Name of the Student:_____
Max. Marks : 26 Marks **Time : 26 Minutes**

Q1.

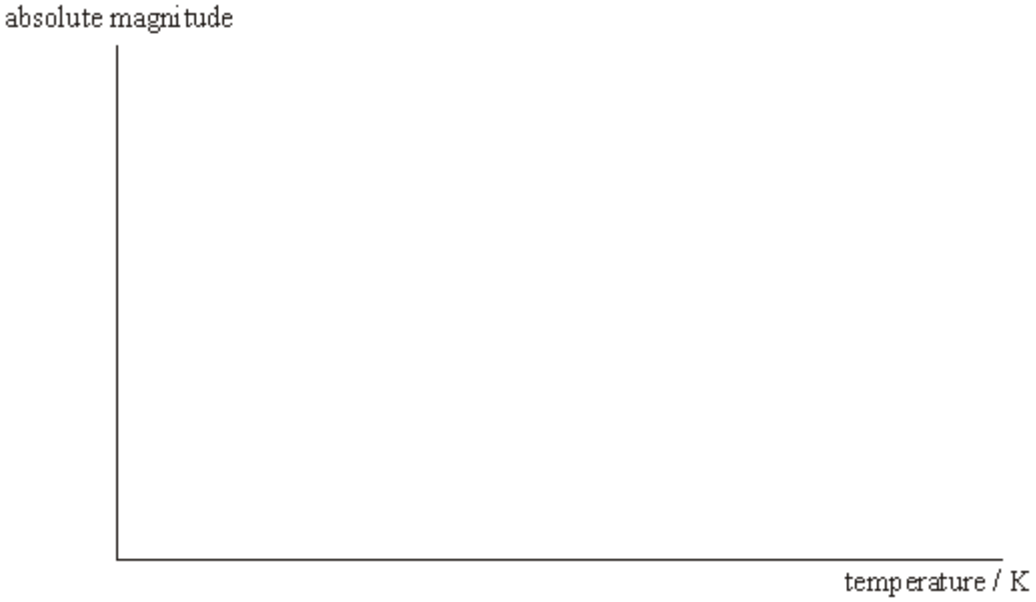
(a) Define the *absolute magnitude* of a star.

_____

_____

(1)

(b) The figure below shows the axes of a Hertzsprung-Russell (H-R) diagram.



(i) On each axis indicate a suitable range of values.

(ii) Label with an S the current position of the Sun on the H-R diagram.

(iii) Label the positions of the following stars on the H-R diagram:

(1) star W, which is significantly hotter and brighter than the Sun,

(2) star X, which is significantly cooler and larger than the Sun,

(3) star Y, which is the same size as the Sun, but significantly cooler,

(4) star Z, which is much smaller than the Sun, and has molecular bands as an important feature in its spectrum.

(7)

(Total 8 marks)

Downloaded from www.merit-minds.com

Q2.

Treated as a single source, the Andromeda galaxy has an apparent magnitude of 3.54 and an absolute magnitude of –20.62.

(a) Calculate the distance to the Andromeda galaxy.

(2)

(b) The Andromeda galaxy is believed to be approaching the Milky Way at a speed of 105 km s^{-1}. Calculate the wavelength of the radio waves produced by atomic hydrogen which would be detected from a source approaching the observer at a speed of 105 km s^{-1}.

wavelength of atomic hydrogen measured in a laboratory = 0.21121 m.

(2)

(c) Some astronomers believe the Andromeda galaxy may collide with the Milky Way in the distant future. Estimate a time, in s, which will elapse before a possible impact with the Milky Way.

(2)

(Total 6 marks)

Q3.

(a) A student wishes to measure the resistivity of the material of a uniform resistance wire. The available apparatus includes a battery, a switch, a variable resistor, an ammeter and a voltmeter.

(i) Draw a circuit diagram which incorporates some or all of this apparatus and which enables the student to determine the resistivity of the material.

Downloaded from www.merit-minds.com

(ii) State the measurements which must be made to ensure that a reliable value of the resistivity is obtained.

_____

_____

_____

_____

_____

_____

(iii) Explain how a value of the resistivity would be obtained from the measurements.

_____

_____

_____

_____

_____

_____

(10)

(b) A wire made from tin with cross-sectional area 7.8×10^{-9} m^2, has a pd of 2.0 V across it. Calculate the minimum length of wire needed so that the current through it does not exceed 4.0 A.

resistivity of tin = 1.1×10^{-7} Ω m

_____

_____

_____

_____

(2)

(Total 12 marks)

Downloaded from www.merit-minds.com