**2018**



Dynamics and Space Homework

## Speed and Acceleration

1. What is meant by the term ‘Average Speed’?

2. Write down the equation for average speed and all the units involved.

3. Describe an experiment to measure the average speed of a person jogging over a distance of 15m.This should include the apparatus required and the measurements taken.

4. What is meant by ‘Human Reaction Time’ and how will this affect the calculation of average speed in Q3?

5. What is meant by the term ‘Instantaneous Speed’?

6. How do average speed and instantaneous speed differ?

7. Describe an experiment to measure the instantaneous speed of a Formula One car when it passes the finishing line in a race. This should include the apparatus required and the measurements taken.

8. Calculate the average speed of a train if it travels 300km in 4 hours.

9. What is meant by the term ‘Acceleration’?

10. State the equation for acceleration with all the units involved.

11. Calculate the acceleration of a car if it accelerates from 8m/s to 14m/s in

12 seconds.

12 What is meant by the term ‘deceleration’ and how is the acceleration equation used to show this?

13 From the speed-time graph above calculate:



a) Acceleration over the first five seconds.

b) Total distance travelled by the object over the 8 seconds.

c) Average speed of the object over the 8 seconds.

14. A lorry accelerates from rest with an acceleration of 0.25m/s² for

6 seconds. What will its speed be after 6 seconds?

15. A van travelling at a constant speed begins to accelerate at 1.25m/s2 for

8 seconds and reaches a speed of 18m/s. Calculate the original speed of the van.

## Relationship between Forces, Motion and Energy

1. What instrument is used to measure Force and how does it work?

2. What is meant by the term ‘Mass’ and what unit is it measured in?

3. What is meant by the term ‘Weight’ and what unit is it measured in?

4. What is meant by the term ‘Gravitational Field Strength’ and which units is it

measured in?

5. State the equation involving Mass and Weight including all the units involved.

6. Calculate the weight of a 76kg person.

## Satellites

1. How is the height of a satellite related to its period (the time taken by the satellite to go round the Earth once)?

2. Name 3 different things satellites are used for. In each case give the approximate height and orbital period of the satellite.

a.

b.

c.

3. Describe how satellites have impacted on our daily life. (for the better and for the worse)

4.

Amazon

Glasgow

Geostationary Satellite

72,000 000 m

72,000 000 m

a)A Scientist in the Amazon uses a satellite phone to talk to her colleague in Glasgow.

After the Scientist asks a question there is a small time delay before her colleague hears the question.. What is causing this time delay?

b)The phone signal is sent using microwaves which travel at the speed of light

300 000 000 m/s. Use d = v x t to find out how long it takes the signal to travel from the Amazon to Glasgow.

5. What is geostationary satellite?

6. What does a geostationary satellite do to a signal when it is being used in communications?

7. Complete this drawing of light rays entering a curved reflector dish.

8. Calculate the mass of a Physics teacher of weight 910N.

9. What is meant by the term ‘Friction’?

10. State two cases where forces of friction are useful.

11. State two cases where forces of friction need to be reduced.

12. . What is meant by the term ‘Thinking Distance’?

13. What is meant by the term 'Braking Distance'?

14. State the equation for Thinking Distance.

15. What is meant by the term 'Balanced Forces'?

16. If an object accelerates or decelerates, what must be exerted on it?

17. An aeroplane is flying at constant altitude with a constant speed. Name the two pairs of forces acting and state their directions.

18. Explain how the seat belts in a car work

19. If a car is involved in a collision, what **three** changes affect the car with the forces being exerted on it during the collision?

20. State **Newton's first law** of motion.

21. State **Newton's second law** of motion.

22. State the equation involving Unbalanced Force and mass and list all the units involved.

23. A force of 9N is exerted on an object of mass 2.25kg. Calculate the acceleration of the mass.

24. A driver forgets to release the handbrake while driving. The engine exerts a force of 2300N on the cars mass of 1100kg. If the car's handbrake exerts a force of 250N then calculate the car's acceleration.

## Cosmology

1. Write down the definitions of these words.

* Planet
* Moon
* Star
* Solar system
* Exo-planet
* Galaxy
* Universe

2. What is meant by a “light-year” and why do scientists use them as a unit?

3. After the Sun, Proxima Centauroi is our nearest star. It is 4.3 light years away. Use d = v x t to find out how far away it is in metres. Hint the speed of light is 300 000 000 m/s. 1 year = 365.25 days x 24 hours x 60 min x 60 s

4. What are exo-planets?

5. What is the Habitable Zone?

6. What are the 5 conditions needed for life to survive on a planet?

a.

b.

c.

d.

e.