Use the following information to answer questions 1 and 2.

A spring obeys Hooke's law. A force of 2.0 N extends the spring by 0.30 m.

1   A 6.0 N force will extend the spring by

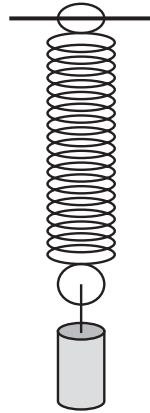⊠ **A** 0.10 m

⊠ **B** 0.30 m

⊠ **C** 0.60 m

⊠ **D** 0.90 m

(Total for Question = 1 mark)

2   The energy stored in the spring when a force of 2.0 N is applied is

⊠ **A** 0.09 J

⊠ **B** 0.30 J

⊠ **C** 0.60 J

⊠ **D** 0.90 J

(Total for Question = 1 mark)

3 A spring is suspended from a bar. When a load of 6.0 N is added to the bottom of the spring, its length changes from 0.040 m to 0.13 m.
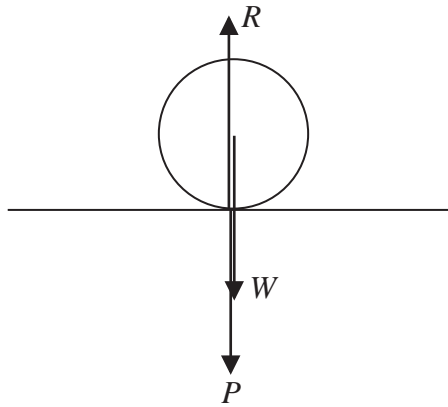

To find the spring constant of the spring you would use

☒ **A** $\dfrac{0.13\,\text{m}}{6.0\,\text{N}}$

☒ **B** $\dfrac{6.0\,\text{N}}{0.13\,\text{m}}$

☒ **C** $\dfrac{6.0\,\text{N}}{0.090\,\text{m}}$

☒ **D** $\dfrac{0.090\,\text{m}}{6.0\,\text{N}}$

(Total for Question = 1 mark)

4 An apple is at rest on the ground.

The diagram shows three forces of equal magnitude.

W = weight of apple

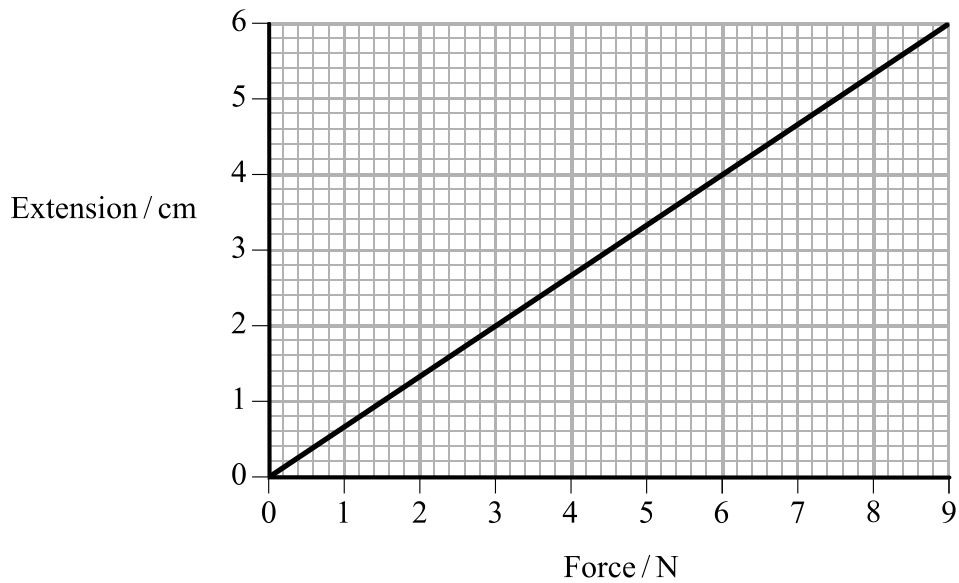P = push of apple on ground

R = normal contact force of ground on apple

Which row in the table shows Newton's first and third laws being applied correctly.

