

Name of the Student: _____

Max. Marks : 17 Marks

Time : 17 Minutes

Q1.

The diagram shows a battery-powered clock on a wall. It has a minute hand and an hour hand.



(a) Calculate the average angular velocity of the minute hand.

(2)

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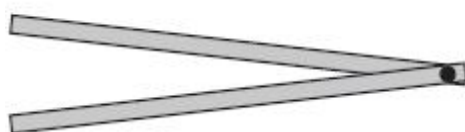
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Angular velocity =

(b) The diagram shows the position of the minute hand when the time is 1 : 44 and when the time is 1 : 46.



The diagram is not to scale.

Show that the work done against the force of gravity to move the minute hand from 1 : 44 to 1 : 46 is about 1 mJ.

mass of minute hand = 14 g

length of minute hand = 8.0 cm

(5)

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- (c) The clock uses a 1.5 V cell and draws a maximum current of 8.0 μA .
 After a time, the maximum power of the cell has reduced to 65% of its initial value making the clock run slowly.
 Calculate the time taken for the minute hand to move from the 1 : 44 position to the 1 : 46 position. (3)

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Time taken =

(Total for question = 10 marks)

Q2.

- (a) State what is meant by the de Broglie wavelength. (2)

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- (b) An electron is accelerated from rest, in a vacuum, through a potential difference of 500 V.
 (i) Show that the final momentum of the electron is about $1 \times 10^{-23} \text{ N s}$. (3)

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(ii) Calculate the de Broglie wavelength for this electron.

(2)

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de Broglie wavelength =

(Total for question = 7 marks)