Unit -IX

Chapter-11. Biotechnology Principles and processes

IMPORTANT POINTS

Biotechnology may be defined as the use of microorganisms animals of plants cells of their components to generate products and services useful to human beings.

Genetic engineering and maintenance of sterile condition in chemical engineering process have given the birth to modern biotechonology.

The basic principles of Recombinant DNA Technology involve the stages like generation of DNA fragments and selection of the desired pieces of DNA, insertion of the selected DNA into a cloning vector i.e. plasmid, to create a recombinant DNA, Introduction of the recombinant vectors into host cells (e.g. Bacteria), multiplication and reflaction of clones containing the recombinant molecules and expression of gene to produce the desired product. The tools required in the recombinant DNA technolbgy include restriction enzymes,cloning vectors and competent host.

The term DNA recombinant technology refer to the transfer of segment of DNA from one organism to another organism (host cell) where it reproduce.The proces involve a sequence of steps like isolation of genetic material,Cutting of DNA at specific site,amplification of gene of interest using PCR,insertion of recombinant DNA into the host cell organism obtaining the foreign gene product and downstream processing.

(1)The enzymes that cuts specifically recognition sites in the DNA is known as

(a) DNA ligase (b) DNA Polymerase

(c) Reverse transcriptase (d) Restriction endonuclease

(2) DNA can be introduced into any cell by

(a) Injection (b) being complexed with Ca salts

(c) gel electrophoresis (d) being placed along with

(3) Ability of a plant or animal cell to repeatedly divide and differentiate into a complete organism is :-

(a) cloning (b) DNA finger printing

(c) cellular totipotency (d) mitosis

(4) Restriction endonuclease is also known as -

(a) molecular glue (b) DNA ligase

(c) DNA Polymerase (d) molecular scissors

(5) Extra chromosomal small cirular double stranded DNA molecule in a bacterial cell is stranded DNA molecule in bacterial cell is

(a) Plastid (b) Plasmid (c) Mitochondrion (d) Chloroplast

(6) Introduction of foreign genes into plant or animal cells using micropipettes is
(a) Electroporation (b) Chemical - mediated genetransfer
(c) microinjection (d) Particle gun

(7) Which one of the following is releated with genetic engineering ?
(a) Mulations (b) Ribosomes (c) Mitochondria (d) Plasmids

(8) In bacteria, genes for antibiotic resistance are usually located in
(a) Plasmids (b) Cytoplasm (c) Mitochondria (d) Nucleus

(9) A technique used to make numerous copies of a specific segment of DNA quickly and accurately
(a) Translation (b) transcription
(c) Ligase chain reaction (d) polymerase chain reaction

(10) The enzyme that cleaves DNA at specific sites, producing sticky ends is called
(a) Restriction endonuclease (b) Cleaving enzyme
(c) Lysing enzyme (d) Exonuclease

(11) Which of the Following is a genetic vector ?
(a) Plasmid (b) Phage (c) Cosmid (d) All of these

(12) Restriction endonucleases are used in genetic engineering because -
(a) They can degrade harmful proteins
(b) They can join DNA fragments
(c) They can cut DNA at specific base sequences
(d) They can cut DNA at variable sites

(13) Ideal host for the amplification of DNA molecules is
(a) Viruses (b) Plants (c) Bacteria (d) Animals

(14) Ti Plasmid naturally occurs in
(a) Agro bacterium (b) Corynebacterium (c) Staphylococcus (d) Vibrio

(15) The sticky ends of Fragmented DNA molecules are made up of
(a) calcuim salts (b) endo nuclease (c) un paired bases (d) methyl groups

(16) Which of the following are the essential requirements for recombination ?
(a) Single stranded DNA (b) DNA ligase
(c) DNA Polymerase I (d) All of the above

(17) The Plasmid derived from E.Coli is
(a) PBR327 (b)PBR322 (c) both a above (d) None

(18) Ti Plasmid is useful in
(a) bringing new genes into animal cells (b) bringing new genes into plant cells
(c) to nearly any sites on a chromosome (d) bringing tumour cells into plant cells

(19) Many copies of a DNA molecule in a test tube are procurred by
(a) Polymerase chain reaction (PCR) (b) Molecular chain reaction (MCR)
(c) Ephemeral chain reaction (ECR) (d) All of these

