

D6BPH1703 (S3)

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Reg. No.....

Name:

SIXTH SEMESTER B.Sc. DEGREE EXAMINATION, APRIL 2023**(Supplementary - 2017 & 2018 Admissions)****PHYSICS****APHY6B12T: NUCLEAR PHYSICS, PARTICLE PHYSICS & ASTROPHYSICS****Time: 3 Hours****Maximum Marks: 80****SECTION A: Answer *all* questions. Each carries 1 mark.**

1. Write down the expression for Q value of beta decay process.
2. What do you understand by magnitude of stars?
3. Define critical mass of chain reaction.
4. State the law of radioactive disintegration.
5. What is an equatorial system?
6. Mention two applications of colour index.
7. What are leptons? Name them
8. What is meant by the term distance modulus?

(8 × 1 = 8 Marks)**SECTION B: Answer any *six* questions. Each carries 4 marks.**

9. Write a note on shell model.
10. Distinguish between electrostatic accelerators and cyclic accelerators.
11. Explain the principle of linear accelerator.
12. Give a brief idea about semiconductor detectors.
13. What are the uses of nuclear reactor? Mention about breeder reactor.
14. Briefly explain an Ionization chamber.
15. Explain the geomagnetic effects of cosmic rays.
16. Give a note on fundamental interactions.
17. Explain how a Bubble chamber is used for particle detection.

(6 × 4 = 24 Marks)**(PTO)**

SECTION C: Answer any eight questions. Each carries 4 marks.

18. Find the absolute magnitude of SUN whose apparent magnitude $m = -26.74$ and $d = 4.854 \times 10^{-6}$ parsecs.
19. Consider two stars A and B. Star A at a distance half that of B appears twice as bright as B. Compare their luminosities.
20. Which one is a possible reaction?
a) $\pi^- + p \rightarrow \Lambda^0 + K^0$ b) $K^- + p \rightarrow \Sigma^+ + \pi^+$
21. A muon (μ^-) collides with a proton, a neutron plus another particle is formed. What is the other particle
22. Write the quarks combination of proton, neutron, Σ^+ , Λ^0
23. The electric field in a cyclotron is reversed every 9.372×10^{-8} s. It is used to accelerate deuterons, each of mass 3.34×10^{-27} kg and charge 1.6×10^{-19} C. Calculate the flux density of the magnetic field.
24. It is required to operate a proportional counter with a maximum radial field of 6Vm^{-1} . What is the applied voltage required if the radii of the wire and tube are 0.01 cm and 1 cm respectively.
25. Calculate the mass in gram of a radioactive sample Pb^{214} having an activity of one microcurie and a half-life of 26.8 minute.
26. Determine the amount of energy released in the D-T (deuterium-tritium) fusion reaction.
27. The radius of ${}_{29}\text{Cu}^{64}$ is measured to be 4.8×10^{-13} cm. Find the radius of ${}_{12}\text{Mg}^{27}$
28. Find the binding energy per nucleon value of ${}^{120}\text{Sn}_{50}$. Given atomic mass of $\text{Sn}^{120} = 119.9099$ amu, mass of hydrogen atom = 1.00783 amu, Mass of neutron = 1.00865 amu.
29. Find the density of ${}_{6}\text{C}^{12}$ nucleus.

(8 × 4 = 32 Marks)

SECTION D: Answer any two questions. Each carries 8 marks.

30. Explain the postulates of liquid drop model. Derive Weiz sacker semi empirical mass formula.
31. Describe the principle, construction and working of a betatron.
32. Classify the elementary particles in detail.
33. Discuss the tunnel theory of alpha decay.

(2 × 8 = 16 Marks)