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MANIPAL INSTITUTE OF TECHNOLOGY
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V SEMESTER B.TECH. (BIOTECHNOLOGY ENGINEERING)

END SEMESTER EXAMINATIONS, November 2018

SUBJECT: ANIMAL, PLANT BIOTECHNOLOGY AND BIOETHICS

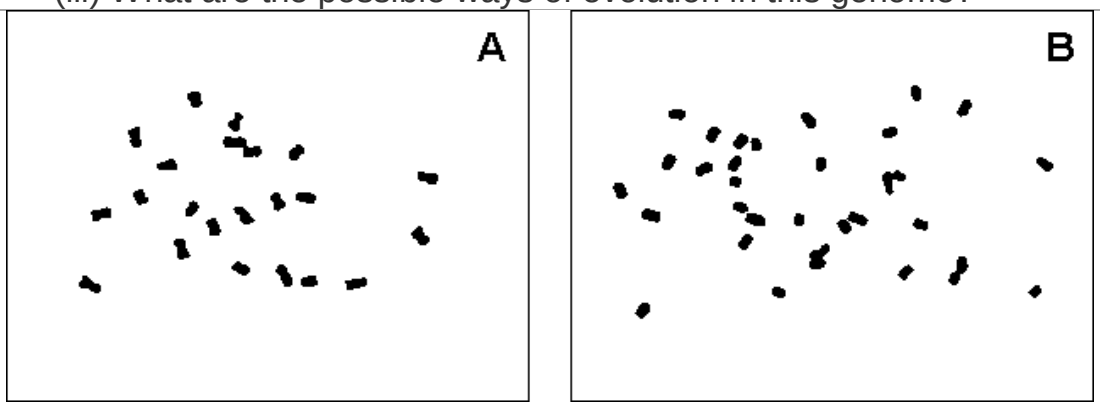
[BIO3101]

REVISED CREDIT SYSTEM

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitable assumed.

1A.	Mohan got a genome. The complete size is 157,780 bp in length, and consists of a large single copy of 86,673 bp and a small single copy of 18,349 bp, separated by two inverted repeats of 25,792 bp. (i) According to you what can be source of the genome? (ii) Construct a map showing the illustration of genomes (iii) What are the possible ways of evolution in this genome?	**4**
1B.	 Deepthi was analysing the chromosome numbers of two banana varieties A and B. Given figure illustrates the chromosomes. Analyze this and answer the following questions (i) What are the chromosome numbers of A and B? (ii) What can be the reason for two different chromosome numbers in A and B? Can you identify which stage of cell division it can be? Select from prophase, metaphase, anaphase and telophase. Justify	**4**
1C.	"Large *complex plant genomes* remain a particularly *difficult* challenge for scientists" How will you justify this statement?	**2**

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2A.	Develop a micro-propagation protocol for disease free tomato plants	**3**
2B.	Sangeetha claims that plants can survive even with half of the normal total genome size. (1) How will you evaluate her statement? Justify (2) Develop an experimental design to support your justification	**3**
2C.	A plant biotechnology group develops cell suspension cultures of goose berry tree (Amla tree). (i) How will you characterize the cell suspension cultures in terms of growth? (ii) How will you justify the heterogeneity in this suspension cultures? (iii) The team leader claims that he has an elite clone of this tree which is producing a novel secondary metabolite nick named as "X". What are the possible strategies for scaling up? (iv) Suggest a fluorescent dye which is suitable for analyzing the cell death in these cultures	**4**
3A.	Ms. Sita developed callus cultures of rice for genetic transformation. She is confused with the method. The gene of interest is 300 kb in size. Solve her problem by suggesting an ideal protocol with valid reasoning	**2**
3B.	Ms. Meenakshi wanted to develop an artificial gene for tomato. This gene promotes high yield, long shelf life and relatively bigger size. (i) She is aiming at a biological method to transfer the genes. Which method you will select for this? Justify (ii) Can she claim a patent for this variety? Explain	**3**
3C.	a) Ms. Tulasi wanted to grow the He-La (adherent) cells *in vitro*. In this line, He-La cells of appropriate cell density was seeded under completely aseptic conditions in to culture flask containing autoclaved DMEM media (10% FBS). Culture flasks were incubated at 37ºC with 10% CO_2. Upon overnight incubation, she observed the cultures using inverted microscope. On observation, it was found that all the cells were free floating and none of the cells were live. Surprisingly, cultures were not contaminated as well. What is wrong with this culture? Justify. b) Nature of the problem during feeding in regular monolayer cells is described below. List out three possible cause for the observed problem and suggest a suitable action plan for each. Nature of the problem: pH falls too quickly Cause: Action plan: .	**3**
3D	Ms. Priya was culturing Human gingival fibroblast cells in her lab. Before performing an experiment she wanted to see the cell morphology. She used bright field upright microscope for this purpose, however unable to visualize the fibroblast cells. What could be the possible problem? Suggest an alternative	**2**

