QP CODE: 22100927

22100927

Reg No : .....

Name : .....

B.Sc DEGREE (CBCS) REGULAR / REAPPEARANCE EXAMINATIONS, APRIL 2022

Sixth Semester

CORE - PH6CRT11 - NUCLEAR, PARTICLE AND ASTROPHYSICS

Common for B.Sc Physics Model I, B.Sc Physics Model II Applied Electronics, B.Sc Physics Model II Computer Applications & B.Sc Physics Model III Electronic Equipment Maintenance

2017 Admission Onwards

2AB8B4AB

Time: 3 Hours Max. Marks : 60

Part A

*Answer any **ten** questions.*

*Each question carries **1** mark.*

1. Distinguish between isobars and isotones.
2. What limits the size of a stable nucleus?
3. Why nuclear shell model referred to as independent model ?
4. What is the role of magnetic field in a cyclotron?
5. Which isotope is the end product of Neptunium series?
6. Explain how alpha particles of energy less than 26MeV can escape from a nucleus?
7. What is meant by orbital electron capture?
8. What is the unit of reaction cross section?
9. From which isotope the fissionable Plutonium is produced in breeder reactor?
10. Distinguish between baryons and hadrons.
11. What is meant by hyperons?
12. Define Chandrasekhar limit.

(10×1=10)

Part B

*Answer any **six** questions.*

*Each question carries **5** marks.*

13. Calculate the nuclear density of the carbon nucleus.

14. Explain liquid drop model of Nuclear structure.

15. Explain nuclear spin and magnetic moment.

16. The linear attenuation coefficient for 3 MeV gamma rays in water is about $5m^{-1}$. Find the relative intensity of the beam after it has passed through 0.15 m of water.

17. Find the activity of 1mg of Radon whose atomic mass is 222U and half life period is 3.8days.

18. Determine the amount of energy released in the so-called D – T fusion reaction
$_1H^2 + _1H^3 = _2He^4 + n$
Given m ($_1H^2$) = 2.014102u, m ($_1H^3$) = 3.016049u, m ($_2He^4$) = 4.002603u, m_n = 1.008665u.

19. Explain latitude and altitude effect on cosmic rays and the reason behind it.

20. Check whether the following reactions are allowed or not. Explain the reason
(a) $\pi^+ + n \rightarrow K^0 + K^+$ (b) $\pi^- + p \rightarrow K^0 + \Lambda^0$

21. Briefly explain various conservation laws in particle physics.

(6×5=30)

Part C

*Answer any **two** questions.*

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

22. Explain the principle, construction and working of Wilson cloud chamber.

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. Write a short on (a) Primary and secondary cosmic rays (b) Cosmic ray shower (c) Van Allen belt.

25. Define HR diagram. What are the uses? Sketch and explain HR diagram

(2×10=20)

23105172

QP CODE: 23105172

Reg No : .....

Name : .....

B.Sc DEGREE (CBCS) REGULAR / REAPPEARANCE EXAMINATIONS, MARCH 2023

Sixth Semester

CORE COURSE - PH6CRT11 - NUCLEAR, PARTICLE AND ASTROPHYSICS

Common for B.Sc Physics Model I, B.Sc Physics Model II Applied Electronics, B.Sc Physics Model II Computer Applications & B.Sc Physics Model III Electronic Equipment Maintenance

2017 Admission Onwards

FDB209D9

Time: 3 Hours Max. Marks : 60

Part A

*Answer any **ten** questions.*

*Each question carries **1** mark.*

1. What are isomers?
2. What is mass defect?
3. What is meant by short range of nuclear forces?
4. What is the application of Van de Graaff generator?
5. Write down the relation between half life period and decay constant.
6. Give an example of branched disintegration in Thorium series.
7. What is meant by electron capture?
8. How energy is produced in stars?
9. What is east – west effect in cosmic rays?
10. What is meant by Parity?
11. Name a particle which can take part in all the four types of interaction.
12. What is meant by nebula?

