

FOURTH SEMESTER (CUCBCSS—UG) DEGREE EXAMINATION, APRIL 2021

Physics/Applied Physics

PHY 4C 04—ELECTRICITY MAGNETISM AND NUCLEAR PHYSICS

Time : Three Hours

Maximum : 80 Marks

Section A*Answer all questions.**Each question carries 1 mark.**Answer in a word or phrase.*

1. Betatron is used to accelerate _____ particle.
2. The particle emitted in β decay together with electron is _____.
3. Superconductivity was discovered by _____.
4. The combination of one u quark and two d quarks is called _____.
5. Range of nuclear force in the order of _____.
6. An example for paramagnetic substance is _____.
7. Nuclear fission can be explained by _____.
8. The susceptibility of paramagnetic material is _____.
9. Charge of u quark is _____.
10. The principle of _____ used in the construction of atom bomb.

(10 × 1 = 10 marks)

Section B*Answer all questions.**Each question carries 2 marks.**Answer in two or three sentences.*

11. State Coulomb's theorem.
12. State Gauss Law.
13. Explain nuclear fission.
14. Explain critical temperature in superconductivity.
15. Explain the properties of electric lines of force.

(5 × 2 = 10 marks)

Turn over

Section C

*Answer any four questions.
Each question carries 5 marks.
Answer in one paragraph.*

16. Differentiate between nuclear fission and fusion with example.
17. Explain the terms : binding energy of the nucleus, packing fraction mass defect.
18. Distinguish between Para, Dia and ferromagnetic materials.
19. Explain the terms, decay constant, half life and average life as applied to a radioactive substance. Find the relation between them.
20. Discuss with the neat diagram the working of a semiconductor detector.
21. Explain latitude effect in cosmic rays

(4 × 5 = 20 marks)

Section D

*Answer any two questions.
Each question carries 5 marks.*

22. A horizontal overhead power line carries a current of 50A from the south to north. Calculate the magnitude and direction of the magnetic field due to the current at a point 2m above the line.
23. Given the following isotopic masses ${}_3\text{Li}^7 = 7.016004$, ${}_3\text{Li}^6 = 6.015125$ and ${}_0\text{n}^1 = 1.008665$. Calculate the binding energy of neutron in ${}_3\text{Li}^7$ nucleus. Express the result in u, MeV and Joules.
24. A metallic wire 1 mm in diameter carries a charge of 100C in one hour. The metal contains 6×10^{22} free electrons per cubic centimetre. Calculate the current in the wire and the drift velocity of electrons.
25. Calculate the force and acceleration of an α particle when it is at a distance of 6.9×10^{-15} from the surface of the gold nucleus. Nuclear radius = 6.9×10^{-15} m Mass of the α particle = 6.7×10^{-27} Kg Charge of the electron = 1.6×10^{-19} C Atomic No. of gold = 79.
26. How many kilowatt energy will be released by complete fission of one kg of U^{235} . Given that the energy released per fission is 200 MeV ?

(2 × 5 = 10 marks)

Section E

*Answer any two questions.
Each question carries 15 marks.*

27. Explain nuclear fission and fusion and also explain the working of hydrogen bomb.
28. Write an essay on Elementary Particles.
29. With the help of neat diagram and necessary theory, explain how the temperature coefficient of the material of a resistor can be determined using Carey Foster's Bridge.

(2 × 15 = 30 marks)