Name: _____ Class: _____

Additional Science Homework

P2 Physics for your future

Topic 3: Motion and forces

3.13 Use the equation linking Force, Mass and Acceleration

Equation: _____ Unit:_____

A lorry with a mass of 12000kg accelerates at a rate of 0.8m/s^2. Calculate the resultant force acting on the lorry.

m=_____
a=_____
F= ??

Equation: _____

Insert values:_____

Answer: F=_____ unit:_____

The same lorry now has a resultant force of 19 000 N acting on it. What is its acceleration?

Equation: _____

m=_____
F=_____
a= ??

Rearranging:

Insert values:_____

Answer: a=_____ unit:_____

3.14 Use the equation linking mass, weight and gravitational field strength.

Equation: _____ Unit:_____

A man has a mass of 70kg. How much weight does he push on the ground with?

m=_____
g=_____
w= ??

Equation: _____

Insert values:_____

Answer: w=_____ unit:_____

The same man puts on a backpack. His weight is now 1100N. What is the combined mass of the man and the backpack? Equation: _____

w=_____
g=_____
m= ??

Rearranging:

Insert values:_____

Answer: m=_____ unit:_____

3.15 Investigate the relationship between force, mass and acceleration

Describe how to set up an experiment using an air-track to investigate the relationship between force, mass and acceleration: _____

_____

_____

_____

_____

_____

Air-track experiment diagram

3.16 Recall that in a vacuum all falling bodies accelerate at the same rate

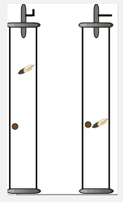
Describe the "penny and the feather" experiment and explain how it demonstrates that in a vacuum all falling bodies accelerate at the same rate: _____

_____

_____

_____

_____



3.17 Demonstrate an understanding that when an object falls through an atmosphere air resistance increases with increasing speed, air resistance increases until it is equal in size to the weight of the falling object and when the two forces are balanced, acceleration is zero and terminal velocity is reached Draw forces on the diagrams and complete the table:

Force Diagram	Forces are (Balanced / Unbalanced)	Type of motion (Acceleration, deceleration, constant speed)	Explanation
			
			
			
			
			

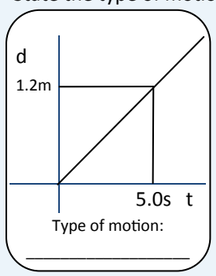
3.1 Demonstrate an understanding of the following as vector quantities: displacement, velocity, acceleration and force

3.3 Recall what velocity is A vector quantity contains information about _____ and _____. Describe the meaning of the following terms and explain how each on is a vector quantity:

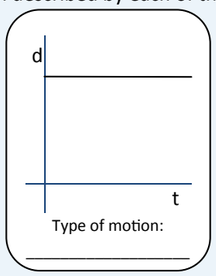
Term	Meaning
Displacement	
Velocity	
Acceleration	
Force	

3.2 Interpret distance/time graphs including determination of speed from the gradient

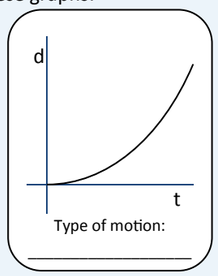
State the type of motion described by each of these graphs:



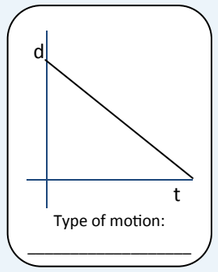
Type of motion: _____



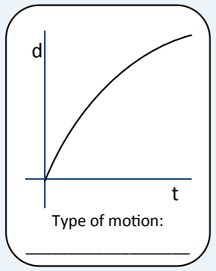
Type of motion: _____



Type of motion: _____



Type of motion: _____



Type of motion: _____

Calculate the speed described on the first graph: _____

_____

3.4 Use the equation linking speed, distance and time.

Equation: _____ Unit:_____

A motorbike travels 400m in 15s. How fast is it travelling?

d=_____
t=_____
v= ??

Equation: _____

Insert values: _____

Answer: v=_____ unit:_____

Another motorbike has the same speed but travels for 17.5s. How far has it travelled?

Equation: _____

v=_____
t=_____
d= ??

Rearranging:

Insert values:_____

Answer: v=_____ unit:_____

3.5 Use the equation linking acceleration, change in velocity and time.

Equation: _____ Unit:_____

A runner accelerates from 1.5 m/s to 2.5 m/s in 3s. What is her acceleration??

v=_____
u=_____
t=_____
a= ??

Equation: _____

Insert values: _____

Answer: a=_____ unit:_____

She then slows down to a standstill at a rate of $-4m/s^2$. How long did this take her?

v=_____
u=_____
a=_____
t= ??

