Qu 5	Scheme	Marks	AO
(a)	{Let X = time spent, P($X > 15$) = } 0.105649… awrt **0.106**	B1 **(1)**	1.1b
(b)	$H_0 : \mu = 10$ $H_1 : \mu > 10$	B1	2.5
	$\bar{X} \sim N\left(10, \left(\frac{4}{\sqrt{20}}\right)^2\right)$; $P(\bar{X} > 11.5)$ = 0.046766… [Condone 0.9532…]	M1;A1	3.3;3.4
	[This is significant (< 5%) so] there is evidence to support the complaint	A1 **(4)**	2.2b
(c)(i)	[P($T < 2$) =] 0.1956… awrt **0.196**	B1 **(1)**	1.1b
(ii)	Require $\frac{P(0 < T < 2)}{P(T > 0)} = \frac{0.119119...}{0.923436...}$; = 0.1289955… awrt **0.129**	M1 A1;A1 **(3)**	3.4 1.1bx2
(iii)	The current model suggests **non-negligible** probability of T values < 0 which is impossible	B1 **(1)**	3.5b
(d)	Require t such that P($T > t \mid T > 2$) = 0.5 or P($T < t \mid T > 2$) = 0.5	M1	3.1b
	e.g. $\frac{P(T > t)}{P(T > 2)} = 0.5$; so P($T > t$) = 0.5×[1 – (c)(i)] or P($T > t$) = 0.5×0.8043..	M1; A1ft	1.1b 3.4
	[i.e. P($T > t$) = 0.40… implies] $\frac{t-5}{3.5} = 0.2533$ or P($T < t$) = "0.5978.."	M1	1.1b
	t = 5.886… or from calculator 5.867… so awrt **5.9**	A1 **(5)**	1.1b
		(15 marks)	

	Notes
(a)	B1 for awrt 0.106 (from calculator) [Allow 10.6%]
(b)	B1 for both hypotheses correct in terms of μ. M1 for selection of a correct model (sight or use of correct normal- may not have label $\bar{X}$) 1st A1 for use of this model to get probability allow 0.046~0.047 [Condone awrt 0.953]
ALT	**OR** test statistic z = 1.677… (awrt 1.68) and cv of 1.64 (or better) **or** CR $\bar{X}$ > 11.47..
	2nd A1 (dep on 1st A1 or at least $P(\bar{X} > 11.5) < 0.05$ (o.e.))
	for a correct conclusion in context -must mention **complaint**/claim or **time**/mins is > 10
SC	**(M0 for $\bar{X}$ ~N(11.5, …)** for correct probability **and** conclusion (score M0A0A1 on epen)
(c)(i)	B1 for awrt 0.196 (from calculator) [Allow 19.6%]
(ii)	M1 for a correct probability ratio expression (may be implied by 1st A1 scored) 1st A1 for a correct ratio of probabilities (both correct or truncated to 2 dp) 2nd A1 for awrt 0.129
(iii)	B1 for a suitable explanation of why model is not suitable based on negative T values Must say that a **significant** proportion of values < 0 (o.e.) e.g. P($T > 0$) should be **closer** to 1 or Difference between P($T < 2 \mid T > 0$) and P($T < 2$) is **too big** (o.e.)
(d)	1st M1 for a correct conditional probability statement to start the problem or 0.5×P($T > 2$) 2nd M1 for correct ratio of probability expressions [Must have P($T > t$) or P($2 < T < t$)] 1st A1ft for a correct equation for P($T > t$) (o.e.) ft their answer to part (c)[May be in a diagram] 3rd M1 for attempt to find t (standardising and sight of 0.2533) or prepare to use calc (ft) Arriving at P($T <$ median) = 1 – 0.5×"their 0.8043" will score 1st 4 marks 2nd A1 for awrt 5.9 Sight of awrt 5.9 and at least one M mark scores 5/5 [Answer only send to review]