Skill 48: Applying Basic Wave Vocabulary
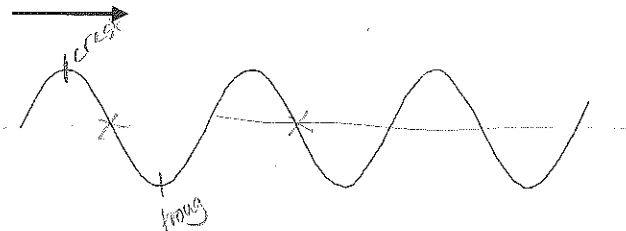
28. Pulse – a vibratory disturbance in a medium that carries __energy__ but NOT __mass__ .

29. Periodic Wave - a set of regularly repeating pulses.

1. Add an equilibrium line
2. Label the crest and trough
3. Mark two location one wavelength apart with an "X"

30. Periodic waves do everything that pulses do but since they repeat they also have:

- Frequency – (f) measured in __hertz__ Equation $\frac{cycles}{second}$

- Period – (T) measured in __second__ Equation $= \frac{seconds}{cycle}$

- Wavelength – (λ) measured in __meters__ Equation $= \frac{meters}{cycle}$

31. Speed is the measure of a distance a "pulse" travels over time

In waves distance is measured by __wavelength__ and time is measured by __frequency__ or period

$$V = \lambda f = \left(\frac{meters}{cycle}\right)\left(\frac{cycles}{second}\right)$$

32. Write an equation for speed using λ and T

$$V = \frac{\lambda}{T} = \frac{\frac{meters}{cycle}}{\frac{seconds}{cycle}} = \frac{meters}{second}$$

33. Summarize concepts we have learned so far in terms of variables, units and equations

	Variable	Unit of measurement	Important Equations/Notes
Wavelength	λ	m	$\dfrac{meters}{cycle}$
Frequency	f	Hz	$\dfrac{cycles}{second}$
Period	T	s	$\dfrac{second}{cycle}$
Speed of wave	V	m/s	$\dfrac{meters}{second}$ $V = \lambda f$ $V = \lambda/T$

34. On the diagram below label wavelength and amplitude (label crest and trough)
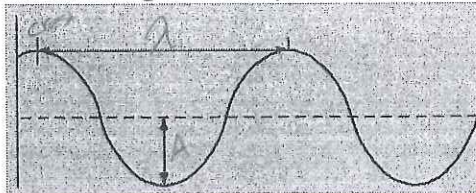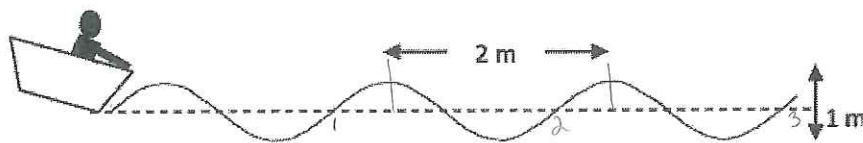

35. A wave completes a cycle 3 times per second.
   a. What is the frequency of the wave?

   3Hz

   b. What is the period of the wave?

   $\dfrac{1 second}{3 cycles} = .33s$

A person sitting in a rowboat produces a set of waves by rocking the boat back and forth. He pushes the side of the boat downward once every 2.5 seconds.

36. What is the amplitude of the wave? _____.5m_____

37. What is the wavelength of the wave? _____2 m_____

38. What is the period of the wave? _____2.5s_____

39. Calculate the frequency of the wave. $\frac{1}{2.5s} = .4Hz$

40. Calculate the speed of the wave.

   $V = f\lambda = (.4Hz)(2m) = .8 m/s$

41. While sitting in a boat, a fisherman observes that two complete waves pass by his position every 4 seconds. What is the period of these waves?

