

BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI
ADVANCED & APPLIED MICROBIOLOGY (BIO G523)

FIRST SEMESTER 2022-23

MID-SEMESTER EXAM

Total Marks: 60

Max time: 90 minutes

Date: 04.11.2022

Instruction: Please write the answers in precise and pointwise manner.

Q1. Answer the following.

[4×5=20]

- (i) Why is the RNA world hypothesis more convincing than protein and DNA?
- (ii) What is the principle of acetylene reduction assay? Show the process in the flow chart.
- (iii) You are given to perform API of a test bacterial isolate using a commercial kit. You obtain the following result. Based on the given result write the code obtained and what will be the further step to identify the organism?

The image shows an API 20 E test strip with the following results:

Test	Result
ONPG	+
ADH	-
LDH	+
DOC	+
αGT	-
H ₂ S	-
URE	-
TDA	-
IND	+
VPI	-
αGLU	-
GLU	+
MAN	+
INO	-
SOR	+
RHA	+
SAC	+
MEL	+
AMY	-
ARA	+
OX	-
NO ₂	
N ₂	
MOB	
M/C	
O/F	
O/F	

- (iv) Evolution of cyanobacteria is supposed to be a game changer for the evolution of different species. Explain with appropriate reasons.
- (v) What is a biofilm and its implication in health and industries? Also, write the steps involved in biofilm formation.

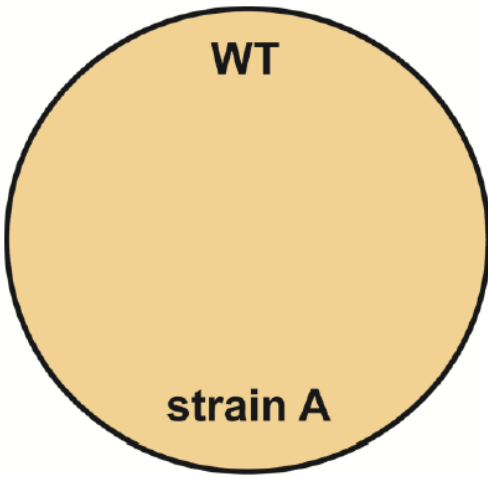
Q2. The microbial diversity of soil is determined by various factors including soil type, soil management practices, and plant genotype. What will be your experimental setup/design to find the optimal microbiome suitable for enhanced productivity of plants? **[10]**

Q2. Answer the following questions.

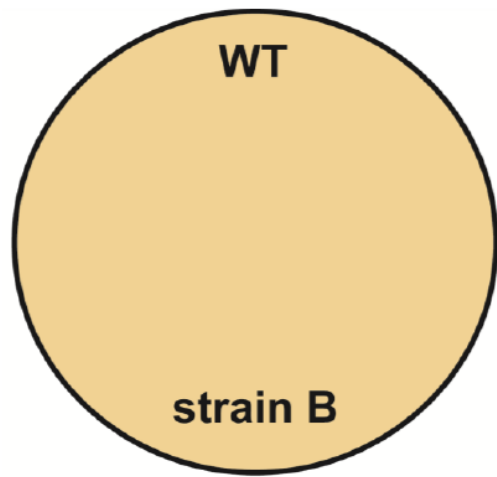
[6×5 =30]

- (i) Cite an example of social behaviors like cooperation, selfishness, altruism, and spite exhibited by microorganisms.
- (ii) Write short notes on the role of the gut microbiome in health management.
- (iii) One of the researchers in the Microbiology lab is trying to identify microorganisms involved in the degradation of poly-aromatic hydrocarbons (PAHs). Suggest a method with an appropriate flow chart that can allow selective identification of only PAH-degrading bacteria.
- (iv) Discuss (in brief) major mechanisms by which certain plant growth-promoting bacteria can ameliorate abiotic stressors.
- (v) The wild-type strain has a functional *lux* operon and can produce bioluminescence. Strain A is lacking the *luxR* gene. Strain B is lacking the *luxI* gene. Strain C is lacking the *luxR* gene, but has a promoter mutation that causes the *lux* operon to be constitutively ON. Answer the question based on problems shown for each figures given below.

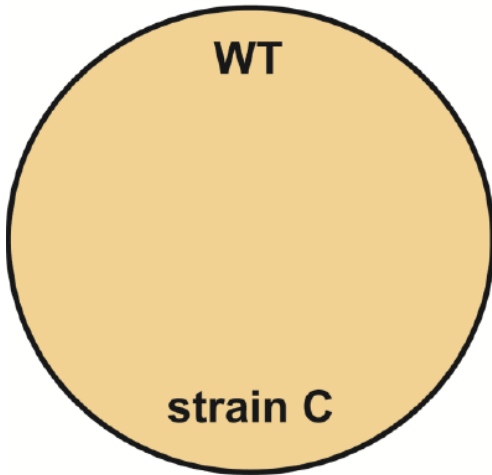
Problem 1. Draw what you predict would happen if we streaked the WT strain against Strain A. (Would we see luminescence? If so, where?)



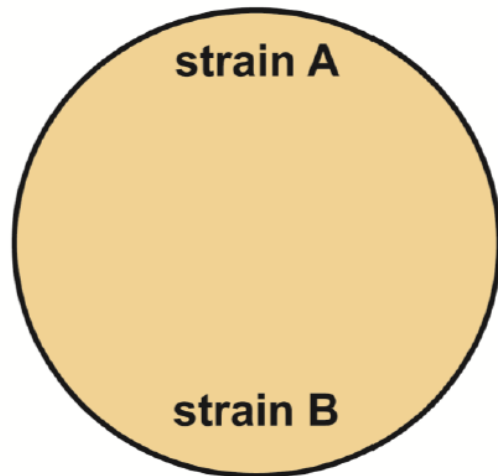
Problem 2. Draw what you predict would happen if we streaked the WT strain against Strain B. (Would we see luminescence? If so, where?)



Problem 3. Draw what you predict would happen if we streaked the WT strain against Strain C. (Would we see luminescence? If so, where?)



Problem 4. Draw what you predict would happen if we streaked the Strain A against Strain B. (Would we see luminescence? If so, where?)



-----All the best-----