

St. Philomena's College (Autonomous), Mysore			
PG Department of Biochemistry			
Question Bank { Revised Curriculum (LOCF) - 2020-22 Batch }			
Second Year- Third Semester			
Course Title (Paper Title): Genetic Engineering and Gene Expression (HC)			
QP Code -84322			
Sl. No.	Unit	PART A	Marks
1	1	How do you measure the purity of DNA and RNA in a given extract of nucleic acid?	2
2	1	Highlight the importance of EDTA and SDS in in extraction of nucleic acids.	2
3	1	Comment on use of hydroxyapatite column in DNA purification.	2
4	1	Give the principle behind ethanol precipitation of nucleic acids.	2
5	1	Give the principle of behind phenol chloroform extraction.	2
6	1	Why iso-amylalcohol is used in DNA extraction?	2
7	1	Extraction of DNA from plant is more tedious than from animal source. Why?	2
8	1	Give the principle of behind trizol extraction of RNA.	2
9	1	Why poly u coated sepharose column is used in extraction of mRNA?	2
10	1	Give the use of streptavidin beads in mRNA extraction.	2
11	1	Differentiate between cDNA library and genomic library.	2
12	1	Differentiate between sticky ends and blunt ends.	2
13	1	State the application of alkaline phosphatase and polynucleotide kinase in gene cloning.	2
14	1	What are restriction endonucleases? Give two of its application	2
15	1	What are palindrome sequences and mirror repeats?	2
16	1	What are Isoschizomers? Give two examples.	2
17	1	What are Neoschizomers? Give two examples.	2
18	1	What are isocaudomers? Give two examples.	2
19	1	Differentiate between Isoschizomers and Neoschizomers with examples.	2
20	1	Differentiate between isoisoimers and isocaudomers with examples.	2
21	1	What are vectors? Give its characteristic features.	2
22	1	Give two advantages of a bacteriophage vector over a plasmid vector.	2
23	1	Differentiate between cosmids and phagemids.	2
24	1	What are shuttle vectors and expression vectors?	2
25	1	Highlight the importance of a selectable marker in a vector.	2
26	1	What is double screening? Give the importance of double screening in gene cloning technology.	2
27	1	What is blue white screening selection?	2
28	1	What is red white screening selection?	2
29	1	What is a catenane?	2

30	1	What are cos sites? Give its significance.	2
31	1	Differentiate between insertional and replacement λ vector.	2
32	1	What are polylinker sites in a vector?	2
33	1	Give two advantages of cosmid vector over a bacteriophage vector.	2
34	1	Give two characteristic feature of a bacterial artificial chromosome.	2
35	1	Give two characteristic feature of an expression vector system	2
36	1	How are sticky ends converted to blunt ends?	2
37	1	What are linkers and adaptors? Give their applications.	2
38	1	What is a cDNA? How it is useful in DNA cloning technology	2
39	1	Give the features of a shuttle vector.	2
40	1	Give the features of cosmids and phagemids.	2
41	1	What is insertional inactivation? Give an example.	2
42	1	State the applications of lac Z gene in DNA cloning.	2
43	1	How is restriction enzyme activity measured?	2
44	1	How is restriction enzyme activity measured?	2
45	1	What is homopolymer tailing? Give its applications.	2
46	2	Define electroporation. Comment on its advantages and disadvantages.	2
47	2	Give the principle behind electroporation.	2
48	2	Give application of micro injection method of gene transformation	2
49	2	What is lipofection? Give its applications.	2
50	2	Mention the advantages and disadvantages of electroporation	2
51	3	State the principle behind RT- PCR. Give its applications.	2
52	3	What is chromosome walking?	2
53	3	Give the principle and application of Nested PCR.	2
54	3	Give any two applications of PCR technique.	2
55	3	Differentiate between RT-PCR and real time PCR.	2
56	4	Give the principle behind RFLP.	2
57	4	Give the principle and application of RAPD.	2
58	4	Give the principle behind Western blotting. Give two of its applications.	2
59	4	What are micro and minisatellites?	2
60	4	What are STRs and VNTRs? Give its importance in genetic engineering field.	2
61	4	State the principle behind Northern blotting technique? Give its applications.	2
62	4	What is Southern blotting? Give its applications.	2
63	4	Comment on the use of blotting techniques in the field of genetic engineering.	2
64	4	Give the principle behind nuclease protection assay.	2
65	4	Ligation reaction is carried out at low temperature. Why?	2
66	4	Give two applications of blotting technique.	2
67	4	Give the principle behind gel retardation assay. Mention its applications.	2
68	4	What is DNA foot printing? Give its applications.	2
69	4	What is lipofection? Give its applications.	2

