STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI 600 086
(For candidates admitted during the academic year 2011 – 12)

SUBJECT CODE: 11BI/PC/BP14

M. Sc. DEGREE EXAMINATION, NOVEMBER 2011
BIOINFORMATICS
FIRST SEMESTER

COURSE : CORE
PAPER : BIOPHYSICS
TIME : 3 HOURS **MAX. MARKS: 100**

SECTION - A

ANSWER ALL OF THE FOLLOWING QUESTIONS: (1X20=20)

1. Most of the volume of an atom is occupied by
   a) electrons.
   b) protons.
   c) neutrons.
   d) empty space
2. The idea of matter waves, as reasoned by de Broglie, describes a wavelike behavior of any
   a) particle, moving or not.
   b) particle that is moving.
   c) charged particle that is moving.
   d) particle that is stationary
3. One reason the Bohr model of the atom failed was because it did not explain why
   a) accelerating electrons do not emit electromagnetic radiation.
   b) moving electrons have a greater mass.
   c) electrons in the orbits of an atom have negative energies.
   d) electrons in greater orbits of an atom have greater velocities.
4. Which of the following nuclei will have a magnetic moment?

   (a) $^{2}_{1}D$ (b) $^{16}_{8}O$ (c) $^{12}_{6}C$ (d) $^{32}_{16}S$

5. NMR spectroscopy involves
   a) diffraction
   b) emission
   c) radiation
   d) absorption

6. The path of ions after deflection depends on _____
   a) only the mass of the ion
   b) only the charge on the ion
   c) both the charge and the mass of the ion
   d) neither the charge nor the mass of the ion
7. Which of the following is not a use for mass spectrometry?
   a) calculating the isotopic abundance in elements
   b) investigating the elemental composition of planets
   c) confirming the presence of O-H and C=O in organic compounds
   d) calculating the molecular mass of organic compounds

..2

8. For the incorrect answer above, which method can be used?
9. Which of the following transitions is the highest energy transition?
    a) n to s*
    b) n to p*
    c) s to s*
    d) p to p*

10. Which of the following bonds would show the strongest absorption in the IR?
    a) carbon-hydrogen
    b) oxygen-hydrogen
    c) nitrogen-hydrogen
    d) sulfur-hydrogen

11. The region of an infra-red spectrum where many absorptions take place is known as the _____

    a) thumbprint region
    b) handprint region
    c) footprint region
    d) fingerprint region

12. Signals in a proton nmr spectrum do not provide information about _____

    a) the relative number of hydrogen atoms in a particular environment
    b) the number of chemically different hydrogen atoms on adjacent atoms
    c) the environment of different hydrogen atoms in a molecule
    d) the molecular mass of an organic molecule

13. For the incorrect answer above, which method can be used?

14. How does the hydrophobic effect influence the structures of large molecules?

    a. Nonpolar molecules are not easily solubilized in water and aggregate
    b. Polar groups are oriented on the surface, interacting with the water
    c. Nonpolar molecules can mask the polar characteristics of the hydrophilic molecules
    d. a) and b)

15. The AFM consists of a _____ with a sharp tip (probe) at its end that is used to scan the specimen surface.
    a) Beam (structure)
    b) Cantilever
    c) Truss bridge
    d) Cantilever bridge

16. How do you differentiate CFM from AFM?

17. What is rayleigh's scattering?

18. What is MALDI?

19. Define entropy.

20. Explain bond distance.

SECTION B

ANSWER ANY FOUR OF THE FOLLOWING: 4X10=40

21. Explain the two laws of thermodynamics. Derive an equation for change in free energy.
22. Explain the theory and instrumentation of fluorescence spectroscopy
23. Explain NMR application to Macromolecules.
24. Explain the dispersion Techniques used in Mass spectrometry.
25. How are proteins identified by peptide mass fingerprinting?
26. Write a note on properties of crystals, methods of crystal growth and methods of data collection.
27. Explain the principle and instrumentation of atomic force microscopy.

SECTION C

ANSWER ANY TWO OF THE FOLLOWING 2X20 = 40

28. . Explain
    a) Relaxation in NRM
    b) Nuclear overhauser effect
29. Explain the principle and instrumentation behind mass spectrometry by emphasising on the variation in type based on mechanism of ionisation and analyses.
30. Explain the concept behind evolution of De Broglie theory of matter? What variation leads to the evolution of these waves? Add a note on the equation developed based on this principle?
31. Explain the principle, instrumentation and application of Raman spectroscopy.

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