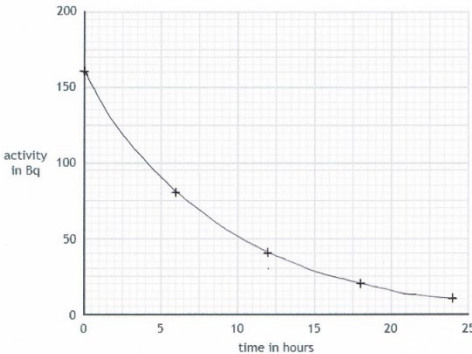


Question number	Answer	Notes	Marks
10 (a) (i)	light {refracts, bends, changes direction, changes speed, changes wavelength} = 1 mark; light {refracts/bends towards normal, slows down, wavelength decreases} = 2 marks;;		2
(ii)	normal;		1
(iii)	$\sin(c) = 1/n$;	allow in words and rearrangements	1
(iv)	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

Question number	Answer	Notes	Marks
11 (a)	<p>activity shown to decrease over time; descending curve getting shallower starting at (0,160); line passes through two other valid points;</p> <ul style="list-style-type: none"> • (6,80) • (12,40) • (18,20) • (24,10) 		3
(b) (i)	idea that it decays very quickly / activity will be zero by the time it is injected / there will be no technetium-99m left;	ignore 'it has a short half-life'	1
(ii)	<p>any one from:</p> <ul style="list-style-type: none"> • idea that gamma can penetrate out of the body; • idea that gamma can be detected outside the body; <p>any one from:</p> <ul style="list-style-type: none"> • idea that half-life is long enough to complete the procedure; • idea that activity will fall to safe level in a day / quickly; 	<p>marks must be from separate lists</p> <p>allow idea that technetium will not be in body for very long</p>	2
(c)	<p>harmful effect of gamma radiation given;</p> <p>idea that patient will have procedure very rarely / only when necessary (so risk is low);</p> <p>idea that doctor will administer procedure regularly (so risk is higher) / doctor limits time exposure to patient (to reduce risk);</p>	<p>e.g.</p> <ul style="list-style-type: none"> • cancer • cell damage • cell mutation <p>allow suggestion that risk to patients is higher as they receive greater dose</p> <p>allow idea that doctor increases distance from patient (to reduce risk)</p>	3

Total for Question 11 = 9 marks