

Question Number	Answer	Mark
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**\*15**

This question assesses a student's ability to show a coherent and logically structured answer with linkages and fully-sustained reasoning.  
Marks are awarded for indicative content and for how the answer is structured and shows lines of reasoning.  
The following table shows how the marks should be awarded for indicative content and lines of reasoning.

IC points	IC mark	Max linkage mark available	Max final mark
<b>6 or more</b>	4	2	<b>6</b>
<b>5</b>	3	2	<b>5</b>
<b>4</b>	3	1	<b>4</b>
<b>3</b>	2	1	<b>3</b>
<b>2</b>	2	0	<b>2</b>
<b>1</b>	1	0	<b>1</b>
<b>0</b>	0	0	<b>0</b>

	Marks
Answer shows a coherent and logical structure with linkages and fully sustained lines of reasoning demonstrated throughout.	2
Answer is partially structured with some linkages and lines of reasoning	1
Answer has no linkages between points and is unstructured	0

#### **Indicative content**

- When the spacecraft is accelerating the astronaut accelerates at the same rate.
- The seat is applying a forward force to the astronaut so (by N3) the astronaut is applying a backward/opposite force to the seat (which compresses the seat).
- As the fuel is used up, the mass of the spacecraft decreases.
- (As the mass of the spacecraft decreases) the acceleration increases.
- The force between the seat and the astronaut increases thus further compressing the seat.
- The seat decompresses (to push the astronaut forwards) when the force (from the rocket motor) becomes zero.

**Or**

The seat decompresses when the force (from the rocket motor) is removed.

**Or**

The force from the safety strap decelerates the astronaut.

1IC

2IC **Or** 3IC

3IC + linkage **Or** 4IC **Or** 5IC

4IC + linkage **Or** 5IC + linkage **Or** 6IC

5IC + 2 × linkage **Or** 6 IC + linkage

6IC + 2 × linkage

**(1)**

**(1)**

**(1)**

**(1)**

**(1)**

**(1)**

**6**

**Total for question 15**

**6**