Name: _____

Proportionality Practice
SPH4U

Matching

Match the relationships on the left to their descriptions on the right.

_____	$a \propto b$	A. *a* is proportional to the square root of *b*
_____	$a \propto 1/b$	B. *a* is directly proportional to *b*
_____	$a \propto 1/b^2$	C. *a* is proportional to *b* squared
_____	$a \propto b^2$	D. *a* is inversely proportional to *b*
_____	$a \propto \sqrt{b}$	E. *a* is proportional to the inverse square of *b*

Multiple Choice

1. Given $a = \frac{F_{net}}{m}$, which of the following is true?

A. $a \propto m$ B. $a \propto 1/m$ C. $a \propto 1/m^2$ D. $a \propto \sqrt{m}$

2. Given $v_{av} = \frac{\Delta d}{\Delta t}$, which of the following is true?

A. $v_{av} \propto \Delta d$ B. $v_{av} \propto 1/\Delta d$ C. $v_{av} \propto \sqrt{\Delta d}$ D. $v_{av} \propto \Delta d^2$

3. Given $v = \lambda f$, which of the following is true?

A. $\lambda \propto f$ B. $\lambda \propto 1/f$ C. $\lambda \propto \sqrt{f}$ D. $\lambda \propto f^2$

4. Given $F_e = k\frac{q_1 q_2}{r^2}$, which of the following is true?

A. $F_e \propto r^2$ B. $F_e \propto 1/r$ C. $F_e \propto 1/r^2$ D. $F_e = 1/\sqrt{r}$

5. Given $W = \frac{1}{2}k x^2$, which of the following is true?

A. $x \propto W^2$ B. $x \propto \sqrt{W}$ C. $x \propto \frac{1}{W}$ D. $x \propto \frac{1}{W^2}$

More Multiple Choice

1. Given $p = mv$, if velocity *v* is doubled, momentum *p* is multiplied by a factor of:

   A. 1/4 B. 1/2 C. 2 D. 4

2. Given $F_c = \frac{mv^2}{r}$, if radius *r* is doubled, force F_c is multiplied by a factor of:

   A. 1/4 B. 1/2 C. 2 D. 4

3. Given $E_k = \frac{1}{2}mv^2$, if speed *v* is doubled, kinetic energy E_k is multiplied by a factor of:

   A. 1/4 B. 1/2 C. 2 D. 4

4. Given $F_G = G\frac{m_1 m_2}{r^2}$, if distance *r* is doubled, is force F_G is multiplied by a factor of:

   A. 1/4 B. 1/2 C. 2 D. 4

5. Given $P = VI$, if voltage is doubled, power is multiplied by a factor of:

   A. 1/4 B. 1/2 C. 2 D. 4

Problem Solving

1. Graph the following data set on a separate sheet of graph paper. Determine the relationship between the variables and draw a second graph (if necessary) to illustrate this relationship and determine the proportionality constant *k*. Time is the independent variable.

Time (s)	1.0	2.0	3.0	4.0	5.0
Distance (m)	4.9	19.6	44.1	78.4	122.5

2. Graph the following data set on a separate sheet of graph paper. Determine the relationship between the variables and draw a second graph (if necessary) to illustrate this relationship and determine the proportionality constant *k*. Frequency is the independent variable.

Frequency (Hz)	185	220	277	392	466
Wavelength (m)	1.86	1.57	1.24	0.88	0.74

3. Graph the following data set on a separate sheet of graph paper. Determine the relationship between the variables and draw a second graph (if necessary) to illustrate this relationship and determine the proportionality constant *k*. Length is the independent variable.

Length (m)	0.10	0.20	0.30	0.40	0.50
Period (s)	0.63	0.90	1.10	1.27	1.42

Answers: Matching: B, D, E, C, A Multiple Choice: 1. B; 2. A; 3. B; 4. C; 5. B

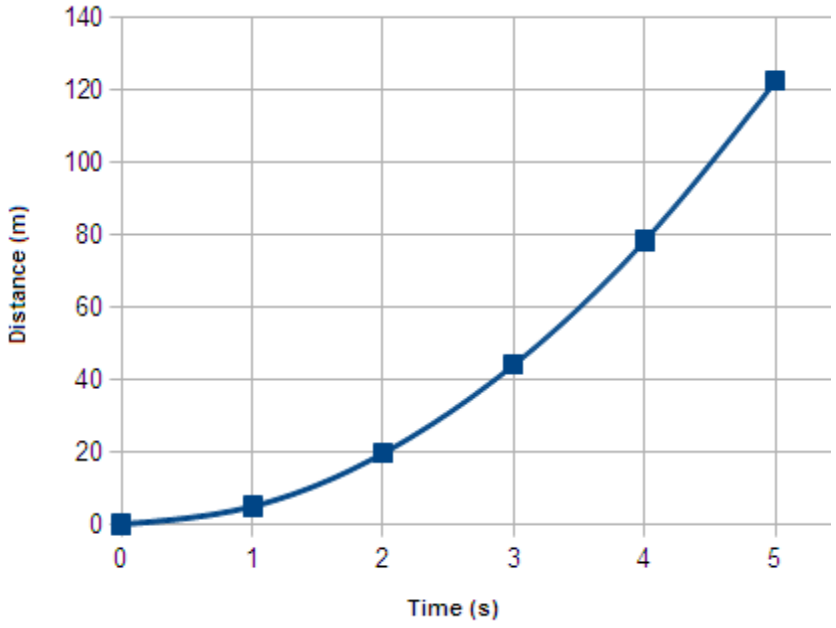
More Multiple Choice: 1. C; 2. B; 3. D; 4. A; 5. D

