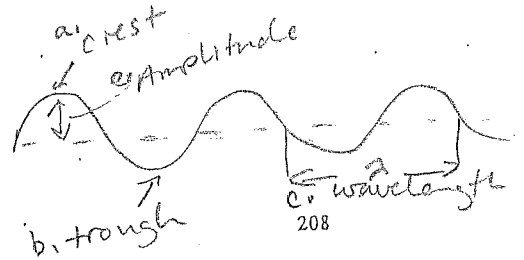


CHAPTER REVIEW QUESTIONS

1. What is the difference between a pulse and periodic waves?

2. Explain, with the help of a sketch, what each of these terms means with respect to waves: (a) crest; (b) trough; (c) wavelength; (d) frequency; (e) amplitude.

3. What is a Hertz?

4. How are frequency and period related?

5. A dog wags its tail 50 times in 20 s. What is (a) the frequency and (b) the period of vibration of the tail?

6. What is the difference between a transverse wave and a longitudinal wave?

7. For any kind of wave motion, how are wave speed, wavelength and frequency related to one another?

8. Alternating current in power lines produces electromagnetic waves of frequency 60 Hz that travel outward at the speed of light, which is 3.0×10^8 m/s. What is the wavelength of these waves?

9. If the speed of sound is 330 m/s, what wavelength does a sound of frequency 512 Hz have?

10. Name at least three properties of light that can be explained adequately with a wave theory.

11. Explain the difference between refraction and diffraction. Give an example of each phenomenon from everyday experience.

12. When waves slow down on entering a new medium, what happens to (a) their wavelength? (b) their frequency? and (c) their direction? Under what conditions will the direction *not* change?

13. What is (a) constructive interference? (b) destructive interference?

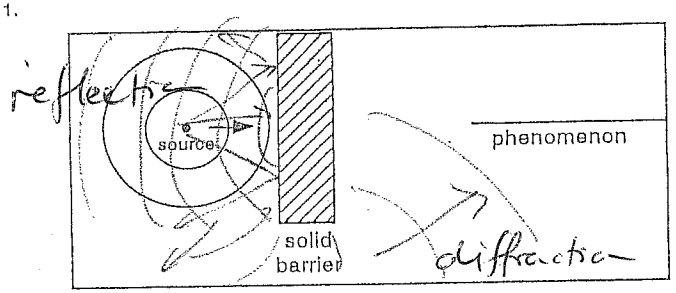
14. In a ripple tank, what causes a nodal line? a maximum?

15. Violet light of a single wavelength is made to pass through a pair of slits spaced 0.100 mm apart. On a film 6.0 m away, there are 10 uniformly spaced bright interference bands in a space of 24 cm. What is the wavelength of the violet light? Express your answer in nanometres.

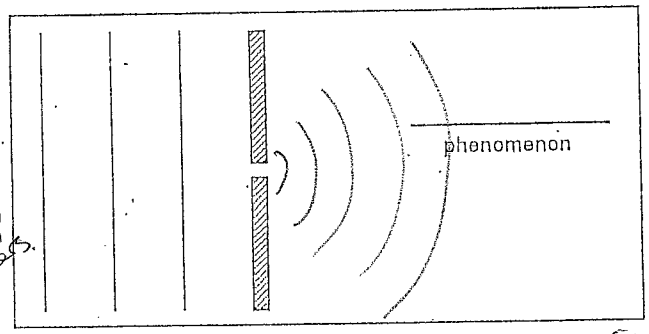
Test Yourself!

(1-2) Please *complete* these diagrams, to show what happens to waves after they encounter the barrier or other obstacle. Also, *name the phenomenon* that occurs in each situation (refraction, diffraction, interference, or reflection).

1.



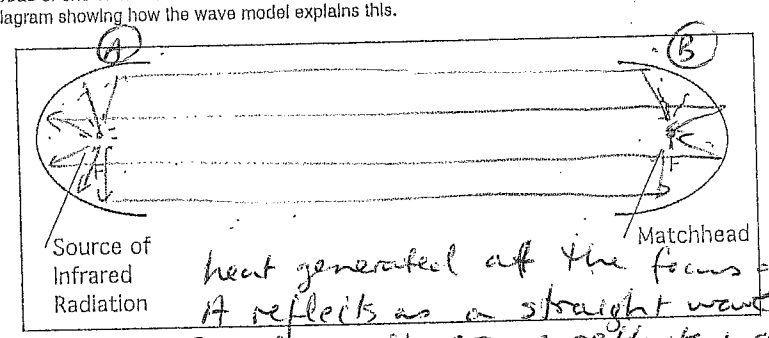
2.



