Frequency and Period of a Vibrating Mass on a Spring

Activity 1 Frequency and Period Concepts

Question Group 1

Question 1

A mass is vibating on a spring. Its frequency describes _____

a. how often it vibrates back and forth
b. how fast it moves from one extreme to the other
c. how far it moves from its resting position to an extreme position

And its period describes _____.

a. how many times it vibrates back and forth
b. how much time it takes to complete one vibrational cycle
c. how much distance it travels during one vibrational cycle

Question 2

A mass is vibating on a spring. Its frequency describes _____

a. how fast it moves from one extreme to the other
b. how far it moves from its resting position to an extreme position
c. how often it vibrates back and forth

And its period describes _____.

a. how much distance it travels during one vibrational cycle
b. how many times it vibrates back and forth
c. how much time it takes to complete one vibrational cycle

Question 3

A mass is vibating on a spring. Its frequency describes _____

a. how far it moves from its resting position to an extreme position
b. how often it vibrates back and forth
c. how fast it moves from one extreme to the other

And its period describes _____.

a. how much time it takes to complete one vibrational cycle
b. how much distance it travels during one vibrational cycle
c. how many times it vibrates back and forth

Question 4

A mass is vibating on a spring. Its frequency describes _____

a. how far it moves from its resting position to an extreme position
b. how fast it moves from one extreme to the other
c. how often it vibrates back and forth

And its period describes _____.

a. how much time it takes to complete one vibrational cycle
b. how many times it vibrates back and forth
c. how much distance it travels during one vibrational cycle

Question Group 2

Question 5

The unit of frequency is _____.

a. meter per second
b. cycles per second
c. joule per second

And the unit of period is _____.

a. meter
b. second
c. oscillations

Question 6

The unit of frequency is _____.

a. joule per second
b. meter per second
c. cycles per second

And the unit of period is _____.

a. second
b. oscillations
c. meter

Question 7

The unit of period is _____.

a. oscillations
b. meter
c. second

And the unit of frequency is _____.
a. joule per second
b. meter per second
c. cycles per second

Question 8
The unit of period is _____.
a. second
b. oscillations
c. meter

And the unit of frequency is _____.
a. joule per second
b. meter per second
c. cycles per second

Question Group 3
Question 9
A mass vibrating on a spring makes 20 complete vibrational cycles in 40 seconds. This means that _____.
a. the frequency is 2.0 Hertz and the period is 20 seconds
b. the frequency is 0.5 Hertz and the period is 2.0 seconds
c. the frequency is 20 seconds and the period is 2.0 Hertz
d. the frequency is 2.0 seconds and the period is 0.5 Hertz

Question 10
A mass vibrating on a spring makes 20 complete vibrational cycles in 80 seconds. This means that _____.
a. the frequency is 4.0 Hertz and the period is 20 seconds
b. the frequency is 0.25 Hertz and the period is 4.0 seconds
c. the frequency is 20 seconds and the period is 4.0 Hertz
d. the frequency is 4.0 seconds and the period is 0.25 Hertz

Question 11
A mass vibrating on a spring makes 20 complete vibrational cycles in 40 seconds. This means that _____.
a. the period is 2.0 Hertz and the frequency is 20 seconds
b. the period is 0.5 Hertz and the frequency is 2.0 seconds

c. the period is 20 seconds the and frequency is 2.0 Hertz
d. the period is 2.0 seconds and the frequency is 0.5 Hertz

Question 12
A mass vibrating on a spring makes 20 complete vibrational cycles in 80 seconds. This means that _____.
a. the period is 4.0 Hertz and the frequency is 80 seconds
b. the period is 4.0 Hertz and the frequency is 0.25 seconds
c. the period is 80 seconds and the frequency is 0.25 Hertz
d. the period is 4.0 seconds and the frequency is 0.25 Hertz

Question Group 4
Question 13
The period of a vibrating mass on a spring depends mostly upon _____. Choose two.
a. the mass of the vibrating object
b. the gravitational field constant (g)
c. the spring constant (k)
d. the length of the spring