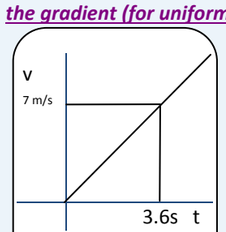
Equation: _____

Rearranging:

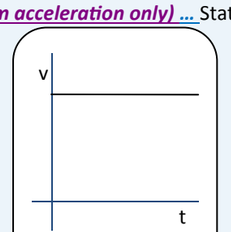
Insert values:_____

Answer: t=_____ unit:_____

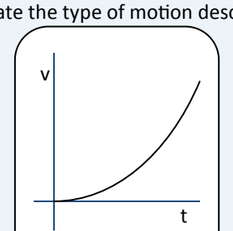
3.6 Interpret velocity/time graphs to compare acceleration from gradients qualitatively, calculate the acceleration from the gradient (for uniform acceleration only) … State the type of motion described by each of these graphs:



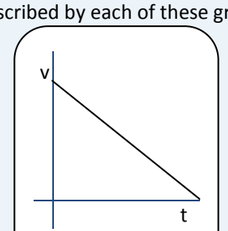
Type of motion: _____



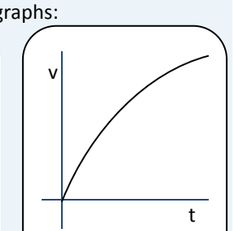
Type of motion: _____



Type of motion: _____



Type of motion: _____



Type of motion: _____

Calculate the acceleration described on the first graph: _____

_____

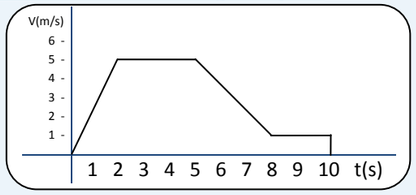
3.6 … and determine the distance travelled using the area between the graph line and the time axis (for uniform acceleration only)

Calculate the distance travelled described on this graph. Show your full workings:_____

_____

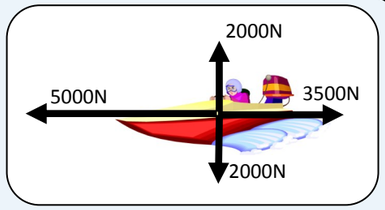
_____

_____



3.7 Draw and interpret a free-body force diagram

Draw a free-body force diagram for a car with 1500N of thrust, 300N of friction and 1200N of air resistance, 17000N of weight and 17000N reaction force.

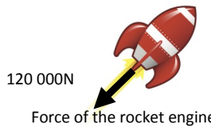


The resultant force on this boat is: _____N

3.8 Demonstrate an understanding that when two bodies interact, the forces they exert on each other are equal in size and opposite in direction and that these are known as action and reaction forces

Draw the missing force on each diagram, state the size of the force and the object on which it acts:

Force of the engine pushing the water backwards



Force of the rocket engine pushing the exhaust gases backwards.

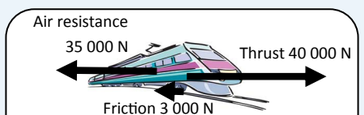
Force of the fist acting on the face

3.9 Calculate a resultant force using a range of forces (limited to the resultant of forces acting along a line) including resistive forces

3.10 Demonstrate an understanding that if the resultant force acting on a body is zero, it will remain at rest or continue to move at the same velocity

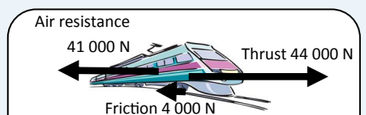
3.11 Demonstrate an understanding that if the resultant force acting on a body is not zero, it will accelerate in the direction of the resultant force

Calculate the resultant force and state its motion in each case:



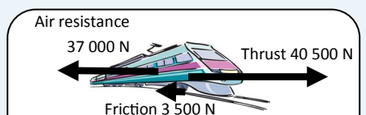
Resultant Force: _____N to the _____

Type of motion: _____



Resultant Force: _____N to the _____

Type of motion: _____



Resultant Force: _____N to the _____

Type of motion: _____

3.12 Demonstrate an understanding that a resultant force acting on an object produces an acceleration which depends on the size of the resultant force and the mass of the object

State and explain the difference in motion between two identical cars in a drag race (starting from a standstill), where car A is carrying a load and so has twice the mass of car B: _____

_____

_____

_____

State and explain the difference in motion between two identical cars in a drag race (starting from a standstill), where car C has Nitrous Oxide fitted so can produce twice the thrust of car D:_____

_____

_____

_____