C 81849 **(Pages : 3)** **Name**

Reg. No. . . . . .

FOURTH SEMESTER B.Sc. DEGREE EXAMINATION APRIL/MAY 2015

(UG–CCSS)

Complementary Course – Physics

PH 4C 07 – ELECTRICITY, MAGNETISM AND NUCLEAR PHYSICS

(2013 Admissions)

Time : Three Hours **Maximum : 30 Weightage**

Section A

Answer **all** *questions.*

Each question carries a ***weightage*** *01¼.*

1. A uniform electric field of magnitude 100 N/C exists in space along the X- direction. The flux of this field through a plane square area of sides 10 cm placed in the Y-Z plane is :

(a) **10.** **(b) 1.**

(c) **100.** **(d) 0.**

2. A positive point charge is brought near an isolated metal cube. Then the interior of the cube will be :

(a) Negatively charged. **(b) Positively charged.**

(c) Charge free. **(d) None of the above.**

3. Capacitance of a parallel plate capacitor increases with :

(a) Increase in plate area and decrease in distance between the plates.

(b) Decrease in plate area and increase in distance between the plates.

(c) Decrease in plate area and decrease in dielectric constant.

(d) Increase in distance between the plates and decrease in dielectric constant.

4. When a dielectric is placed between the plates of a capacitor, the electric field between the plates :

(a) Decreases. **(b) Increases.**

(c) Reduces to zero. **(d) Remains unchanged.**

5. The unit of resistivity is :

(a) Ohm. **(b) Ohm m.**

(c) $(\text{Ohm-m})^{-1}$. **(d) $(\text{Ohm})^{-1}$.**

Turn over

6. The magnetic susceptibility is negative for :

(a) Paramagnetic materials only.

(b) Diamagnetic and paramagnetic materials.

(c) Diamagnetic materials only.

(d) Ferromagnetic materials only.

7. Which of the following is *not true* about nuclear force?

(a) It is charge dependent. (b) It is a short range force.

(c) It is the strongest force in nature. (d) It exhibits saturation property.

8. As the mass number increases, which of the following quantities related to a nucleus does not change?

(a) Mass. (b) Volume.

(c) Density. (d) Binding energy.

9. Which of the following are electromagnetic waves?

(a) Alpha rays. (b) Beta minus rays.

(c) Beta plus rays. (d) Gamma rays.

10. Particles which are made up of three quarks are known as :

(a) Leptons. (b) Baryons.

(c) Mesons. (d) Neutrinos.

11. In which of the following decays the mass number decreases?

(a) Alpha decay. (b) Beta minus decay.

(c) Beta plus decay. (d) Gamma decay.

12. _____ is a device which measures the potential difference without drawing any current from the circuit in which it is connected.

(12 x ¼ = 3 weightage)

Section B

Answer **all** *questions.*

Each question carries a ***weightage*** *of 1.*

13. State Coulomb's Law.

14. What is drift velocity? How is it related to the current in a conductor?

15. What is hysteresis?

16. Distinguish between paramagnets and ferromagnets.

17. Define half life and mean life of a radioactive material.

18. Explain latitude effect in cosmic rays.
19. What is superconductivity?
20. Explain the concept of 'colour' in quark theory.
21. Distinguish between nuclear fission and nuclear fusion.

(9 x 1 = 9 weightage)

Section C

Answer any **five** *questions.*

Each question carries a ***weightage*** *of* 2.

22. State Gauss's Law. Find the electric field due to an infinite plane of positive charge with uniform surface charge density G.
23. Two charges 10 μC and 20 μC are placed at a separation of 2 cm. Find the electric potential due to these charges at the middle point of the line joining the two charges. Given $\varepsilon_0 = 8.85 \times 10^{-12} C^2/Nm^2$.
24. A tangent galvanometer has 66 turns and the diameter of its coil is 22 cm. It gives a deflection of 45° for 0.10 A current. What is the value of the horizontal component of earth's magnetic field?
25. What is a deflection magnetometer? Explain, with necessary equations, how the ratio of the moment of a magnet to the earth's horizontal field (m/B_H) can be determined in tan-A position.
26. Estimate the age of a piece of wood from the ruins of an ancient dwelling if it has a ^{14}C activity of 13 disintegrations per minute per gram. The ^{14}C activity of living wood is 16 disintegrations per minute per gram and halflife period of ^{14}C is 5760 years.
27. Define the three elements of earth's magnetic field.
28. Write a short note on the origin of the universe.

(5 x 2 = 10 weightage)

Section D

Answer any **two** *questions.*

Each question carries a ***weightage*** *of* 4.

29. Explain with necessary theory how Carey Foster's Bridge can be used to determine the temperature coefficient of resistance.
30. Describe with necessary theory and diagram, the working of a linear accelerator. What are the limitations of this accelerator?
31. Discuss in detail the classification of elementary particles.

(2 x 4 = 8 weightage)