

D 120207

(Pages : 2)

Name.....

Reg. No.....

**SIXTH SEMESTER (CBCSS—UG) DEGREE EXAMINATION
MARCH 2025**

Physics/Applied Physics

PHY6B13/APH6B13—RELATIVISTIC MECHANICS AND ASTROPHYSICS

(Admissions Year—2019 Onwards)

Time : Two Hours

Maximum : 60 Marks

*The symbols used in this question paper have their usual meanings.***Section A (Short Answer Type)***Answer **all** questions in two **or** three sentences, each correct answer carries a maximum of 2 marks.*

1. What are the significances of negative results in Michelson-Morley experiment ?
2. Distinguish between space like and time like intervals.
3. Explain the significances of special theory of relativity.
4. State the principle of equivalence.
5. What is Chandrasekhar limit ?
6. Establish the relation between apparent magnitude and brightness ratio.
7. Explain the method 'stellar parallax'.
8. What are pulsating stars ?
9. Give a note on proton-proton chain reaction.
10. Explain the mechanism of star formation triggers.
11. State Hubble's law.
12. Two stars, α -Canis Majoris and o-Ceti, have a temperature of 9200 K and 1900 K, respectively. What are their peak wavelengths ?

(Ceiling = 20 marks)

Turn over

Section B (Paragraph / Problem Type)

Answer **all** questions in a paragraph of about **half a page** to one page, each correct answer carries a maximum of 5 marks.

13. Obtain the Lorentz transformation equations.
14. Explain the doppler shift in sound.
15. Explain the big bang cosmology.
16. Outline the significances of H-R diagram.
17. Explain the features of Planetary Nebulae.
18. Discuss the features of gravitational lensing.
19. Explain the evolution of white dwarfs.

(Ceiling = 30 marks)

Section C (Essay Type)

*Essays - Answer in about **two pages**, any **one** question.*

The question carries 10 marks.

20. Derive the relativistic mass-energy relation.
21. Explain the terms :
 - (1) Neutron stars ; (2) Black holes ; and (3) Pulsars.

(1 × 10 = 10 mark)

D 100637

(Pages : 2)

Name.....

Reg. No.....

SIXTH SEMESTER U.G. (CBCSS-UG) DEGREE EXAMINATION, MARCH 2024

Physics/Applied Physics

PHY6B13/APH 6B 13—RELATIVISTIC MECHANICS AND ASTROPHYSICS

(2019 Admission onwards)

Time : Two Hours

Maximum : 60 Marks

*The symbols used in this question paper have their usual meanings.***Section A - Short Answer type.***Answer **all** questions in two or three sentences,
each correct answer carries a maximum of 2 marks.*

1. State the postulates of special theory of relativity.
2. Explain the conditions of photoelectric emission.
3. Obtain the expression for rest mass of photon.
4. What are red giant stars ?
5. Explain the principle of equivalence.
6. Give the relationship between luminosity and brightness.
7. How does the color of a star vary with surface temperature ?
8. What are galactic clusters ?
9. Why do stars pulsate ?
10. Explain the supernovae remnants.
11. Distinguish between spiral and elliptical galaxies.
12. A galaxy has an observed $H\alpha$ line at 662.9 nm. The rest wavelength of $H\alpha$ is 656.3 nm. Calculate the redshift of the galaxy and its velocity of recession.

(Ceiling 20 marks)

Section B - Paragraph / Problem type.*Answer **all** questions in a paragraph of about half a page to one page,
each correct answer carries a maximum of 5 marks.*

13. Distinguish between time like and space like intervals.
14. Explain why a moving clock runs slow.

Turn over

15. Explain the different stages of stellar evolution.
16. Draw the H-R diagram. Explain its key features.
17. Outline the internal structure of the sun.
18. Explain Cepheid variables and the period-luminosity relationship.
19. Write a note on gravitational lensing.

(Ceiling 30 marks)

Section C - Essay type

*Essays - Answer in about two pages, any **one** question.
Answer carries 10 marks.*

20. Explain the Michelson-Morley experiment.
21. What are white dwarfs ? Explain its origin and evolution.

(1 × 10 = 10 marks)

C 40628

(Pages : 2)

Name.....

Reg. No.....