Question 14
The period of a vibrating mass on a spring depends mostly upon _____. Choose two.
a. the gravitational field constant (g)
b. the mass of the vibrating object
c. the length of the spring
d. the spring constant (k)

Question 15
The period of a vibrating mass on a spring depends mostly upon _____. Choose two.
a. the length of the spring
b. the spring constant (k)
c. the gravitational field constant (g)
d. the mass of the vibrating object

Question 16
The period of a vibrating mass on a spring depends mostly upon _____. Choose two.
a. the spring constant (k)
b. the length of the spring
c. the mass of the vibrating object

d. the gravitational field constant (g)

Question Group 5
Question 17
A mass is vibrating on a spring. As the frequency of its vibrations increases, …
a. the period of vibration also increases.
b. the period of vibration decreases.
c. the period of vibration is unaffected.
d. the period of vibration increases at first; then it decreases.

Question 18
A mass is vibrating on a spring. As the frequency of its vibrations increases, …
a. the period of vibration increases at first; then it decreases.
b. the period of vibration also increases.
c. the period of vibration decreases.
d. the period of vibration is unaffected.

Question 19
A mass is vibrating on a spring. As the frequency of its vibrations increases, …
a. the period of vibration is unaffected.
b. the period of vibration increases at first; then it decreases.
c. the period of vibration also increases.
d. the period of vibration decreases.

Question 20
A mass is vibrating on a spring. As the frequency of its vibrations increases, …
a. the period of vibration decreases.
b. the period of vibration also increases.
c. the period of vibration increases at first; then it decreases.
d. the period of vibration is unaffected.

Question Group 6
Question 21
A mass is vibrating on a spring. Which one change is certain to increase the period of its vibrations?
a. Increase the mass of the vibrating object.
b. Decrease the length of the spring.

c. Increase the length of the spring.
d. Use a spring with a larger spring constant (k).

Question 22
A mass is vibrating on a spring. Which one change is certain to increase the period of its vibrations?
a. Increase the length of the spring.
b. Decrease the length of the spring.
c. Use a spring with a smaller spring constant (k).
d. Decrease the mass of the vibrating object.

Question 23
A mass is vibrating on a spring. Which one change is certain to decrease the period of its vibrations?
a. Decrease the length of the spring.
b. Use a spring with a smaller spring constant.
c. Decrease the mass of the vibrating object.
d. Increase the length of the spring.

Question 24
A mass is vibrating on a spring. Which one change is certain to decrease the period of its vibrations?
a. Use a spring with a larger spring constant.
b. Increase the mass of the vibrating object.
c. Increase the length of the spring.
d. Decrease the length of the spring.

Activity 2 Frequency and Period Ranking Tasks
Question Group 7
Question 25
Anna Litical is experimenting with an object vibrating up and down on the end of a spring. She is studying the effect of object mass (m), spring constant (k), and spring length (L) upon the period. The parameter values used for three trials are shown. Rank the three trials in order of their period (T).

Trial 1	**Trial 2**	**Trial 3**
m = 0.250 kg	m = 0.250 kg	m = 0.250 kg
k = 0.050 N/m	k = 0.010 N/m	k = 0.025 N/m
L = 0.05 m	L = 0.10 m	L = 0.15 m

Question 26
Anna Litical is experimenting with an object vibrating up and down on the end of a spring. She is studying the effect of object mass (m), spring constant (k), and spring length (L) upon the period. The parameter values used for three trials are shown. Rank the three trials in order of their period (T).

Trial 1	**Trial 2**	**Trial 3**
m = 0.250 kg	m = 0.250 kg	m = 0.250 kg
k = 0.025 N/m	k = 0.050 N/m	k = 0.010 N/m
L = 0.15 m	L = 0.05 m	L = 0.10 m

Question 27
Anna Litical is experimenting with an object vibrating up and down on the end of a spring. She is studying the effect of object mass (m), spring constant (k), and spring length (L) upon the period. The parameter values used for three trials are shown. Rank the three trials in order of their period (T).

