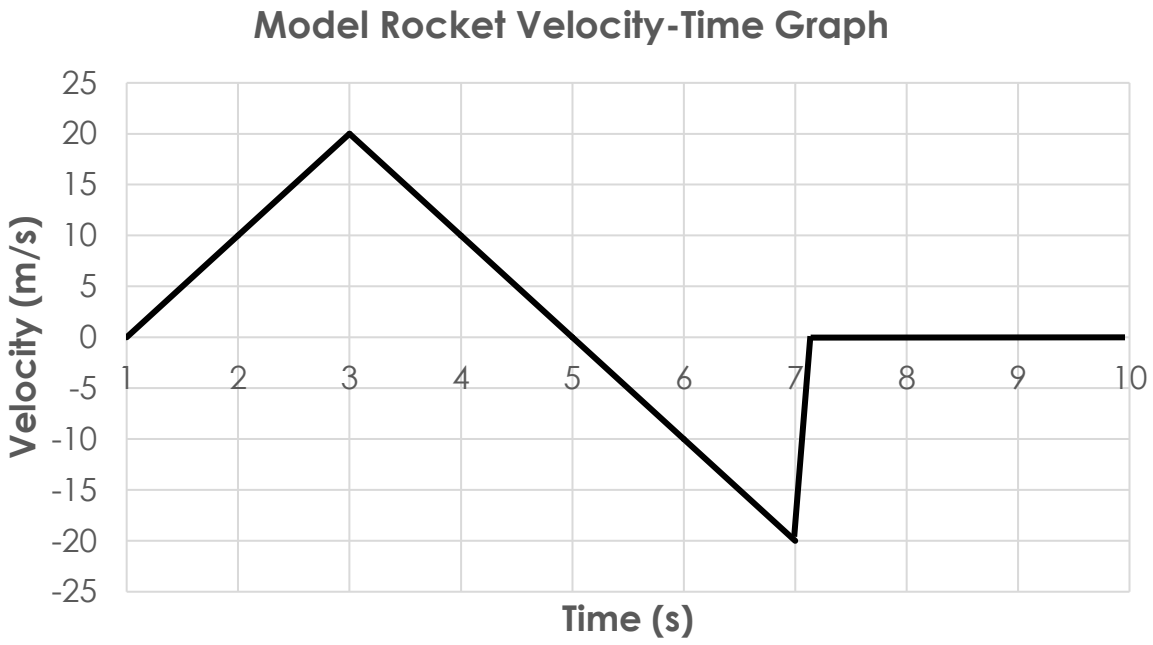
Name _____ Date _____

Acceleration

A group of students want to use a model rocket to help them explain the Physics involved in launching a rocket, which is an area that many technology companies are interested in and investing in.

The students wanted to know the perfect amount of fuel to put into the rocket so tested it with 100g of fuel as a preliminary investigation. They launched the rocket and recorded its velocity before, during and after its launch and then plotted their recordings in the velocity time graph below.



1. On the graph mark:
    a. The point where the rocket ran out of fuel
    b. The highest point the rocket reached
    c. The point where the rocket hit the ground

2. Describe the motion of the rocket over the 10 seconds.

3. Explain the velocity changes in terms of the forces acting on the rocket.

WHAT IF?

Name _____ Date _____

Science Mastery

P3.1.10 - Teacher Guidance

Purpose of this activity

This task presents an opportunity for pupils to

- write an extended response, demonstrating the depth of their understanding of the current topic.
- apply their knowledge in an unfamiliar context.

Pupils should be encouraged to think about the structure of their response. It may be beneficial for pupils to plan their answer in pairs or groups by drawing mind maps or flow charts. Pupils should also be mindful of spelling and grammar in their writing.

Scaffolding this Task

- Break up the answer into some simple steps on the board.
- Underline and define the words in the question which may lead to confusion
- Supply sentence starters or writing frames to help students structure their response.
- Model part of an answer on the board.
- Give students words that you would like them to include in their answer,
- You may want to stretch pupils by asking them to include a description of how increasing the amount of fuel in the model rocket would affect the forces acting on it

Running this Activity

This activity can be run in a number of ways, including;

- Have students plan out the answer together in small groups. They can sketch out a plan for the answer in the form of a mind map or flow chart. They can they go away and write their own response individually or in pairs.
- As an independent formative assessment task or activity
- As a paired activity, where students take turns describing what is shown in the graph to help them determine the process

Assessing this question

Credit can be awarded for any of the statements below (or words to this effect).

Part 1

- Rocket runs out of fuel at 3 seconds (after which time it slows down)
- Highest point reached is at 5 seconds (where the rocket will stop for a fraction of a second before changing direction and falling back down)
- Rocket hits the ground just after 7 seconds (where its velocity suddenly decreases to 0)

Part 2

- The rocket accelerates (uniformly) from 0 to 20 m/s in 3 seconds
- Between 3 seconds and 5 seconds the rocket slows down (uniformly) to 0
- Between 5 seconds and 7 seconds the rocket accelerates to 20 m/s in the opposite direction
- After 7 seconds the rocket stops as its velocity decreases to 0
- The rocket remains stationary until 10 seconds

Part 3

- The rocket initially accelerates because the thrust force is greater than the weight/force of gravity
- The rocket runs out of fuel so the thrust force is removed
- This means that the weight is now the resultant force so the rocket accelerates in the direction of the resultant force
- It was already travelling upwards, which means that its acceleration is now downwards (it is not moving downwards yet, it is still travelling upwards but slowing down)
- It reaches the highest point when its velocity is 0 before turning around (the velocity has become negative)
- The rocket accelerates downwards because the resultant force is still weight
- The rocket hits the ground and the reaction force from the ground causes the rocket to stop
- The resultant force of weight and reaction force becomes 0 so the rocket remains stationary