Physics 11
Chapter 3 Quiz Solutions

1.	a. ☐	b. ☒	c. ☐	d. ☒
2.	a. ☐	b. ☐	c. ☒	d. ☐
3.	a. ☒	b. ☐	c. ☐	d. ☐
4.	a. ☐	b. ☐	c. ☐	d. ☒
5.	a. ☒	b. ☐	c. ☐	d. ☐
6.	a. ☐	b. ☐	c. ☒	d. ☐
7.	a. ☒	b. ☐	c. ☐	d. ☐
8.	a. ☐	b. ☒	c. ☐	d. ☐
9.	a. ☐	b. ☒	c. ☐	d. ☐
10.	a. ☐	b. ☐	c. ☒	d. ☐
11.	a. ☒	b. ☐	c. ☐	d. ☐
12.	a. ☐	b. ☐	c. ☐	d. ☒
13.	a. ☐	b. ☐	c. ☐	d. ☒
14.	a. ☐	b. ☐	c. ☐	d. ☒
15.	a. ☐	b. ☒	c. ☐	d. ☐

1. **Problem**
Which of the following are scalars? *Select all that apply.*

   a. velocity
   b. distance
   c. acceleration
   d. time

   Solution
   A scalar quantity is fully described by magnitude only. A vector quantity is fully described by both magnitude and direction. Distance, speed, and time are scalars. Acceleration, displacement, and velocity are vectors.

   a. vector
   b. scalar
   c. vector
   d. scalar

2. **Problem**
A vector quantity is fully described by

   a. magnitude alone
   b. direction alone
   c. both magnitude and direction
   d. none of these

   Solution
   A vector quantity is fully described by both magnitude and direction.

3. **Problem**
A car travels at $50\,\mathrm{km/h}$ for $30\,\mathrm{minutes}$ and $80\,\mathrm{km/h}$ for $1\,\mathrm{hour}$ and $15\,\mathrm{minutes}$. How far does it travel in this time?

   a. $125\,\mathrm{km}$
   b. $130\,\mathrm{km}$
   c. $117\,\mathrm{km}$
   d. $113.75\,\mathrm{km}$

   Solution
   Use the formula for constant velocity motion for each part and add the two distances together.

$$d = v_1 t_1 + v_2 t_2 = (50\,\mathrm{km/h})(0.5\,\mathrm{h}) + (80\,\mathrm{km/h})(1.25\,\mathrm{h}) = 125\,\mathrm{km}$$

4. **Problem**
Suppose an object travels at a constant velocity of $30.0\,\mathrm{km/h}$. What distance would it travel in $89.0\,\mathrm{minutes}$?

   a. $39.3\,\mathrm{km}$
   b. $1640\,\mathrm{km}$
   c. $2270\,\mathrm{km}$
   d. $44.5\,\mathrm{km}$

   Solution
   Use the formula for constant velocity motion making sure to convert to the proper units.

$$d = vt = (30.0\,\mathrm{km/h})(89.0\,\mathrm{min})\left(\frac{1\,\mathrm{h}}{60\,\mathrm{min}}\right) = 44.5\,\mathrm{km}$$

5. **Problem**
Suppose an object travels at a constant velocity of $13.4\,\mathrm{m/s}$. What distance would it travel in $48\,\mathrm{s}$?

   a. $643\,\mathrm{m}$
   b. $531\,\mathrm{m}$
   c. $0.28\,\mathrm{m}$
   d. $465\,\mathrm{m}$

   Solution
   Use the formula for constant velocity motion.

$$d = vt = (13.4\,\mathrm{m/s})(48\,\mathrm{s}) = 643\,\mathrm{m}$$

6. **Problem**
How many seconds would it take the Sun's light to reach Earth? The speed of light in vacuum is $3.00 \times 10^8\,\mathrm{m/s}$. The Sun is $1.5 \times 10^{11}\,\mathrm{m}$ from the Earth.

   a. $0\,\mathrm{s}$
   b. $2.0 \times 10^{-3}\,\mathrm{s}$
   c. $5.0 \times 10^{2}\,\mathrm{s}$
   d. $4.5 \times 10^{19}\,\mathrm{s}$

   Solution
   Use the formula for constant velocity motion.

$$t = \frac{d}{v} = \frac{1.5 \times 10^{11}\,\mathrm{m}}{3 \times 10^{8}\,\mathrm{m/s}} = 5.0 \times 10^{2}\,\mathrm{s}$$

7. **Problem**
A light-year (ly) is the distance that light travels in vacuum in one year.
The speed of light is $3.00 \times 10^8\,\mathrm{m/s}$. How many miles are there in a light-year?

