N4 Dynamics and Space

Homework One

1. Copy and complete the following sentences about speed measurements.

- Using a stopwatch to measure time and a t_____ w_____ to measure distance it would be possible to measure the _____ speed of a vehicle.
- Using a l_____ g_____ connected to an electronic timer may be necessary when finding the _____ speed of a vehicle.

(4)

2. Calculate the average speed of a car which travels 240 m in 15 seconds.

(3)

3. A train travels from Glasgow to Edinburgh, a distance of 34 km. If the journey takes 30 minutes, calculate the average speed of the train in kilometres per hour.

(3)

Homework Two

1. Draw speed-time graphs to show the following types of motion: -

a) An object slowing down and coming to rest.

b) An object travelling with a constant speed.

c) An object speeding up from rest.

(3)

2. Draw the speed-time graph described by these statements: -

The object starts from rest and accelerates for 5 seconds reaching a final speed of 12 ms^{-1}. The object then continues at 12 ms^{-1} for another 8 seconds.

(4)

3. Calculate the total distance travelled by the object in question 2?

(3)

Homework Three

1. Which quantity in Physics is defined as “the change in speed per unit time”?

(1)

2. A cyclist accelerates down a hill for 4 seconds.

The change in speed of the cyclist is 10 ms^{-1}. Calculate the acceleration of the cyclist.

(3)

3. A sports car changes speed from 13 ms^{-1} to 27 ms^{-1} in 3.5 seconds. Calculate the acceleration of the sports car.

(3)

4. A train starts from rest and reaches a speed of 15 ms^{-1} in 20 seconds. Calculate the acceleration of the train.

(3)

Homework Four

1. State the three factors that a force can change about an object.

(1)

2. Name the force that is caused by the contact between two surfaces.

(1)

3. State an example where high friction is used to slow down a moving object.

(1)

4. State an example where low friction is used to make an object move faster.

(1)

5. State the unit in which force measured.

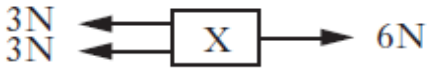
(1)

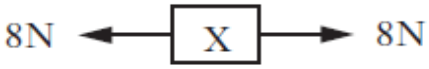
6. Copy and complete this statement about Newton’s First Law of Motion.

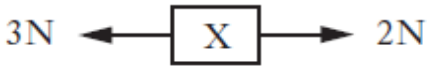
“A stationary object will remain at rest or a moving object will remain with a constant _____ when _____ forces act on the object.”

(1)

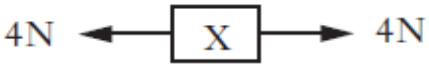
7. For each diagram state if the forces are balanced or unbalanced.

a) 

b) 

c) 

d) (4)



Homework Five

1. A student carries out an experiment to investigate the relationship between force, mass and acceleration of a trolley.

The results of the experiment are shown in the table.

Mass (kg)	Acceleration (ms^{-2})
0.2	15
0.4	7.5
0.6	
0.8	3.75
1.0	3

a) State a possible value for the acceleration when the mass is 0.6 kg.

(1)

b) Calculate the force used in the experiment by using the data in the first row of the table.

(3)

2. By using a force of 4800 N, a car can accelerate at 3 ms^{-2}. Calculate the mass of the car.

(3)

3. Calculate the acceleration of a 15 kg object when a 60 N force acts on it.

(3)

Homework Six

1. Pick the correct words from the brackets to complete these sentences.

"Weight is a force which is measured in (kilograms/Newtons). Mass is a measure of how much matter there is in an object and is measured in (kilograms/Newtons)."

(2)

2. What is the value for gravitational field strength on planet Earth?

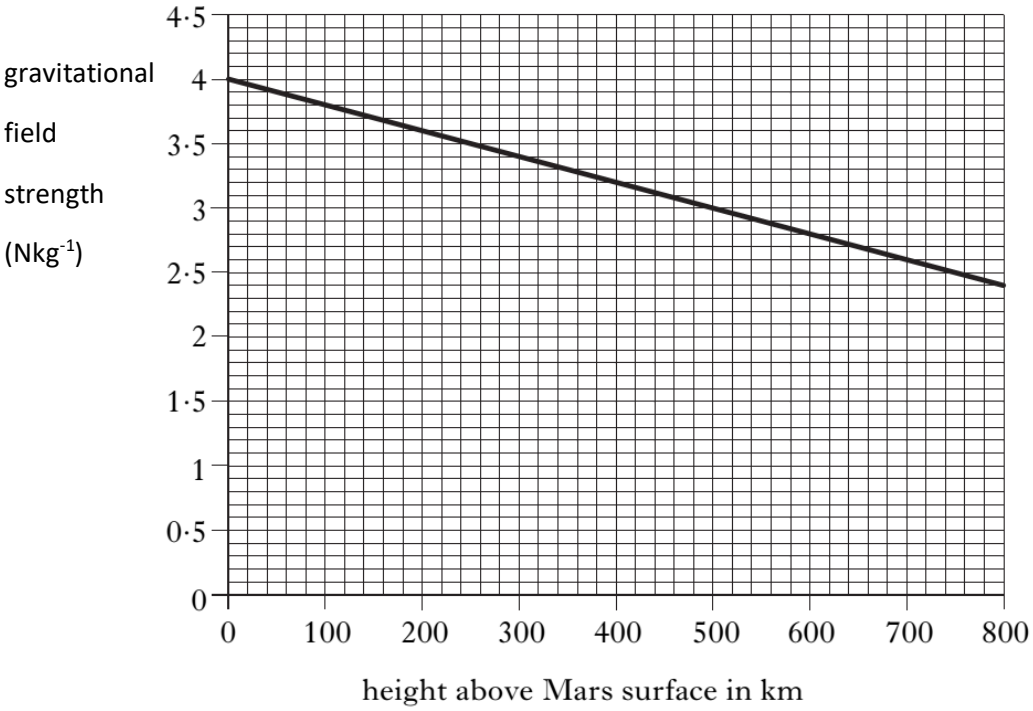
(1)

