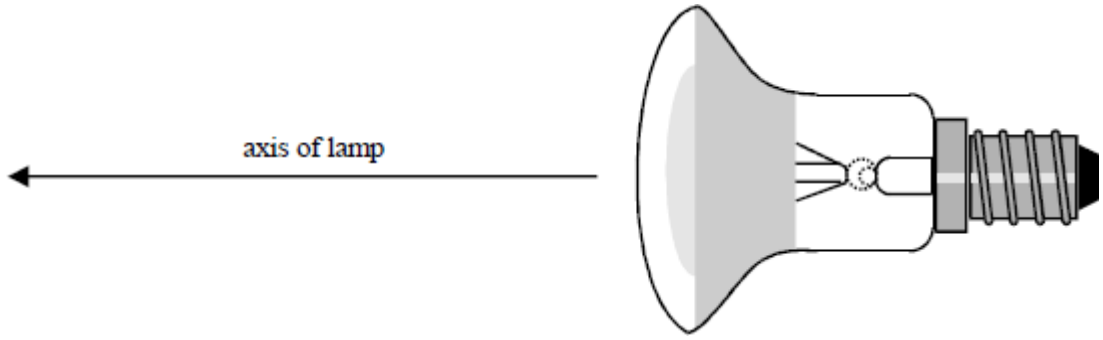
Name of the Student:_____

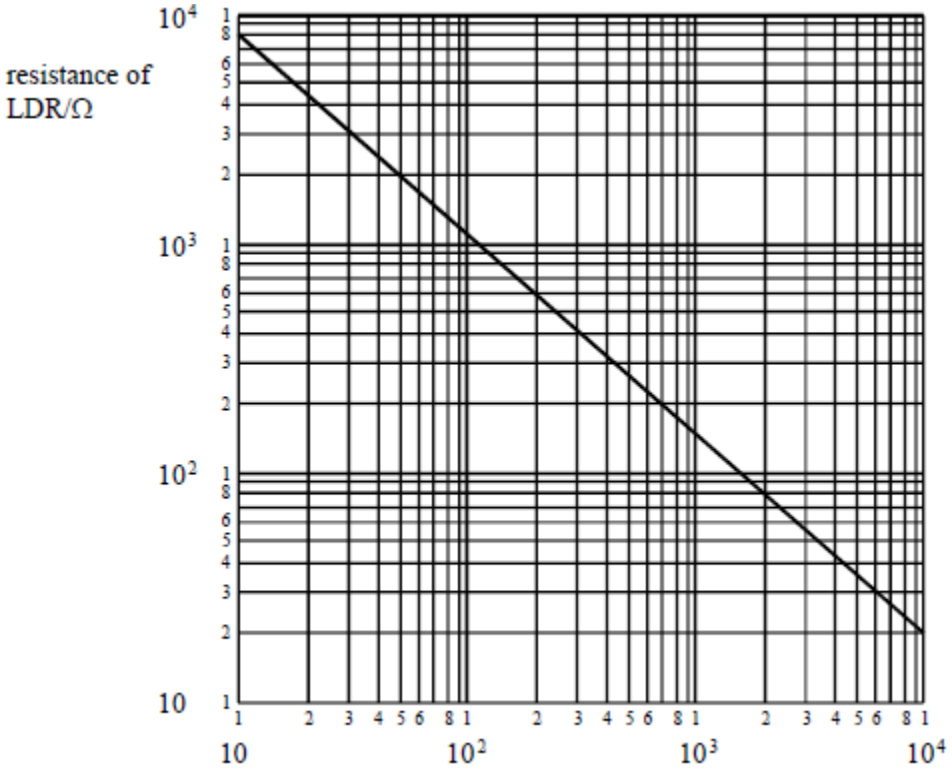
Max. Marks : 18 Marks **Time : 18 Minutes**

Q1.

Two students discuss how the intensity of the illumination provided by a spotlight varies with the distance along the axis of the lamp.



Student A argues that the lamp should be regarded as a point source so the intensity of illumination should vary as the inverse-square of the distance along the axis from the lamp. Student B disagrees, pointing out that the lamp incorporates a reflector that produces a narrow concentrated beam. Therefore, he reasons, the intensity must decrease exponentially with the distance along the axis from the lamp. Researching the problem, the students discover the calibration graph, shown below, that shows how the resistance of a light dependent resistor (LDR) varies with the intensity of the illumination falling on it.



Design an experiment that the students could perform to test their theories.

You should assume that a well-equipped physics laboratory is available to you.
You are advised to draw a suitable diagram of the arrangement you intend to use as part of your answer.

You should also include the following in your answer:

- The quantities you intend to measure and how you will measure them.
- How you propose to use your measurements to settle the argument between the students.
- The factors you will need to control and how you will do this.
- How you could overcome any difficulties in obtaining reliable results.

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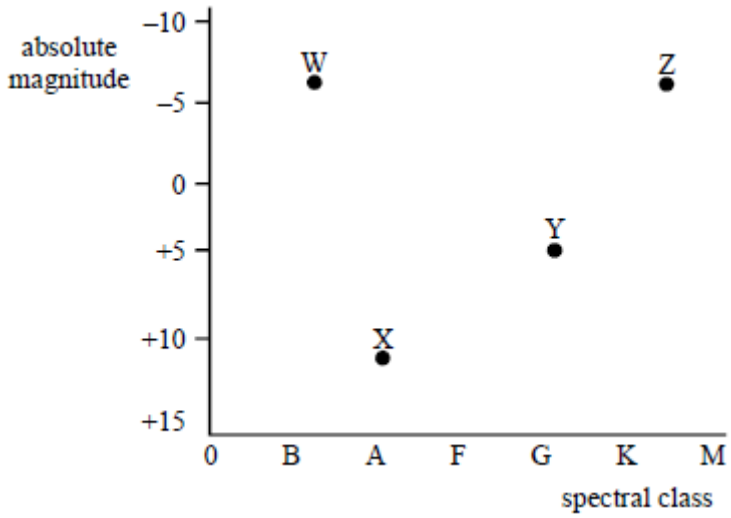
(Total 8 marks)

Q2.

The absolute magnitude and spectral class of four stars W, X, Y and Z are plotted using the axes below.



(a) Draw and label, on the diagram above, the regions occupied by the main sequence, white dwarf stars and red giant stars.

(2)

(b) The following observations were made for the star Alnilam in the constellation of Orion.

apparent magnitude: 1.7
distance from Earth: 1350 light years
spectrum: strong hydrogen Balmer absorption lines

(i) Explain what is meant by *apparent magnitude*.

_____

_____

(ii) Calculate the distance in parsecs of Alnilam from the Earth.

_____

_____

(iii) Hence calculate the absolute magnitude of Alnilam.

_____

_____

_____

_____

(iv) Which of the stars, W, X, Y or Z is Alnilam? Explain your answer.

_____

_____

(7)

(c) The stars shown on the graph could represent the position of a star at different times during its evolution. Write down the correct sequence, using some or all of the letters, that would best represent the evolution of the Sun starting from its present position.

_____

(1)

(Total 10 marks)