Trial 1	**Trial 2**	**Trial 3**
m = 0.250 kg	m = 0.250 kg	m = 0.250 kg
k = 0.010 N/m	k = 0.025 N/m	k = 0.050 N/m
L = 0.10 m	L = 0.15 m	L = 0.05 m

Question 28

Anna Litical is experimenting with an object vibrating up and down on the end of a spring. She is studying the effect of object mass (m), spring constant (k), and spring length (L) upon the period. The parameter values used for three trials are shown. Rank the three trials in order of their period (T).

Trial 1	Trial 2	Trial 3
m = 0.250 kg	m = 0.250 kg	m = 0.250 kg
k = 0.050 N/m	k = 0.025 N/m	k = 0.010 N/m
L = 0.05 m	L = 0.15 m	L = 0.10 m

Question Group 8

Question 29

Anna Litical is experimenting with an object vibrating up and down on the end of a spring. She is studying the effect of object mass (m), spring constant (k), and spring length (L) upon the period. The parameter values used for three trials are shown. Rank the three trials in order of their period (T).

Trial 1	Trial 2	Trial 3
m = 0.200 kg	m = 0.100 kg	m = 0.500 kg
k = 0.050 N/m	k = 0.050 N/m	k = 0.050 N/m
L = 0.20 m	L = 0.15 m	L = 0.10 m

Question 30

Anna Litical is experimenting with an object vibrating up and down on the end of a spring. She is studying the effect of object mass (m), spring constant (k), and spring length (L) upon the period. The parameter values used for three trials are shown. Rank the three trials in order of their period (T).

Trial 1	Trial 2	Trial 3
m = 0.500 kg	m = 0.200 kg	m = 0.100 kg
k = 0.050 N/m	k = 0.050 N/m	k = 0.050 N/m
L = 0.10 m	L = 0.20 m	L = 0.15 m

Question 31
Anna Litical is experimenting with an object vibrating up and down on the end of a spring. She is studying the effect of object mass (m), spring constant (k), and spring length (L) upon the period. The parameter values used for three trials are shown. Rank the three trials in order of their period (T).

Trial 1	Trial 2	Trial 3
m = 0.100 kg	m = 0.500 kg	m = 0.200 kg
k = 0.050 N/m	k = 0.050 N/m	k = 0.050 N/m
L = 0.15 m	L = 0.10 m	L = 0.20 m

Question 32
Anna Litical is experimenting with an object vibrating up and down on the end of a spring. She is studying the effect of object mass (m), spring constant (k), and spring length (L) upon the period. The parameter values used for three trials are shown. Rank the three trials in order of their period (T).

Trial 1	Trial 2	Trial 3
m = 0.200 kg	m = 0.500 kg	m = 0.100 kg
k = 0.050 N/m	k = 0.050 N/m	k = 0.050 N/m
L = 0.20 m	L = 0.10 m	L = 0.15 m

Question Group 9
Question 33
Anna Litical is experimenting with an object vibrating up and down on the end of a spring. She is studying the effect of object mass (m), spring constant (k), and spring length (L) upon the period. The parameter values used for three trials are shown. Rank the three trials in order of their period (T).

Trial 1	Trial 2	Trial 3
m = 0.100 kg	m = 0.500 kg	m = 0.200 kg
k = 0.050 N/m	k = 0.010 N/m	k = 0.050 N/m
L = 0.15 m	L = 0.15 m	L = 0.15 m

Question 34
Anna Litical is experimenting with an object vibrating up and down on the end of a spring. She is studying the effect of object mass (m), spring constant (k), and spring length (L) upon the period. The parameter values used for three trials are shown. Rank the three trials in order of their period (T).

Trial 1	**Trial 2**	**Trial 3**
m = 0.200 kg	m = 0.100 kg	m = 0.500 kg
k = 0.050 N/m	k = 0.050 N/m	k = 0.010 N/m
L = 0.15 m	L = 0.15 m	L = 0.15 m

Question 35
Anna Litical is experimenting with an object vibrating up and down on the end of a spring. She is studying the effect of object mass (m), spring constant (k), and spring length (L) upon the period. The parameter values used for three trials are shown. Rank the three trials in order of their period (T).

