**N5 Physics Dynamics and Space**

**“Making Accurate Statements”**

**Vectors and Scalars**

1. State the difference between a vector and a scalar quantity

*Vector magnitude and direction scalar magnitude only*

1. Make a table separating these physical quantities into vectors and scalars

***Force Mass Displacement Speed Velocity Distance (vector)***

1. What word is used to mean a single vector which acting alone produces the same effect as group of vectors

*resultant*

1. State the relationship between velocity displacement and time

*s=vt*

1. A student writes the relationship D=ST in a test about speed and velocity , what is wrong with this as a statement of physics?

*Capitalised formula changes meaning of terms*

1. What is meant by a velocity of 6m/s . What other piece of information is required to properly define a velocity

*The position / or displacement changes by 6m in one second.*

*Other information required is the direction of travel*

1. Which force could be the resultant of these two forces X or Y?

 X y

 *X*

1. The resultant of a group of vectors at right angles can be found using trigonometry and Pythagoras Theorem. What other strategy can be used to find a resultant vector.

*Scale drawing*

1. Two vectors of magnitude 4units are added.

What is the maximum magnitude of the resultant? *8units*

What is the minimum magnitude of the resultant? *0units*

1. Two forces are acting on an object force A of 4N and force B 0f -6N. what can you say about the directions of A and B

*They are acting in opposite directions*

**Velocity Time Graphs**

v

(m/s)

A B C D t(s)

0

5

10

15

20

25

0

10

20

30

40

50

60

70

**time s**

**speed m/s**

Series1

1. Which part of the vt graph shows an acceleration? -how do you know? *AB positive gradient*
2. Which part of the vt graph shows a deceleration?-how do you know? *CD negative gradient*
3. Which part of the graph shows balanced forces acting on the vehicle? How do you know? *BC constant speed*
4. Fully describe the motion of the object from A to B, B to C and C-D
5. Does the object travel furthest while accelerating, travelling at constant speed or decelerating?How do you know? *Constant speed area under graph is greatest*

**Acceleration**

1. What is meant by acceleration

*Acceleration is the change in speed or velocity in unit time*

1. State the relationship between acceleration, initial velocity, final velocity and time so that the final velocity is the subject of the equation.

*v = u+at*

1. What is meant by an acceleration of 9.8ms-2

*Speed or velocity changes by 9.8m/s every second*

1. What is significant or noteworthy about this value of acceleration?

*Acceleration due to gravity on earth ( in data sheet!)*

1. Using Newton’s second law give another unit which is equivalent to ms-2

*N/kg*

1. Describe an experiment to measure the acceleration of an object on a linear air track. Describe clearly what apparatus to be used, necessary measurements and any calculation that would be necessary.
2. Describe an experiment to measure the instantaneous speed of an object on a linear air track. Describe clearly what apparatus to be used, necessary measurements and any calculation that would be necessary.
3. Describe an experiment to measure the average of an object on a linear air track . Describe clearly what apparatus to be used, necessary measurements and any calculation that would be necessary.

*See notes*

**Newtons Laws**

1. State Newton’s second law.

*Fun=ma*

1. An unbalanced force of 10N produces an acceleration of 2ms-2 on an object. The unbalanced fore is now doubled , what happens to the size of the acceleration?

*Doubles*

1. What two behaviours ( types of motion) might be exhibited by an object which is subject to balanced forces.

*Remain at rest or constant speed in a straight line*

1. What is the name of the mechanical force which acts against the motion of an object producing heat energy.

*Friction*

1. What is meant by the terminal velocity of an object falling through the atmosphere? How is the terminal velocity achieved?

*Air resistance = Weight giving balance forces*

1. On the Moon a hammer and a feather dropped by an astronaut fall with exactly the same acceleration. Why does this not happen on earth?

*No air resistance on the moon*

1. Rocket propulsion is an application of Newton’s third law. State newton’s third law.

*For every action there is an equal and opposite reaction ( Fab =-Fba)*

1. At lift off the speed of a rocket is shown by the vt graph. What happens to the acceleration of the rocket. Explain this observation.



*Mass decreases as fuel is burnt and exhausted hence acceleration increases as a=F/m and F is constant*

1. Draw a diagram showing the forces acting on the Orion spacecraft at take off

 *Thrust*

  *Weight*

1. Draw a diagram showing the forces acting on the Orion spacecraft on re-entry

  *Friction*

 *Weight*

**Projectile Motion**

1. Define a projectile?

*An object moving subject only to the force of its own weight due to gravity*

1. Perpendicular vectors are independent of each other Why are horizontal and vertical directions chosen for the analysis of projectile motion?

*Gravity acts in the vertical direction*

1. What shape of path does a projectile follow . Explain this shape in terms of the vertical and horizontal motion of the projectile.

*Parabola – horizontal speed is constant and vertical acceleration is constant*

1. What is the vertical speed of a projectile at its highest point.

*0 m/s*

1. What would happen to a projectile if it was given an extremely high launch speed?

*Achieve orbit (like in Newton’s cannon thought experiment)*

**Space exploration**

1. Give an example of how spaceflight is used in everyday life.

*GPS satnav, Satellite TV, weather forecasting, google maps, etc*

1. Why does a spacecraft become very hot during re-entry to the earth’s atmosphere

*Frictional heating by the atmosphere due to very high re-entry velocity*

1. What is meant by a geostationary orbit

*Orbit above the equator of 24 hour period meaning the satellite stays above same point*

1. What does GPS stand for?

*Global positioning system*

1. Where did the NASA Apollo missions go to?

*The moon*

1. Why do astronauts experience weightlessness in orbit?

*Because they are in free fall and there is no reaction force from the ground*

1. What two characteristics of a planet controls the gravitational field strength at its surface?

*Planetary mass and radius*

1. What is meant by the specific latent heat of vaporisation of water?

*The amount of energy required to change the state of 1kg of water from liquid to gas without changing its temperature*

**Cosmology**

1. Arrange these structures in order of their size galaxy, galactic cluster, planetary system, universe

*Planetary system, galaxy, galactic cluster, universe*

1. How fast does light travel through space?

*300,000,000m/s*

1. Which is bigger one astronomical unit or one light year?

*Light year*

1. What is meant by an astronomical unit?

*The radius of the earth’s orbit around the sun*

1. Approximately how long would it take light to cross a spiral galaxy?

*50,000 -100,000 years*

1. What is meant by the red shift of the galaxies?

*The increase in wavelength of light from distant galaxies when observed on earth. This is an example of the Doppler effect.*

1. What name is given to the theory that the universe began with an explosive inflationary period 14 billion years ago? What evidence is there for this theory?

*Big bang – red shift, microwave background radiation, Olbers paradox,*

1. What change would you note if you observed light from distant galaxy through a spectrometer?

*Wavelength of observed light would be longer*

1. How do the line spectra observed through spectroscopes give evidence for the composition of distant stars?

*Each element has a distinct line spectrum ( like a barcode) which can be identified in the spectrum*

1. What is meant by the habitable zone around a star?

*Area where life might be possible on the surface of planets. Right temp for liquid water*

1. Which chemical is thought to be essential for the formation of life on other planets ? Explain why.

*Liquid water – very good solvent associated with all life on earth*

1. What does the Drake equation estimate?

*The number of possible intelligent civilisations present in the galaxy*