(10×1=10)

Part B

*Answer any **six** questions.*

*Each question carries **5** marks.*

13. Explain Mass defect.
14. What is propotional counter?
15. Explain Wilson Cloud Chamber.
16. Derive the frequency of ions in a cyclotron.
17. Find the age of death of an organism from the following data. Half life of $_6C^{14}$ = 5600 years. Ratio of amount of $_6C^{14}$ at the death and present time is 10^8.
18. Draw and explain the K- and L- conversion lines obtained along with the continuous β – emission spectrum.
19. Distinguish between laboratory frame of reference and center of mass frame of reference.
20. Write a note on the elementary particle quantum numbers.
21. Are hotter stars brighter than cooler stars? Give reason.

(6×5=30)

Part C

*Answer any **two** questions.*

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

22. Explain the postulates of liquid drop model. Derive Weizsacker semi empirical mass formula.
23. What is nuclear shell model and explain the evidences for shell model?
24. What is nuclear fission? Describe the components and working of a nuclear reactor with a simplified figure. Explain the peculiarities of a breeder reactor.
25. Describe Hadrons and Leptons. Write down the classification of elementary particles.

(2×10=20)

20100437

QP CODE: 20100437

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

1957469E

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 $_{92}U^{233}$ is produced from $_{90}Th^{232}$?
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 weber/m^2 is employed to accelerate protons. How rapidly should the electric field between the dees be reversed? mp = 1.67 x 10^{-27} kg and e = 1.6 x 10^{-19} C.

17. Find the decay constant of Cs^{137}(half – life = 30 years).

18. Draw and explain the K- and L- conversion lines obtained along with the continuous β – 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 = 1x10^{-12} 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 α and β emissions.

25. Describe the stellar evolution.

(2×10=20)

QP CODE: 21101107

21101107

Reg No : .....

Name : .....

B.Sc DEGREE (CBCS) EXAMINATION, APRIL 2021

Sixth Semester

CORE COURSE - PH6CRT11 - NUCLEAR, PARTICLE AND ASTROPHYSICS

Common for B.Sc Physics Model I, B.Sc Physics Model II Applied Electronics, B.Sc Physics Model II Computer Applications & B.Sc Physics Model III Electronic Equipment Maintenance

2017 Admission Onwards

4C8C0051

Time: 3 Hours Max. Marks : 60

Part A

*Answer any **ten** questions.*

*Each question carries **1** mark.*

1. What are the elementary particles in a nucleus?
2. What is the empirical formula for nuclear radius?
3. Nuclear forces have saturation property. Explain.
4. What are the general utilizations of a Van de Graff generator?
5. What is alpha decay? Give an example for alpha decay.
6. Write down the general expression for nuclear reaction.
7. What is a breeder reactor?
8. What is east – west asymmetry of cosmic rays?
9. What is the average energy of cosmic ray particles reaching earth atmosphere at magnetic equator?
10. Name the six different leptons.
11. Define isospin.
12. What is the charge of a down quark?

(10×1=10)

Part B

*Answer any **six** questions.*

*Each question carries **5** marks.*

13. Calculate the binding energy of an alpha particle in MeV and in joules.
14. Calculate the atomic number of the most stable nucleus for a given mass number A.
15. Explain the evidences for nuclear shell model.

16. The magnetic field for a cyclotron is 3 Tesla. The extraction radius is 0.5m. Calculate the radiofrequency and the energy of the accelerated protons.

17. One gram of radium is reduced by 2.1mg in 5 years by alpha decay. Calculate the half life period of radium.

18. Explain the three β – decay processes using examples.

19. Explain the three Gamma decay processes.

20. If a star luminosity equal to the sun and is 10 light year away from the earth, how much faint will it appear?

21. Distinguish between white dwarf and neutron star.

(6×5=30)

Part C

*Answer any **two** questions.*

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

22. With Suitable diagram, explain the working of ionization chamber.

23. Describe how a scintillation counter can be effectively utilized in the study of nuclear radiation.

24. What are the four radioactive series? Name the parent isotope and the stable end product of all these radioactive series. Write down the Neptunium series from the parent isotope to the end product showing the α and β emissions.

25. Explain the symmetry and conservation laws in particle physics.

(2×10=20)