

Question number	Answer	Notes	Marks
1	north; steel; hard; north; soft;	this order only	5

Total for Question 1 = 5 marks

Question number	Answer	Notes	Marks
5 (a) (i)	B, D, F;	all required for the mark reject if additional sections listed	1
(ii)	<p>use of speed = distance / time;</p> <p>correctly read time or distance from graph; conversion from minutes to seconds or km to m; correct evaluation;</p> <p>e.g. $v = s / t$ distance = 2.6 km or time = 2 minutes distance = 2600 m or time = 120 s (v =) 22 (m/s)</p>	<p>seen anywhere allow symbols allow attempt to find gradient of line</p> <p>allow $s = d / t$</p> <p>allow 21.7, 21.6... (m/s) 0.0216..., 1300 = 3 marks 1.3 = 2 marks</p>	4
(iii)	idea that speed of bus is greater in section A; (because) line is steeper / gradient is larger / eq;		2
(b)	<p>single horizontal line drawn;</p> <p>horizontal line drawn at 0.5 km/minute for some period of time in journey;</p>	<p>judge by eye line must extend the entire length of the time axis</p>	2

Total for Question 5 = 9 marks

Question number	Answer	Notes	Marks
10 (a) (i)	light {refracts, bends, changes direction, changes speed, changes wavelength} = 1 mark; light {refracts/bends towards normal, slows down, wavelength decreases} = 2 marks;;		2
(ii)	normal;		1
(iii)	$\sin(c) = 1/n$;	allow in words and rearrangements	1
(iv)	substitution; rearrangement; evaluation; e.g. $\sin(c) = 1/1.6$ $(c =) \sin^{-1}(0.625)$ $(c =) 39 (^{\circ})$	allow 38.68...	3
(v)	TIR at the glass/air boundary; angle of incidence = angle of reflection;	allow ecf from (iv) that would suggest refraction e.g. if answer to (iv) is greater than 50° judge by eye	2
(b)	light ray is refracted out into the air; refracting away from the normal;	ray does not need to show deviation reject if ray emerges to the left of the normal	2

Total for Question 10 = 11 marks