Name of the Student:_____
Max. Marks : 20 Marks **Time : 20 Minutes**

Q1.

The table has information on two stars.

Star	Apparent magnitude	Absolute magnitude	Spectral class
Sirius	–1.4	–1.4	A
Rigel	0.12	–7.1	B

(a) State the difference between apparent magnitude and absolute magnitude.

_____

_____

_____

(2)

(b) Sirius has an intensity of 1.18×10^{-7} Wm^{-2} at the Earth. The distance between Sirius and the Earth is 8.13×10^{13} km.

Calculate the luminosity of Sirius.
Give an appropriate unit for your answer.

luminosity _____ unit _____

(3)

(c) State which star in the table is closer to the Earth.
Explain your reasoning.

_____

_____

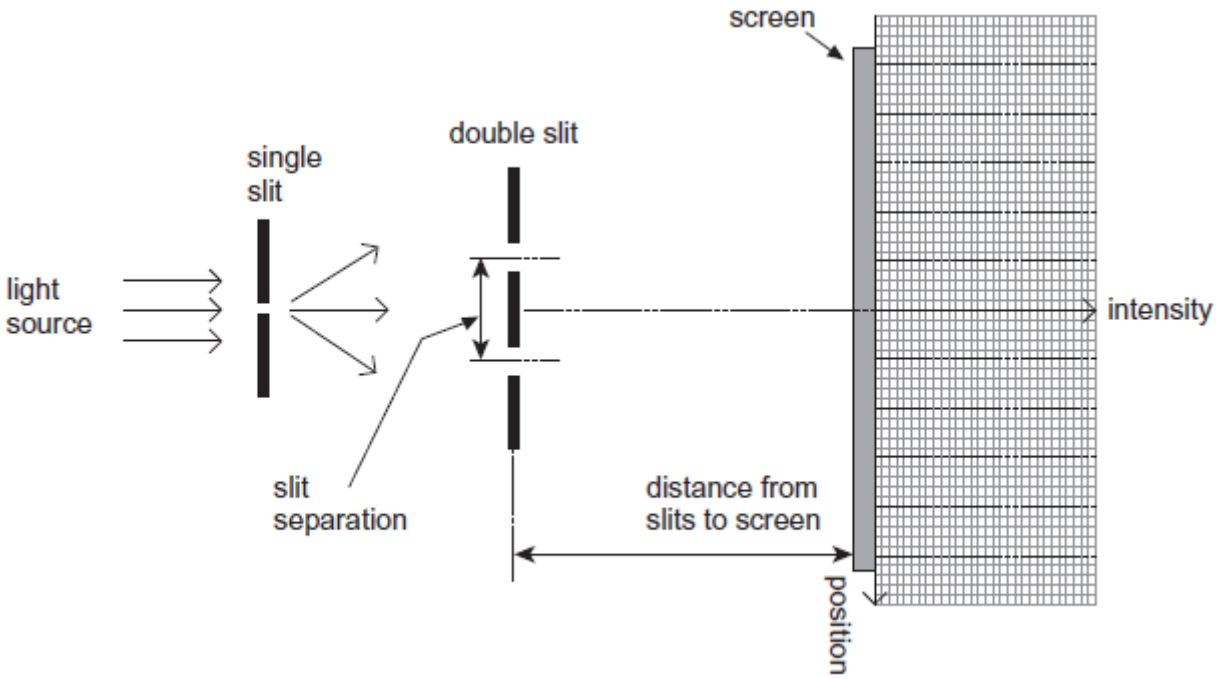
_____

(2)

(Total 7 marks)

Q2.

The diagram shows Young's double-slit experiment performed with a tungsten filament lamp as the light source.



not to scale

(a) On the axes in the diagram above, sketch a graph to show how the intensity varies with position for a **monochromatic** light source.

(2)

(b) (i) For an interference pattern to be observed the light has to be emitted by two **coherent sources**.
Explain what is meant by coherent sources.

_____

_____

_____

_____

(1)

(ii) Explain how the use of the single slit in the arrangement above makes the light from the two slits sufficiently coherent for fringes to be observed.

_____

_____

_____

_____

(1)

(iii) In this experiment light behaves as a wave.
Explain how the bright fringes are formed.

_____

(3)

(c) (i) A scientist carries out the Young double-slit experiment using a laser that emits violet light of wavelength 405 nm. The separation of the slits is 5.00×10^{-5} m.

Using a metre ruler the scientist measures the separation of two adjacent bright fringes in the central region of the pattern to be 4 mm.

Calculate the distance between the double slits and the screen.

distance = _____ m

(2)

(ii) Describe the change to the pattern seen on the screen when the violet laser is replaced by a green laser. Assume the brightness of the central maximum is the same for both lasers.

(1)

(iii) The scientist uses the same apparatus to measure the wavelength of visible electromagnetic radiation emitted by another laser.
Describe how he should change the way the apparatus is arranged and used in order to obtain an **accurate** value for the wavelength.

_____

_____

_____

(3)
(Total 13 marks)