A-Level Physics: **w25 11**

Question 27 (Answer: **D**)

- The dolphin is approaching, so $f_o = f_s v/(v - v_s) = 122 \times 1480/(1480 - 16.0)$.
- $= 122 \times 1480/1464 = 123$ kHz.
- The shift is small because 16 m s^{-1} is tiny next to the speed of sound in water.

A-Level Physics: **w25 12**

Question 27 (Answer: **C**)

- The pitch heard is lower than the pitch emitted, so the source is receding.
- $960 = 1200 \times 340/(340 + v_s)$, so $340 + v_s = 425$.
- $v_s = 85$ m s^{-1} directly away from the observer.

A-Level Physics: **w25 14**

Question 27 (Answer: **C**)

- Write both cases: $500 = f_s v/(v + v_s)$ and $250 = f_s v/(v + v_s')$.
- Dividing one by the other gives $(v + v_s')/(v + v_s) = 2$.
- So $v_s' = v + 2v_s$ – the aircraft must more than double its speed.

A-Level Physics: **s25 11**

Question 24 (Answer: **C**)

- The pitch heard is lower than the pitch emitted, so the aircraft must be moving away.
- $f_o = f_s v/(v + v_s)$, so $20.0 = 30.0 \times 330/(330 + v_s)$.
- $330 + v_s = 495$, giving $v_s = 165$ m s^{-1} away from the observer.

A-Level Physics: **s25 12**

Question 26 (Answer: **D**)

- The pitch is highest when the buzzer is moving directly towards the observer, at its full 25.0 m s^{-1}.
- $f_o = f_s v/(v - v_s) = 846 \times 340/(340 - 25.0)$.
- $= 846 \times 340/315 = 913$ Hz.

A-Level Physics: **s25 14**

Question 22 (Answer: **D**)

- Moving towards the observer bunches the wavefronts up, so the pitch rises.
- $f_o = f_s v/(v - v_s) = 440 \times 340/(340 - 30.0)$.
- $= 440 \times 340/310 = 483$ Hz; C comes from the moving-*observer* formula, which does not apply here.

A-Level Physics: **m25 12**

Question 24 (Answer: **C**)

- The car travels in a straight line at constant speed, directly away from P and directly towards Q.
- With the speed constant and the motion along the line, each listener hears one steady shifted pitch – so 1 and 2 are wrong.
- Q is always being approached and P always left behind, so Q's pitch is always the higher: statement 3 only.