    A) 0.5 s   B) 2 s   C) 8 s   D) 4 s

    $T = \dfrac{seconds}{cycle} = \dfrac{4s}{2cycles} = 2s$

42. What is the period of a water wave if 4.0 complete waves pass a fixed point in 10. seconds?

    A) 0.25 s   B) 0.40 s
    C) 2.5 s   D) 4.0 s

    $T = \dfrac{seconds}{cycle} = \dfrac{10s}{4cycle} = 2.5s$

43. The time required for a wave to complete one full cycle is called the wave's

    A) frequency   B) period
    C) velocity   D) wavelength

44. The product of a wave's frequency and its period is

    A) one
    B) its velocity
    C) its wavelength
    D) Planck's constant

    $f \times T$ $T = \frac{1}{f}$ $f \cdot \frac{1}{f} = 1$

45. If the frequency of a periodic wave is doubled, the period of the wave will be

    A) halved   B) doubled
    C) quartered   D) quadrupled

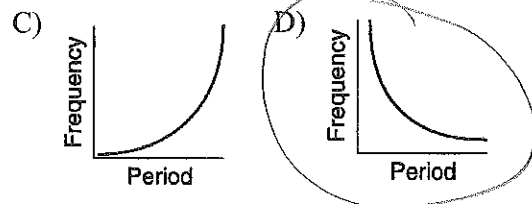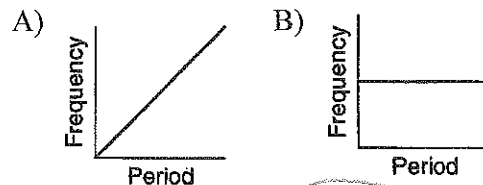 $f = \frac{1}{T}$ $T = \frac{1}{f}$

    Inverse

46. What is the frequency of a wave if its period is 0.25 second?

    A) 1.0 Hz   B) 0.25 Hz
    C) 12 Hz   D) 4.0 Hz

    $T = .25s$ $f = \frac{1}{T} = \frac{1}{.25s} = 4Hz$

47. Which graph best represents the relationship between the frequency and period of a wave?

    A)   B)
    C)   D)

    $f = \frac{1}{T}$

48. A motor is used to produce 4.0 waves each second in a string. What is the frequency of the waves?

    A) 0.25 Hz   B) 15 Hz
    C) 25 Hz   D) 4.0 Hz

    $f = \dfrac{cycles}{second} = \dfrac{4cycles}{second} = 4Hz$

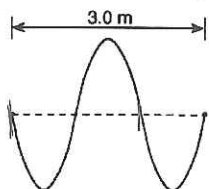49. **Note that the question below has only three choices.**
    If the amplitude of a wave is increased, the frequency of the wave will

    A) decrease   B) increase
    C) remain the same

    Amplitude is independent of other variables

50. The diagram below represents a periodic wave generated during a 1.5-second interval.

3.0 m

$$\frac{1.5 \text{ cycles}}{1.5 \text{ seconds}} = 1 \text{ Hz}$$

The frequency of the wave is

A) 1.0 Hz   B) 2.0 Hz
C) 0.50 Hz   D) 4.5 Hz

51. The hertz is a unit that describes the number of

A) seconds it takes to complete one cycle of a wave
B) cycles of a wave completed in one second
C) points that are in phase along one meter of a wave
D) points that are out of phase along one meter of a wave

52. The number of water waves passing a given point each second is the wave's

A) frequency   B) amplitude
C) wavelength   D) velocity

53. A distance of 1.0×10^{-2} meter separates successive crests of a periodic wave produced in a shallow tank of water. If a crest passes a point in the tank every 4.0×10^{-1} second, what is the speed of this wave?

A) 2.5×10^{-4} m/s   B) 4.0×10^{-3} m/s
C) 2.5×10^{-2} m/s   D) 4.0×10^{-1} m/s
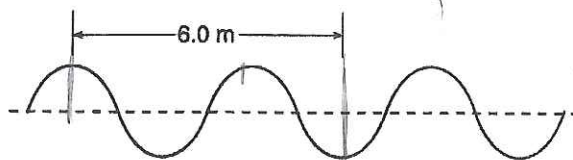
$\lambda = 1.0 \times 10^{-2} \text{ m}$

$T = 4 \times 10^{-1} \text{ s}$

$V = \frac{\lambda}{T} = \frac{1 \times 10^{-2} \text{ m}}{4 \times 10^{-1} \text{ s}}$

$= .25 \times 10^{-1} \text{ m/s}$

$= 2.5 \times 10^{-2} \text{ m/s}$

54. The diagram below represents a periodic wave traveling through a uniform medium.

6.0 m

If the frequency of the wave is 2.0 hertz, the speed of the wave is

A) 6.0 m/s   B) 2.0 m/s
C) 8.0 m/s   D) 4.0 m/s

$\lambda = \frac{\text{meters}}{\text{cycle}} = \frac{6 \text{ m}}{1.5 \text{ cycles}} = 4 \text{ m}$ $V = f\lambda$

