Aim

To determine the velocity of a pulse propagated through a stretched string/slinky.

MATERIALS AND APPARATUS REQUIRED

A slinky with flat wire made up of metal/plastic should be at least 1 m long, and have a metre scale, a stopwatch, and a marker/ chalk.

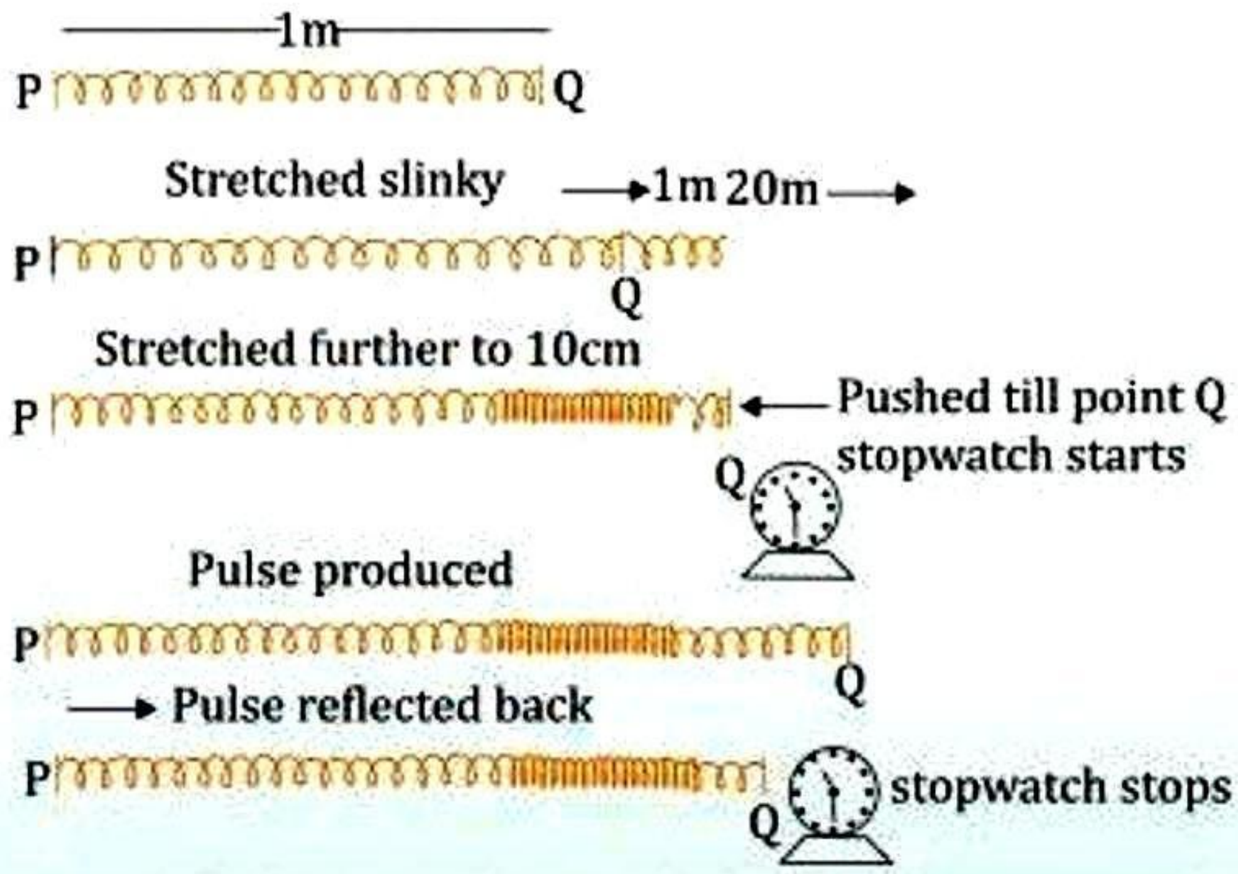
THEORY

1. **Wave:** A wave is a disturbance that moves through a medium when the particles of the medium set neighbouring particles into motion by transfer of energy.
2. **Slinky:** A slinky is a long spring which is flexible and has appreciable elasticity.
3. **Pulse:** A wave produced by a single disturbance in a medium is known as a pulse.

