Name of the Student:_____
Max. Marks : 20 Marks **Time : 20 Minutes**

Mark Schemes

Q1.

(a) two faces of a thin slice of crystal (coated with a thin layer of silver) act as electrodes **(1)**
electrodes connected to high frequency (several MHz) source of e.m.f. **(1)**
as applied e.m.f. alternates it applies alternating (rapidly reversing direction) electric field across the slice of crystal between the electrodes **(1)**
crystal expands and contracts at the same frequency as the applied e.m.f. **(1)**
the vibrations of the faces of the crystal slice produce ultrasound pressure waves **(1)**

max 4

(b) (i) pulse short compared with the transit time **(1)**
pulses are used for timing echoes which give measurements of depth in the body **(1)**
pulse must be short enough to ensure the leading edge returns after the trailing edge departs **(1)**

(ii) behind the crystal a vibration-absorbing backing material is attached **(1)**
this stops the vibrations quickly after the electrical signal is stopped, ensuring that the pulse is short **(1)**

max 3

(c) (i) when there is a large difference in acoustic impedance
[or significant change in density or significant change in elasticity or texture of tissue] **(1)**

(ii) tissue density **(1)**
tissue elasticity / texture **(1)**

(iii) ultrasound is reflected back at boundaries with air
[or replacement of air prevents reflection] (*)
gel between transducer and skin
(prevents loss of signal due to boundary reflection) (*)

acoustically well -matched gel gives good transmission
(with minimum reflection at skin boundary) (*)
(*) any two **(1) (1)**

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[12]

Q2.

A ear drum [or tympanic membrane] **(1)**
transfers sound waves from the outer ear to the ossicles of the middle ear **(1)**

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B ossicles [or bones of the middle ear] **(1)**
system of levers with a mechanical advantage (of 1.5) [or amplification]
[or which links two membranes (ear drum and oval window)
or transmits sound vibrations from outer to inner ear] **(1)**

C windows: oval and round **(1)**
allow sound vibrations to enter the fluid of the inner ear
[or allows sound vibrations to be transmitted around the cochlea
or contain the inner ear's fluid while allowing the fluid to move] **(1)**

D cochlea **(1)**
convert (pressure) waves [or vibrations] in the fluid into electrical signals
[or stimulates (auditory) nerves to send signals to the brain] **(1)**

[8]

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