SIXTH SEMESTER U.G. DEGREE EXAMINATION, MARCH 2023

(CBCSS—UG)

Physics/Applied Physics

PHY 6B 13/APH 6B 13—RELATIVISTIC MECHANICS AND ASTROPHYSICS

(2019 Admission onwards)

Time : Two Hours

Maximum : 60 Marks

*The symbols used in question paper have their usual meanings.***Section A (Short Answer Type)***(Answer all questions in two or three sentences.**Each correct answer carries a maximum of 2 marks.*

1. Define the term proper length.
2. Explain why the theory of relativity is so called ?
3. What can be used as a standard candle in Astronomy ?
4. Describe the features of T Tauri stars.
5. At which velocity would the mass of an electron become double of its rest mass ?
6. List the classification of stars based on the surface temperature.
7. Pulsars do not pulsate. Explain the statement.
8. State the principle of equivalence.
9. The larger the parallax, the smaller the distance to the star. Is the Statement true or false ? Illustrate with a figure.
10. Give the relationship between distance, brightness and luminosity.
11. Define Chandrasekhar limit.
12. What are the features of Population I stars ?

(Ceiling 20)

Turn over

Section B (Paragraph/Problem Type)

Answer all questions in a paragraph of about half a page to one page.

Each correct answer carries a maximum of 5 marks.

13. Explain the concept of the radiation pressure of light. Mention one example.
14. Do the muon experiments verify time dilation ? How ?
15. Briefly discuss Hubble's classification of Galaxies.
16. With what velocity should a rocket fly so that every year spent on it may correspond to 3 years on Earth's surface ?
17. (a) Even light cannot come out of a Black Hole. Why ?
(b) Determine the Schwarzschild radius of a black hole with 5 solar mass.
18. Draw the H-R diagram.
19. Briefly describe the internal structure of Sun.

(Ceiling 30)

Section C (Essay Type)

Answer in about two pages, any one question.

Answer carries 10 marks.

20. Discuss the relativistic energy and momentum in an inelastic collision.
21. Which are the three discoveries that fundamentally altered our concept of the universe ? Briefly discuss.

(1 × 10 = 10 marks)

C 20661

(Pages : 2)

Name.....

Reg. No.....

SIXTH SEMESTER U.G. DEGREE EXAMINATION, MARCH 2022

(CBCSS—UG)

Physics/Applied Physics

PHY 6B 13/APH 6B 13—RELATIVISTIC MECHANICS AND ASTROPHYSICS

(2019 Admissions)

Time : Two Hours

Maximum : 60 Marks

*The symbols used in question paper have their usual meanings.***Section A***Answer at least **eight** questions.**Each question carries 3 marks.**All questions can be attended.**Overall Ceiling 24.*

1. What is meant by transformation equations in relativity ?
2. Why did Einstein assume that the speed of light in vacuum is a universal constant ?
3. State the Cosmological principle.
4. Is the white dwarf a stable equilibrium state ? Explain why.
5. Give the postulates of special relativity.
6. Define luminosity of a star. Is the luminosity of a star related to its temperature ?
7. Sirius has a parallax of 0.379 arcseconds. How much parsec is its distance from the Earth ?
8. What is CMBR ?
9. Explain Hubble's law for the expansion of the universe.
10. Explore the features of AGN. Why are they called so ?
11. What are Binary stars ?
12. Mention the features of Population II stars ?

(8 × 3 = 24 marks)

Turn over

Section B (Paragraph/Problem Type)

*Answer at least **five** questions.*

Each question carries 5 marks.

All questions can be attended.

Overall Ceiling 25.

13. Show that in the non-relativistic limit, Lorentz transformations reduces to Galilean transformations.
14. (a) If a star's brightness is increased by 45,000 times, how much is the change in its magnitude ?
(b) Faint Brown dwarf stars have absolute magnitudes of around 17.5. How much fainter they are compared to Sun ?
15. Mention the important features of Cepheid variables. Why are they used as distance indicators ?
16. Discuss the standard big-bang theory for the origin of the universe.
17. A particle is traveling through the Earth's atmosphere at a speed of $0.6c$. To an Earth-bound observer, the distance it travels is 1.50 km. How far does the particle travel in the particle's frame of reference ?
18. Discuss the classification of galaxies.
19. What kinds of objects make up the dark matter ?

(5 × 5 = 25 marks)

Section C (Essay Type)

*Answer any **one** question.*

The question carries 11 marks.

20. Derive the law of addition of velocities using Lorentz transformation equations.
21. Explain the star formation and life cycle of stars.

(1 × 11 = 11 marks)