

Indian Institute of Technology Delhi
Department of Biochemical Engineering and Biotechnology

Course Code: BBI.231
Minor 1
Time: 1 hour

Course Name: Molecular Biology and Genetics
Date: 29th August 2017
Marks: 20 Marks

Answer all the following questions

Q.1 You have isolated a new bacterial strain which shows Nickel resistance upto 5 mM. The culture however got contaminated with strains which do not exhibit nickel resistance as well. Design an experiment to purify the culture and identify whether the source of nickel resistance is plasmid or chromosomal. 1.5

Q.2 You have isolated a plasmid of size 4 kb from *E. coli*. During the isolation a little amount of genomic DNA also came. Draw the expected gel image showing the mobility of genomic DNA, supercoiled plasmid DNA, relaxed circular and linear plasmid DNA. Define electrophoretic mobility. 2

Q.3 Differentiate between 4

- Staining dye and tracking dye
- Heterochromatin and euchromatin
- Baculovirus, M13 and Lambda phage
- Constitutive heterochromatin and Facultative heterochromatin

Q.4 Give reasons 5

- When a staining dye is used, what is the need for using a tracking dye in electrophoresis?
- Why agarose gels and not polyacrylamide gels are used for plasmid separation?
- Why we cannot achieve separation of multiple chromosomes in a long agarose gel in the horizontal gel electrophoresis apparatus and require pulse field gel electrophoresis?
- Why polyacrylamide gels are always run in vertical gel electrophoresis apparatus and never on horizontal gel electrophoresis apparatus?
- Why in high molecular weight genomic DNA preparation, plasmid DNA never comes as an impurity whereas in plasmid DNA preparation, chromosomal DNA often comes as an impurity?

Q.5 Can we put five plasmids each conferring a unique trait like nickel resistance, cadmium resistance, chromium resistance, hydrocarbon degradation, dye decolorization etc in one bacterial cell and make a superbug. Discuss whether such a superbug can be created artificially. What will be the fate of such a superbug? 1.5

Q.6 What is C value paradox? How many chromosomes would there be in a human cell displaying 1) monosomy 2) trisomy and 3) triploidy? 2.5

Q.7 You are given two DNA fragments, one from a prokaryotic source and one from a eukaryotic source, of length 250 bp and purified HU protein. Design an experiment to determine which fragment binds to HU protein. 1

Q.8 What are the various types of histone proteins present in a eukaryotic cell. Describe the role of histones in bead on a string model. 2

Q.9 Draw the diagram of a telocentric and a metacentric chromosome and show the p and q arms. 0.5