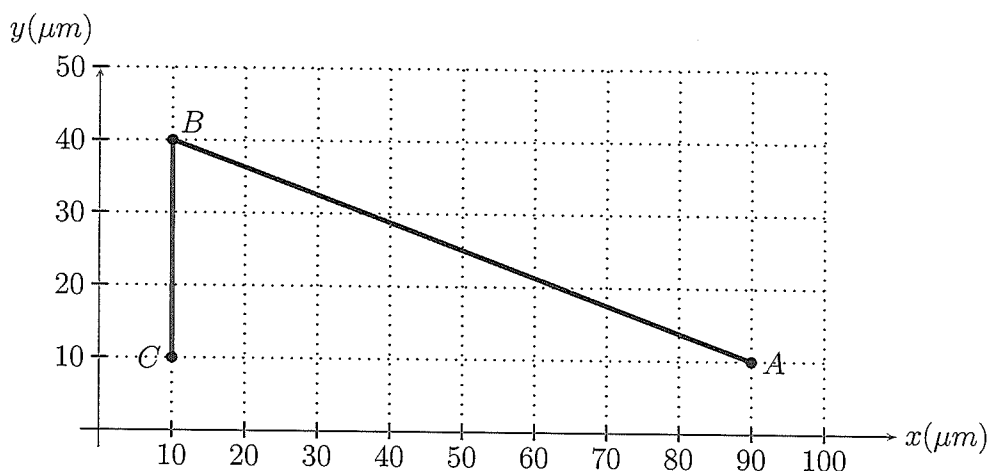


PHYSICS 151 TEST 3

Name: _____

Shown below is the trajectory of a bacterium as it moves from point A to point B to point C with a constant speed of $10 \mu\text{m/s}$.

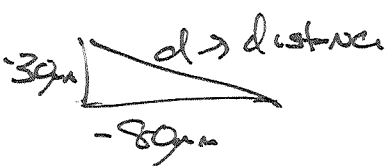


(a.) How long does it take the bacterium to travel from point A to point B? (3pts)

Use $\text{speed} = \frac{\text{distance}}{\Delta t}$

From A to B: $\Delta x = 10 \mu\text{m} - 90 \mu\text{m} = -80 \mu\text{m}$

$\Delta y = 40 \mu\text{m} - 10 \mu\text{m} = +30 \mu\text{m}$



$$d = \sqrt{(-80 \mu\text{m})^2 + (+30 \mu\text{m})^2} = \sqrt{6400 \mu\text{m}^2 + 900 \mu\text{m}^2} = \sqrt{7300 \mu\text{m}^2}$$

$$\Rightarrow d = 85.44 \mu\text{m} \quad \therefore 10 \mu\text{m/s} = \frac{85.44 \mu\text{m}}{\Delta t} \Rightarrow \Delta t = \frac{85.44 \mu\text{m}}{10 \mu\text{m/s}} = 8.544 \text{ s} = \underline{\underline{8.5 \text{ s}}}$$

(b.) How long does it take the bacterium to travel from point B to point C? (2pts)

Here $\Delta x = 0$, $\Delta y = 10 \mu\text{m} - 40 \mu\text{m} = -30 \mu\text{m} \Rightarrow d = +30 \mu\text{m}$

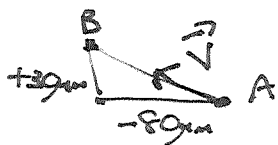
$$\therefore 10 \mu\text{m/s} = \frac{30 \mu\text{m}}{\Delta t} \Rightarrow \Delta t = \frac{30 \mu\text{m}}{10 \mu\text{m/s}} = 3 \text{ s}$$

- (c.) What are the x - and y -components of the bacterium's velocity vector as it moves from point A to point B? (3pts)

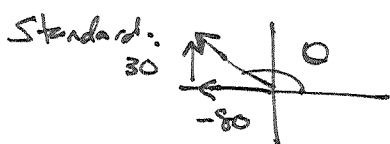
The Easiest way to do this is to use $V_x = \frac{\Delta x}{\Delta t}$ and $V_y = \frac{\Delta y}{\Delta t}$

$$\Rightarrow V_x = \frac{-80 \mu\text{m}}{8.54 \text{ s}} = -9.36 \mu\text{m/s}, \quad V_y = \frac{+30 \mu\text{m}}{8.54 \text{ s}} = 3.51 \mu\text{m/s}$$

But you can also find the Angle from A to B since \vec{V} is in the same direction.



Non-standard: $\theta = \tan^{-1}\left(\frac{30}{80}\right) = 20.556^\circ$



2nd Quadrant \Rightarrow

$$\theta = \tan^{-1}\left(\frac{30}{80}\right) + 180^\circ$$

$$= -20.6^\circ + 180^\circ = 159.4^\circ$$

$$V_x = V \cos \theta = 10 \mu\text{m/s} \cos 159.4^\circ = -9.36 \mu\text{m/s}$$

$$V_y = V \sin \theta = 10 \mu\text{m/s} \sin 159.4^\circ = 3.51 \mu\text{m/s}$$

- (d.) What are the x - and y -components of the bacterium's velocity vector as it moves from point B to point C? (2pts)

Using $\theta = 20.556^\circ \Rightarrow$ have to put negative in by hand.

~~From B to C~~ From B to C \vec{V} is downward



A DOWNWARD Vector has NO x -Component AND A negative y -component

$$\Rightarrow V_x = 0, \quad V_y = -10 \mu\text{m/s}$$