2 (a) A car approaches traffic lights.
   The traffic lights turn to red so the car has to stop.

   Which of the following factors affects the thinking distance when the car has to stop?
   (1)

   ☒ **A** condition of the road

   ☒ **B** mass of the car

   ☒ **C** reaction time

   ☒ **D** worn brakes

   (b) Figure 3 shows how the thinking distance and braking distance change
   depending on the speed of a car.

speed in km / h	speed in m / s	thinking distance in m	braking distance in m	stopping distance in m
50	14	21	21	42
60	17	25	31	56
70		29	42	71
80	22	33	55	88
90	25	37	85	107
100	28	42	85	127

Figure 3

   (i) Fill in the gap in the table.
   (1)

   (ii) A student studies these results and writes the conclusion:

   'The thinking distance is proportional to the speed of the car'.

   Comment on the student's conclusion.
   (3)

....

....

....

....

....

(c) (i) The car is moving at 90 km/h when the driver has to stop.
Calculate the thinking time of the driver.

Using the equation:

time = distance ÷ average speed

(2)

thinking time = ... s

(ii) A car has a mass of 1300 kg.

Calculate the kinetic energy of the car when it is travelling at 20 m/s.

(2)

kinetic energy = ... J

(Total for Question 2 = 9 marks)

Question number	Answer	Mark
2(a)	C reaction time	(1)

Question number	Answer	Mark
2(b)(i)	any value from 19 to 20 inclusive.	(1)

Question number	Answer	Additional guidance	Mark
2 (b)(ii)	An explanation that combines identification via a judgment (2 marks) to reach a conclusion via justification/reasoning (1 mark): • Idea that (approximately) equal incremental increases in speed cause equal incremental increases in thinking distance • correct reference to figures in table **and** • therefore the student's conclusion is correct	The last marking point can only be achieved if at least one of the other two marks is awarded	(3)

Question number	Answer	Additional guidance	Mark
2(c) (i)	substitution Time = 37/ 25 (1) Evaluation (1) = 1.5 (s)	Allow 1.48 (s) full marks will be awarded for correct numerical answer without working	(2)

Question number	Answer	Additional guidance	Mark
2(c) (ii)	substitution K.E. = 0.5 x 1300 x 20^2 (1) evaluation (1) = 260,000 J	260 kJ full marks will be awarded for correct numerical answer without working	(2)

Total for question 2 = 9 marks