(20) Bam H I, ECo R I, Sal I are the types of
(a) restriction endonucleasses (b) restraction endoxidases
(c) restriction exonucleases (d) restriction polymerases

(21) Retro viruses have genetic matetial which is
(a) DNA (b) RNA (c) both DAN & RNA (d) proteins

(22) Genetic engineering is possile because
(a) the phenomenon of transducation in bacteria is well understood
(b) we can see DNA by electron microscope
(c) we can cut DNA at specific sites by endonucleases like DNA ase I
(d) restrication endonuclease purified from bacteria can be used in vitro

(23) Plasmids are the suitable vectors for genetic cloning as.....
(a) they are indispendable
(b) they are self replicating units
(c) they are essential for bacterial reproducation
(d) None of the above

(24) Which of the following is used in genetic engineering ?
(a) Restrication endonuclease (b) Mycobacterium
(c) Entameha (d) Pepsin

(25) The first hormone artificially produced by culturing bacteria is_____
(a) Insulin (b) thyroxine (c) Testosterone (d) Adrenaline

(26) When the number of genes increases in response to some signal the effect is called.....
(a) gene dosage (b)Gene pool
(c) gene amplification (d) gene freaquency

(27) Which one of the following pairs is correctly matched ?
(a) RNA polymerase - RNA primer
(b) Restrication enzymes - Genetic engineering
(c) Centeral dogma - codon
(d) okazaki fragments - splicing

(28) Plasmids are autonomously replicating mini chromosomes found in.....
(a) Bachterio phage lambda (b) Leishmania donovani
(c) Escherichia coli (d) para moecium caudatum

(29) Improvement of genotype of an organism by addition of some foreigm gene is.....
(a) genetic diversity (b) gene handing
(c) tissue cutlure (d) genetic engineering

(30) Two bacteria found to be very useful in genetic engineering experiments are.....
(a) Nitrosomonas and Klebsiella (b) Escherichia and Agrobacterium
(c) Nitrobacter and Azotobacter (d) Rhizobium and Diplococcus

(31) Restriction enzymes are isolated chielfy from.....
(a) Algae (b) Fungi (c) Protozoans (d) Prokaryotes

(32) There are special proteins that help to open up DNA double helix in front of the reaplication work . these proteins are.....
(a) DNA gyrase (b) DNA polymerase I
(b) DNA ligase (d) DNA topoisomerase

(33) Technology which uses living components for the welfare of human being is.....
(a) Biology (b) Botany (C) Bioinformatics (D) Biotechnology

(34) Which prosess is involved in making bread cheese, beer and wine ?
(a) Respiration / hydrolysis (B) Degradation
(C) Fermentation (D) Decomposition

(35) EFB stands for .....
(a) European Foudation of Biotechnology
(B) European Foundation of Biology
(c) European Foundation of Biotechnology
(d) European Foundation of Biology

(36) The organism whoes gene have been artificially altered for desired efect is called as.....
(a) genetically mutant organism (b) gene transfer
(c) genetically modified organism (d) Genetically transferred organism

(37) The sequence of DNA that reads the same backward and forward across the double strand is.....
(a) Recipient sequence (B) palindromic sequence
(c) Replicate sequence (d) origin sequence

(38) How many restriction enzymes are known to be isolated ?
(a) more than 800 (b) more than 700
(c) more than 600 (d) more than 900

(39) Which of the following step is necessary part of DNA recombination technology ?
(a) Insertion of DNA fragment into vector
(b) Insertion of vector into Bacteria
(c) multiplication of the clones containing the recombination molecule
(d) All the above

(40) Restriction enzymes belong to which class of enzymes ?
(a) Nucleolase (b) Exo nucleases
(c) Nucleases (d) Endonucleases

(41) A sequence of in a genome at which replication is intiated in .....
(a) origin of relpication (b) selectable marker
(c) cloning site (d) origin of restriction

(42) Genes which helps in the growth of transformants are .....
(a) orgin of replication (b) cloning site
(c) origin of restriction (d) selectable marker

(43) Ti Plasmid is a cloning vector which works with
(a) All the plants (b) Dicots only
(c) Monocots only (d) Thallophytes only

(44) During which of the following techniques host cells are exposed to pulse of high voltage current ?
(a) Electroporation (b) Particle Bombard ments
(c) Micro injection (d) lipofection

(45) Particle bombardment technique is also known as .....
(a) Lipofection (b) Electroporation (c) Biolistic (d) Micro injection

