

20U408S

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Name:

Reg. No.

FOURTH SEMESTER B.Sc. DEGREE EXAMINATION, APRIL 2022

(CUCBCSS-UG)

CC15U PH4 C04 - ELECTRICITY, MAGNETISM AND NUCLEAR PHYSICS

(Physics- Complimentary Course)

(2016 to 2018 Admission – Supplementary/Improvement)

Time: Three Hours

Maximum: 64 Marks

Section A

Answer *all* questions. Each question carries 1 mark.

1. The SI unit of electric charge is _____
2. Write the expression for Gauss' law.
3. The energy stored in a parallel plate capacitor is given by _____
4. Give an example of an equipotential surface.
5. What is meant by specific resistance?
6. An ammeter is connected _____ to a given circuit.
7. A diamagnetic property decreases with temperature (True/False).
8. What is mass defect of a nucleus?
9. What is meant by pair production?
10. What are hadrons?

(10 × 1 = 10 Marks)

Section B

Answer *all* questions. Each question carries 2 marks.

11. State the principle of superposition.
12. Define drift velocity for electric charges? Write a formula for it.
13. Explain Meissner effect.
14. Write a short note on magnetic elements of earth's magnetism.
15. Explain briefly how binding curve is related to stability of atom.
16. Write a short note on Higgs boson
17. Write a short note on cosmic rays.

(7 × 2 = 14 Marks)

Section C

Answer any *three* questions. Each question carries 4 marks.

18. Use Gauss' law to find the electric field due to a spherical charge distribution.
19. Explain the principle of potentiometer with a neat diagram.

20. Explain ferromagnetism and paramagnetism.

21. Explain Carbon-14 dating.

22. Explain hydrogen bomb.

(3 × 4 = 12 Marks)

Section D

Answer any *three* questions. Each question carries 4 marks.

Problems. Write all relevant formulas. Each important step carries separate marks.

23. Consider two charges, $q_1 = 4 \times 10^{-6} \text{ C}$ and $q_2 = 6 \times 10^{-6} \text{ C}$ separated by distance of 0.4 m.

Find the point at which electric field due to them cancels.

24. When two cells are connected in series to a potentiometer then the balancing length is 500cm. When one of the cells is reversed, then the new balancing length is 300cm.

What is the ratio of emf of the cells?

25. When a magnetic bar of cross section 0.1 cm^2 is placed in a magnetizing field 3000 Am^{-1} and magnetic flux in the specimen is $2.5 \times 10^{-5} \text{ Wb}$. Find the permeability and susceptibility of the material.

26. How long does it take for 40% of a sample of radon to decay? Given, the half-life of radon is 3.82 days.

27. Show that muon decay and pair production conserves Lepton number.

(3 × 4 = 12 Marks)

Section E

Answer any *two* questions. Each question carries 8 marks.

28. (a) Find the electric field due to a plane sheet of charge.

(b) Use the above results to find the electric field due to two parallel plane sheets of equal and opposite charge.

29. Discuss the principle of deflection magnetometer to find the magnetic moment of magnet for Tan A and Tan B positions.

30. Explain the working of cyclotron with a neat diagram. Derive the expression for kinetic energy acquired by the particle.

31. (a) Write a note on the basic forces of nature.

(b) Explain about different classifications of elementary particles.

(2 × 8 = 16 Marks)
