Practice Question Set For A-Level
Subject : Physics
Paper-1 Topic: Waves

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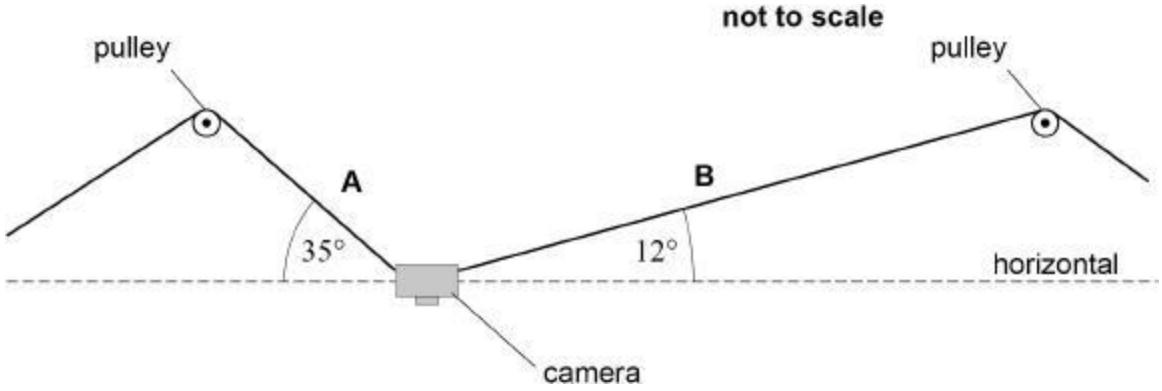
Name of the Student:_____
Max. Marks : 22 Marks **Time : 22 Minutes**

Q1.

The diagram shows a camera filming a sports event from above. The position of the camera is controlled by two steel cables, **A** and **B**, that pass over fixed, smooth pulleys.



(a) In the diagram above the camera is stationary. The tension in **A** is 430 N and **A** makes an angle of 35° to the horizontal. **B** makes an angle of 12° to the horizontal.

Calculate the tension in **B**.

tension in **B** = _____ N

(2)

(b) The cross-sectional area of **A** is 7.0×10^{-6} m^2. The unstretched length of **A** is 150 m.

Calculate the extension of **A** when the tension in it is 430 N.

Young modulus of steel = 210 GPa

extension = _____ m

(2)

(c) The camera is moved horizontally to the right to a new stationary position. The tension in **A** is now different from that in the diagram above.

Deduce whether the tension in **A** has increased or decreased.

(3)

(d) The camera's signal is transmitted as a series of pulses through an optical fibre. The table shows data for two optical fibres **X** and **Y**. Both optical fibres are identical except for their core diameter.

Optical fibre	Core diameter / μm
X	8
Y	50

Deduce which fibre allows a greater pulse transmission rate.

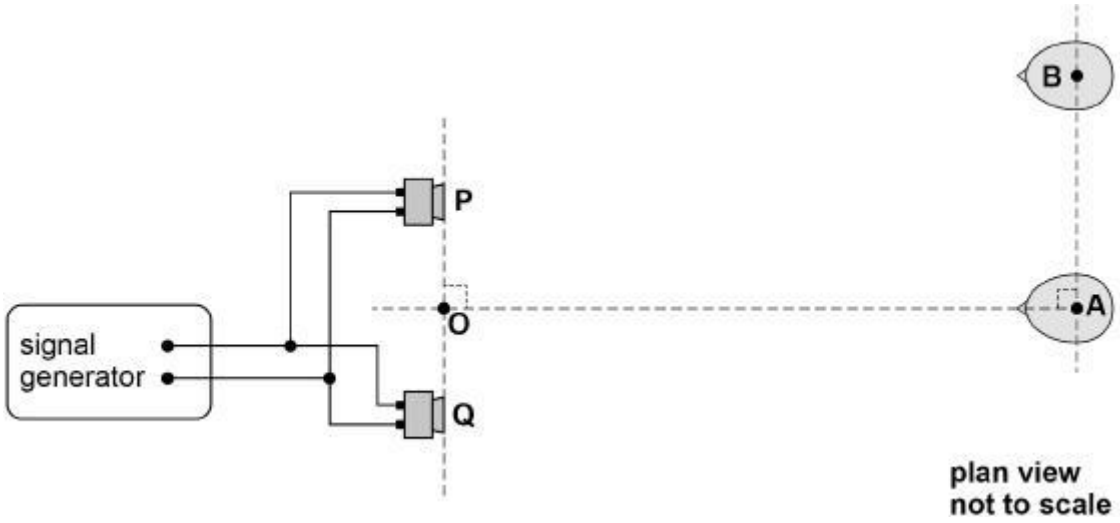
(3)