Trial 1	**Trial 2**	**Trial 3**
m = 0.500 kg	m = 0.200 kg	m = 0.100 kg
k = 0.010 N/m	k = 0.050 N/m	k = 0.050 N/m
L = 0.15 m	L = 0.15 m	L = 0.15 m

Question 36
Anna Litical is experimenting with an object vibrating up and down on the end of a spring. She is studying the effect of object mass (m), spring constant (k), and spring length (L) upon the period. The parameter values used for three trials are shown. Rank the three trials in order of their period (T).

Trial 1	**Trial 2**	**Trial 3**
m = 0.100 kg	m = 0.200 kg	m = 0.500 kg
k = 0.050 N/m	k = 0.050 N/m	k = 0.010 N/m
L = 0.15 m	L = 0.15 m	L = 0.15 m

Activity 3 Proportional Reasoning
Question Group 10
Question 37
Noah Formula is conducting an experimental study of the **period** of a vibrating mass on a spring. If Noah **increases the mass value by a factor of two**, then he can expect the **period** of its vibrations to …
a. increase by a factor of 2.
b. increase by a factor of 4.
c. increase by a factor of the square root of 2.
d. decrease by a factor of 2.
e. decrease by a factor of 4.
f. decrease by a factor of the square root of 2.
g. not be affected by the mass change.

Question 38
Noah Formula is conducting an experimental study of the **period** of a vibrating mass on a spring. If Noah **increases the mass value by a factor of two**, then he can expect the **period** of its vibrations to …
a. increase by a factor of 2.
b. decrease by a factor of 2.
c. increase by a factor of the square root of 2.
d. decrease by a factor of the square root of 2.
e. increase by a factor of 4.
f. decrease by a factor of 4.
g. not be affected by the mass change.

Question 39
Noah Formula is conducting an experimental study of the **period** of a vibrating mass on a spring. If Noah **decreases the mass value by a factor of two**, then he can expect the **period** of its vibrations to …
a. increase by a factor of 2.
b. increase by a factor of 4.
c. increase by a factor of the square root of 2.
d. decrease by a factor of 2.
e. decrease by a factor of 4.
f. decrease by a factor of the square root of 2.
g. not be affected by the mass change.

Question 40

Noah Formula is conducting an experimental study of the **period** of a vibrating mass on a spring. If Noah **decreases the mass value by a factor of two**, then he can expect the **period** of its vibrations to …

a. increase by a factor of 2.
b. decrease by a factor of 2.
c. increase by a factor of the square root of 2.
d. decrease by a factor of the square root of 2.
e. increase by a factor of 4.
f. decrease by a factor of 4.
g. not be affected by the mass change.

Question Group 11

Question 41

Noah Formula is conducting an experimental study of the **period** of a vibrating mass on a spring. If Noah **increases the mass value by a factor of three**, then he can expect the **period** of its vibrations to …

a. increase by a factor of 3.
b. increase by a factor of 9.
c. increase by a factor of the square root of 3.
d. decrease by a factor of 3.
e. decrease by a factor of 9.
f. decrease by a factor of the square root of 3.
g. not be affected by the mass change.

Question 42

Noah Formula is conducting an experimental study of the **period** of a vibrating mass on a spring. If Noah **increases the mass value by a factor of three**, then he can expect the **period** of its vibrations to …

a. increase by a factor of 3.
b. decrease by a factor of 3.
c. increase by a factor of the square root of 3.
d. decrease by a factor of the square root of 3.
e. increase by a factor of 9.
f. decrease by a factor of 9.
g. not be affected by the mass change.

Question 43

Noah Formula is conducting an experimental study of the **period** of a vibrating mass on a spring. If Noah **decreases the mass value by a factor of three**, then he can expect the **period** of its vibrations to …

a. increase by a factor of 3.
b. increase by a factor of 9.
c. increase by a factor of the square root of 3.
d. decrease by a factor of 3.
e. decrease by a factor of 9.
f. decrease by a factor of the square root of 3.
g. not be affected by the mass change.

