KEY

First Name:_____ Last Name:_____

L12 – EQ – Springs

Use the following information to answer Q1-Q2:

A spring of unknown spring constant is attached to a mass of 3kg and stretched a maximum distance of 10m. When it is released, it speeds up, reaching a maximum speed of 2m/s at the equilibrium position, before returning to its original position.

Q1: The spring constant of this spring is ***a.bc*** x 10^{-d} N/m, where ***a, b, c,*** and ***d*** are ___, ___, ___, and ___.

*(Record your **four digit** answer in the Numerical Response boxes below)*

1	2	0	1

$E_p \rightarrow E_K$

$\frac{1}{2}kx^2 = \frac{1}{2}mv^2$

$\frac{1}{2}k(10)^2 = \frac{1}{2}(3)(2)^2$

$\frac{1}{2}(k)(100) = 6$

$k = 0.12\ N/m$

$k = 1.20 \times 10^{-1}\ N/m$

Q2: The frequency of oscillation is

a. 3.18×10^{-2} Hz
b. 7.96×10^{-1} Hz
c. 1.26 Hz
d. 3.14×10^{1} Hz

$T = 2\pi\sqrt{\frac{m}{k}} = 2\pi\sqrt{\frac{3}{0.12}}$

$= 2\pi\sqrt{25}$

$= 31.4159s$

$f = \frac{1}{T} = \frac{1}{31.4159} = 3.18 \times 10^{-2}\ Hz$

KEY

Q3: Algebraically rearrange the equation $T = 2\pi\sqrt{\frac{m}{k}}$ to solve for k. Simplify your expression. *(2 marks)*

$T = 2\pi\sqrt{\frac{m}{k}}$

$\div 2\pi \quad \div 2\pi$

$\frac{T}{2\pi} = \sqrt{\frac{m}{k}}$

$\frac{T^2}{4\pi^2} = \frac{m}{k}$

$\times k \quad \times k$

$\frac{kT^2}{4\pi^2} = m$

$\times 4\pi^2 \quad \times 4\pi^2$

$kT^2 = 4\pi^2 m$

$\div T^2 \quad \div T^2$

$\boxed{k = \frac{4\pi^2 m}{T^2}}$

MARKING:

Beginning	0 – 1.5
Progressing	2 – 2.5
Competent	3 – 3.5
Exemplary	4