$f = 2 \text{ Hz}$ $=(2 \text{ Hz})(4 \text{ m}) = 8 \text{ m/s}$

55. A periodic wave having a frequency of 5.0 hertz and a speed of 10. meters per second has a wavelength of

A) 0.50 m   B) 2.0 m
C) 5.0 m   D) 50. m

$f = 5 \text{ Hz}$ $V = f\lambda$

$V = 10 \text{ m/s}$ $\lambda = \frac{V}{f} = \frac{10 \text{ m/s}}{5 \text{ Hz}} = 2 \text{ m}$

$\lambda = ?$

56. **Note that the following question has only three choices.**
If the amplitude of a wave traveling in a rope is doubled, the speed of the wave in the rope will

A) decrease   B) increase
C) remain the same

Amplitude is independent of other variables

57. A surfacing whale in an aquarium produces water wave crests having an amplitude of 1.2 meters every 0.40 second. If the water wave travels at 4.5 meters per second, the wavelength of the wave is

A) 1.8 m   B) 2.4 m
C) 3.0 m   D) 11 m

$T = .4 \text{ s}$ $V = \frac{\lambda}{T}$

$V = 4.5 \text{ m/s}$ $\lambda = VT$

$\lambda = ?$ $= (4.5 \text{ m})(.4 \text{ s}) = 1.8 \text{ m}$

58. A wave completes one vibration as it moves a distance of 2 meters at a speed of 20 meters per second. What is the frequency of the wave?

A) 10 Hz   B) 2 Hz

C) 20 Hz   D) 40 Hz

$f = ?$

$\lambda = 2m$

$v = 20 \, m/s$

$v = f\lambda$

$f = \frac{v}{\lambda} = \frac{20 \, m/s}{2m} = 10 Hz$

59. If the velocity of a constant-frequency wave increases, the wavelength

A) decreases

B) increases

C) remains the same

$v = f\lambda$

direct

60. The rate at which a wave travels from one point to another determines the wave's

A) frequency   B) period

C) amplitude   D) velocity

61. A pulse traveled the length of a stretched spring. The pulse transferred

A) energy, only

B) mass, only

C) both energy and mass

D) neither energy nor mass

62. As a pulse travels along a rope, the pulse loses energy and its amplitude
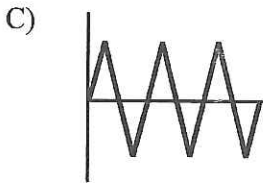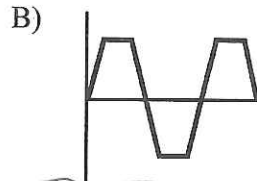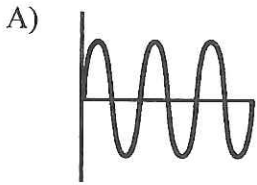
A) decreases

B) increases

C) remains the same

Amplitude is associated with the energy of a wave that requires a medium (Mechanical)

Topic 6B: Wave Vocabulary

63. Which diagram below does *not* represent a periodic wave?
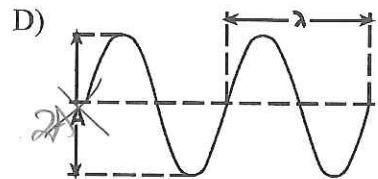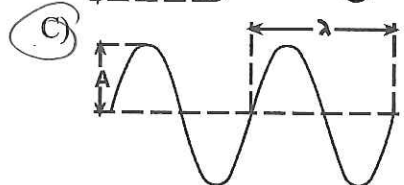
A)

B)

C)

D)
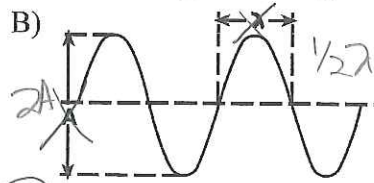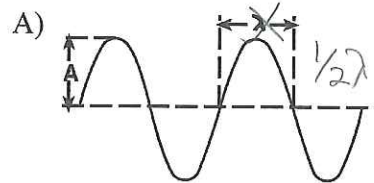

Intervals not regular

64. Which phrase best describes a periodic wave?

A) a single pulse traveling at constant speed
B) a series of pulses at irregular intervals
C) a series of pulses at regular intervals
D) a single pulse traveling at different speeds in the same medium

65. Which wave diagram has *both* wavelength (λ) and amplitude (A) labeled correctly?

A)

½λ

B)

2A ½λ

C)

λ

D)

