

APOLLO

Doppler effect

HL

Physics

First assessment 2025

3 questions | mark schemes

4.	a		sound waves are longitudinal OR light waves are transverse ✓ sound waves cannot travel through vacuum OR light waves travel can travel through vacuum ✓ sound waves are propagated due to pressure changes OR light waves are propagated due to electric or magnetic field changes ✓ speed of sound not the same between inertial reference frames OR speed of light same in all inertial reference frames ✓ Speed of sound is «generally» slower OR speed of light is «generally» faster. ✓		2 max
4.	b	i	Wavelength = 0.68 «m» ✓ Period = 0.002 «s» ✓	Accept 0.67 – 0.70 m for wavelength.	2
4.	b	ii	$v = \lambda/T = 0.68 / 0.002 = \gg 340 \text{ «m s}^{-1}\text{»} \checkmark$	Allow ECF from 4bi Allow $v = 335 - 350 \text{ m s}^{-1}$	1

– 12 –

2225 – 6721M

4.	c	i	«apparent» change in the frequency/wavelength/pitch✓ caused by a compression/stretching of wavefronts « due to relative motion» OR meets wavefronts more of less frequently ✓		2
4.	c	ii	$440 \cdot \frac{340 + v}{340} = 540 \cdot \frac{340 - v}{340} \checkmark$ so $v = 34.7 \text{ «m s}^{-1}\text{»} \checkmark$		2
4.	c	iii	$\text{Use of } \frac{v}{c} = \frac{\Delta\lambda}{\lambda} = \frac{(659 \times 10^{-9}) - (656.1 \times 10^{-9})}{(656.1 \times 10^{-9})} \checkmark$ $v = 1.33 \times 10^6 \text{ «m s}^{-1}\text{»}$ OR 0.00442 c ✓		2

– 13 –

2225 – 6721M

Question	Answers	Notes	Total
----------	---------	-------	-------

Mark-scheme answers

Physics HL | Paper 1A | Nov 2025 TZ1 | Q23 | 1 marks

23. B

Physics HL | Paper 1A | Nov 2025 TZ3 | Q25 | 1 marks

25. D