Ch 13 Assigned Questions

2014 Spring
PHYS 1Cb

2. $\lambda = 2\,m$, $f = 4\,Hz$, $\therefore v = f\cdot\lambda = 8\ m/s$ //

3.

		Amplitude	λ	f	T	v
(a)	$y = 4\sin(3x-15t)$,	4	$2\pi/3$	$15/2\pi$	$2\pi/15$	5
(b)	$y = 6\cos(3x+15t-2)$,	6	$2\pi/3$	$15/2\pi$	$2\pi/15$	5
(c)	$y = 8\sin(2x+15t)$,	8	$2\pi/2$	$15/2\pi$	$2\pi/15$	$15/2$
(d)	$y = 8\cos(4x+20t)$,	8	$2\pi/4$	$20/2\pi$	$2\pi/20$	5
(e)	$y = 7\sin(6x-24t)$,	7	$2\pi/6$	$24/2\pi$	$2\pi/24$	4

§ $y = A\sin(kx \pm \omega t)$ or $A\cos(kx \pm \omega t)$, where $k = \frac{2\pi}{\lambda}$, $\omega = 2\pi f = \frac{2\pi}{T}$

$v = \lambda\cdot f$

5. $v = \sqrt{\frac{T}{\mu}}$ $\Rightarrow$ same tension (T), the speed $v \propto \frac{1}{\sqrt{\mu}}$, where μ = mass per unit length

$\therefore$ the most massive bass string has <u>slower</u> speed than lighter strings.

6. $v = \sqrt{\frac{T}{\mu}}$ $\therefore$ In order to double the speed (v), we should multiply the tension (T) by a factor of <u>4</u>.

8. The speed depends on the medium $\therefore$ 2 sirens will have the <u>same</u> speed of sound.

10. Power $P = \frac{1}{2}\mu\omega^2 A^2 v \propto A^2$ (μ, ω, v are fixed)

$\therefore$ If P is doubled, A will change by a factor of $\sqrt{2}$ //

11. Assume that the speed of sound is v, $\Rightarrow f' = \frac{v + v_o}{v - v_s} f$ (v_o: speed of the observer; v_s: speed of the source)

(a) S • O • $\quad f' = f$

(b) S → 25 m/s • O $\quad f' = \frac{v}{v-25} \cdot f = \frac{343}{343-25} f = 1.0786 f$

(c) S ← 25 m/s • O $\quad f' = \frac{v}{v-(-25)} f = \frac{v}{v+25} f = \frac{343}{343+25} = 0.9321 f$

(d) S • 25 m/s ← O $\quad f' = \frac{v+25}{v} f = \frac{343+25}{343} = 1.0729 f$

(e) S • O → 25 m/s $\quad f' = \frac{v+(-25)}{v} f = \frac{v-25}{v} f = \frac{343-25}{343} f = 0.9271 f$

$\therefore$ (b) > (d) > (a) > (c) > (e) //

14. $f' = \frac{v + v_o}{v - v_s} f$, $f = 1000$ Hz, $v_o = -30$ m/s, $v_s = 50$ m/s

$\therefore f' = \frac{343 - 30}{343 - 50} \times 1000 = 1068$ Hz // where speed of sound is 343 m/s

& if you use $v = 331$ m/s $\quad f' = \frac{331 - 30}{331 - 50} \times 1000 = 1071$ Hz //

the closest answer is (d) as well!