

Answers for Endoscope - Medical Physics Option

1. (a) *coherent bundle:*
fibres maintained in fixed positions relative to each other (1)
non-coherent bundle:
fibres have no fixed relative positions (1) 2
- (b) coherent bundles of fibres transmit images (of internal organs of the body) (1)
non-coherent bundles transmit (or conduct) light
(to inside the human body for illumination) (1) 2
- (c) (i) high resolution [or fine detail can be seen] (*)
very flexible bundle (*)
finer fibres allow bending round tighter curves without escape of light (*)
(*) any two (1)(1)
- (ii) so that scratches on the outer surface do not allow light to escape (1)
so that close contact between adjacent fibres
[or liquid penetrating between fibres]
does not allow light to pass from one fibre to
another to ensure that image is not confused
(*alternatives* :corrupted, scrambled) as a result of
light passing between individual fibres
[or to prevent (mechanical) damage to surface of core e.g scratches] (1) 4
- [8]**
2. (a) $\frac{\sin i}{\sin r} = \frac{\sin C}{l} \quad (1) = \frac{1.40}{1.55} = 0.903 \quad (1)$
angle $C = 64.6^\circ \quad (1)$ 3
- (b) on outer edge only of core (1)
two to four reflections (1)
[no marks for zig-zag] 2
- (c) (i) smaller difference between the core index and cladding index makes critical angle
larger (1)
therefore increases the chance of light escaping (1)
- (ii) makes internal angle of incidence at core-cladding interface
more likely to be less than the critical angle (1)
therefore increases the chance of light escaping (1) max 3
- [8]**
3. (i) coherent: fibres maintain positions at both ends (1)
non-coherent: fibres have random positions (1)
- (ii) carry images (1)
carry light into the body (1)
- (iii) more flexible (1)
image has better definition (1) 6
- [6]**