70	4	How is DNA finger printing is different from DNA profiling?	2
71	5	Differentiate between lysogenic and lytic cycle of a bacteriophage.	2
72	5	What is conjugation? Give its application in genetic engineering.	2
73	5	Differentiate between transduction and transformation.	2
74	5	What is horizontal and vertical gene transfer method?	2
75	5	What are plaques? Give its characteristic features.	2
76	5	What are Hfr cells?	2
77	5	Differentiate between F ⁺ and Hfr cell.	2
78	5	Comment on the importance of U shaped tube experiment in horizontal gene transformation study.	2
79	5	Comment on the importance of Tra genes in conjugation.	2
80	5	Differentiate between generalized transduction and specialised transduction.	2
81	5	What are competent bacterial cells?	
82	6	Give the applications of a terminator gene.	2
83	6	Give two applications of gene knockout.	2
84	6	What are GM foods? Give its positive and negative impact on mankind.	2
85	6	What are transgenic plants? Give its applications	2
86	6	What is gene therapy?	2
87	7	What is catabolic repression?	2
88	7	Differentiate between activators and repressors.	2
89	7	What is an Operon?	2
90	7	What is positive gene regulation?	2
91	7	Differentiate between cis acting units and trans acting units.	2
92	7	What are trans-acting factors? Give its importance in gene regulation.	2
93	7	What are cis acting elements? Give its importance in gene regulation.	2
94	7	Comment on the role of leader peptide in tryptophan operon regulation.	2
95	7	Name the structural genes of an arabinose operon.	2
96	7	Comment on the necessity of two promoters and two operators in regulation of galactose operon.	2
97	7	Give the importance of histone like protein in regulation of galactose operon.	2
98	7	Comment on the regulatory units of an arabinose operon.	2
99	7	Highlight the role of cyclic AMP in prokaryotic gene regulation.	2
100	7	What are riboswitches? Mention its application.	2
101	8	Comment on importance of RISC protein complex in gene silencing.	2
102	8	Why gene regulation is important for life?	2
103	8	Name any four modifications of histone proteins.	2
104	8	Differentiate between miRNA and siRNA.	2
105	8	What are shRNA and siRNA? Give its application in gene regulation.	2
106	8	What is the solenoid structure of chromatin?	2
107	8	Why gene regulation in eukaryotic cell is more complex compared to a prokaryotic cell?	2

108	8	What is chromatin remodelling?	2
109	8	What are non histone proteins? Give two of its characteristic feature.	2
110	8	What are chromo domains? Give its importance.	2
111	8	What are bromo domains? Give its importance.	2
112	8	How RNA stability plays a crucial role in gene regulation.	2
1	1	Detail the steps involved in extraction of DNA from a bacterial cell.	5
2	1	Detail the steps involved in extraction of DNA from plant cell.	5
3	1	Detail the steps involved in extraction of RNA from a bacterial cell.	5
4	1	Detail the steps involved in differential extraction of DNA highlight the use of this technique in the field of forensic science.	5
5	1	Explain the steps involved in construction of genomic library.	5
6	1	Explain the steps involved in construction of a cDNA library.	5
7	1	Write a note on shotgun cloning.	5
8	1	Write a note on restriction endonucleases and its types.	5
9	1	What are type 2 restriction endonucleases? Explain its mechanism of action.	5
10	1	Explain characteristic feature of a plasmid taking an example.	5
11	1	Describe the construction and applications of λ bacteriophage cloning vector.	5
12	1	Discuss the construction and applications of M13 phage cloning vector.	5
13	1	Explain the construction of an expression vector with an example.	5
14	1	Describe a cosmid vector.	5
15	1	Describe a phagemid cloning vector.	5
16	1	Explain the structure and application of a BAC vector	5
17	1	Give a detailed description of YAC vector.	5
18	1	Explain the working principle of lac promoter and λ PL Promoter in an expression vector.	5
19	1	Discuss the T7 expression system.	5
20	1	Describe Tac expression system.	5
21	1	Describe the λ PL promoter system.	5
22	1	Write a note on SV 40.	5
23	1	Describe a plant vector system with an example.	5
24	1	Give the brief description on mechanism of DNA ligation.	5
25	1	Explain DNA cloning phage vectors.	5
26	1	Describe the salient features of shuttle vectors and expression vectors.	5
27	1	Write a short note on PBR322.	5
28	1	Describe a shuttle vector with an example	5
29	2	What is transformation technique? Describe any two methods of transformation technique.	5
30	2	Explain any two chemical methods of gene transformation technique.	5
31	2	Briefly explain the method and applications of microinjection.	5
32	2	Briefly explain the method and applications of electroporation.	5