The velocity of pulse = $\frac{\text{total distance travelled by pulse}}{\text{total time taken}}$

PROCEDURE

1. Mark a point on the floor of a long corridor. Let this point be P.



2. From the point, P measure the distance of 1 m with the help of a metre scale and mark this point as Q.
3. Allow one student to hold one end of the slinky at point P.
4. Let another student stretch the slinky and bring it to point Q.
5. Let the third student hold the stopwatch.
6. The student who has stretched the slinky will stretch it beyond point Q and then give a sharp push towards point Q. The push should stop at point Q.

7. A pulse is produced in the slinky which travels towards point P and it gets reflected towards point Q.
8. Record the time from a push at Q to the pulse travelling towards P and back at Q.
9. Follow the above procedure 56 times and record your observation.
10. Calculate the velocity of the pulse by the formula,

$$\textbf{The velocity of pulse} = \frac{\text{Total distance travelled by pulse}}{\text{total time taken}} \qquad v = \frac{2d}{t}$$

OBSERVATION TABLE

S. No.	Length of stretched slinky	Total distance travelled by pulse 2(d)	Time is taken (t)	Velocity of pulse $v = \frac{2d}{t}$
1.				
2.				
3.				
4.				
5.				

The average velocity of pulse $= \frac{v_1+v_2+v_3+v_4+v_5}{5} = \frac{\text{.....}}{5}\ ms^{-1}$

RESULT

The velocity of the pulse = ... ms^{-1}

PRECAUTIONS

1. Slinky used should be of good quality and with even springs coiled all over.
2. Accurately measure the distance and time.
3. The push at the end should be forceful to see the pulse and get the reflected wave back.
4. The slinky should not have any knot or kink at any point along its length.

VIVA VOCE

Q1. What is the aim of your experiment?

Ans. To determine the velocity of a pulse propagated through a stretched string/slinky.

Q2. What is the pulse?

Ans. It is a single disturbance moving through a medium from one end to another end.

Q3. What is the position of each turn of a slinky when it is stretched?

Ans. When a slinky is stretched, the individual turn of the slinky is to be assumed in an equilibrium or rest position.

Q4. While giving the jerk to the free end of a spring, which physical quantity does move to the other end?

Ans. Energy moves from one end to another end.

Q5. Do the particles of the medium also move from one end to the other end?

Ans. No, particles of the medium oscillate about their mean position. In the case of a transverse wave, they vibrate up and down while in the case of a longitudinal wave, they vibrate to and from.

Q6. Suppose the vibration of the coils of the spring is in the same direction in which the pulse propagates. Which type of pulse is generated?

Ans. Longitudinal pulse.

Q7. Name a common device available in the laboratory for the production of sound waves in the air.

Ans. Tuning fork.

Q8. Which type of wave can be produced on a slinky?

Ans. Both, transverse waves as well as a longitudinal waves.

Q9. What is slinky?

Ans. It is a long helical spring, usually made of steel, flexible and has elasticity.

Q10. Are the waves travelling on a string/slinky mechanical wave?

Ans. Yes, the wave travelling on a slinky are mechanical waves.

Q11. What will happen when the incident pulse reaches the fixed end of the string/slinky?

Ans. The pulse returns to the left after bouncing off and is known as the reflected pulse.

Q12. If a crest is an incident towards a fixed end, the reflected pulse will be crest or trough?

Ans. The pulse will reflect as a trough.

Q13. What is the speed of the reflected pulse?

Ans. It is the same as the speed of the incident pulse.

Q14. What is the wavelength of the incident and reflected pulse?

Ans. Both have the same wavelength.

Q15. A student sets up a slinky on a smooth tabletop in the manner shown here. He can produce a pulse in the slinky by giving a jerk to its free end; the jerk is given.

Ans. To get the pulse the jerk should be given upwards or downwards.