($1\,\text{mile} = 1.609 \times 10^3\,\text{m}$, $1\,\text{year} = 365\,\text{days}$)

a. $5.88 \times 10^{12}\,\text{mi}$
b. $9.46 \times 10^{12}\,\text{mi}$
c. $5.88 \times 10^{15}\,\text{mi}$
d. $9.46 \times 10^{15}\,\text{mi}$

Solution
Use the formula for constant velocity motion and convert to the desired units.

$$(1\,\text{yr})\left(\frac{365\,\text{days}}{1\,\text{yr}}\right)\left(\frac{24\,\text{h}}{1\,\text{day}}\right)\left(\frac{60\,\text{min}}{1\,\text{h}}\right)\left(\frac{60\,\text{s}}{1\,\text{min}}\right) = 3.1536 \times 10^7\,\text{s}$$

$$d = vt = (3.00 \times 10^8\,\text{m/s})(3.1536 \times 10^7\,\text{s}) = 9.4608 \times 10^{15}\,\text{m}$$

$$(9.4608 \times 10^{15}\,\text{m})\left(\frac{1\,\text{mi}}{1.609 \times 10^3\,\text{m}}\right) = 5.88 \times 10^{12}\,\text{mi}$$

8. **Problem**
A runner completes a marathon ($42.195\,\text{km}$) with an average pace of $3\,\text{minutes}$ and $54\,\text{seconds}$ per kilometre. What is the runner's time for the marathon? (Answers are formatted as $\text{hours} : \text{minutes} : \text{seconds}$)

a. $01 : 54 : 37$
b. $02 : 44 : 34$
c. $01 : 36 : 24$
d. $02 : 29 : 42$

Solution
First, calculate the speed in kilometres per second.

$$v = \frac{1\,\text{km}}{180\,\text{s} + 54\,\text{s}} = 0.004\,273\,5\,\text{km/s}$$

Then, calculate the time using the formula for constant velocity motion.

$$t = \frac{d}{v} = \frac{42.195\,\text{km}}{0.004\,273\,5\,\text{km/s}} = 9874\,\text{s}$$

Finally, convert the number of seconds into hours, minutes, and seconds. ($60\,\text{s} = 1\,\text{minute}$ and $60\,\text{minutes} = 1\,\text{hour}$)

$$9874\,\text{s} = 2\,\text{hours}, 44\,\text{minutes}, 34\,\text{seconds}$$

9. **Problem**
Suppose an object travels at a constant velocity of $8.2\,\text{m/s}$. How much time would it take for the object to travel a distance of $20\,\text{m}$?

a. $0.41\,\text{s}$
b. $2.44\,\text{s}$
c. $164\,\text{s}$
d. $108\,\text{s}$

Solution
Use the formula for constant velocity motion.

$$t = \frac{d}{v} = \frac{20\,\text{m}}{8.2\,\text{m/s}} = 2.44\,\text{s}$$

10. **Problem**
A car travels $36\,\text{km}$ at $11\,\text{km/h}$ and $288\,\text{km}$ at $112\,\text{km/h}$. What is the average speed for this trip?

    a. $80\,\text{km/h}$
    b. $13\,\text{km/h}$
    c. $55\,\text{km/h}$
    d. $106\,\text{km/h}$

    Solution
    The average speed is the total distance divided by the total time.

$$v_{avg} = \frac{d_{total}}{t_{total}} = \frac{d_1 + d_2}{d_1/v_1 + d_2/v_2} = \frac{36\,\text{km} + 288\,\text{km}}{\frac{36\,\text{km}}{11\,\text{km/h}} + \frac{288\,\text{km}}{112\,\text{km/h}}} = 55\,\text{km/h}$$

