d) To equilibrate extracellular substances and the biomolecules of the cell.
e) To assemble the building-block molecules into macromolecules.

Write one correct answer and justify it. (2)

Q.5. Consider *Escherichia coli* growing in a medium containing glucose and all required nutrients plus (a) oxygen in one case and (b) nitrate in other case. In which medium will it grow faster and why? (2)

The half-cell potential of the following redox couples are as follows:

E_0' (NAD^+/NADH) = - 0.32 volts
E_0' (NO_3^-/ NO_2^-) = + 0.43 volts
E_0' ($1/2\,O_2$/ H_2O) = + 0.82 volts

Q. 6. Write short notes on any two:

(a) Mode of energy generation in chemolithotropic microorganisms.
(b) Nitrifying and denitrifying bacteria.
(c) Function of citric acid cycle in cellular metabolism. (2 x3 =6)

PART B

Q. 1. Which of the following can affect fungal cells? Explain why or why not for each? (4)

(a) Penicillin,

(b) tetracycline,

(c) chloramphenicol, and

(d) rifampicin.

Q. 2. How are the two types of prokaryotic cells: bacteria and archaea different from each other? What are their similarities? (4)

Q. 3. Diagrammatically explain the cell wall of a typical Gram- negative bacterium. (2)

Department of Biochemical Engineering and Biotechnology
Indian Institute of Technology, Delhi

BEL103 General Microbiology (I Semester, 2013-2014)
MAJOR TEST

Date: 28.11.2013 **Timing:** 10.30 – 12.30 hrs **Maximum Marks:** 30

Note: Attempt all questions. Answer Part A and Part B in separate answer books.

PART A

Q.1. Lactic acid bacteria (LAB), which are aerotolerant anaerobes, carry out homofermentative and heterofermentative lactic acid metabolism. How many moles of ATP are generated for conversion of one mole of glucose to lactic acid and acetic acid in heterofermentative LAB? Show the complete pathway (formulae of compounds are not required). (4)

Q.2. Consider glyoxalate pathway for catabolism of acetic acid for energy generation in a bacterium. How many moles of ATP are generated per mole of acetic acid if only glyoxalate pathway is followed? Write one complete reaction, which is specific to glyoxalate pathway only.

(3+1=4)

Q.3. The steps of glycolysis between glyceraldehyde 3-phosphate and 3-phosphoglycerate involve all of the following *except:*

(a) *ATP synthesis*
(b) *the utilization of* P_i
(c) *the oxidation of* NADH to NAD^+
(d) *the formation of* 1,3-bisphosphoglycerate
(e) catalysis by phosphoglycerate kinase

Write one correct answer and justify it. (2)

Q.4. Which of the following *is not* a function of metabolism?

(a) To extract chemical energy from substances obtained from the external environment.
(b) To form and degrade the biomolecules of the cell.
(c) To convert exogenous nutrients into building blocks and precursors of macromolecules.