33	2	Describe gene gun method of transformation.	5
34	3	Explain the concept of chromosome walking. Give its applications.	5
35	3	Discuss the methodology and applications of Nested PCR	5
36	3	Discuss the methodology and applications of RT PCR.	5
37	3	Discuss the application of PCR techniques in the field of agriculture and medicine	5
38	3	What is PCR? Explain its principle, methodology and applications.	5
39	3	What is Real time PCR? Explain its principle, methodology and applications.	5
40	4	Describe the strategies developed to identify recombinant clones in yeast and mammalian culture.	5
41	4	Describe the strategies used to identify clones in recombinant bacterial clones.	5
42	4	Give an account on nucleus protection assay.	5
43	4	Describe the principle and methodology involved DNA foot printing. Give its application.	5
44	4	Write a note on colony hybridization.	5
45	4	Explain indirect screening methods used in identifying recombinant clones.	5
46	4	Discuss the use of probes in gene clone technology.	5
47	4	Write a detailed noted on RFLP.	5
48	4	Write a detailed noted on RAPD.	5
49	4	Explain hybrid arrest translation method of clone selection	5
50	4	Describe hybrid select translation method of clone selection	5
51	4	Explain the types and construction of probes	5
52	4	Write a note on plaque hybridization.	5
53	4	Write a note on Southern blotting	5
54	4	Write a note on Western blotting	5
55	5	Describe the regulation of lytic and lysogenic cycle of bacteriophage.	5
56	5	Briefly explain time of entry gene mapping.	5
57	5	Describe the lytic and lysogenic cycle of a bacteriophage	5
58	5	Give an account on use of bacterial transformation and transduction in gene mapping.	5
59	5	Explain Benzer's work in analysing the fine structure of R2 locus of T4 phage.	5
60	5	Give detailed description of specialized transduction and its application in bacterial gene mapping.	5
61	5	Describe the process of transformation in Gram positive and Gram negative bacteria.	5
62	6	Write a note on gene therapy and genetically modified foods.	5
63	6	Discuss the negative impact of genetic engineering.	5
64	6	How transgenic plants are made? Give its application.	5
65	6	What are GM foods? Comment on its positive and negative impact.	5
66	6	Describe any two applications of genetic engineering. Comment on the	5

		negative impact of genetic engineering.	
67	6	Write a note on application of genetic engineering in the field of medical and agricultural science.	5
68	7	Describe the regulation of an Lac Operon.	5
69	7	How tryptophan operon is regulated?	5
70	7	Write a note on CRISPR-Cas gene regulation. Give its applications.	5
71	7	Explain the mechanism of gene regulation by Riboswitches.	5
72	7	Describe the regulation of an arabinose operon.	5
73	7	Describe the regulation of a galactose operon.	5
74	8	Discuss the mechanism of Gcn 4 gene regulation.	5
75	8	Describe NFkB mediated gene regulation.	5
76	8	Discuss the mechanism of gene silencing using RNA interference.	5
77	8	What is the role of SWI/SNF complex in gene regulation?	5
78	8	What is histone code hypothesis? Explain.	5
79	8	Describe the role of HATs and HMTs in eukaryotic gene regulation.	5
80	8	Describe nucleosome structure.	5
81	8	How eukaryotic gene expression is regulated by acetylases and deacetylases?	5
82	8	Discuss the methodology and application of chromatin immunoprecipitation.	5
1	1	Explain the characteristic features, applications, and limitations of the vector. Write a note on plant vectors with an example.	10
2	1	Describe the salient features of shuttle vectors and expression vectors.	10
3	1	Describe different types of plant vector systems with suitable example.	10
4	1	Describe cloning vectors with suitable examples	10
5	1	Detail the steps involved in differential extraction of DNA highlight the use of this technique in the field of forensic science.	10
6	1	Explain the characteristic features, applications, and limitations of the vector. Write a note on plant vectors with an example.	10
7	2	What is transformation in genetic engineering? Explain microinjection technique and calcium phosphate method of transformation.	10
8	2	What is transformation technique? Describe any two methods of transformation technique.	10
9	2	What is transformation in genetic engineering? Explain microinjection technique and calcium phosphate method of transformation.	10
10	3	Discuss the methodology and application of Nested & RT PCR.	10
11	4	Discuss on the strategies developed to identify recombinant clones in yeast and mammalian culture.	10
12	4	Describe the strategies used to identify clones in recombinant bacterial clones.	10
13	4	Give a detailed account of the principle and procedure of colony and plaque hybridization techniques with a neat labelled diagram.	10
14	4	Give a detailed account of the principle and procedure of colony and plaque hybridization techniques with a neat labelled diagram	10

