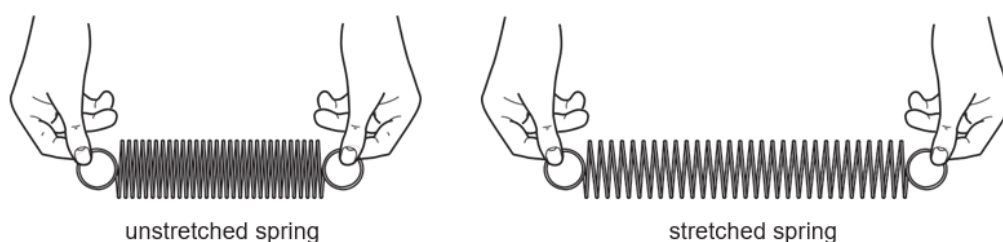


**GCSE Physics B (Twenty First Century Science)**  
**J259/01** Breadth in Physics (Foundation Tier)

**Question Set 21**

1

Sundip wants to use a spring to make a device to measure forces. She picks up a spring and stretches it.



**Sundip**  
I only need one force to stretch the spring.



(a) Explain why Sundip is wrong.

[2]

(b) Sundip investigates the extension of identical springs when different forces are applied.

The table shows her results.

| Force (N) | Extension (cm) | Type of deformation |
|-----------|----------------|---------------------|
| 1.0       | 2.5            | elastic             |
| 2.0       | 5.0            | elastic             |
| 3.0       | 7.5            | elastic             |
| 4.0       | 10.5           | elastic             |
| 5.0       | 14.0           | elastic             |
| 6.0       | 18.0           | plastic             |
| 7.0       | 25.0           | plastic             |

Sundip comments on her data in the table.

**Sundip**  
I can't use these springs to measure forces higher than 5.0 N, because higher forces cause plastic deformation.



(i) Describe what is meant by plastic deformation.

[1]

(ii) Explain why Sundip is correct.

[1]

(c) Sundip's teacher looks at her data in the table.

You can only use the spring as a device to measure forces if the relationship between force and extension is linear.



(i) Describe what is meant by a **linear relationship**.

[1]

(ii) Identify the maximum force for which the spring shows a linear force-extension relationship.

Use the data in the table to explain your answer.

[2]

**Total Marks for Question Set 21: 7**

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