Name of the Student:_____
Max. Marks : 25 Marks **Time : 25 Minutes**

Q1.

(a) The lenses used in refracting telescopes can cause chromatic aberration.

Complete the diagram to show how a lens produces chromatic aberration.



(1)

(b) A Cassegrain telescope uses mirrors.

What are the shapes of the primary and secondary mirrors in a Cassegrain telescope?

Tick (✔) **one** box.

Primary mirror	Secondary mirror	
concave	concave	
concave	convex	
convex	concave	
convex	convex	

(1)

(c) The table contains information about two telescopes, **A** and **B**. Each telescope is planned to be the biggest of its type in the world.

Telescope	**A**	**B**
Type	Optical reflecting telescope	Radio telescope
Diameter / m	39.3	110

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Range of wavelengths detected	350 nm to 1800 nm	2.5 mm to 1000 mm

Discuss the similarities and differences between optical reflecting telescopes and radio telescopes. Your answer should include references to:

- structure
- positioning
- collecting power.

Go on to discuss which telescope, **A** or **B**, will give a more detailed image of an astronomical object that emits both radio waves and visible light.

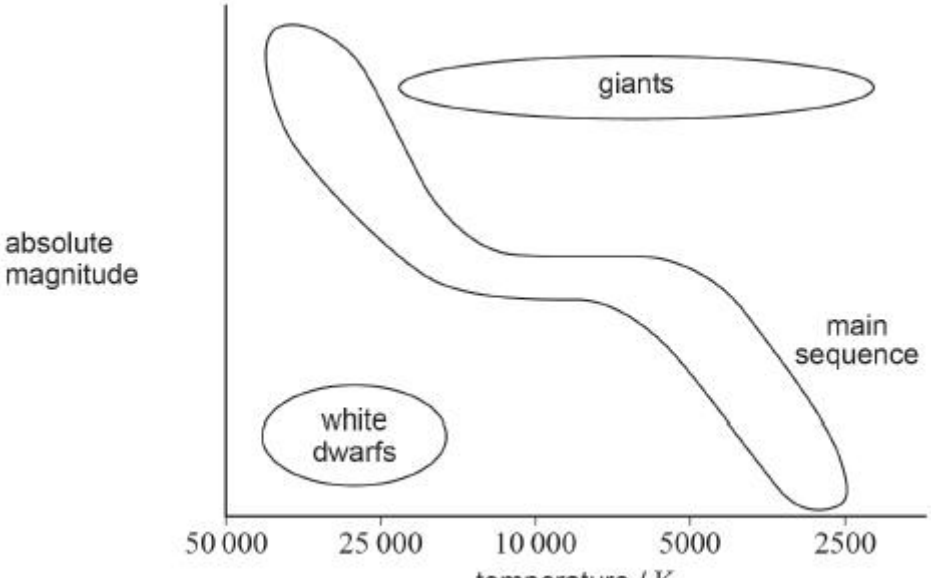
(6)

(Total 8 marks)

Q2.

Below is a Hertzsprung-Russell (HR) diagram.

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(a) Label the absolute magnitude axis with a suitable scale.

(1)

(b) Label with an **S** the position of the Sun on the HR diagram.

(2)

(c) Draw a line on the HR diagram to show the evolution of a star similar to the Sun from formation to white dwarf.

(2)

(d) Label with a **P** the position on the HR diagram of a star much redder, and with a greater power output, than the Sun.

(1)

(e) A star much more massive than the Sun may become a supernova and then a black hole.

Discuss whether supernovae and black holes can be placed on the HR diagram in.

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(3)

(Total 9 marks)

Q3.

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The Griffith Observatory in Los Angeles includes an astronomical refracting telescope (Griffith telescope) with an objective lens of diameter 305 mm and focal length 5.03 m

(a) Calculate the wavelength of light for which the Griffith telescope has a minimum angular resolution of 1.8×10^{-6} rad

wavelength = _____ m

(2)

(b) The Griffith telescope is used to observe two point objects which subtend an angle of 1.8×10^{-6} rad at the unaided eye.

The typical human eye has a minimum angular resolution of approximately 3.2×10^{-4} rad

Calculate the focal length of the eyepiece lens so that an observer can just resolve the two objects when observing them through the Griffith telescope.

focal length = _____ m

(3)

(c) The asteroid Apophis has a diameter of 325 m

It has been calculated that, in 2029, its distance of closest approach to the Earth's surface will be 3.0×10^{4} km

The Griffith telescope may be used to view Apophis using the eyepiece calculated in question (b)

Deduce whether this telescope is suitable to obtain a detailed view of Apophis.
Support your answer with a calculation.

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(3)
(Total 8 marks)

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