

10 (a) Describe how the piezoelectric crystal in a transducer generates ultrasound waves for use in medical diagnosis.

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..... [3]

(b) A parallel ultrasound beam is incident on the boundary between two media, as illustrated in Fig. 10.1.

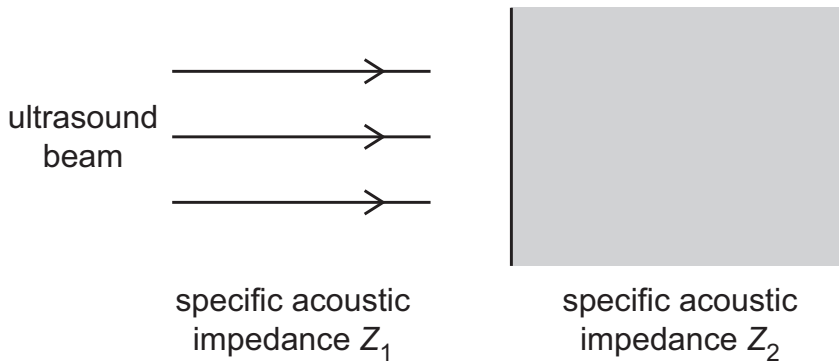


Fig. 10.1

The media have specific acoustic impedances Z_1 and Z_2 .

At the boundary, a fraction α of the incident intensity of the ultrasound beam is reflected. The remainder is transmitted.

(i) State what is meant by specific acoustic impedance.

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(ii) Describe how α depends on the relative values of Z_1 and Z_2 .

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(c) A parallel ultrasound beam of intensity I_0 enters a region of soft tissue. After passing a distance of 2.1 cm through this tissue, the intensity of the ultrasound is $0.62I_0$.

Calculate the linear attenuation coefficient μ of ultrasound in the soft tissue. Give a unit with your answer.

$\mu =$ unit [2]