2A λ

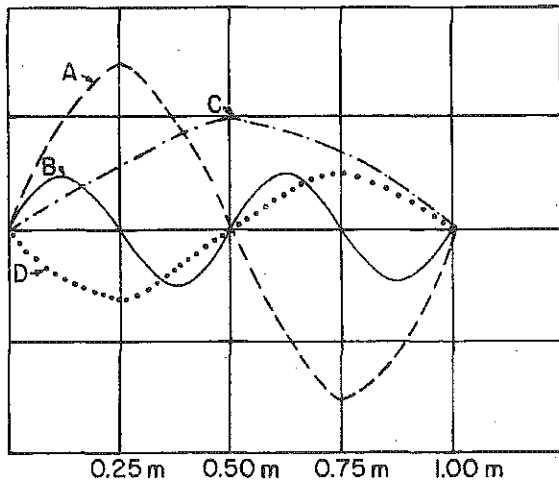66. The diagram below shows two points, *A* and *B*, on a wave train.
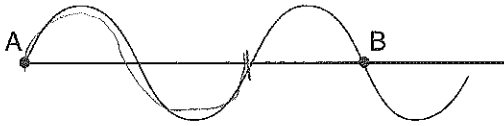
How many wavelengths separate point *A* and point *B*?

A) 1.0   B) 1.5   C) 3.0   D) 0.75

67. Which is a unit of wavelength?

A) cycles/second   B) meters/second
C) seconds   D) meters/cycle

meters

Base your answers to questions **68** and **69** on the diagram below which represents four waves traveling to the right in the same transmitting medium.

0.25 m   0.50 m   0.75 m   1.00 m

68. Which wave has the greatest frequency
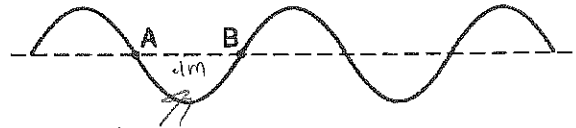
A) *A*   B) *B*   C) *C*   D) *D*

A = 1 cycle/time = 1m/cycle
B = 2 cycles/time
C = .5 cycles/time
D = 1 cycle/time

69. What is the wavelength of wave *A*?

A) 1.00 m   B) 0.75 m
C) 0.50 m   D) 0.25 m

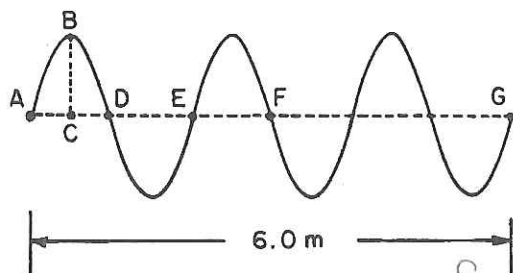70. In the diagram below, the distance between points *A* and *B* on a wave is 0.10 meter.

This wave must have

A) an amplitude of 0.10 m
B) an amplitude of 0.20 m
C) a wavelength of 0.10 m   ½λ
D) a wavelength of 0.20 m

Base your answers to questions **71** and **72** on the diagram below which represents a vibrating string with a periodic wave originating at *A* and moving to G a distance of 6.0 meters.

71. If the waves were produced at a faster rate, the distance between points *D* and *E* would

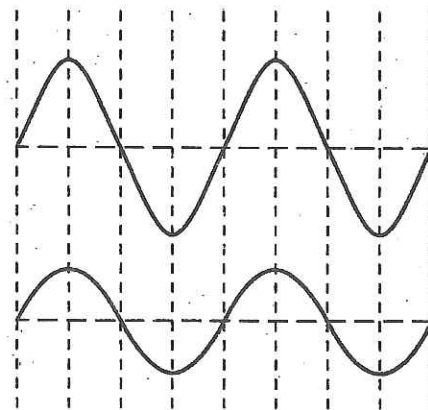   A) decrease   B) increase
    C) remain the same

$$V = f\lambda \qquad f = \frac{v}{\lambda} \text{ inverse}$$

72. What is the wavelength of this wave?

    A) 1.0 m   B) 2.0 m
    C) 3.0 m   D) 6.0 m

$$\lambda = \frac{\text{meters}}{\text{cycle}} = \frac{6m}{3 \text{ cycles}} = 2m$$

73. The diagram below shows two waves traveling in the same medium for the same length of time.

The two waves have different

    A) amplitudes   B) frequencies
    C) speeds   D) wavelengths