STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI – 600 086.
(For candidates admitted during the academic year 2004-05 & thereafter)

SUBJECT CODE : **PH/MC/AN64**

B.Sc. DEGREE EXAMINATION APRIL 2009
BRANCH III - PHYSICS
SIXTH SEMESTER

REG. No._____

COURSE   :   **MAJOR – CORE**
PAPER   :   **ATOMIC AND NUCLEAR PHYSICS**
TIME   :   **30 MINS.**   MAX. MARKS : 30

SECTION – A

TO BE ANSWERED IN THE QUESTION PAPER ITSELF

ANSWER ALL QUESTIONS: (30 x 1 = 30)

I   CHOOSE THE CORRECT ANSWER:

1.   The photoelectric effect can be explained on the basis of
    a) corpuscular theory of light   b) wave theory of light
    c) electromagnetic theory of light   d) quantum theory of light

2.   The wave function of a photoelectric material is 3.3eV. The threshold frequency
    will be equal to
    a) 8×10^{14}Hz   b) 8×10^{10}Hz   c) 5×10^{20}Hz   d) 4×10^{14}Hz

3.   X Ray is
    a) phenomenon of conversion of kinetic energy inter radiation
    b) conversion of momentum
    c) conversion of energy to mass
    d) principle of conservation of charge.

4.   The elliptical orbits of electron in the atom were proposed by
    a) J J Thomson   b) Bohr   c) Sommerfeld   d) de Broglie

5.   The first excitation potential energy or the minimum energy required to excite
    atom from the ground state of hydrogen atom is
    a) 13.6eV   b) 10.2eV   c) 3.4eV   d) 1.89eV

6.   In anomalous Zeeman effect the longer wavelength component $^2Px_2 \rightarrow\ ^2Sv_2$
    splits into
    a) 6 lines   b) 4 lines   c) 2 lines   d) 8 lines

7.   The nuclear fission was explained by
    a) liquid drop model   b) shell model
    c) collective model   d) radioactive model

..2

8. Sun releases energy by the process of
    a) spontaneous combustion
    b) nuclear fusion
    c) nuclear fission
    d) electrical incandescence

9. The mass defect of a certain nucleus is found to be 0.03 amu. Its binding energy is
    a) 24.93eV
    b) 27.93KeV
    c) 27.93MeV
    d) 27.93GeV

10. The boron – steel rods in nuclear reactor work as
    a) moderator
    b) controller
    c) coolant
    d) shield

11. The fission of $_{92}U^{235}$ is caused by
    a) α – particles
    b) β particles
    c) fast neutrons
    d) slow neutrons

12. Bi^{210} has half life of 5 days. The time taken for seven eighth of the sample to decay is
    a) 3.4 days
    b) 10 days
    c) 15 days
    d) 20 days

13. Cyclotrons is used to accelerate
    a) electrons only
    b) positive ions only
    c) both positive ions and electrons
    d) neutrons only

14. Nuclear particles are bound in nucleus by
    a) gravitational forces
    b) Masonic forces
    c) electrostatic forces
    d) electromagnetic forces

15. Strange particles are
    a) Baryons and leptons
    b) photons
    c) leptons and mesons
    d) neutrons and baryons

II FILL IN THE BLANKS:

16. The stopping potential of a metal surface in independent of _____.

17. The difference in energy of the electrons having spin parallel and antiparallel to the magnetic field B is given by ΔU_m _____

18. The empirical formula for nuclear radius is _____

19. In β decay the neutron number _____

20. In elementary particle physics, the mirror symmetry is known as _____.

III STATE TRUE OR FALSE:

21. When $\ell = 1$; it is called s orbit

22. Moseley's law is $\sqrt{r} = a(z - b)$

23. The magic numbers are 2, 4, 16, 32, 82. 125.

24. Cyclotron is used to accelerate negatively charged particles.

25. Fermions have half – integral spin.

IV   ANSWER BRIEFLY:

26. Write Einstein's photoelectric equations.

27. What is Lande g factor?

28. Define critical mass.

29. Write the relation connecting of half-life and mean life of a radioactive substance.

30. What is the principle of G.M. counter.

✳✳✳✳✳✳

STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI – 600 086.
(For candidates admitted during the academic year 2004-05 & thereafter)

SUBJECT CODE : **PH/MC/AN64**

B.Sc. DEGREE EXAMINATION APRIL 2009
BRANCH III - PHYSICS
SIXTH SEMESTER

COURSE   :   **MAJOR – CORE**
PAPER   :   **ATOMIC AND NUCLEAR PHYSICS**
TIME   :   **2 ½ HOURS**   MAX. MARKS : 70

SECTION – B

ANSWER ALL QUESTIONS: (5 x 5 = 25)

1.   A photo electric surface has a work function of 4eV. What is the maximum
      velocity of photo electrons emitted by light of frequency 10^{15} Hertz incident on
      the surface.

2.   A singly charged positive ion is accelerated through a potential difference of 1 kv
      and the ion passes through a uniform magnetic field of B=0.2T and consequently
      gets deflected through a circular path of radius 0.1m. Find the mass number of
      the ion.

3.   The experimental value of Bohr magneton is 9.21 x 10^{-24}ST units and Plank's

      constant $\hbar = 6.6 \times 10^{-34} J - s$. Calculate the value of $\dfrac{e}{m}$ of electron.

4.   Estimate the energy released when two deutron nuclei fuse together to form H^2
      and He^4 are 1.1 and 7MeV respectively.

5.   Radon, the disintegration product of radium is in equilibrium with 1 gram of
      radium. Find the mass of radon. Half life of Ra^{226}=1590 years, Rr^{222}=3.82 days.

6.   If X-rays of wavelengths 0.5A are detected at an angle of 5° in the first order,
      what is the spacing between the adjacent planes of the crystal? At what angle will
      the second order maximum occurs?

7.   Calculate the wavelength separation between two component lines which are
      observed in the normal Zeeman effect. The magnetic field used is 0.4T; the
      specific charge = 1.76 x 10^{11}c/kg and λ =6000A°.

SECTION – C

ANSWER ANY THREE QUESTIONS: (3 x 15 = 45)

8.   Discuss Thomson's parabola method of determining e/m of positive rays.

9.   Define excitation and ionization potential. Describe Frank and Hertz experiment for the determination of critical potentials.

10.   Explain the phenomenon of nuclear fission. Explain it on the basis of liquid drop model.

11.   State the laws of radio active disintegration. Obtain expression for half life and mean life of a radio active substances.

12.   Describe the construction, working and theory of cyclotron. What are its limitations?

✕ ✕ ✕ ✕ ✕ ✕ ✕