# **Electromagnetic Wave Propagation Along One Line**

Electromagnetic wave propagating along +x direction. Red indicates the electric field, blue the magnetic field.



# **Electromagnetic Wave Propagation Along Several Directions**

Electromagnetic waves produced by charge oscillating up and down the y axis. Red indicates the electric field.



### Question 1

Snapshots of three waves on strings are illustrated.



Rank the waves in order of wavelength.

- 1.  $\lambda_{A} > \lambda_{B} = \lambda_{C}$ 2.  $\lambda_{A} < \lambda_{B} = \lambda_{C}$ 3.  $\lambda_{A} = \lambda_{B} < \lambda_{C}$
- 4.  $\lambda_{\rm A} = \lambda_{\rm B} > \lambda_{\rm C}$
- 5.  $\lambda_A = \lambda_B = \lambda_C$

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### Question 2

The electric field for an electromagnetic wave at one instant is illustrated.



Which of the following best represents the wavenumber?

1. 
$$k = 30$$
  
2.  $k = 40$   
3.  $k = \frac{2\pi}{20}$   
4.  $k = \frac{2\pi}{30}$   
5.  $k = \frac{2\pi}{40}$ 

#### **Sinusoidal Waves: Wavenumber**

Waves described by various sinusoidal functions.



#### **Sinusoidal Waves: Phase**

Waves described by various sinusoidal functions.



### Question 3

A wave at one instant is illustrated. The equation for this wave has form

 $y = A \sin\left(\frac{2\pi}{40}x + \phi\right).$ 

y



Which of the following best represents the phase?

1. 
$$\phi = 0$$
  
2.  $\phi = \frac{\pi}{4}$   
3.  $\phi = \frac{\pi}{2}$   
4.  $\phi = \pi$   
5.  $\phi = \frac{3\pi}{2}$