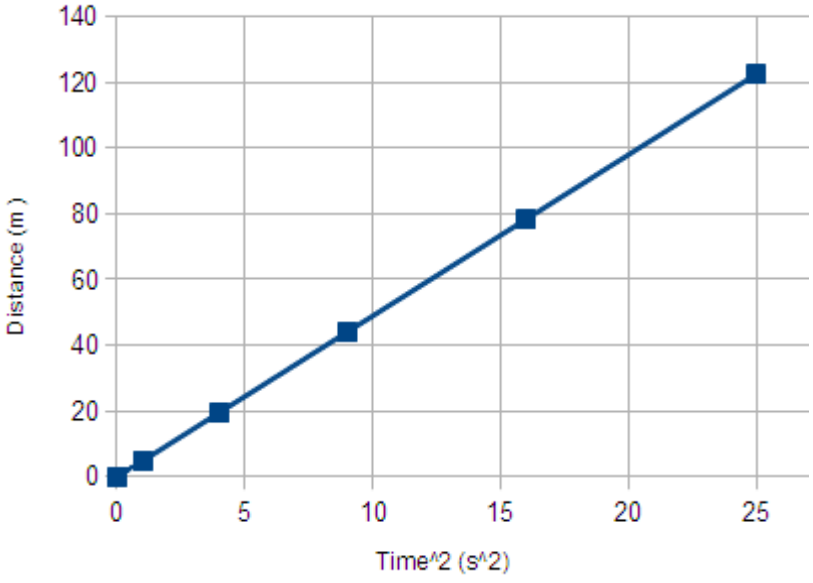
Question 5 is a trick question, as the current also depends on the voltage:

$$I = \frac{V}{R} \quad \text{so} \quad P = VI = V\left(\frac{V}{R}\right) = \frac{V^2}{R}$$

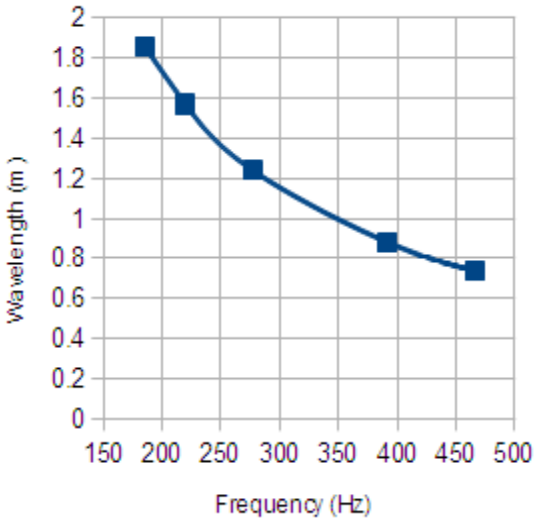
Problem Solving:

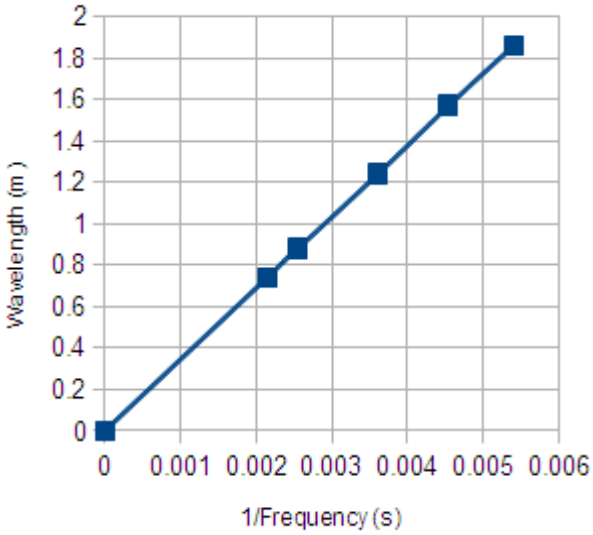
1. $Distance \propto Time^2$, $k = 4.9\, m/s^2$





2. $Wavelength \propto \frac{1}{Frequency}$, $k = 345\, m/s$





3. $Period \propto \sqrt{Length}$, $k = 2.0 \frac{s}{\sqrt{m}}$