MINISTRY OF EDUCATION

SECONDARY ENGAGEMENT PROGRAMME

GRADE 10

PHYSICS

Week 10 **Worksheet**

Topic & Sub-topic: Dynamics: motion in a straight line/Distance time graph/ velocity time graph & Speed, velocity and acceleration

Answer all questions.

1. A roller coaster car rapidly picks up speed as it rolls down a slope. As it starts down the slope, its speed is 4 m/s. But 3 seconds later, at the bottom of the slope, its speed is 22 m/s. What is its average acceleration?

2. A cyclist accelerates from 0 m/s to 8 m/s in 3 seconds. What is his acceleration? Is this acceleration higher than that of a car which accelerates from 0 to 30 m/s in 8 seconds?

3. A car advertisement states that a certain car can accelerate from rest to 70 km/h in 7 seconds. Find the car's average acceleration.

4. A lizard accelerates from 2 m/s to 10 m/s in 4 seconds. What is the lizard's average acceleration?

5. If a Ferrari, with an initial velocity of 10 m/s, accelerates at a rate of 50 m/s2 for 3 seconds, what will its final velocity be?

6. A girl cycles for 3hrs at a speed of 40 km/h. What distance did she travel?

7. A train travels at a speed of 30mph and travel a distance of 240 miles. How long did it take the train to complete its journey?

8. A car travels a distance of 540km in 6 hours. What speed did it travel at?

9. John is a runner. He runs the 100m sprint in 10x6s. What speed did he travel at? (in m/s)

10. A cyclist travels 20km in 4hrs. What speed did the cyclist cycle at?

11. The distance between two cities is 144km, it takes me 3hours to travel between these cities. What speed did I travel at?

12. A coach travels from the station to the beach, a distance of 576km away in 6hrs. The coach is only allowed to travel at a maximum speed of 90km/h. Did the coach break the speed limit?

13. At the equator, the earth spins a distance of 25,992miles every day. What speed does the Earth spin at in mph?

14. Lauren walks 100m in half a minute. What must her speed have been to travel this distance?

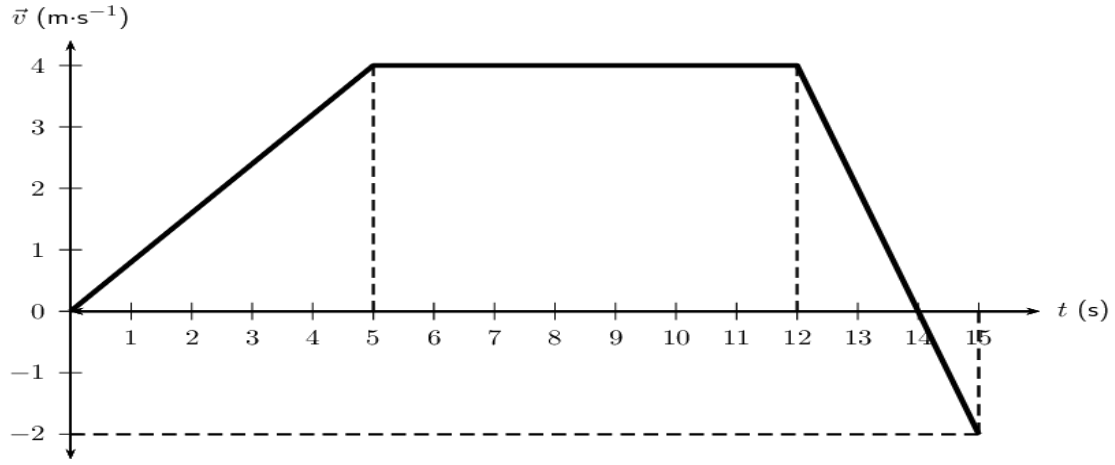
15. A mouse runs a distance of 2metres in 15 seconds. What is its speed?

16. Jim travelled at a speed of 18km/h for 2 hours. What was the distance covered?

17. Marc was told his dinner would be ready at 18:00. He left his house at 12:00 and travelled in his car at an average speed of 45mph to his mum's house 300 miles away. Did Marc make it home in time for dinner?

18. A whale swims at a constant speed of 8m/s for 17s. What distance did it travel?

19. The velocity vs. time graph of a truck is plotted below. Calculate the distance and displacement of the truck after 1515 seconds.



All we need to remember here is that we can use the area between the velocity vs. time graph and the time axis to determine the distance and displacement.

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1. 6 m/s^2

2. 3 m/ s^2 (2.67 m/ s^2without sig figs); less than

3. 10 km/h per second

4. 2 m/s^2

5. 200 m/s (160 m/s without sig fig)

6. 120km

7. 8 hours

8. 90km/h

9. 9.4m/s

10. 5km/h

11. 48km/h

12. Yes, it travelled at 96km/h

13. 1083mph

14. 3.33m/s

15. 0.13m/s

16. 36km

17. No, he arrived at 18:40

18. 136m

19. **Determine the area under the velocity vs. time graph**

Break the motion up: 00 – 5 seconds, 5– 12seconds, 12 – 14seconds and 14– 15seconds.

For 00 – 5 seconds: The displacement is equal to the area of the triangle on the left:

Area△=12b×h

=12×5 s×4 m·s−1

=10 m

For 5– 12 seconds: The displacement is equal to the area of the rectangle:

Area□=l×b

=7 s×4 m·s−1

=28 m

For 12 – 14 seconds: The displacement is equal to the area of the triangle above the time axis on the right:

$\text{Area}\triangle = \frac{1}{2}b \times h$

$= \frac{1}{2} \times 2\ \text{s} \times 4\ \text{m·s}^{-1}$

$= 4\ \text{m}$

For 14 – 15 seconds: The displacement is equal to the area of the triangle below the time axis:

$\text{Area}\triangle = \frac{1}{2}b \times h$

$= \frac{1}{2} \times 1\ \text{s} \times 2\ \text{m·s}^{-1}$

$= 1\ \text{m}$

The total distance of the car is the sum of all the areas:

$D = 10\ \text{m} + 28\ \text{m} + 4\ \text{m} + 1\ \text{m}$

$= 43\ \text{m}$

(because it is a displacement in the opposite direction).

$\Delta \rightarrow x = 10\ \text{m} + 28\ \text{m} + 4\ \text{m} - 1\ \text{m} = 41\ \text{m}$ in the positive direction.