15	4	Give an account on western blotting and DNA Foot printing.	10
16	4	Discuss on principle , procedure and application of DNA finger printing	10
17	4	Write a detailed noted on RFLP.	10
18	4	Explain the principle, procedure and application of RAPD.	10
19	4	Explain the principle, procedure and application of RFLP.	10
20	4	Give an account on clonal selection methods with suitable examples.	10
21	4	Describe any two methods of blot transfer methods in detail.	10
22	4	Give an account on western blotting and DNA Foot printing.	10
23	5	Give detailed description of specialized transduction and its application in bacterial gene mapping.	10
24	5	Describe the process of transformation in Gram positive and Gram negative bacteria.	10
25	6	What is gene therapy? Comment on positive and negative impacts of genetic engineering.	10
26	6	Write a note on application of genetic engineering in the field of medical and agricultural science.	10
27	6	Write a note on gene therapy and genetically modified foods.	10
28	7	Describe the regulation of an Lac Operon.	10
29	7	How Lac Operon is regulated?	10
30	7	How tryptophan operon is regulated?	10
31	7	Describe the regulation of an Tryptophan operon.	10
32	7	Write a note on CRISPR-Cas gene regulation. Give its applications.	10

Model Question Paper		
St. Philomena's College (Autonomous), Mysore		
III Semester M.Sc-Final Examination		
Subject: Biochemistry		
Title: Genetic Engineering and Gene Expression (HC)		
Time: 3 Hours		Max Marks: 70
PART-A		
Answer any TEN of the following:		10x2=20
1.	What are Isoschizomers? Give an example.	2
2.	What is an expression vector? Give an example.	2
3.	What is a phagemid?	2
4.	What are Riboswitches?	2
5.	Distinguish between RT-PCR and Real time PCR.	2
6.	What are GM Foods? Give an example.	2
7.	What is Ti Plasmid? Give its application in genetic engineering.	2
8.	Name any four modifications in histone tails.	2
9.	What is mi RNA?	2
10.	Mention the role of Swi/snf complex.	2
11.	What is meant by 'Gene knockout'?	2
12.	Give the application of gene therapy.	2
PART-B		
Answer any SIX questions:		6x5=30
13.	Write a note on restriction endonucleases and its types.	5
14.	Explain cDNA cloning technique.	5
15.	What is PCR technique? Explain its principle and applications.	5
16.	Explain Benzer's work in analysing the fine structure of R2 locus of T4 phage	5
17.	Write a note on Western blotting.	5
18.	Describe the regulation of lytic and lysogenic cycle of bacteriophage.	5
19.	Discuss the negative impact of genetic engineering.	5
20.	Describe the regulation of a galactose operon.	5
Answer any TWO questions:		2x10=20
21.	Explain the characteristic features, applications, and limitations of the vector. Write a note on plant vectors with an example.	10
22.	What is transformation in genetic engineering? Explain microinjection technique and calcium phosphate method of transformation.	10
23.	Write a note on CRISPR-Cas gene regulation. Give its applications	10

3. a. Explain cDNA cloning technique.
- b. What is PCR? Explain the principle and application. 5+5
4. Give the principles of the following techniques. 3+3+4
- a) Southern blotting
- b) RFLP
- c) DNA finger print assay
5. a. Explain Benzer's work on the fine structure of the r II locus of T4 phage.
- b. Explain Lysogenic cycle of a bacteriophage. 5+5
6. a. Describe any two applications of genetic engineering comment on the negative impact of genetic engineering
- b. What are type II restriction endonucleases? What is their application in genetic engineering? 5+5
7. a. Explain the regulation of Lac operon by Lactose.
- b. What is histone code hypothesis? Explain 5+5
8. Write short note on any TWO of the following. 5+5
- a) Attenuation control of Trp operon.
- b) DNA footprint assay.
- c) PBR322