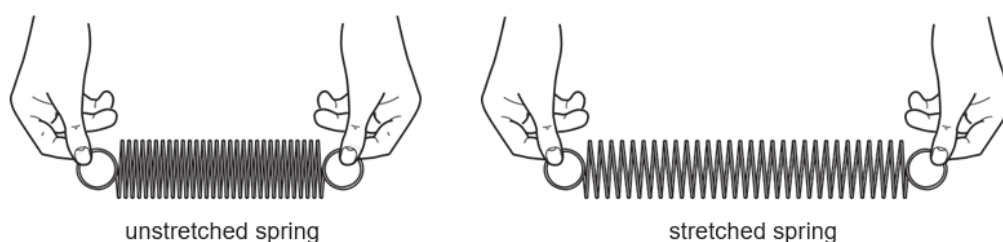


**GCSE Physics B (Twenty First Century Science)**  
**J259/01** Breadth in Physics (Foundation Tier)

**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.

You need two forces at both ends pulling in opposite directions to stretch the spring [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.

The spring doesn't return to its original shape once the force is removed

[1]

- (ii) Explain why Sundip is correct.

If the spring is plastically deformed, you won't get accurate results

[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**.

They are directly proportional

[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]

3N as it goes up by 2.5cm with every newton up to 3N

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

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