STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI – 600 086.
(For candidates admitted during the academic year 2004-06)

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

B.Sc. DEGREE EXAMINATION APRIL 2007
BRANCH III - PHYSICS
SIXTH SEMESTER

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

SECTION - B

ANSWER ANY FIVE QUESTIONS: (5 x 5 = 25)

1. Sodium has the first two excited states 2.1eV and 3.7eV. In a Franck Hertz experiment electrons of energy 4.7eV are fired in sodium gas.
   i) Deduce the possible energy values of the electrons received at the collector.
   ii) Deduce the wavelength of the spectral lines expected.

2. Na Cl has its principal planes spaced at 2.820 Angstrom. The first order Bragg's reflection is located at 10^o.
   a) calculate the wavelength of the x-rays.
   b) the angle for second order Braggs reflection.

3. Light of wavelength 4300 A^o units is incident on
   a) nickel surface of work function 5eV
   b) a potassium surface of work function 2.3 eV. Find out if electrons will be emitted and if so the minimum velocity of the electrons emitted in each case.

4. Calculate the binding energy per nucleon for $_{17}Cl^{35}$, given that mass of a proton = 1.007825 amu, mass of a neutron = 1.008665 amu and actual mass of the $_{17}Cl^{35}$ nuclues = 34.98 amu.

5. Determine the age of the earth given that the isotopic abundance of U238 and U235 are 99.28% and 0.72% respectively today. Originally they were present in equal abundance given half life of U-238 and U-235 are $4.5x10^9$ years and $7.1x10^8$ years.

6. The cadmium line of wavelength 4226.73 A^o exhibits normal human splitting when placed in a uniform magnetic field of 4 wb/m^2. Calculate the wavelength of the three components of the normal human pattern and the separation between them.

7. Explain the principle of a nuclear power reactor.

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SECTION - C

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

8. Derive Einsteins photo-electric equation and describe Millikan's experiment to verify the same.

9. Give the theory of Compton effect and briefly explain its experimental verification.

10. Describe the stern and Gerlach experiment and indicate the importance of the results obtained.

11. Discuss liquid drop model of a nucleus and obtain the semi-empirical mass formula.

12. Describe the construction and working of a cyclotron. Discuss its limitation.