

THE OPEN UNIVERSITY OF SRI LANKA  
B.Sc DEGREE PROGRAMME – LEVEL –05  
FINAL EXAMINATION-2007/2008  
BIO PHYSICS -PHU 3152 /PHE 5152  
DURATION: TWO AND A HALF (2½) HOURS.



064

DATE: 16<sup>th</sup> June 2008

TIME: 10.00 A.M – 12.30 P.M

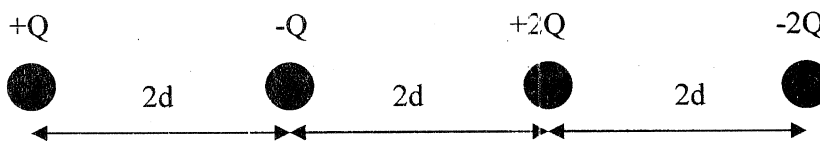
ANSWER ANY FOUR (04) QUESTIONS ONLY

Use the following values where necessary.

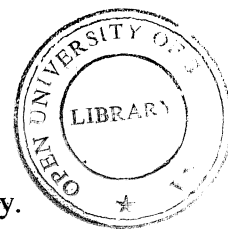
Plank's constant  $h = 6.63 \times 10^{-34}$  Js

Boltzmann constant  $= 1.38 \times 10^{-23}$  JK<sup>-1</sup>

01. (a) What is a dipole? How do you describe the interaction between dipoles?  
(b) Calculate the potential energy between the two dipoles shown in the arrangement below.



- (c) Calculate the resultant of two dipole moments of magnitude 1.5 D and 0.8 D that make an angle 109.5° to each other.
02. (a) What are the structure levels of a protein? Describe them, briefly.  
(b) What are enzymes? Explain their function in a living system, briefly.  
(c) An enzyme speeds up a chemical reaction to a rate of  $0.5 \times 10^{-3}$  mol L<sup>-1</sup> min<sup>-1</sup> when the substrate concentration is 0.4 mol L<sup>-1</sup>. If Michaelis constant is 0.03 mol L<sup>-1</sup>, find the maximum possible rate of the reaction.



03. (a) Give a qualitative description of the vibrational and rotational states of a diatomic molecule.
- (b) Compare the vibrational and rotational energy levels of such a diatomic molecule with its electronic energy levels giving a sketch.
- (c) A sample of thickness 0.45 cm absorbs 80 % of the incident light falling on to it. What is the absorption coefficient of the sample?
04. (a) Discuss how Nuclear Magnetic Resonance (NMR) technique is different from X-ray technique in protein structure determination. State the advantages as well as disadvantages in NMR.
- (b) A biological sample is placed in a magnetic field of 15T. At temperature 500K it has been found that the ratio of spin up to spin down state is 1.0008. What is the gyromagnetic ratio ( $\gamma$ ) of nuclei in the sample? Calculate the frequency of the radio wave, which makes the above absorption process.
05. (a) State the first and the second law of thermodynamics and describe each of them.
- (b) Discuss the importance and validity of the application of above laws on the evolution of life.
- (c) Discuss how entropy and the free energy should be modified in order to accommodate processes occur in a biological system.
- 06 Write short notes on the following
- (a) Process of photosynthesis
- (b) Adenosine triphosphate as the energy of the cell
- (c) Process of sedimentation

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