(46) Which enzyme is used to break the membrane to relase plant DNA ?
(a) Lysozyme (b) Chitinase (c) Cellulose (d) All the above

(47) Which enzyne is used to break the membrane to relase animal DNA ?
(a) Lysozyme (b) chitinase (c) Celluose (d) All the above

(48) Which is the first step in the process recombinant DNA technology ?
(a) denaturing of DNA (b) Annealing of DNA
(c) Isolation of Donor DNA (d) Down streaming

(49) Which primers are used in annealing during amplification of gene ?
(a) Reverse primers (b) Forward primers
(c) Oligo nucleotide primer (d) Internal primers

(50) What is temperature required for annealing of DNA molecule ?
(a) 50-65^0 C (b) 30-35^0 C
(c) 40-45^0 C (d) 20-25^0 C

(51) Which of the following is related with genetic engineering ?
(a) Breeding (b) somatic hybridization
(c) mutation (d) Transgenic

(52) What is C - DNA ?
(a) circular DNA
(b) Cloned DNA
(c) DNA produced from reverse transcription of RNA
(d) Cytoplasmic DNA

(53) Which of the bollowing statement is incorrect ?
(a) cosmid contains gene coding for viral protein
(b) cosmid relpicates like plasmids
(c) cosmid has antibioticresistant marker gene
(d) cos sit has 12 bases helping to join complete genome to make it circular

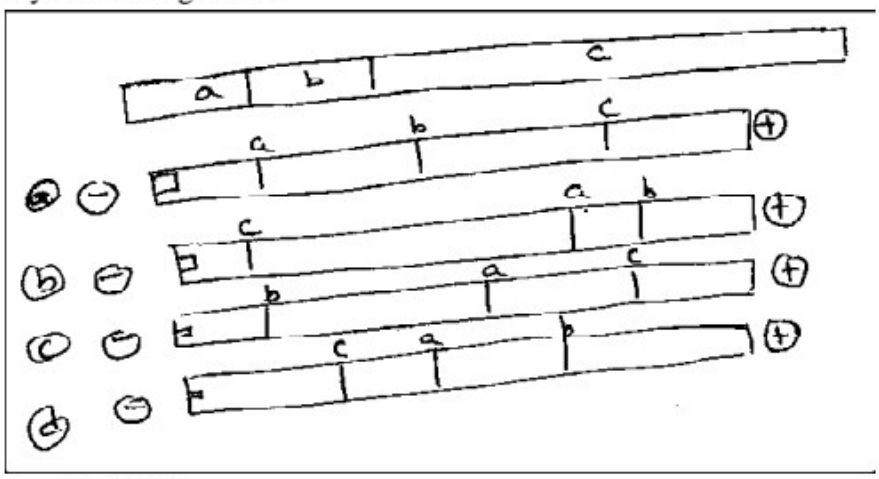
(54) The genetic recombinants obtained by in sertion of plasmid into 1 phage genome is called
(a) cosmid (b) plasmid
(c) phagmid (d) foreign DNA

(55) TATAATG sequnce near the RNA start point of phokaryotic promoter is.....
(a) NICKS (b) DNA marker
(c) pallindrome (d) pribnow box

(56) Exonucleases cleaving nucleotides one at a time from the end of polynucleotide chain are.
(a) Specific for 5' end of RNA strand (b) specific for 3' end of RNA strand
(c) specific for both 5' and 3' ends of nucleotide strand
(d) Non- specific for 5' and 3' ends of nucleotide

(57) Genes that are involved in turning on or off the transcription of a set of structural genes are called
(a) Polymorphic genes (b) operator gene
(c) Rebundant gene (d) Regulatory gene

