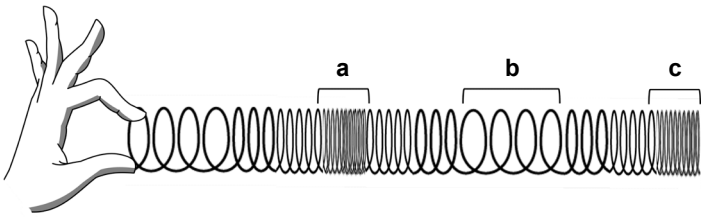
EXERCISE 2.2

MODULE 2 TOPIC 3, p. 89
Gr 10 Physical Sciences 3-in-1

QUESTION 1

Sarah moves the free end of a slinky spring a few times forward and backwards so that several waves are created and move along the spring.



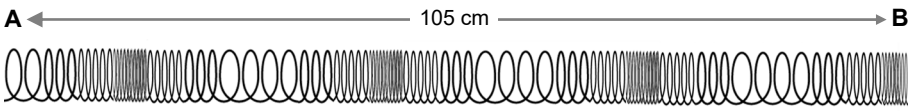
1.1 Describe what happens to the coils of the spring.

1.2 What type of waves move along the spring? Give a definition of this type of wave.

1.3 Name the areas **a**, **b** and **c** in the spring.

QUESTION 2

One end of a slinky spring vibrates forwards and backwards and produces waves as shown below. The length of the spring from point **A** to **B** is 105 cm.



2.1 How many full waves are shown in the diagram?

2.2 What is the wavelength of a wave?

2.3 If the speed of the waves is 330 $m \cdot s^{-1}$, calculate the frequency of the waves.

2.4 What is the period of the waves?

2.5 How long does it take for a wave to move from one end of the spring to the other?

2.6 Wait until the spring comes to a rest. Now push and pull it forwards and backwards at a lower frequency.

2.6.1 How will the wavelength of the waves change? Give a reason for your answer.

2.6.2 How will the speed of the waves change? Give a reason for your answer.

EXERCISE ANSWERS

QUESTION 1

1.1 The coils move forwards and backwards, one after the other, around their equilibrium positions.

1.2 Longitudinal waves.
A longitudinal wave is a wave in which the particles of the medium vibrate parallel to the direction of motion of the wave.

1.3 a and c: compression b: rarefaction

QUESTION 2

2.1 3 full waves

2.2 $\lambda = \frac{105}{3,5} = 30$ cm

2.3 $f = \frac{v}{\lambda} = \frac{330}{0,3}$ $v = 330\ m \cdot s^{-1}$

$= 1\ 100$ Hz

2.4 $T = \frac{1}{f} = \frac{1}{1\ 100}$

$= 0,0009$ s

2.5 $\Delta t = \frac{\Delta x}{v} = \frac{1,05}{330} = 0,003$ s

OR

Calculate the time for 3,5 waves to pass a certain point, i.e. cover a length of 1,05 m:

$\Delta t = 3,5 \times 0,0009 = 0,003$ s

2.6.1 The wavelength will be longer. The wavelength is inversely proportional to frequency.

2.6.2 The speed remains the same. The speed of a wave in the same medium remains constant ($v = f\lambda$).