

**Answer THREE questions from Section A and THREE questions from Section B.**

**You are advised to spend no more than 10 minutes on each Section A answer, and about 30 minutes on each Section B answer.**

**The numbers in square brackets indicate the provisional allocation of maximum marks for sub-sections of the question.**

**SECTION A**

**1. What is the Apparent Visual Magnitude of a star? [4]**

**How was the magnitude scale originally set up? [3]**

**2. What is the definition of a Black Body? [2]**

**State some of the main properties of Black Body Radiation. [5]**

**3. Give the names of the different regions of the electromagnetic spectrum, as a function of the wavelength. [4]**

**Which regions of the spectrum can be observed in ground-based astronomy? [3]**

**4. Describe the currently accepted theory of the origin of Earth's Moon. [4]**

**Include a description of the evidence that favours this theory above others. [3]**

**5. Write brief notes on any TWO (and only two) of the following three topics:**

**(a) Trojan asteroids [3\_]**

**(b) Apollo asteroids [3\_]**

**(c) The Kuiper Belt [3\_]**

**6. Write brief notes on the atmosphere of Venus. [4]**

**Why is it so different today from Earth's atmosphere, even though the two planets are of similar size and density? [3]**

**SECTION B.**

**7. Explain what is meant by the Parallax of a star, and define the parsec. [4]**

**For each of these situations, discuss one principal method used to determine distances:**

**(a) within the Solar System [2]**

**(b) for nearby stars [3]**

**(c) for stars of known spectral and luminosity class [4]**

**Explain what is meant by the Radial Velocity and the Proper Motion of a star, and how they can be combined. Outline how each of them can be measured. [7]**

**8. How can hot regions of the interstellar medium be observed? [4]**

**Discuss the various types of bright nebula, their appearance and how they originate. [10]**

**How can cold regions of the interstellar medium be observed? [6]**

**9. Binary stars can be observed in the three ways listed below. Explain the circumstances in which each can occur and the nature of the observations.**

**(a) visual binaries; [6]**

**(b) spectroscopic binaries; [7]**

**(c) eclipsing variables. [7]**

**10. Describe briefly the main types of terrain and features seen on the Moon's surface, and state which features are probably oldest and which are youngest. [6]**

**What is the most likely explanation for maria being seen only on the side of the Moon facing the Earth? [5]**

**Describe the current evidence for the presence of ice deposits on the Moon. Where are the deposits, and how were they detected? [5]**

**What kind of rock is an impact breccia, and why is it rare on the surface of the Earth but common on the Moon? [4]**

**11. State Kepler's three laws of planetary motion. [9]**

**Draw a sketch of a cometary or planetary orbit and label the various parts (e.g., Sun, perihelion, etc.) [3]**

**The mass of the imaginary distant giant planet Persephone was poorly known until a faint satellite, Madonna, was discovered. The satellite is much smaller than the planet, and has a period of 14.2 days in a circular orbit of radius 1,500,000 km. What is the mass of Persephone in units of solar masses? If Jupiter's mass =  $0.955 \times 10^{-3} M_{\text{sun}}$ , how many Jupiter masses does Persephone have? [8]**

**[You may assume that 1 AU = 149,600,000 km]**

**12. Write short essays (including diagrams if appropriate) on any TWO (and only two) of the following three topics:**

**Comets, addressing both their physical and orbital characteristics. [10]**

**The internal structure of the giant planets Jupiter and Saturn. [10]**

**The Galilean satellites of Jupiter. [10]**