Question 44

Noah Formula is conducting an experimental study of the **period** of a vibrating mass on a spring. If Noah **decreases the mass value by a factor of three**, then he can expect the **period** of its vibrations to …

a. increase by a factor of 3.
b. decrease by a factor of 3.
c. increase by a factor of the square root of 3.
d. decrease by a factor of the square root of 3.
e. increase by a factor of 9.
f. decrease by a factor of 9.
g. not be affected by the mass change.

Question Group 12

Question 45

Noah Formula is conducting an experimental study of the **frequency** of a vibrating mass on a spring. If Noah **increases the mass value by a factor of two**, then he can expect the **frequency** of its vibrations to …

a. increase by a factor of 2.
b. increase by a factor of 4.
c. increase by a factor of the square root of 2.
d. decrease by a factor of 2.
e. decrease by a factor of 4.
f. decrease by a factor of the square root of 2.
g. not be affected by the mass change.

Question 46

Noah Formula is conducting an experimental study of the **frequency** of a vibrating mass on a spring. If Noah **increases the mass value by a factor of two**, then he can expect the **frequency** of its vibrations to …

a. increase by a factor of 2.
b. decrease by a factor of 2.
c. increase by a factor of the square root of 2.
d. decrease by a factor of the square root of 2.
e. increase by a factor of 4.
f. decrease by a factor of 4.
g. not be affected by the mass change.

Question 47

Noah Formula is conducting an experimental study of the **frequency** of a vibrating mass on a spring. If Noah **decreases the mass value by a factor of two**, then he can expect the **frequency** of its vibrations to …

a. increase by a factor of 2.
b. increase by a factor of 4.
c. increase by a factor of the square root of 2.
d. decrease by a factor of 2.
e. decrease by a factor of 4.
f. decrease by a factor of the square root of 2.
g. not be affected by the mass change.

Question 48

Noah Formula is conducting an experimental study of the **frequency** of a vibrating mass on a spring. If Noah **decreases the mass value by a factor of two**, then he can expect the **frequency** of its vibrations to …

a. increase by a factor of 2.
b. decrease by a factor of 2.
c. increase by a factor of the square root of 2.
d. decrease by a factor of the square root of 2.
e. increase by a factor of 4.
f. decrease by a factor of 4.
g. not be affected by the mass change.

Question Group 13

Question 49

Noah Formula is conducting an experimental study of the **period** of a vibrating mass on a spring. If Noah uses a spring that has **a spring constant that is two times greater**, then he can expect the **period** of its vibrations to …

a. increase by a factor of 3.
b. increase by a factor of 9.
c. increase by a factor of the square root of 3.

d. decrease by a factor of 3.
e. decrease by a factor of 9.
f. decrease by a factor of the square root of 3.
g. not be affected by the spring constant change.

Question 50

Noah Formula is conducting an experimental study of the **period** of a vibrating mass on a spring. If Noah uses a spring that has **a spring constant that is two times greater**, then he can expect the **period** of its vibrations to …

a. increase by a factor of 3.
b. decrease by a factor of 3.
c. increase by a factor of the square root of 3.
d. decrease by a factor of the square root of 3.
e. increase by a factor of 9.
f. decrease by a factor of 9.
g. not be affected by the spring constant change.

Question 51

Noah Formula is conducting an experimental study of the **period** of a vibrating mass on a spring. If Noah uses a spring that has **a spring constant that is two times smaller** (one-half the value), then he can expect the **period** of its vibrations to …

a. increase by a factor of 3.
b. increase by a factor of 9.
c. increase by a factor of the square root of 3.
d. decrease by a factor of 3.
e. decrease by a factor of 9.
f. decrease by a factor of the square root of 3.
g. not be affected by the spring constant change.

Question 52

Noah Formula is conducting an experimental study of the **period** of a vibrating mass on a spring. If Noah uses a spring that has **a spring constant that is two times smaller** (one-half the value), then he can expect the **period** of its vibrations to …

a. increase by a factor of 3.
b. decrease by a factor of 3.
c. increase by a factor of the square root of 3.
d. decrease by a factor of the square root of 3.
e. increase by a factor of 9.
f. decrease by a factor of 9.
g. not be affected by the spring constant change.

