Department of Biochemical Engg. and Biotechnology

BEL103: General Microbiology
Major Test

Dec.2, 2006
10.30- 12.30 hrs
Max Marks: 35

Note: Answer all questions.

Q.1. (a) Discuss the possible reasons why a culture might have a long lag phase after inoculation? (2)

b) Why are generation times of mieroorganisms present in nature usually much longer than in culture? (2)

e) A baeterial eulture consists of two microbial species, A and B. The species A is the desired one while species B is the contaminant. The initial population of species A is 4 x 10^4 per ml and that of B is 2 x 10^2 per ml. If the doubling times of A and B are 60 minutes and 30 minutes respectively, caleulate the number of cells of two species that would have present in the culture broth after 16 hours of exponential growth. If the mass of two species are the same i.e. 2 x 10^{-6} microgram per cell, what will be their mass after 16 hours? Further, if the bio-mass yield coefficient $(Y)_{x/s}$ is 0.5, how much substrate each species would have consumed in 16 hours? (4)

(d) (i) *Escherichia coli*, a mesophilic bacterium, has an optimum growth temperature of 39 C, and *Pyrodictum brockii*, a hyperthermophile, of 110 C. When incubated at 75 C, none of them grows. Why? (2)

(ii) However, if *P brockii* is brought back to 110 C, it grows well in its growth medium, whereas *E coli*, when brought back to 39 C, fails to grow in its growth medium. Why does it happen? (2)

Q. 2 (a) How does an antibiotic work to inhibit growth of microorganisms and control their populations? (2)

(b) What in your opinion are the properties of an ideal antibiotic? (2)

c) Describe any three methods by which the microorganisms ean become resistant to antibiotics. (3)

Q.3 (a) Define Phenol coefficient ? While testing the effectiveness of disinfectants with the phenol coefficient test, the following results were obtained:

Dilution	Bacterial Growth after treatment		
	Disinfectant A	Disinfectant B	Disinfectant C
1/20	-	-	-
1/40	+	-	-
1/80	+	-	+
1/160	+	+	+
1/320	+	-	+

From the results given in the table, which disinfectant can be safely considered to be the most effective? (3)

(b) Can the phenol coefficient be taken as a direct indication of disinfectant potency of a particular compound during their normal use ? (2)

Q.4. Consider a bacterial isolate which requires ferric iron in the medium for growth but cannot survive in the presence of oxygen. It can utilize succinate as carbon source but not glucose or pyruvate. It requires riboflavin as a growth factor. It does not require niacin or thiamine for growth, and any compound derived from them is also not found in the cell. The electron carriers present in the cell are: cytochrome b, cytochrome c, FAD and coenzyme Q.

(a) What is the order of electron carriers in the electron transport chain which is employed by the bacterium for generation of ATP? (2)

(b) Based on the information given, find out why is the bacterium unable to utilize glucose or pyruvate? (1)

Q.5. (a) What is the full name of the enzyme, commonly known as RUBISCO? Write the reaction catalysed by this enzyme at high carbon dioxide to oxygen ratio. (2)

(b) How will you distinguish assimilative metabolism from dissimilative metabolism with respect to use of nitrate by bacteria? (2)

Q.6. (a) Write the reactions, specific to glyoxalate cycle, used by microbes growing on acetate as the sole source of carbon and energy. (2)

(b) Write the importance of the microorganism(s), you have worked upon for your Term Paper. (2)