Name of the Student:_____
Max. Marks : 18 Marks **Time : 18 Minutes**

Q1.

* Figure 9 shows two ice skaters during a sequence in their performance.

Figure 9

The man stays at the same place on the ice throughout the sequence.

At the start of the sequence, the woman is moving at a constant speed around the man while the man holds her arm.

After she has gone round the man several times, the man lets go of the woman's arm.
The sequence ends a few seconds later.

Explain the motion of the woman, in terms of the forces acting and the effects on her motion, for the whole sequence.

(6)

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(Total for question = 6 marks)

Q2.

Another rocket has a total mass of 90 g when it takes off. The acceleration of the rocket when it takes off is 3.3 m/s^2.

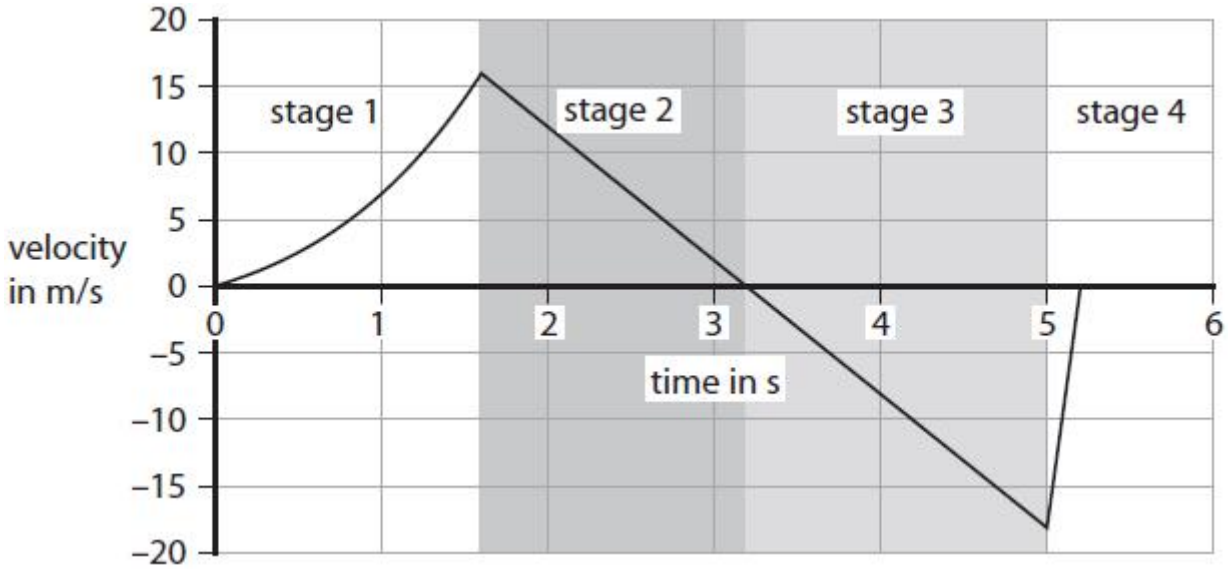
(i) Calculate the resultant force on the rocket when it takes off.

(2)

resultant force = ... N

*(ii) The rocket contains 50 g of fuel when it takes off.
The fuel burns and the rocket rises vertically.
After a while, there is no fuel left.
Eventually the empty rocket falls back to the ground.

The graph is a velocity–time graph for the rocket.
Four stages are labelled on the graph.



Explain why the velocity of the rocket changes as shown in the graph.

(6)

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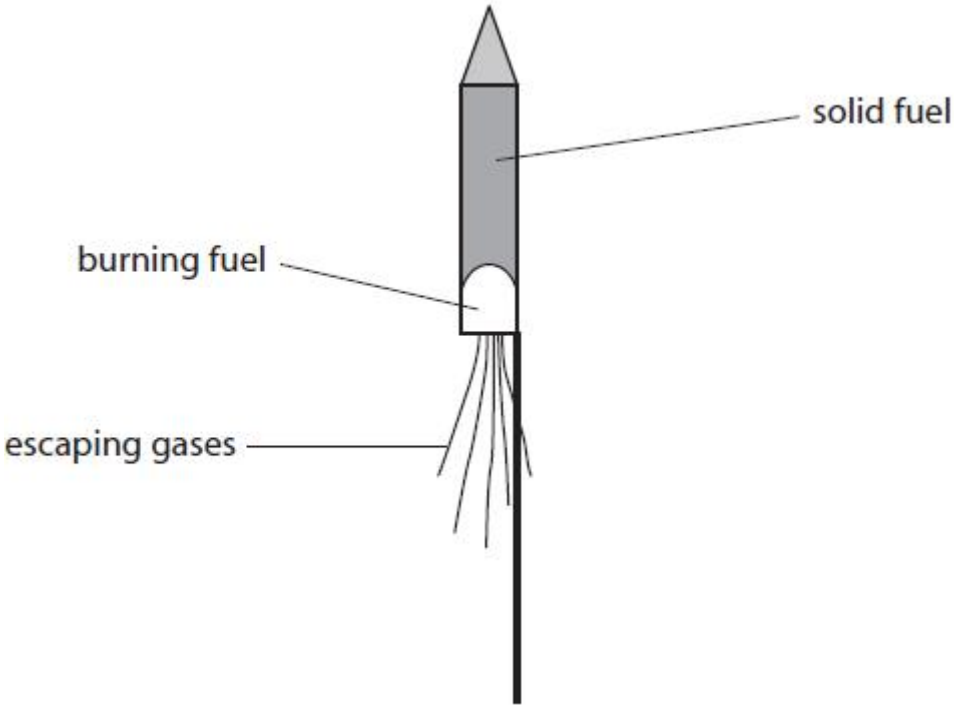
Q3.

A firework rocket contains a solid fuel inside a cardboard tube.

The burning of the fuel creates a thrust to propel the rocket upwards.



(i) Scientists can refer to several different quantities when describing the motion of the rocket.

mass	energy	speed	force

Only one of these quantities is a vector.
Complete this sentence using **one** of the words from the box.

(1)

The vector quantity is .....

(ii) Before the fuse is lit, the total weight of a rocket including fuel is 0.7N.

The gravitational field strength is 10 N/kg.
Complete the sentence by putting a cross (☒) in the box next to your answer.
The total mass of the rocket including fuel is

(1)

☒ **A** 0.007 kg

- ☒ **B** 0.07 kg
- ☒ **C** 0.7 kg
- ☒ **D** 7 kg

(iii) There is a resultant force on the rocket of 0.5 N upwards when it takes off.

The arrow on the diagram shows the size and direction of the force of gravity acting on the rocket when it takes off.

Add another arrow to the diagram to show the thrust produced by the burning fuel at the time the rocket takes off.
You should label the arrow with the size of the thrust.

(2)