ST MARY’S UNIVERSITY

TWICKENHAM, LONDON

BSc Degree Examination students registered for

Level **SIX**

Title: **Space Physics**

Code: **APH6009**

Semester: **TWO**

Date: **May 22nd 2019**

Time: **09.30-11.30 AM**

TIME ALLOWED: **2** HOURS

Answer **SECTION A** and **ONE of the other two sections** (B or C)

**Section A:**

**[60 marks]**

1. Explain the difference between CNO cycle and p-p chain reaction **[3 Marks]**
2. State the Virial Theorem **[1 Mark]**
3. Why white dwarfs cannot support themselves against gravity using gas pressure? What did Fowler and Chandrasekhar suggest to explain how white dwarfs can exist? **[2 Marks]**
4. Define Chandrasekhar mass. Give the most accurate value for Chandrasekhar mass **[2 Marks]**
5. List the five steps of stellar evolution **[5 Marks]**
6. List three plasma models and give a brief explanation of each **[6 Marks]**
7. Describe the main features of heliosphere, heliosheath and heliopause  **[10 Marks]**
8. Define space weather **[1 Mark]**
9. Write a 1 page essay on “Going from red giants to white dwarfs: The life of a star” **[15 Marks]**
10. Write a 1 page essay on “A brief history of the Universe: From the initial singularity to today” **[15 Marks]**

**Section B:**

**[40 marks]**

1. List the five evidences for the Big Bang **[5 Marks]**
2. List the three inflation epochs **[3 Marks]**
3. What is a supernova? **[1 Marks]**
4. What is a neutron star? **[1 Marks]**
5. Write an essay (1 to 2 pages) on “Dark matter: Its discovery and its properties”

In particular discuss the following points:

* Historical discovery of dark matter
* The two types of dark matter
* How to detect dark matter **[30 Marks]**

**Section C:**

**[40 marks]**

1. List the four main projects that aim to detect dark energy. **[4 Marks]**
2. What is the dominant driving mechanism for the cosmic expansion? **[1 Mark]**
3. Define commoving coordinates. How do observers in the commoving coordinates see the Universe? **[2 Marks]**
4. Describe the two main features of measuring cosmic distances using parallax **[2 Marks]**
5. What does Einstein’s equation E = mc2 tell us? **[1 Mark]**
6. Write an essay (1 to 2 pages) on “Redshift and its importance in cosmology”

In particular discuss the following points:

* Describe cosmological redshift
* Describe Doppler shift (classical and relativistic)
* Importance of redshift’s interpretation in cosmological theories **[30 Marks]**

**END OF EXAMINATION**