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

Mark Schemes

Q1.

(a) (i) (use of $\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$ gives) $\frac{1}{f} = \frac{1}{0.25} - \frac{1}{0.60}$ **(1)** (= 2.33)

(use of $P = \frac{1}{f}$ gives) P = (+)2.3 D **(1)**

(ii) $m\left(= \frac{0.60}{0.25}\right)$ = 2.4 **(1)**

3

(b) diagram to show: two correct rays to locate image **(1)**
correct (virtual) image **(1)**
two distances shown **(1)**

3

(c) (i) long sight **(1)**

(ii) aided far point at focal length of lens **(1)**

$f = \frac{1}{2.33}$ = 0.43 m **(1)**

aided near point is 0.25 m **(1)**

4

[10]

Q2.

(a) (i) Z_{air} = 330 × 1.3 = 430 kg m^{-2}s^{-1} **(1)**

(ii) Z_{tissue} = 1540 × 1100 = 1.7 × 10^6 (kg m^{-2}s^{-1}) **(1)**

(iii) (use of $\frac{I_T}{I_i} = \left[\frac{(Z_2 - Z_1)}{(Z_2 + Z_1)}\right]^2$ gives) $\frac{I_T}{I_i} = \left[\frac{1700000 - 430}{1700000+430}\right]^2 = 0.999$ **(1)**

(allow C.E. for values from (i) and (ii))

3

(b) without gel, air between probe and tissue **(1)**
reflects nearly all the ultrasound or very little enters the body **(1)**
with gel air excluded and require I_r = 0 **(1)**

$\therefore Z_{gel} = 1.7 \times 10^6$ or equals that of skin / tissue **(1)**

max 3

(c) (i) transmitter produces <u>short</u> pulses
at internal boundary some reflected, rest transmitted to next boundary
reflected pulse received by probe and signal sent to oscilloscope
oscilloscope sweep started when pulse is first transmitted
(any two) **(1) (1)**

(ii) time taken between pulses from front and back of organ
(from oscilloscope) **(1)**

$$\text{distance} = \text{speed} \times \frac{\text{time}}{2}$$ **(1)**

4

[10]