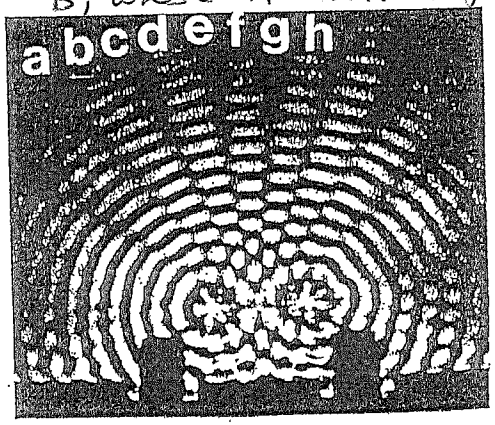
3. An observer counts 36 waves arriving at the shore of a beach, in a time of 3.00 min.
(a) What is the frequency of the waves?
(b) What is the period of the waves?

4. A small spider, which became lost while looking for its web-site, is on the surface of an old phonograph record, which is spinning at 33 rpm (rotations per minute). It is trying to escape by jumping on the needle of the phonograph player. The spider misses the needle on the first try. How long will it have to wait for the next try?

5. The following diagram shows two parabolic reflectors. A small source of infrared heat is placed at the focus of one of the mirrors. Soon after, a match at the focus of the other reflector lights on fire. Draw a diagram showing how the wave model explains this.



heat generated at the focus of A reflects as a straight wave to B, where it reflects + converges as the point f



6. (a) What wave property is illustrated by this photograph of water waves? interference

(b) Imagine the waves were sound waves travelling across an open field from two loudspeakers. What would you hear as you walk across the field from left to right? Be specific about what you would hear at positions a, b, c, d, etc. a - soft (c, e, g) b - loud (c, f, h)

7. At room temperature, sound has a speed of 3.4×10^2 m/s. What is the wavelength of sound from a tuning fork that vibrates at 256 Hz? $\lambda = \frac{v}{f} = \frac{3.4 \times 10^2 \text{ m/s}}{256 \text{ Hz}} = 1.3 \text{ m}$

8. Light travels with a speed of 3.00×10^8 m/s. What is the frequency of red light, if its wavelength is 610 nm. (1 nm = 1 nanometre = 10^{-9} m)

$v = f\lambda$

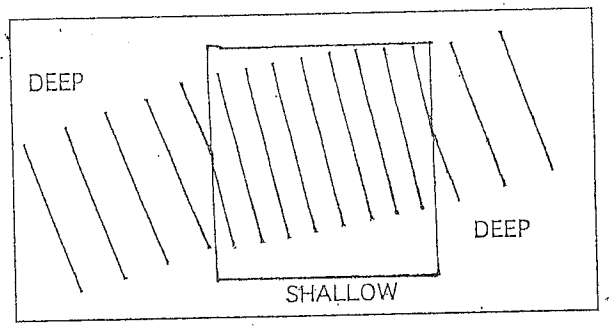
$\therefore f = \frac{v}{\lambda} = \frac{3.00 \times 10^8 \text{ m/s}}{610 \times 10^{-9} \text{ m}} =$

$f = 4.9 \times 10^{14}$ Hz

Multiple Choice Questions

1. If you look at streetlights through a fine mesh curtain, you will see a 'starburst' effect. What phenomenon is involved in this situation?
   A. reflection
   B. refraction
   C. transmission
   D. diffraction

(2-4)



2. The above diagram shows water waves in a wave tank moving from deep water into shallow water, then back into deep water. What property of waves does this model illustrate?
   A. reflection
   B. refraction
   C. diffraction
   D. interference
   E. dispersion

3. What measurable property of the waves does not change as the waves move from one medium into another?
   A. wavelength
   B. frequency
   C. wave speed
   D. direction

4. According to the diagram, what can you conclude happens to the waves when they enter the shallow water?
   A. Wave frequency is reduced by about one half.
   B. Wave frequency is approximately doubled.
   C. Wave speed is approximately doubled.
   D. Wave speed is reduced by about one half.

5. You are leaning against a large, lonely tree in an empty field. You can hear a dog barking on *the other side* of the tree, a hundred metres away. What property of waves makes this possible?
   A. refraction
   B. diffraction
   C. interference
   D. dispersion