YEAR 09

Physics Homework

Revision of Forces and Speed

1. A racing car is traveling around a circuit that is 6.3 km long.

a) Over one lap of the track the average speed of the car was 52.5 m/s. Calculate how long it took the car to complete the lap **in minutes**.

…… minutes

b) The horizontal forces that act on the racing car as it moves are the driving force and the drag.

Compare the sizes of the driving force and the drag when:

i. The car is decelerating.
The driving force is ……..
……...

ii. The car is accelerating.
The driving force is ……..
……...

iii. The car is moving at a steady speed.
The driving force is ……..
……...

2. Mercury is the closest planet to the Sun.

a. i. Mercury is about 0.000006 light years from the Sun.

What is a light year?

……

……

ii. How many seconds does it take light from the Sun to reach Mercury? Give your answer to the nearest second.

…… s

(Hint: the speed of light is equal to 300,000 km/s)

b. An astronaut has a mass of 80 kg.
The gravitational field strength 'g' on Mercury is 3.7 N/kg.
Calculate the weight of the astronaut if he was standing on Mercury.

…… N

Solutions

1. a)

speed = $\frac{distance}{time}$ so time = $\frac{distance}{speed}$ = $\frac{6.3\ x\ 1000\ m}{52.5\ m/s}$ = **120 s**.

this means in minutes: $\frac{120}{60}$ = **2 minutes**.

b) i. The driving force is **smaller than the drag**.

ii. The driving force is **greater than the drag**.

iii. The driving force is **equal to the drag**.

2. i. Light year is the **distance** needed **for the light to cover if it was traveling for 1 year**.

ii. If light covers 300,000 km in one second, we can estimate

the distance for one light year:

300,000 km x 60 x60 x24 x 365 = **9.46 x 10^{12} km**!!!!

The distance of Mercury from the Sun is 0.000006 light years.

Hence the distance will be:

$0.000006 \times 9.46 \times 10^{12}$ km = **56,764,800 km**.

b) The weight of the astronaut on Mercury will be:

W = 80 kg x 3.7 N/kg = **296 kg**.