

State Examination Commission – Physics Higher Level, 2008

Question 12b

The pitch of a musical note depends on its frequency.

On what does (i) the quality, (ii) the loudness, of a musical note depend? (6)

What is the Doppler effect? (6)

A rally car travelling at 55 m s^{-1} approaches a stationary observer. As the car passes, its engine is emitting a note with a pitch of 1520 Hz.

What is the change in pitch observed as the car moves away? (12)

Give an application of the Doppler effect. (4)



The pitch of a musical note depends on its frequency.

On what does (i) the quality, (ii) the loudness, of a musical note depend? (6)

- i. the extent of overtones present in the note
- ii. the amplitude of the sound

What is the Doppler effect? (6)

basic statement

A rally car travelling at 55 m s^{-1} approaches a stationary observer. As the car passes, its engine is emitting a note with a pitch of 1520 Hz. What is the change in pitch observed as the car moves away? (12)

Engine is emitting a note with a pitch of 1520 Hz, i.e., actual (real) frequency, $f = 1520 \text{ Hz}$

Apparent frequency as car moves away (recedes), $f' = \frac{cf}{(c + u)} = \frac{340(1520)}{(340 + 55)}$
 $= 1308 \text{ Hz}$

So, change of frequency $= 1520 - 1308 = 212 \text{ Hz}$

Give an application of the Doppler effect. (4)

Speed traps