

20/03

physics



QP CODE: 20100437  
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Reg No : .....  
Name : .....

**BSc DEGREE (CBCS) EXAMINATION, MARCH 2020**  
**Sixth Semester**

**Core course - PH6CRT11 - NUCLEAR, PARTICLE AND ASTROPHYSICS**

B.Sc Physics Model I, B.Sc Physics Model II Computer Applications, B.Sc Physics Model III Electronic  
Equipment Maintenance, B.Sc Physics Model II Applied Electronics  
2017 Admission Onwards  
F957469E

Time: 3 Hours

Marks: 60

**Part A**

*Answer any ten questions.*  
*Each question carries 1 mark.*

1. What are mirror nuclei? Give examples.
2. Explain the asymmetry energy of a nucleus.
3. Why nuclear shell model referred to as independent model ?
4. What is a semiconductor detector?
5. What is meant by orbital electron capture?
6. Define Q value of a reaction...
7. Explain how the fissionable  ${}_{92}\text{U}^{233}$  is produced from  ${}_{90}\text{Th}^{232}$ ?
8. What is east – west asymmetry of cosmic rays?
9. What are primary cosmic rays?
10. Name the six different leptons.
11. What are fermions?
12. What is the charge of an Up quark?

(10×1=10)

**Part B**

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



13. What are the different properties of an atomic nucleus ?
  14. Explain the stability of a nucleus with binding energy curve.
  15. What are the principles of nuclear radiation detection?
  16. A cyclotron in which the flux density is  $1.5 \text{ weber/m}^2$  is employed to accelerate protons. How rapidly should the electric field between the dees be reversed?  $m_p = 1.67 \times 10^{-27} \text{ kg}$  and  $e = 1.6 \times 10^{-19} \text{ C}$ .
  17. Find the decay constant of  $\text{Cs}^{137}$  (half – life = 30 years).
  18. Draw and explain the K- and L- conversion lines obtained along with the continuous  $\beta$  – emission spectrum.
  19. Explain proton – proton cycle.
  20. Which of the following reactions are forbidden? Explain the reason. (a)  $\pi^+ + n \rightarrow \pi^- + p$  (b)  $\pi^+ + n \rightarrow \Lambda^0 + K^+$
  21. Suppose that a star lies on the main sequence of an HR diagram. Estimate the distance from earth. Given, apparent brightness =  $1 \times 10^{-12} \text{ W/m}^2$  and peak wavelength = 600 nm.
- (6×5=30)

### Part C

*Answer any **two** questions.*

*Each question carries **10** marks.*

22. Explain the meson theory of Yukawa.
23. Explain the working of Linear accelerator. What are the advantages of Linear accelerator? What are the advantages of Linear Accelerator over Van de Graaff generator ?
24. What are the four radioactive series? Name the parent isotope and the stable end product of all these radioactive series. Write down the Actinium series from the parent isotope to the end product showing the  $\alpha$  and  $\beta$  emissions.
25. Describe the stellar evolution.

(2×10=20)

