

ASSIGNMENT BOOKLET
Bachelor's Degree Programme (B.Sc.)

ASTRONOMY AND ASTROPHYSICS

Valid from January 1, 2022 to December 31, 2022

**It is compulsory to submit the Assignment before filling up the
Term-End Examination Form.**

Please Note

- You can take electives (56 or 64 credits) from a minimum of TWO and a maximum of FOUR science disciplines, viz. Physics, Chemistry, Life Sciences and Mathematics.
- You can opt for elective courses worth a MINIMUM OF 8 CREDITS and a MAXIMUM OF 48 CREDITS from any of these four disciplines.
- At least 25% of the total credits that you register for in the elective courses from Life Sciences, Chemistry and Physics disciplines must be from the laboratory courses. For example, if you opt for a total of 64 credits of electives in these 3 disciplines, at least 16 credits out of those 64 credits should be from lab courses.
- You cannot appear in the Term-End Examination of any course without registering for the course. Otherwise, your result will not be declared and the responsibility will be yours.



School of Sciences
Indira Gandhi National Open University
Maidan Garhi, New Delhi-110068

Dear Student,

We hope you are familiar with the system of evaluation to be followed for the Bachelor's Degree Programme. At this stage you may probably like to re-read the section on assignments for Elective Courses in the Programme Guide that we sent you after your enrolment. A weightage of 30 per cent, as you are aware, has been earmarked for continuous evaluation which would consist of **one tutor-marked assignment (TMA)** for this course.

Instructions for Formatting Your Assignment:

Before attempting the assignment please read the following instructions carefully:

- 1) On top of the first page of your TMA answer sheet, please write the details exactly in the following format:

ENROLMENT NO.:.....

NAME :.....

ADDRESS :.....

.....

.....

COURSE CODE:

COURSE TITLE :

ASSIGNMENT NO.

STUDY CENTRE: DATE:.....

PLEASE FOLLOW THE ABOVE FORMAT STRICTLY TO FACILITATE EVALUATION AND TO AVOID DELAY.

- 2) Use only foolscap size writing paper (but not of very thin variety) for writing your answers.
- 3) Leave 4 cm margin on the left, top and bottom of your answer sheet.
- 4) Your answers should be precise.
- 5) While solving problems, clearly indicate the question number along with the part being solved. Be precise. Write units at each step of your calculations as done in the text because marks will be deducted for such mistakes. Take care of significant digits in your work. Recheck your work before submitting it.
- 6) This assignment will remain valid **from January 1, 2022 to December 31, 2022**. However, you are advised to submit it **within 12 weeks** of receiving this booklet to accomplish its purpose as a teaching-tool.

We strongly recommend that you should retain a copy of your assignment response to avoid any unforeseen situation.

We wish you good luck.

**Tutor Marked Assignment
Astronomy and Astrophysics (PHE-15)**

Course Code: PHE-15
Assignment Code: PHE-15/TMA/2022
Max. Marks: 100

Note: Attempt all questions. Answer in your own words. Symbols have their usual meanings. The marks for each question are indicated against it.

1. a) Express the distance of the star Proxima Centauri from the star Sirius B and the planet Earth in light years. (5)
- b) Draw the celestial sphere and show the observer's meridian, zenith, celestial equator and the horizon for an observer at latitude 30°N . Show the horizon coordinates of a star X on the celestial sphere for this observer. Would these coordinates be the same at latitude 60°N ? (5+4+1)
- c) Which telescope, optical or X -ray, would have higher resolving power for the same aperture? Calculate the magnitude of the faintest object that a 15 m optical telescope can detect. (2+3)
- d) The average temperature of the interior of a sun-like star is of the order 10^8 K . Estimate the mass of the star in terms of the solar mass if it has a radius of order 10^{10} cm . (5)
2. a) List different layers of the Sun's atmosphere. Explain why the temperature in the chromosphere increases with height. How is solar wind generated? (2+4+4)
- b) If the pressure in the solar atmosphere is 10^4 Pa , calculate the strength of the magnetic field required to balance it (pressure). (5)
- c) State nebular hypothesis. Explain the formation of solar system as per the nebular model. (3+7)
3. a) Discuss Jeans criterion for the formation of stars and obtain an expression for Jeans mass and Jeans length. (10)
- b) A supernova explosion takes place at the distance of 4 pc. If the absolute magnitude of the supernova is -25 , calculate its apparent magnitude. Will the supernova be brighter than the Sun? Justify your answer. (5)
- c) Discuss the qualitative difference between a main sequence star and a compact star. Show that, as the mass of the white dwarf increases, its radius decreases. (5+5)
4. a) Distinguish between spiral and barred spiral galaxies giving examples of each type of galaxy. (3+2)
- b) What is a Seyfert galaxy? Explain how broad-line and narrow-line regions originate in a Seyfert galaxy. (3+7)

- c) Using the virial theorem, explain why there is a need to postulate the existence of dark matter. (5)
- d) A galaxy of absolute magnitude of -20 is at a distance of 100 kpc. Would it be visible to the naked eye? (5)