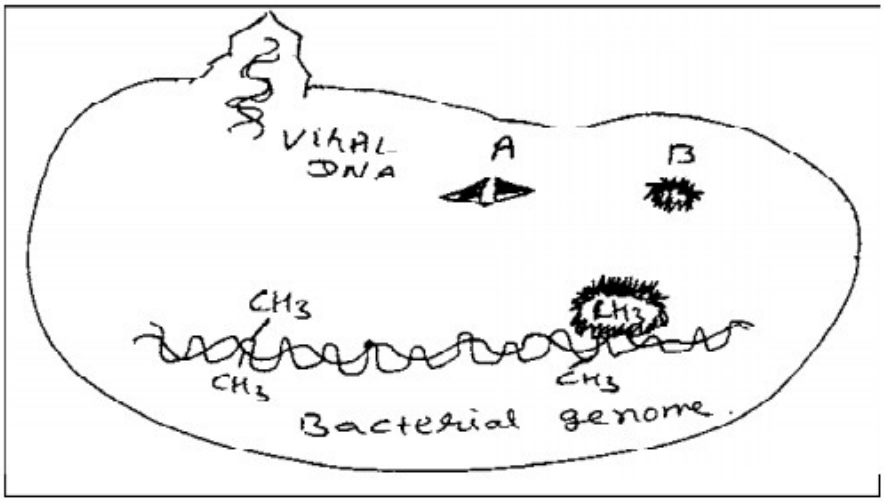
(58) This segment of DNA restuction sites I and II which create restriction fragments a,b and c which of the following gel (s) Produces by electrophoresis would represent the separation and identity of these fragments ?



(59) Enzymes used in PCR is ....
(a) taq polymerase
(b) gyrase
(c) transcriptase
(d) hexokinase

(60) What are structure labelled A & B respectively
(a) EcoRv restriction endonuclease and E coRv ligase
(b) EcoRv ligase and EcoRv nuclease and EcoRvmethlase
(c) Eco— Rv restriction endo EcoRv methylase
(d) EcoRv Polymerase and EcoRv methylase

(61) Can you pick up from the figure how bacteria protects its own genone from degradation by restreiction endonuclease ?



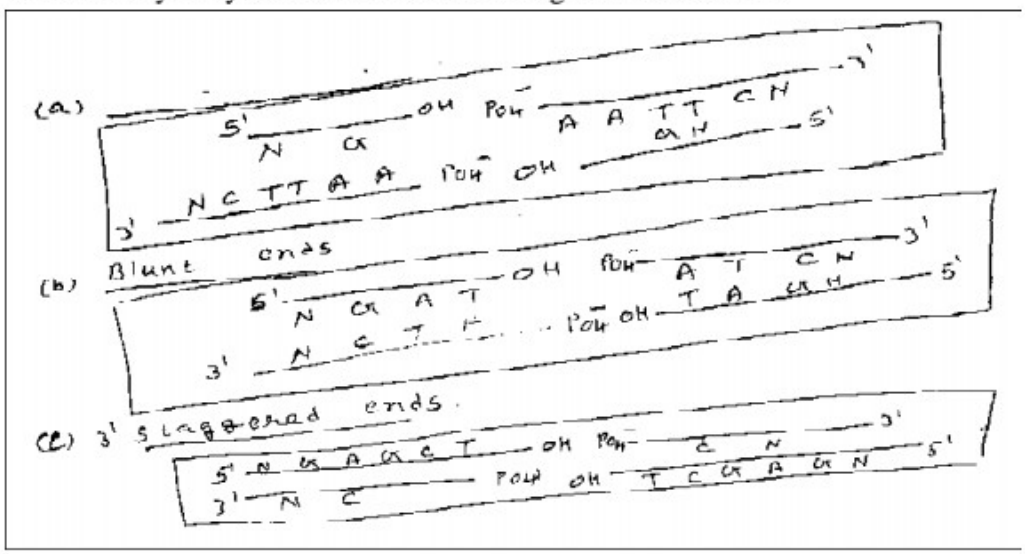
(a) site specific coupling

(b) site specific oxidizing

(c) site specific oxidizing

(d) site specific methylases

(62) EcorI, EcoRv and Sac I are types of restriction enzymes Three types of termini can be generated (1) 5^1 staggered and (2) Blund ends (e) 3^1 staggered ends 5^1 termini of each strand in the cleavage product retain phosphory, group from the phosphodiester bond 3^1 termini are hydroxylated which of the following is correct answer ?