	Newton's first law	**Newton's third law**
☒ **A**	$P = W$	$R = P$
☒ **B**	$R = P$	$W = R$
☒ **C**	$W = R$	$P = W$
☒ **D**	$W = R$	$R = P$

(Total for Question = 1 mark)

5. The graph shows how extension varies with applied force for a spring.

Extension / cm (y-axis, 0 to 6)
Force / N (x-axis, 0 to 9)

5   The stiffness of the spring in $N\,m^{-1}$ is
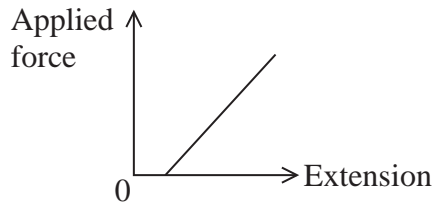
☒   **A** 1.5

☒   **B** 54

☒   **C** 67
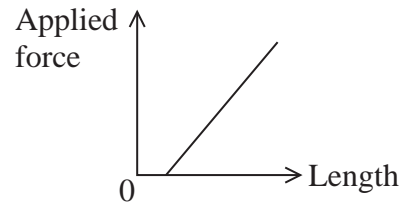
☒   **D** 150

(Total for Question = 1 mark)

Questions 6 and 7 refer to the graphs and information below.

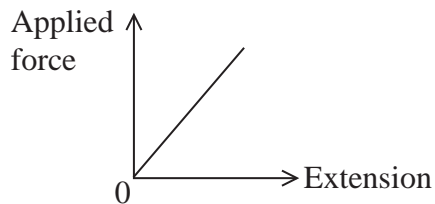A force is applied to a spring and the spring extends. The new length of the spring is recorded.

This procedure is repeated for different applied forces.

P

Q

R
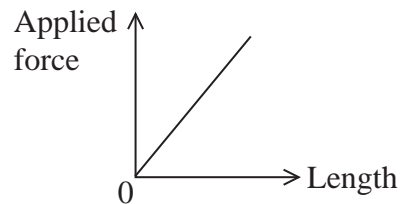
S

6 Which of the above graphs could be obtained from this experiment?

    ☒ **A** P and Q

    ☒ **B** P and S

    ☒ **C** R and Q

   ☒ **D** R and S

(Total for Question = 1 mark)

7 The graphs could show that the spring is

    ☒ **A** obeying Hooke's law.

    ☒ **B** extending plastically.

    ☒ **C** extended beyond the limit of proportionality.

    ☒ **D** being compressed as well as extended.

(Total for Question = 1 mark)

8 A force is applied across the ends of a spring and the following force-extension graph is drawn.

Three points, P, Q and R, are marked on the graph. At point Q the applied force is zero.
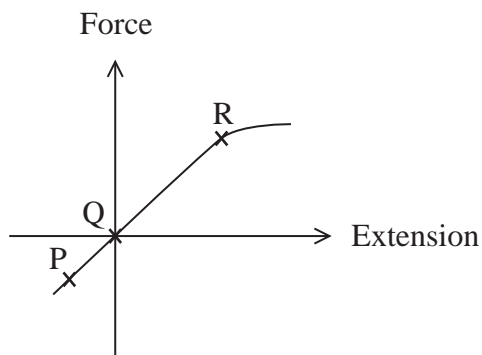
In the table below, the spring is represented using diagrams drawn to scale. The spring at Q is represented by ⋀⋀⋀⋀⋀.

Select the row from the table that correctly represents the length of the spring at positions P, Q and R.

	P	**Q** (no applied force)	**R**
☒ **A**	(short spring)	(spring)	(long spring)
☒ **B**	(spring)	(spring)	(long spring)
☒ **C**	(long spring)	(spring)	(short spring)
☒ **D**	(short spring)	(spring)	(spring)

(Total for Question = 1 mark)