B. N. BANDODKAR COLLEGE OF SCIENCE, THANE

F.Y.B.Sc. Second Semester March 2012 ®

Duration : 2 Hrs **USPH 202** **MARKS** : **60**

N.B.: **1**) All questions are **compulsory**.
2) Figures on the right indicate **full marks**.
3) **Non – programmable calculators** are allowed.

Q.1) **(A)** Attempt any **ONE** of the following. **(8)**

1) With the help of a neat labeled circuit diagram, obtain the balance condition for the Schering Bridge.

2) Describe the ballistic galvanometer of a suspended type and give the theory of its working.

(B) Explain the Maxwell's inductance – capacity (L-C) bridge. **(4)**

(C) A ballistic galvanometer has current sensitivity of 600 mm/μA. Find the current that produces a deflection of 3 mm. The coil has period 6 s, what is the charge sensitivity? **(3)**

Q.2) **(A)** Attempt any **ONE** of the following. **(8)**

1) What is 'radioactive equilibrium'? Explain (i) ideal equilibrium
(ii) Secular equilibrium

2) Describe Nuclear Magnetic Resonance (NMR) .

(B) Write a short note on : carbon dating **(4)**

(C) Using the Heisenberg's uncertainty principle,
Show that mass of π meson = 275 x Mass of an electron **(3)**

Q.3) **(A)** Attempt any **ONE** of the following. **(8)**

1) Show that the Compton shift is

$$\Delta\lambda = \frac{h}{m_0 c}(1 - \cos\theta)$$

2) State de Broglie hypothesis. Explain de Broglie concept of matter waves. State the characteristics of matter waves.

(B) Define : **(4)**
(i) nuclear binding energy
(ii) binding or packing fraction
(iii) nuclear fission
(iv) nuclear fusion

(C) If a photon has an energy 5 KeV, what will be its wavelength and frequency? **(3)**

Q.4) **(A)** Attempt any **THREE**.

1) Distinguish between the ballistic and dead-beat galvanometer. **(4)**

2) In a Wien bridge circuit, R_1=R_2= 1 KΩ, C_1= C_2= 0.22 μF, and R_4 = 2.2 KΩ. Find the value of R_3 and the frequency of the applied voltage needed to balance the bridge. **(4)**

3) Determine the weight in kg if 2 Curie of RaB (^{214}Pb) has a half–life of 26.8 minutes? **(4)**

4) Define atomic mass unit (a.m.u.). Show that 1 a.m.u. = 931 MeV **(4)**

5) Write a short note on : gravitational red shift **(4)**

(B) Explain the physical significance of Heisenberg uncertainty principle. **(3)**