| Question             | Answer  | Notes   | Marks |
|----------------------|---|---|-------|
| number<br>10 (a) (i) | n =1/sin(c);  | accept any rearrangement or word equation                               | 1     |
| (ii)                 | substitution;<br>evaluation;  |   | 2     |
|                      | e.g.<br>n = 1/sin(26)<br>n = 2.3                                    | allow 2.28  |       |
| (iii)                | correct TIR at first boundary; refraction at boundary at 7 o'clock; | allow ECF for incorrect<br>TIR and correct<br>subsequent<br>boundaries. | 3     |
|                      | refraction away from the normal at exit point;                      |   |       |

| (b) (i) | any FOUR from:   |  | 4 |
|---------|--|--|---|
| (8)     | MP1 any method of recording an incident ray;   | accept marks on a clear, labelled diagram  | · |
|         | MP2 any method of recording a refracted ray;   |  |   |
|         | MP3 range of angle of incidences;  |  |   |
|         | MP4 normal lines drawn;  |  |   |
|         | MP5 angles measured using a protractor;  |  |   |
| (ii)    | axes labelled;<br>appropriate scale with data enclosed by 3 x 3 grid<br>or larger;<br>points plotted correctly within ½ a square;                      |  | 3 |
| (iii)   | best fit straight line drawn with ruler;   | judge by eye   | 1 |
| (iv)    | evidence of gradient triangle used; evaluation of 1.6;   | accept markings on graph or evidence of a gradient calculation. accept answer in range | 2 |
|         |  | 1.55 - 1.65 consistent<br>with candidate's LoBF<br>allow ecf from<br>candidate's LoBF  |   |
|         | Sin i  0.9  0.9  0.9  0.6  0.5  0.7  0.3  0.2  0.1  0.1  0.2  0.3  0.4  0.5  0.5  0.5  0.5  0.5  0.7  0.7  0.8  0.9  0.9  0.9  0.1  0.1  0.1  0.1  0.1 |  |   |

Total for Question 10 = 16 marks