(a) All of these produce sticky ends

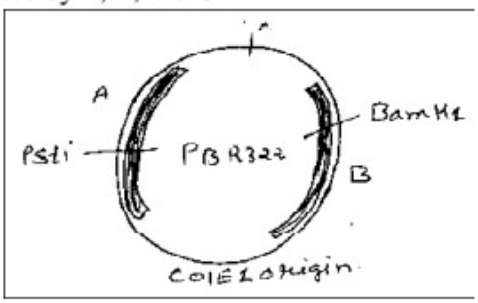
(b) All of them produce blunt ends

(c) Each one of them can produce sticky and blunt ends

(d) All of them act on pallindromic sequences

(63) This is figure of plasmid $_{p}$BR322 Identiby what represented by A, B, and C

(a) A TcR, B ApR and C EcorI
(b) A TcR, B EcoRI and C ApR
(c) A - EcorI, B ApR and C TcR
(d) A ApR, B TcR and C EcoRz



Matching type questions

(64) These are important set of enzymes used in biotechnology Match them with exact role

P	Taq DNa Polymerase	(i) cutting single stranded part of DNA
Q	S I nuclease	(ii) Ligase
R	Restriction endo nuclease	(iii) Thermostable enzyme
S	mole cular glue	(iv) cutting pallindromic sequences
		(v) union of pallindromic sequences

	P	Q	R	S
(a)	(iii)	(iv)	(i)	(ii)
(b)	(iii)	(v)	(iv)	(ii)
(c)	(iv)	(i)	(v)	(ii)
(d)	(iii)	(iv)	(i)	(ii)

(65) Match the column I and column II

P	Radio active andibody	(a)	substance that can be constructed in the labora tory
Q	Artificial gene	(b)	substance that can be used to identify colonies of geneticully engineered bacteria that makes particular gene product
R	Amplification	(c)	Abnormal enhanced replication of a plasmid many copies of plasmid in each cell
S	To produce clones	(d)	A large population of idential cells
T	short gun cloning	(e)	The use of entire array of genes of an organis-m in order to obtain particular gene product

	P	Q	R	S	T
(a)	b	a	c	d	e
(b)	a	c	b	d	e
(c)	a	c	d	b	e
(d)	b	c	e	d	a

Assertoin- Reason type Questions

A is assertion R is reasoning

(a) A is correct, R is explanation of A

(b) A is correct, R is correct but it is not exlpanation of A

(c) A is correct , R is false.

(d) A is wrong , R is wrong

(e) A is wrong, R correct

(66) A - Hybridoma cells are shifted to a medium deficient in nutrient which can not be syntth sized by myeloma cells

R - This medium allows selection of hybridoma cells

(a) (b) (c) (d) (e)

(67) A - The term hybridoma is applied to fused cells

R - They are formed by the fusion of lymphocyte cell and myeloma cell

(a) (b) (c) (d) (e)

(68) A - Extraction and purficiation of enzymes is laborious and expensive

R - protein engineering can be used to produce enzymes at large scale

(a) (b) (c) (d) (e)

(69) A - Restriction enzymes of different organisms that recognize the identical sequences a the called isoschizomers

R - They are present only in eukarytoes

(a) (b) (c) (d) (e)

(70) A- Plasmids are tools of genetic engineering

R- Virulence plasmids provide pathogenecity to bacteria

(a) (b) (c) (d) (e)

(71) For transformation, micro particles coated with DNA are bombarded with gene gun made up of.

(a) Platinum or Zinc (b) Silicon or Platinum

(c) Gold or tungsten (d) Silver or Platinum

(72) PCR and Restriction fragment lenth Polymorphism are the methods for. (AIPMT-2012)

(a) genetic transtormation (b) DNA Sequencing

(c) DNA finger printing (d) Study of enzymes

(73) The linking of antibiotic resistance gene with the plasmid Vector became possible with (CBSE-2008)

(a) DNA ligase (b) Exonuclease (c) Endo nuclease (e) DNA Polymerase

(74) Gel electrophoresis is used for-- (CBSE-2008)

(a) Isolation of DNA molecule

(b) Cutting of DNA in to fragments

(c) Separation of DNA fragments according to their size

(d) Construction of recombinant DNA by joining with cloning Vector

(75) Which one of the follwing Palindromic base sequence in DNA can be easily cut at about the middle by some Particular restriction enzyme? (CBSE-2010)

(a) 5^1 _____ GATATG _____ 3^1
3^1 _____ CTACTA _____ 5^1

(b) 5^1 _____ GAATTC _____ 3^1
3^1 _____ CTTAAG _____ 5^1

(c) 5^1 _____ CACGTA _____ 3^1
3^1 _____ CTCAGA _____ 5^1

(d) 5^1 _____ CGTTCG _____ 3^1
3^1 _____ ATGGTA _____ 5^1

(76) Gentic engineering has been sucessfully used for producing ___ (CBSE-2010)

(a) trangenic models for studying new treatments for Certain cardiac diseases.

