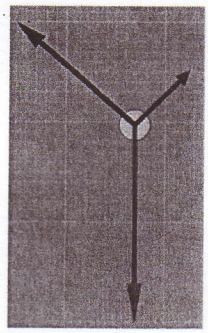
Physics 2A
Fall 2024

ave. = 7.6
σ = 1.9

Name Answer Key

Quiz #1: Representing Motion

Problem 1 (2 points)
The sum of the following three vectors will be a vector pointing in which quadrant?



C

a) I
b) II
c) III
d) IV

Problem 2 (2 points)
What are each of the following lengths in meters? Express your answers in scientific notation.

a) 10^{12} μm

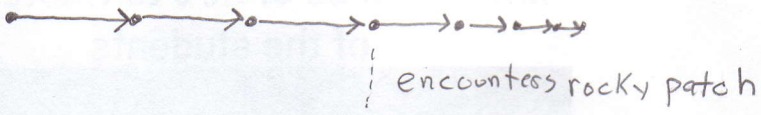
$10^{12}\,\mu m = 10^{12}\,\mu m \left(\frac{10^{-6}\,m}{1\,\mu m}\right) = \boxed{10^{6}\,m}$

b) 10^{7} nanometers

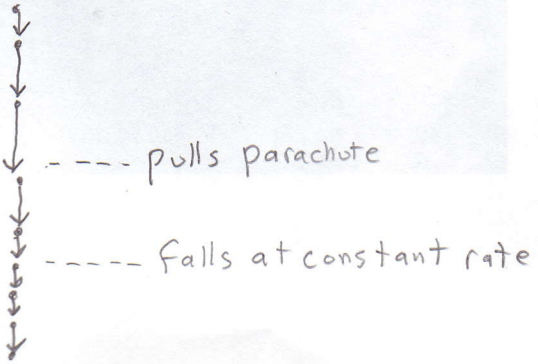
$10^{7}\,nm = 10^{7}\,nm \left(\frac{10^{-9}\,m}{1\,nm}\right) = \boxed{10^{-2}\,m}$

Problem 3 (2 points)
Draw a motion diagram, using the particle model, showing the velocity vectors for the following two situations:

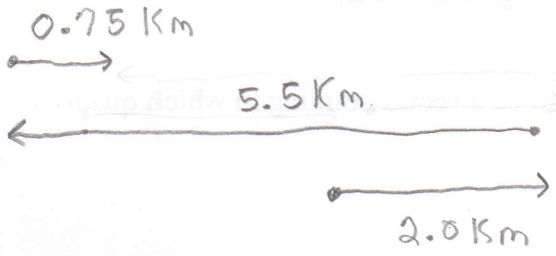
a) A child is sledding on a smooth, level patch of snow. She encounters a rocky patch and slows to a stop.



b) A skydiver jumps out of an airplane. Her speed steadily increases, until she employs her parachute, at which point her speed quickly decreases. She subsequently falls to earth at a constant rate, stopping when she lands on the ground.



Problem 4 (4 points)
Foraging bees often move in straight lines away from and towards their hives. Suppose a bee starts at its hive and flies 2.0 km due east, then 5.5 km due west, then 0.75 km east. If the entire trip takes 1.25 hours, what is the bee's average **(a)** speed and **(b)** velocity **in m/s** for the entire trip?



bee ends up 2.75 Km west of starting point ($x_f = -2.75$ Km)

total distance = 8.25 Km = 8.25×10^3 m

displacement $\Delta x = x_f - x_i$ = -2.75 Km $- 0$ Km

= -2.75 Km = -2.75×10^3 m

total time = 1.25 hrs $\left(\frac{3600\text{s}}{1\text{hr}}\right)$ = 4500 s

average speed = $\frac{\text{distance traveled}}{\text{time interval}} = \frac{8.25 \times 10^3 \text{m}}{4500\text{s}} =$ **1.8 m/s**

$v_{ave} = \frac{\Delta x}{\Delta t} = \frac{-2.75 \times 10^3 \text{m}}{4500\text{s}} \longrightarrow$ **$v_{ave} = -0.61$ m/s**