DOPPLER EFFECT : WAVES

- · Doppler effect is defined as the apparent change in the frequency caused by the relative motion between the source of the wave and the observer
- . A common example is that of an ambulance with its siren blasting You may recall that as the ambulance travels towards you, the pitch/frequency of the siren appears to be high and then after the ambulance posses by and moves away from the observer, the pitch/frequency appears to be low.
- . The shift in the apparent frequency for a wave produced by a moving source is the doppler effect

Example 1. Source is stationary - In this case, the observed frequency is the actual frequency

fo: fs where fo: observed frequency of source

- · · observer
- · = Source

Example 2: The source is moving towards the observer

is higher than the actual frequency

 $f_0 > f_s$

- · · observer
- = Source

I waves seem "compressed" or "squashed" near the observer Hence, the \(\lambda\) decreases and this causes the \(\frac{1}{2}\) to morease

Calculating the obs	erved frequency:
	,
	fo = fs x v where fo = observed frequency
	v - vs fs = actual frequency
	fo = fs x v where fo = observed frequency v - vs fs = actual frequency v = speed of sound vs = speed of the source
Example	Us = speed of the source
Q. Calculate the observed	trequency
000 × 300	fs = 900H2
f ₀ = 900 × 300	45ms ⁻¹ = Vs
330 - 45	Lool A
= 1042 Hz	03.6
fo ≈ 1040Hz	v = 330ms-1
4 Note 1	
the (observed frequency
is gr	eater than the source
requ	ency (900 Hz)
Francola 3: The sai	To 10 abs 05/185
Example 3. The so	urce is moving away from the observer
	Win His soon the beauted Decrees
	is lower than the actual frequency
	is tome than the actual the quertag
	$f_0 < f_s$
	· · observer
	• = Source
	• - 2001102
Example	
Q. Calculate the obser	ved frequency fs:900Hz
	1. C
fo = 900 × 300	42ms = Vs
330 - (-45)	<u>~~;</u>
	V= 330ms-1
= 792	
fo ≈ 790 Hz	
4 Note h	low the observed
frequen	ay is lower than
1 7	requercy of the source (900 Hz)
the to	equered of the source (400 Hz)
the C	equency of the source (100 Hz)
the fo	equeries of the source (100 Hz)
the fo	equeries of the source (100 Hz)

UGHT WAVES: same principle applies
ACITY WITTES: Same prinage appues
· If an observer is loooking at a star which is emitting light
· If the star recedes away from the observer the fo (of light waves) will be less than the actual frequency of the light emitted by the star
· Since lower frequency of light is towards the red end of the spectrum, this effect is known as the red shift.
this effect is known as the red shift.
· However, if the star moves towards the observer, the observed frequency is greater than the actual frequency of the light emitted by the star
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· Since higher frequencies are closer towards the blue/violent end of the spectrum, this effect is known as the blue shift
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