(b) transgenic Cow - Rosie which produces high fat milk for making ghee.

(c) animals linke bulies for farm work as they have super power.

(d) transgenic mice for testing safety of polio Vaccine before use in humans.

(77) Match the following and choose the correct combination from the option given ... (Karnatak PMT-2005)

	Column I	Column II
(a)	*Escherichia coli*	1 - nif gene
(b)	*Rhizobium meliloti*	2 - digestion of hydrocarbons of crude oil
(c)	*Bacilius thuringiensis*	3 - human insulin production
(d)	*Pseudomonas putida*	4 - Biocontrol of fungal disease
		5 - biodegradable insecticide

(a) A = 3, B = 1, C = 5, D = 4 (b) A = 1, B = 2, C = 3, D = 4,

(c) A = 2, B = 1, C = 3, D = 4 (d) A = 4, B = 3, C = 1, D = 2

(e) A = 3, B = 1, C = 5, D = 2

(78) Find the incorrrect statement

(a) Gene therapy is a genetic engineering technique used to treat disease at molecular level by replacing defective genes with normal genes.

(b) Calcitonin is a medically useful recombinant product in the treatment of intetility

(c) Bt toxin is a Biodegradable insecticide obtained from bacillis thuringiensis

(d) Trichoderma sp. is a biocontrol agent for fungal diseases of plants

(e) Totipotency is the potential ability of a cell to develop into a complete plant (Karnatak PMT-2005)

(79) Production of a human protein in bacteria genetic engineering is possible because

(a) bacterial cell can carry out the RNA splicing reactions

(b) the human chromosome can replicate in bacterial cell

(c) the mechanism of gene regulation is identical in human and bacteria

(d) The genetic code is universal (CBSE-2005)

(80–) The basis of DNA finger printing is

(a) The double helix (b) Errors in base sequence

(c) Poly morphism in sequence (d) DNA replication

(e) DNA Coiling (Kerala - 2008)

(81) A genetically engineered microorganism used successfully in biomediation of oil spillg is species of (CBSE-2007)

(a) Trichoderma (b) Xamthomonas (c) Bacillus (d) Pseudomonas

(82) What is the function of Restriction endonuclease ? (AIPMT -2006)

(a) Restricts the synthesis of DNA inside the nucleus

(b) Synthesizes DNA

(c) Cuts DNA molecule randomly

(d) cuts DNA molecule at specific sites

(83) The nuclease enzyme which begins its attack from Free end of a polynucleotide is (Pb-PMT-2001)

(a) Exonuclease (b) Kinase (c) Polymerase (d) Endonuclease

(84) Identify the Plasmid (ET 2004)

(a) Alu I (b) Hind III (c) ECORI (d) P^{BR322}

(85) Molecular scissors, which cut DNA at specific site (Kerala-2004)

(a) ligase (b) cellulase (c) pectinase (d) Polymerase

(e) restriction endonuclease

(86) In transgenics the experession of transce in the target tissue is known by (CBSE-2004)

(a) Enhancer (b) Transgene (c) Promoter (d) Reporter

(87) Variable number of tender repeats (VTNR) in the DNA molecule are highly useful in

(a) monoclonal antibody production (b) DNA finger printing

(c) Recombinant DNA technology (d) stem cell culture (K.C.E.T - 2006)

(88) Which one of the following bacteria has found extensive use in genetic engineering work in plants ?

(a) Agrobacterium tamefaciens (b) Clostridium septicum

(c) Xanthomonas citri (d) Bacilius Coagulens

(CBSE - 2003)

(89) What does Bt stand For the Popular crop Bt Cotton ?

(a) Best (b) Best type (c) Biotechnology (d) Bacilius tomentosta

(90) The total number of nitrogenous bases in human genome is estimated to be about

(a) 35 million (b) 3.1 million (c) 3.5 million (d) 3.5 thousand (AIIMS 2004)

(91) Name of the drug used in cancer treatment produced by using biotechnology is .....

