19U613S (Pages: 2) Name: …..……..……….

Reg. No: …….…..……….

SIXTH SEMESTER B.Sc. DEGREE EXAMINATION, APRIL 2022
(CUCBCSS-UG)
CC15U PH6 B12 - NUCLEAR PHYSICS, PARTICLE PHYSICS & ASTROPHYSICS
(Physics – Core Course)
(2016 to 2018 Admissions – Supplementary/Improvement)

Time: Three Hours   Maximum: 80 Marks

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

1. An example for best nuclear fuel ………….

2. Quantum chromodynamics deals with the theory of ………….

3. In a linear accelerator, high energy particles are produced by using the principle of ……

4. The energy equivalent of 1 atomic unit is …………. MeV

5. Which is the lightest meson?

6. 1 parsec is equal to …………. light years

7. Graphite is used as …………. in nuclear reactors.

8. Fermions are particles with …………. wave function

9. The number of available nuclear states in a p shell is ………….

10. Does a neutrino have mass?

(10 × 1 = 10 Marks)

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

11. What are isotopes? Give an example.

12. What is the strange behaviour of kaons and hyperons?

13. What do you mean by ecliptic?

14. What is east west effect?

15. What do you mean by breeder reactor?

16. On the basis of uncertainty principle show that electron cannot exist inside a nucleus.

17. What are baryons?

(7 × 2 = 14 Marks)

SECTION C (Answer in a paragraph)
Answer any *five* questions. Each question carries 4 marks.

18. Discuss the principle of radio carbon dating. Mention its applications.

19. Explain what is meant by celestial sphere?

20. Discuss the principle of betatron accelerator.

21. Write short note on the proton-proton cycle in sun.

22. Explain the term stellar paradox.

23. Give the fundamental laws of radioactivity.

24. Write a note on cosmic ray showers.

(5 × 4 = 20 Marks)

SECTION D

(Problems-write all relevant formulas, all important steps carry separate marks)
Answer any *four* questions. Each question carries 4 marks.

25. With the help of neat diagram, explain the working of a Wilson cloud chamber.

26. The half life of radon is 3.8 days. After how many days will only one twentieth of a radon sample be left over?

27. Calculate the binding energy of the deutron which consists of a proton and a neutron. Given that atomic mass of the deutron is 2.014102u, M_H= 1.007825u and M_n= 1.00865u, 1u=931.5 MeV.

28. Estimate the energy released by fission of 1kg of U^{235}. Given the energy released per fission is 200 MeV.

29. Discuss briefly the origin of cosmic rays.

30. A cyclotron is connected to the oscillator of frequency 15MHz. What should be the operating magnetic field for accelerating protons? The radius of the dees is 60cm. Calculate the maximum kinetic energy of the proton in e V, the mass of the proton = 1.67×10^{-27}Kg, 1 e V =1.6×10^{-19}J

31. In a proton - proton collision a lambda hyperon, a proton, a positively charged pion and a new particle are formed. What is the new particle?

(4 × 4 = 16 Marks)

SECTION E (Answer in about two pages)

Answer any *two* questions. Each question carries 10 marks

32. Discuss the tunnel theory of alpha particle.

33. Using a neat diagram explain the working of van de Graaf generator.

34. Explain semi empirical mass formula. What are its applications?

35. Explain the evidences for the occurrence of nuclear shells. Give an account of the shell model.

(2 × 10 = 20 Marks)

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