

EXAM 4

Name: \_\_\_\_\_

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A 38.0 kg block is moving back and forth on a frictionless horizontal surface between two springs. The spring on the right has a force constant  $k_R = 2.50 \times 10^3 \text{ N/m}$ . When the block is between the two springs its speed ( $v$ ) is 1.82 m/s. See figure.



A. [12 pts.] If the block compresses the left spring to 5.62 cm beyond its uncompressed length, determine the value of  $k_L$ .

$$k_R = \frac{1}{2} m v^2 = (1/2)(38 \text{ kg})(1.82 \text{ m/s})^2 = 62.9 \text{ J}$$

$$k_R = \frac{1}{2} k_L A_L^2 = 62.9 \text{ J}$$

$$k_L = \frac{(2)(62.9 \text{ J})}{(0.0562 \text{ m})^2} = 3.99 \times 10^4 \text{ N/m}$$

B. [12 pts.] What is the maximum compression of the right spring when the mass interacts with it?

$$k_R = \frac{1}{2} k_R A_R^2 = 62.3 \text{ J}$$

$$A_R = \sqrt{\frac{(2)(62.3 \text{ J})}{2.50 \times 10^3 \text{ N/m}}} = 0.224 \text{ m}$$

C. [10 pts.] What is the total time the spring on the right is compressed during a single event?

TIME REQUESTED IS  $T/2$

$$T/2 = \pi \sqrt{\frac{m}{k}} = \pi \sqrt{\frac{38 \text{ kg}}{2.5 \times 10^3 \text{ N/m}}}$$

$$(T/2) = 0.387 \text{ s}$$