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<table>
<tr><td>4A.</td><td>a) Nature of the problem during cell counting using hemocytometer is described below. Mention any two valid cause for the observed problem and suggest a suitable action plan
<table>
<tr><td>Nature of the problem</td><td>Cause</td><td>Action plan</td></tr>
<tr><td>Variable cell count</td><td></td><td></td></tr>
</table>
b) Mr. Ramu was maintaining Mouse skin fibroblast cells in his lab. His professor has given a synthetic compound and asked him to test the compound in mouse skin fibroblast cells by performing cytotoxic, proliferation, migration and apoptotic assays within 10 days' time. To get high cell density/cell number to perform the experiments, Ramu subcultured cells once in three days and reseeded them at 1 X 10^8 cells /mL to the fresh culture flask (during each subculture). He performed the experiments. Give your comment on procedures followed by Mr. Ramu. Do you have any objection on the method/procedure followed by Mr. Ramu Justify</td><td>4</td></tr>
<tr><td>4B.</td><td>a) Nature of the problem during primary culture is described below. Mention any two valid cause for the observed problem and suggest a suitable action plan
<table>
<tr><td>Nature of the problem</td><td>Cause</td><td>Action plan</td></tr>
<tr><td>Complete disaggregation but poor cell attachment</td><td></td><td></td></tr>
</table>
b) Professor Girish asked his student Mr. Subhash to establish cell line from three different samples. Sample 1: foreskin biopsy tissue (2 -3 mm); Sample 2: Chick embryo; Sample 3: fibrocystic breast tissue, Suggest a most appropriate and suitable method to establish a cell line from each sample with valid justification.</td><td>4</td></tr>
<tr><td>4C.</td><td>Dr. Rosy received Keratinocyte and fibroblast cell line in frozen form from culture collection center. She asked her recently joined student Mr. Roopesh to maintain the cell line. While sub culturing the cells, he used Class I- Biological safety cabinet.
a) Why the cell lines are shipped in the frozen form? Write the general composition of freezing medium.
b) What kind of protection (personal/product/environmental) will be provided by Class I BSC? Which class of Biological safety cabinet will be suitable for cell culture procedures?</td><td>2</td></tr>
<tr><td>5A.</td><td>1. Name the important serum protein which helps in cell attachment
2. Name the serum protein with anti-trypsin activity
3. Name any two cell culture collection centers
4. Name any two regulatory agencies in USA for Biosafety.</td><td>4</td></tr>
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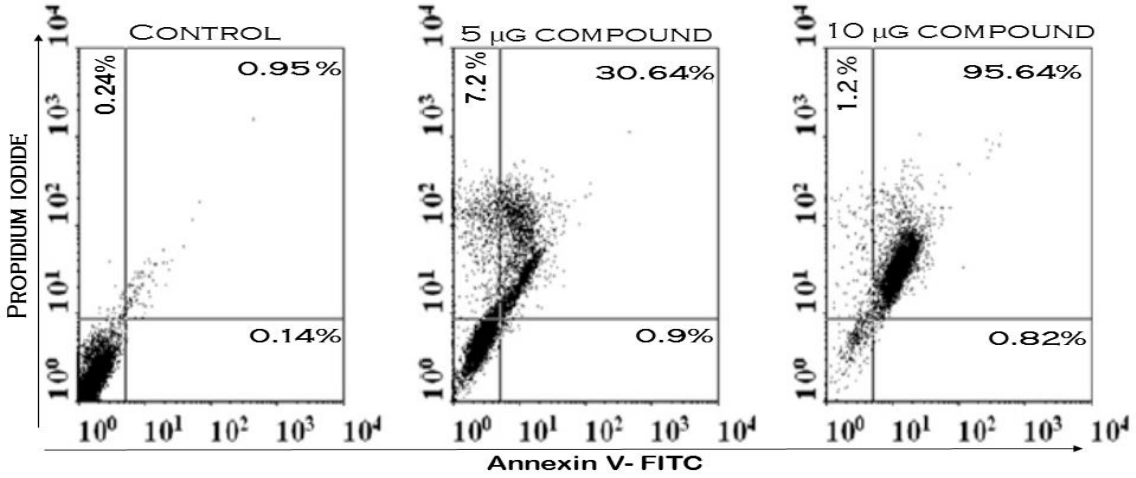
5B.	Dr. Satish has isolated a napthoquinone from roots of the plant *Juglans nigra.* He wanted to test its potential as anticancer compound in melanoma cells. He treated the melanoma cells with 5µg and 10µg of isolated compound and performed the apoptosis assay (dual staining using Annexin V-FITC and PI) through flow cytometry. Results of apoptosis assay experiment with two different concentrations of drug (5µg and 10µg) along with un-treated control are shown below. Based on the information provided answer the following questions  a) Analyze the results of his experiment. b) By looking into the result do you think the isolated compound induces programmed cell death either at 5µg and 10µg treatment? Justify. c) Write the principle of this assay	**4**
5C.	Compare and contrast Patent and trade secrets.	**2**