TERMS

Be able to define or discuss the following terms with their SI units, if any.

1. Doppler effect
2. shock wave
3. Mach number $\frac{|v_S|}{v}$
4. electromagnetic (em) wave
5. electromagnetic spectrum
6. plane wave
7. polarization
8. linearly-polarized em wave
9. Poynting vector $\vec{S}$
10. radiation pressure p_{rad}

EQUATIONS

Understand the meaning and know the SI units of all the symbols in these equations—and be able to use the equations to solve problems. Realize that c is not just for light, but for all em waves in vacuum.

1. Eq. (16.29), changing "velocity" to "velocity component" twice
2. $\sin \alpha = \frac{v}{|v_S|}$
3. Eq. (32.4) and Eq. (32.18), (and see Skill 7 below)
4. Eq. (32.21) (which includes its special case, Eq. (32.9))
5. Eq. (32.28) (See Skill 8 below.)
6. Eq. (32.29) (See Skill 8 below.)
7. Eqs. (32.32) or (32.33) (total absorption or total reflection)
8. Eq. (32.39) (which includes Eq. (32.38)) (See Skill 7 below.)

SKILLS

Use the material in these sections to be able to:

1. understand when $f_L > f_S$, when $f_L < f_S$, and when $f_L = f_S$ in our Doppler effect problems.
2. first define the positive direction to be from the listener L to the source S and then obtain the correct signs for the velocity components v_L and v_S in Doppler effect problems.
3. describe the classical electromagnetic effect of accelerating a charged object.
4. state the sequence in the electromagnetic spectrum in which we find radio waves, microwaves, infrared, visible light, ultraviolet, x rays, and gamma rays. (Give this sequence from your 3" × 5" card or by memory.)
5. determine the directions of the vectors $\vec{E}$, $\vec{B}$, $\vec{S}$, and $\vec{c}$ (or $\vec{v}$) for a linearly–polarized em wave.
6. use the facts that $\varepsilon \equiv \varepsilon_0$, $K = 1$, $\mu \equiv \mu_0$, $K_m = 1$, and $v \equiv c$ in vacuum; that the values in air are approximately those in vacuum; that $\mu = \mu_0$ and $K_m = 1$ for nonmagnetic materials; and that $\mu \approx \mu_0$ and $K_m \approx 1$ near and above room temperature for diamagnetic and paramagnetic materials.
7. replace c with v in Eqs. (32.4), (32.18), and (32.39) for an em wave in a dielectric.
8. replace μ_0 with μ, ε_0 with ε, and c with v as needed in Eqs. (32.28) and (32.29) for an em wave in a dielectric.

Page 528 and following: Change "velocity" to "velocity component" several times when referring to v_L and v_S (Doppler effect) or understand that "velocity" is short for "velocity component" in these one-dimensional cases.
Page 529, Eq. (16.27): For this case, L to S is to the left and so v_S itself is negative. Thus change both minus signs to plus signs. You could then add ",v_S is negative" and, following Eq. (16.28), ",v_S is positive".
Page 530, Example 16.14, right column, first equation line: Change the two numerators to "$v + v_S$" and "340 m/s + (–30 m/s)".
Page 532, last paragraph: c is the speed of all em waves (including light) in vacuum.
Page 533ff: In discussing shock waves, add absolute value signs to all v_S to distinguish between the velocity component of the source v_S (Doppler effect) and the speed of the source $|v_S|$ (shock waves).
Page 1053, "**visible light**" paragraph: Outside of the 400 to 700 nm range (which is 750 to 430 THz) human sight sensitivity is *very* low.
Page 1068, Example 32.5, EXECUTE, line 1: insert "average" before "power".

Concentration

Concentration is the master art, because all other arts depend on it. – Eastern philosophy