

Cambridge International AS & A Level

Mathematics

9709/32

Paper 4 Mechanics

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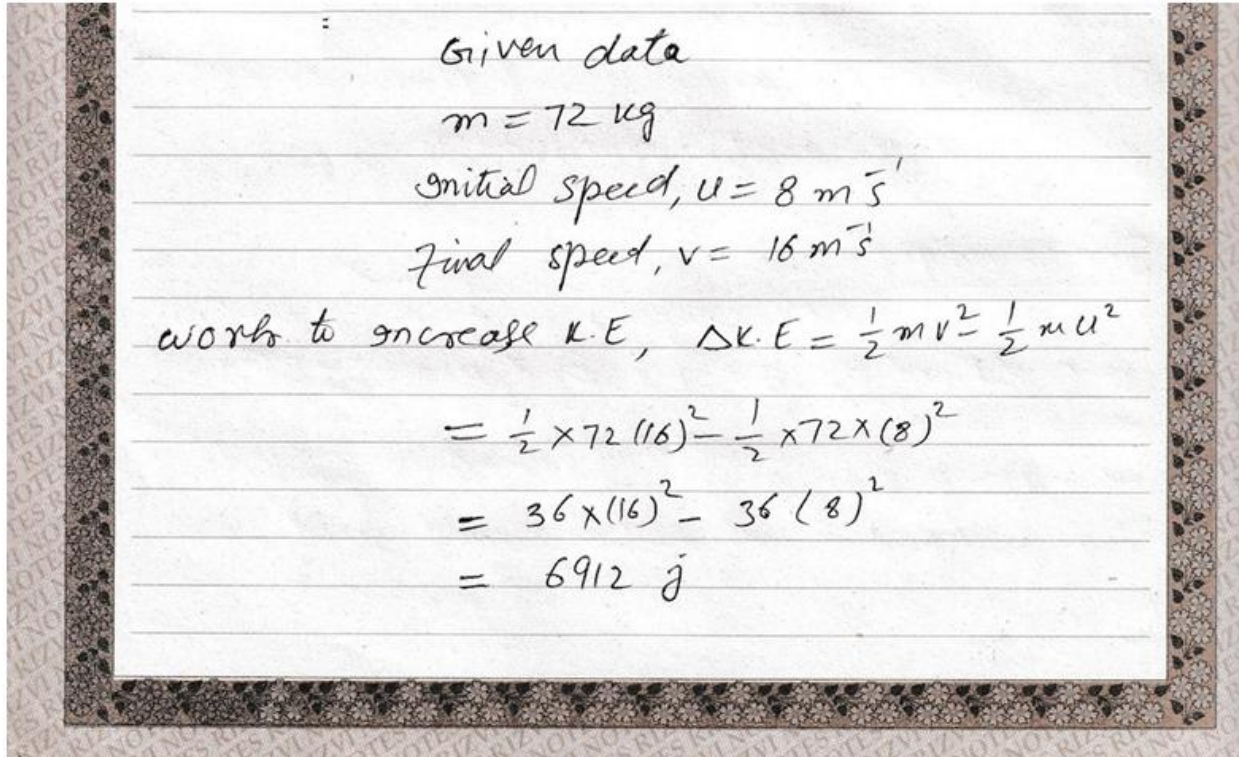
Question No(1)

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A cyclist and bicycle have a total mass of 72 kg. The cyclist rides along a horizontal road against a total resistance force of 28 N.

Find the total work done by the cyclist to increase his speed from 8 m s^{-1} to 16 m s^{-1} while travelling a distance of 100 metres.

Solution:



Given data

$$m = 72 \text{ kg}$$

$$\text{initial speed, } u = 8 \text{ m s}^{-1}$$

$$\text{final speed, } v = 16 \text{ m s}^{-1}$$

work to increase K.E, $\Delta \text{K.E} = \frac{1}{2} m v^2 - \frac{1}{2} m u^2$

$$= \frac{1}{2} \times 72 (16)^2 - \frac{1}{2} \times 72 \times (8)^2$$

$$= 36 \times (16)^2 - 36 \times (8)^2$$

$$= 6912 \text{ J}$$

work to overcome resistance

$$= \text{resistance force} \times \text{distance}$$

$$= 28 \times 100$$

$$= 2800 \text{ J}$$

total work done

$$W = \Delta KE + W_{\text{resistance}}$$

$$= 6912 + 2800$$

$$W = 9712 \text{ J}$$