1. **(a)** A car is travelling at a uniform speed of 14 m s^{-1} when the driver notices a traffic light turning red 98 m ahead.

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Find the minimum constant deceleration required to stop the car at the traffic light,

(i) if the driver immediately applies the brake

(ii) if the driver hesitates for 1 second before applying the brake.

(i)
$$v^2 = u^2 + 2fs$$
$$0 = 14^2 + 2f(98)$$
$$196f = -196$$
$$\Rightarrow f = -1 \text{ m s}^{-2}$$

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(ii)
$$s = ut + \tfrac{1}{2}ft^2$$
$$s = 14(1) + 0$$
$$s = 14$$

5

$$v^2 = u^2 + 2fs$$
$$0 = 14^2 + 2f(98 - 14)$$
$$0 = 14^2 + 168f$$

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$$f = \frac{-196}{168}$$
$$= -\frac{7}{6} \text{ or } -1.17 \text{ m s}^{-2}$$

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