Q2.

A student investigates the interference of sound waves using two loudspeakers, **P** and **Q**, connected to a signal generator (oscillator). Each loudspeaker acts as a point source of sound.

Figure 1 shows the arrangement.

Figure 1



Point **O** is the midpoint between **P** and **Q**.

(a) Explain why the two loudspeakers are coherent sources of sound waves.

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_____

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(2)

(b) The student faces the two loudspeakers at point **A**. Point **A** is at equal distances from **P** and **Q**. He then moves to point **B**, at right angles to the line **OA**, still facing the two loudspeakers. As his head moves from **A** to **B** the amplitude of the sound wave he hears decreases and then increases. The amplitude starts to decrease again as he moves beyond **B**.

Explain why the variation in amplitude occurs as he moves from **A** to **B**.

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(3)

(c) The student records the following data:

separation of the two loudspeakers = 0.30 m
distance **OA** = 2.25 m
distance from **A** to **B** = 0.95 m

Show that the path difference for the sound waves from the two loudspeakers to point **B** is about 0.1 m.

(3)

(d) The frequency of the sound wave is 2960 Hz.

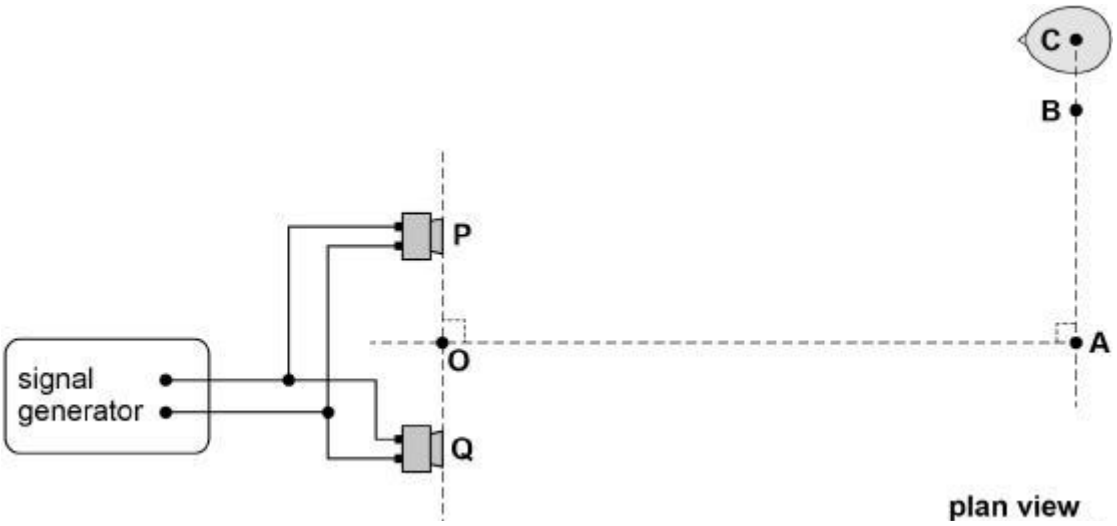
Calculate the speed of sound from the student's data.

speed of sound = _____ m s^{-1}

(1)

(e) The student moves his head to point **C** as shown in **Figure 2**. The emitted frequency of the sound from the loudspeakers is then gradually decreased.

Figure 2



Discuss the effect that this decrease in frequency has on the amplitude of the sound wave heard by the student.

(3)

(Total 12 marks)