d	Promoter	
	5.	Nurse culture and conditioned medium are plating techniques used for	
	a	Artificial seed	
	b	Protoplast	
	c	Callus	
	d	Gene transfer	
	6.	One of the following is not true about synthetic seed	**1 M**
	a	It can be transferred directly to field	
	b	It produces pathogen free plants	
	c	It can be stored and used	
	d	It needs to be hardened in green nursery before transferring to field	
	7.	The region that is responsible for the origin of DNA replication which permits the Ti plasmid to be stably maintained in *A. tumefaciens* is	**1 M**
	a	Virulence region	
	b	Ori region	
	c	Opine region	
	d	Hormone region	

	8.	One of the following is the disadvantage of adsorption method	**1 M**
	a	Easy to carry out	
	b	No reagents required	
	c	Desorption of enzyme from carrier	
	d	Minimum activation step involved	
	9.	When foreign DNA is coated with minute gold particles to deliver into target plant cells it is called as _____ type of gene transfer	**1 M**
	a	Microinjection	
	b	Microprojectile	
	c	Microporation	
	d	Microencapsulation	
	10.	Mechanical agitation is required only in	**1 M**
	a	Stirred tank	
	b	Packed bed	
	c	Airlift reactor	
	d	Bubble column	
	11.	The agent which stains dead protoplast red is	**1 M**
	a	Phenosafranine staining	
	b	Methyl red	
	c	Evan`s blue	
	d	Calciflor	
	12.	One of the following is not true about elicitors	**1 M**
	a	Classified as biotic and abiotic	
	b	Secondary metabolite accumulation is inhibited	
	c	Causes up regulation of gene expression	
	d	Trigger hypersensitive reaction in treated plant cells	
	13.	Product recovery and purification is called _____ in fermentation technology	**1 M**
	a)	Upstream	
	b)	Down stream	
	c)	Clarification	
	d)	Filtration	
	14.	The full form of RAPD is	**1 M**
	a	Rapid Amplified Polymorphic DNA	
	b	Rapid Augmented Polymorphic DNA	
	c	Rapid Accelerated Polymorphic DNA	
	d	Rear Amplified Polymorphic DNA	
	15.	DNA primer is added during PCR in one of the following stages	**1 M**
	a	Denaturing	
	b	Annealing	
	c	Extending	
	d	Both Denaturing and Annealing	

	16.	Statement 1: Phytohormones like salicylic acid is produced in plants in response to stress Statement 2: Phytohormones induce the synthesis of array of proteins involved in defense and secondary metabolites	**1 M**
	a	Statement1 is right. Statement 2 is wrong	
	b	Statement 2 is right. Statement1 is wrong	
	c	Both statements are right	
	d	Both statements are wrong	
	17.	Somatic embryogenesis from the explants without the formation of callus is called	**1 M**
	a	Direct embryogenesis	
	b	Indirect embryogenesis	
	c	In-vitro embryogenesis	
	d	In-vivo embryogenesis	
	18.	One of the followings occurs in the absence of free liquid	**1 M**
	a	Submerged fermentation	
	b	Batch fermentation	
	c	Solid state fermentation	
	d	Surface fermentation	
	19.	A plant X is under the threat of extinction. To save this plant which technique is highly useful	**1 M**
	a	Genetic engineering	
	b	DNA finger printing	
	c	Hybridoma technology	
	d	Invitro tissue culture	
	20	-------- are added in the medium as precursors to increase the production of alkaloids	**1 M**
	a	Amino acid	
	b	Coumarin	
	c	Mevalonic acid	
	d	Shikimic acid	

Q2		**Answer the following (any two)**	**20M**
	1	A. Give a flow chart to explain DNA recombinant technology	**10M**
		B. Differentiate between adsorption and covalent bonding enzyme immobilization technique	
	2	A. Discuss organogenesis of plant cell.	**10M**
		B. Explain the principle and advantages fluidized bed bioreactor. Draw a schematic diagram of the same	
	3	Explain the hairy root multiple shoot cultures in detail with respect to the vector, process of production using an example and application of hairy root cultures.	**10M**
Q3		**Answer any seven out of nine questions**	**35M**
	1	Explain the translation stage in protein synthesis	**5 M**
	2	Write a note on somatic embryogenesis with its applications	**5 M**
	3	Write a note on different methods of cloning and its applications	**5 M**
	4	Differentiate between precursors and elicitors. Explain with example how biotic elicitors can help in the production of secondary metabolite	**5 M**
	5	Discuss the application of genetic and molecular biology in pharmacognosy.	**5 M**
	6	Explain the microinjection method of gene transfer	**5 M**
	7	Write a note on enzymes of pharmaceutical interest	**5 M**
	8	Give two applications of biotransformation in plant cell biotechnology	**5 M**
	9	Summarize the different sterilization methods used in plant biotechnology	**5 M**