(a) HGH (b) TSH (c) Insulin (d) Interfern

(Kerala PMT 2004)

(92) Which of the following pair is correctly matched ?
(a) - central dogma - codon
(b) - Okazaki fragments - splicing
(c) RNA Polymerase - RNA Primer
(d) Restriction enzymes - genetic engineering (JIPMER - 2004)

(93) First Biochemical to be Producod commer cially by microbial cloning and genetic engineering is ___ (BHU-2005)
(a) interferom (b) penicillin
(c) human insulin (d) Fertility factors

(94) First hormone prepared by genetic engineering is .... (Manipal-2005)
(a) Insulin (b) Oxytocin
(c) adrenaline (d) Somatotropin

(95) A technology which has found immense use in solving cases of disputed parentage is (Karnataka ET-2005)
(a) DNA finger printing (b) Polymerase chain reaction
(c) Recombinant DNA technology (d) Monoclonal antibody production

(96) Matching sequence of DNA between two evidences, one of the criminal with the suspect is known as (AMU-2005)
(a) DNA finger printing (b) DNA amplification
(c) Gene maping (d) DNA resolution

(97) Given below is a sample of a portion of DNA strand giving the base sequence on the opposite strands, what is so special shown in it ?
5^1 _____ GAATTC _____ 3^1
3^1 _____ CTTAAG _____ 5^1
(a) Replication Completed
(b) Deletion mutation
(c) start codon at 5^1 end
(d) Palindromic sequence of base pairs

(98) Agarose extracted From weeds finds use in _____ (A.I.PMT 2011)
(a) spectrophoto metry (b) Tissue culture
(c) Gel electrophoresis (d) PCR

(99) Widely used tool in genetic engineering of crop plants is ____ (AIEEE 2004)
(a) protoplast fusion (b) Transposon
(c) Micro injection (d) Agrobacterium mediation

(100) c DNA Probes are copied from messenger RNA molecule with the help of __
(a) Restriction enzyme (b) Reverse transcriptase
(c) DNA Polymerase (d) Adenosine deaminase

(AIIMS 2005)

(101) Which one of the following pair is wrongly matched ?

(a) methanogens - Gobargas (b) Yeast - Ethanol

(c) Streptomycetes - Antibiotic (d) Coliborms - vinegar

(CBSEPMT-2007)

(102) The Prerequisites for biotechnological production of antibiotic is

(a) to search an antibiotic producing microorganism

(b) to isolate the antibiotic gene

(c) to join antibiotic gene with E coli plasmid

(d) All of the above (MP PMT 2008)

(103) Which one of the following is now being commercially produced by biotechnological Procedures

(a) Nicotine (b) Morphine (c) quinine (d) Insulin

(104) Which one of the following is a wrong matching of a microbe and its industrial product while the remaining three are correct

(a) clostridium butylicum - lactic acid

(b) Aspergillis niger cirric acid

(c) yeast - statins

(d) Acetobacter aceti - acetic acid (CBSE PMT 2011)

(105) Some of the steps involved in the production of humulin are given below choose the correct sequence

(i) synthesis of gene (DNA) for human insulin antibicially

(ii) culturing recombinant E.Coli in bioreactors

(iii) Purification of humulin

(iv) Insertion of human insulin gene into plasmid

(v) Introduction of recombinant Plasmid into E.Coli

(vi) Extraction of recombinant gene product From E.Coli

(a) (ii), (i), (iv), (iii) (v), (vi) (b) (i), (iii), (v), (vi), (ii), (iv)

(c) (i), (iv), (v), (ii), (vi), (iii) (d) (iii), (v), (ii), (i), (vi), (iv)

(KCET -2010)

ANSWER KEY

1	d	36	c	71	c
2	a	37	b	72	d
3	c	38	b	73	c
4	d	39	c	74	c
5	b	40	b	75	b
6	b	41	b	76	d
7	d	42	a	77	c
8	b	43	b	78	a
9	b	44	a	79	c
10	d	45	b	80	d
11	a	46	a	81	c
12	d	47	b	82	d
13	c	48	a	83	a
14	a	49	a	84	c
15	d	50	a	85	e
16	b	51	d	86	a
17	b	52	c	87	b
18	c	53	a	88	a
19	a	54	a	89	e
20	c	55	d	90	d
21	b	56	b	91	c
22	a	57	c	92	c
23	b	58	b	93	a
24	a	59	c	94	a
25	a	60	a	95	a
26	c	61	d	96	d
27	b	62	b	97	c
28	c	63	d	98	b
29	a	64	c	99	b
30	b	65	a	100	d
31	b	66	a	101	d
32	a	67	c	102	d
33	d	68	d	103	d
34	c	69	a	104	a
35	c	70	b	105	b

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