SHRI S.H.KELKAR COLLEGE OF ARTS, COMMERCE& SCIENCE, DEVGAD
FIRST TERM END EXAMINATION
USPH 102

MAX.MARKS:75 DURATION: 2 ½ HOURS

N.B (i) All questions are compulsory.
(ii) Figures to the right indicate full marks.
(iii) Use of non-programmable calculator is allowed.

Q 1.A) Attempt **any One.** 08

1. Explain Rutherford α-particles scattering experiment with the help of neat labelled diagram
2. Explain i) atomic mass unit
   ii) Nuclear mass and mass energy equivalence

B) Attempt **any One.** 08

1. What is carbon dating? Explain it as an archaeological time scale.
2. State and explain the law of radioactive disintegration. Derive its relation.

C) Attempt **any One.** 04

1. Calculate the mass of deuterium nucleus; if 1MeV is the B.E/nucleon.
2. The natural carbon the abundance of ^{14}c is $1.3x10^{-12}$ and 5730 years is its half-life time. Calculate the number of disintegration/hour in 1gm of natural carbon.

Q. 2. A) Attempt **any One.** 08

1. Define Q value of nuclear reaction. Derive its necessary equation.
2. Explain construction and working of G.M. counter with neat labelled diagram.

B) Attempt **any One.** 08

1. Give classification of nuclear reaction with suitable example.
2. Explain ionization chamber with the help of neat labelled diagram.

C) Attempt **any One.** 04

1. Draw a neat labelled diagram of proportional counter and give its varied applications.
2. Determine the Q value of the reaction $^{6}_{3}LI\ (d,\alpha)\alpha$
   [Given: mass of lithium=6.015125a.m.u.
   Mass of deuterium= 2.014102 a.m.u.]

Q.3 A) Attempt any **One**. 08

1. Explain the concept of de Broglie hypothesis.
2. Explain Heisenberg's uncertainty principle

B) Attempt **any One.** 08

1. Describe single crystal Bragg's spectrometer.

2. Explain the Crompton effect. Show that the Crompton shift is $\Delta\lambda = h/(m_0c)$ [1-cose]

04

C) Attempt **any One.**

1. Write a short note on wave-particle dualism.
2. What is de Broglie wavelength associated with a proton moving with a velocity equal to 1/30th of velocity of light? [mass of proton: 1.67×10^{-27} kg]

15

Q.4) Attempt any **Three.**

1. Explain mass defect and packing fraction.
2. Explain half-life period of radioactive substance.
3. Write a note on plot of variation of ionization current v/s applied voltage.
4. How much is the energy released in kilowatt hour by 1 gram of Uranium of 235? [given: One nucleus of U-235 release about MeV energy in fission process]
5. Write a note on theory of black hole.
6. The distance between adjacent atomic planes in calcite is 3 Å. Find the smallest angle of Braggs scattering for 0.3 Å X rays.