

Name of the Student: _____

Max. Marks : 18 Marks

Time : 18 Minutes

Q1.

Figure 12 is a diagram showing a rocket that is sent into space to try and change the path of a small asteroid.

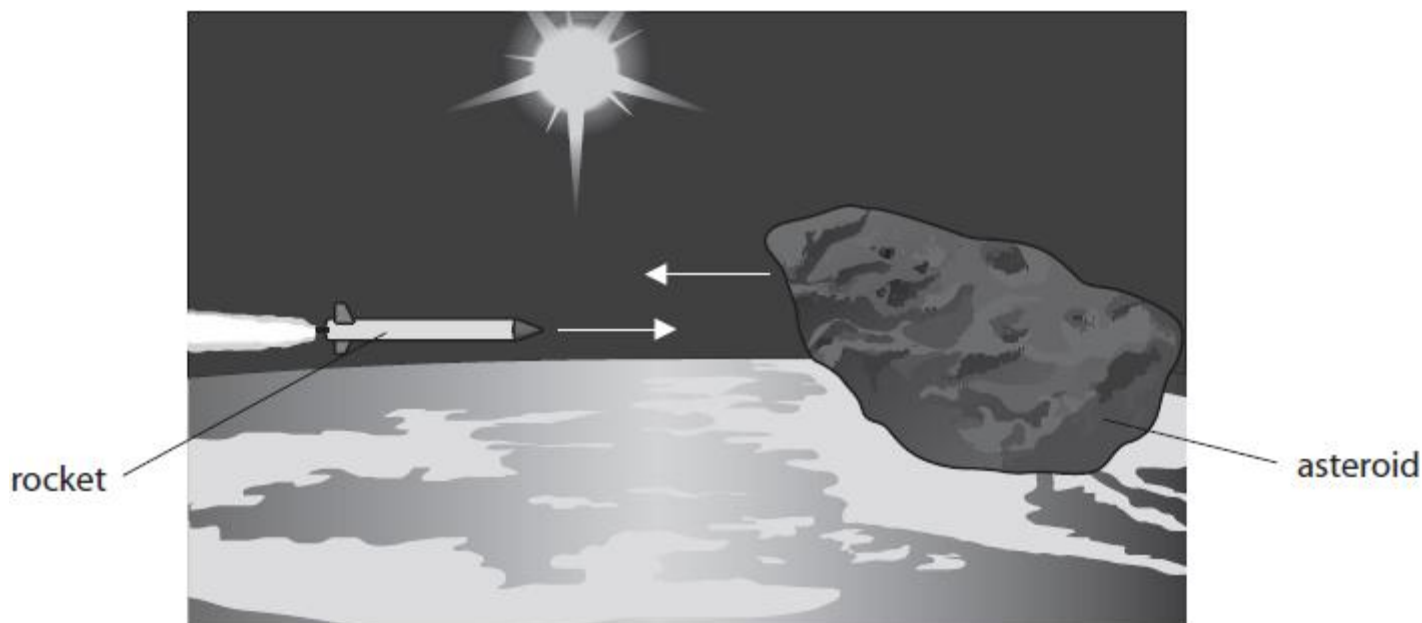


Figure 12

Newton's third law, when applied to the collision of the rocket and the asteroid as shown in Figure 12, can be stated as follows:

The force exerted by the rocket on the asteroid is equal and opposite to the force exerted by the asteroid on the rocket.

Explain how this statement links to the conservation of momentum in the collision.

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(Total for question = 4 marks)

Q2.

A car collides with a barrier on a road.

The time of the collision is very short.

Explain **one** factor, other than the time of the collision, that would affect the force on the car in the collision.

Your explanation should refer to an equation in the Equation Booklet.

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(Total for question = 2 marks)

Q3.

* Figure 14 shows two ice skaters during a sequence in their performance.



Figure 14

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.

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(Total for question = 6 marks)

Q4.

Shot-put is an Olympic event.
The shot is a heavy ball.
An athlete throws the shot as far as possible.

A sports scientist analyses an athlete's throw to help improve performance.
The scientist examines the images to find ways of increasing the momentum of the shot when it leaves the athlete's hand without the athlete using any extra force.
The scientist advises the athlete to

lean further down at the start
and make his arm straight before he releases the shot.

Explain the scientific principles behind this advice.

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(Total for question = 3 marks)

Q5.

Figure 9 shows a rocket soon after it takes off from the ground.



(Source: © Alones/Shutterstock)

Figure 9

The force that the rocket engines produce remains constant during the first few seconds after take-off. Explain what happens to the acceleration during the first few seconds.

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(Total for question = 3 marks)