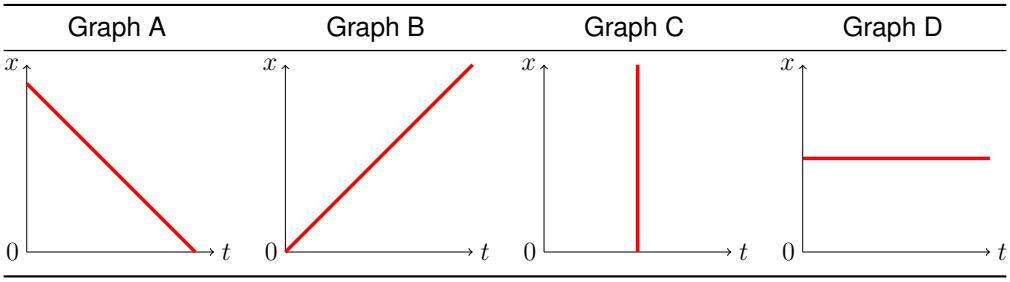
11. **Problem**
A truck travels at $46\,\text{km/h}$ for $3\,\text{hours}$ and at $106\,\text{km/h}$ for $8\,\text{hours}$. What is the average speed for the trip?

    a. $89.6\,\text{km/h}$
    b. $69.2\,\text{km/h}$
    c. $79.5\,\text{km/h}$
    d. $76\,\text{km/h}$

    Solution
    The average speed is the total distance divided by the total time.

$$v_{avg} = \frac{d_{total}}{t_{total}} = \frac{v_1 t_1 + v_2 t_2}{t_1 + t_2} = \frac{(46\,\text{km/h})(3\,\text{h}) + (106\,\text{km/h})(8\,\text{h})}{3\,\text{h} + 8\,\text{h}} = 89.6\,\text{km/h}$$

12. **Problem**
Which position-time graph represents an object at rest?



a. Graph A
b. Graph B
c. Graph C
d. Graph D

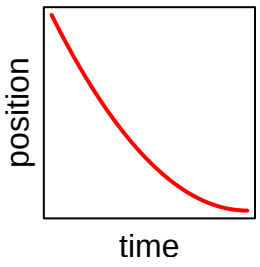
Solution
An object at rest has zero velocity so the slope of its position-time graph must have a slope of zero (horizontal line).

13. **Problem**
What is the magnitude of the slope of a position-time graph?

a. displacement
b. distance
c. acceleration
d. speed

Solution
The magnitude of the slope of a position-time graph is the speed of the object.

14. **Problem**
Which choice best matches the given position-time graph?

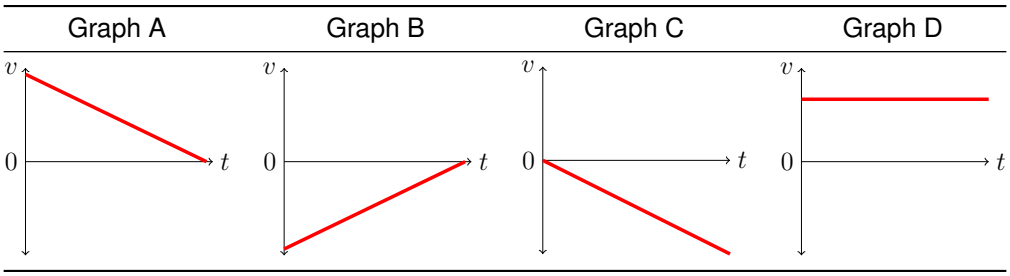


a. moving to the right and speeding up.
b. moving to the right and slowing down.
c. moving to the left and speeding up.
d. moving to the left and slowing down.

Solution
The object is moving to the right if its position is increasing and moving to the left if its position is decreasing. The object is speeding up if the tangent line is becoming more vertical and slowing down if the tangent line is becoming more horizontal.

This graph describes an object that is moving to the left and slowing down.

15. **Problem**
Which velocity-time graph represents motion with constant positive acceleration?



a. Graph A
b. Graph B
c. Graph C
d. Graph D

Solution
Acceleration is the slope of the velocity-time graph. Therefore, the correct answer is the graph with the positive slope. Note that for positive acceleration it does not matter if the velocity is always negative as long as the slope is positive.