3. On planet X, the weight of an 8 kg mass was measured, using a Newton balance, and found to be 96 N. What is the gravitational field strength on planet X?

(3)

4. A space vehicle called Mars Lander was sent to the planet Mars.

The graph shows the gravitational field strength at different heights above the surface of Mars.



a) Before landing, the Mars Lander orbited at a height of 200 km above the surface of Mars. State the gravitational field strength at this height.

(1)

(b) The Mars Lander had a mass of 530 kg. Calculate the weight of the Mars Lander on the surface of Mars.

(3)

Homework Seven

1. Name the terms A, B, C, D and E that are missing from the following table.

Term	Definition
A	A large object moving in an orbit round a star
B	A collection of galaxies.
C	A collection of stars, e.g. Milky Way
D	A luminous object powered by nuclear fusion, e.g. The Sun
E	A planet that is outside our Solar System.

(5)

2. A nebula, recently discovered by space scientists, is approximately 30000 light years from Earth.

Explain why space scientists use light years to measure distances in space.

(1)

3. The table below gives information about some of the planets in our Solar System.

Planet	*Diameter* (kilometres)	*Distance from Sun* (million kilometres)	*Weight of one kilogram at surface* (newtons)	*Time to go around the Sun once* (years)	*Time for one complete spin* (in Earth days or hours)
Mercury	4800	58	4	0·25	59 days
Venus	12 000	110	9	0·6	243 days
Earth	12 750	150	10	1	24 hours
Mars	7000	228	4	1·9	25 hours
Jupiter	140 000	780	26	12	10 hours
Saturn	120 000	1430	11	30	10 hours
Neptune	50 000	4500	12	165	16 hours

a) State the name of the planet from our Solar System that has not been included in the list.

(1)

b) State the name of the planet which has the longest day.

(1)

c) State the name of the planet that has the longest orbit.

(1)

d) On which planet would a 4 kg mass have the greatest weight?

(1)

Homework Eight

1. Copy and complete the following statements about satellites:

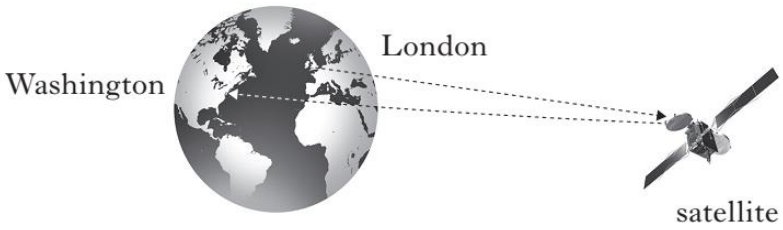
a) The moon is an example of (an artificial/a natural) satellite.

b) The period of a geostationary satellite is (12/24) hours.

c) The altitude of a geostationary satellite is (36000/400000) km.

(3)

2. A television signal is to be transmitted from London to Washington.



The television signal is to be transmitted using microwaves.

a) State the speed of microwaves.

(1)

b) The television signal takes 0.068 s to travel from London to the satellite. Calculate the height of the satellite.

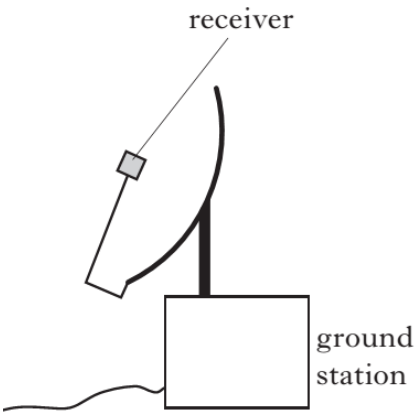
(3)

In Washington a ground station uses a curved reflector to receive the signals from the satellite.

c) Explain why the curved reflector should be as large as possible.

(1)

d) Copy and complete the diagram below to show the effect of this curved reflector on the received signal.



(2)