Question Group 14

Question 53

Noah Formula is conducting an experimental study of the **period** of a vibrating mass on a spring. If Noah uses a spring that has **a spring constant that is three times greater**, then he can expect the **period** of its vibrations to …

a. increase by a factor of 3.
b. increase by a factor of 9.
c. increase by a factor of the square root of 3.
d. decrease by a factor of 3.
e. decrease by a factor of 9.
f. decrease by a factor of the square root of 3.
g. not be affected by the spring constant change.

Question 54

Noah Formula is conducting an experimental study of the **period** of a vibrating mass on a spring. If Noah uses a spring that has **a spring constant that is three times greater**, then he can expect the **period** of its vibrations to …

a. increase by a factor of 3.
b. decrease by a factor of 3.
c. increase by a factor of the square root of 3.
d. decrease by a factor of the square root of 3.
e. increase by a factor of 9.
f. decrease by a factor of 9.
g. not be affected by the spring constant change.

Question 55

Noah Formula is conducting an experimental study of the **period** of a vibrating mass on a spring. If Noah uses a spring that has **a spring constant that is three times smaller** (1/3rd the value), then he can expect the **period** of its vibrations to …

a. increase by a factor of 3.
b. increase by a factor of 9.
c. increase by a factor of the square root of 3.
d. decrease by a factor of 3.
e. decrease by a factor of 9.
f. decrease by a factor of the square root of 3.
g. not be affected by the spring constant change.

Question 56

Noah Formula is conducting an experimental study of the **period** of a vibrating mass on a spring. If Noah uses a spring that has **a spring constant that is three times smaller** (1/3rd the value), then he can expect the **period** of its vibrations to …

a. increase by a factor of 3.
b. decrease by a factor of 3.
c. increase by a factor of the square root of 3.
d. decrease by a factor of the square root of 3.
e. increase by a factor of 9.
f. decrease by a factor of 9.
g. not be affected by the spring constant change.

Question Group 15

Question 57

Noah Formula is conducting an experimental study of the **frequency** of a vibrating mass on a spring. If Noah uses a spring that has **a spring constant that is three times greater**, then he can expect the **frequency** of its vibrations to …

a. increase by a factor of 3.
b. increase by a factor of 9.
c. increase by a factor of the square root of 3.
d. decrease by a factor of 3.
e. decrease by a factor of 9.
f. decrease by a factor of the square root of 3.
g. not be affected by the spring constant change.

Question 58

Noah Formula is conducting an experimental study of the **frequency** of a vibrating mass on a spring. If Noah uses a spring that has **a spring constant that is three times greater**, then he can expect the **frequency** of its vibrations to …

a. increase by a factor of 3.
b. decrease by a factor of 3.
c. increase by a factor of the square root of 3.
d. decrease by a factor of the square root of 3.
e. increase by a factor of 9.
f. decrease by a factor of 9.
g. not be affected by the spring constant change.

Question 59

Noah Formula is conducting an experimental study of the **frequency** of a vibrating mass on a spring. If Noah uses a spring that has **a spring constant that is three times smaller** (1/3rd the value), then he can expect the **frequency** of its vibrations to …

a. increase by a factor of 3.
b. increase by a factor of 9.
c. increase by a factor of the square root of 3.
d. decrease by a factor of 3.
e. decrease by a factor of 9.
f. decrease by a factor of the square root of 3.
g. not be affected by the spring constant change.

Question 60

Noah Formula is conducting an experimental study of the **frequency** of a vibrating mass on a spring. If Noah uses a spring that has **a spring constant that is three times smaller** (1/3rd the value), then he can expect the **frequency** of its vibrations to …

a. increase by a factor of 3.
b. decrease by a factor of 3.
c. increase by a factor of the square root of 3.
d. decrease by a factor of the square root of 3.
e. increase by a factor of 9.
f. decrease by a factor of 9.
g. not be affected by the spring constant change.