

- 2 (a) The distance  $s$  moved by an object in time  $t$  may be given by the expression

$$s = \frac{1}{2}at^2$$

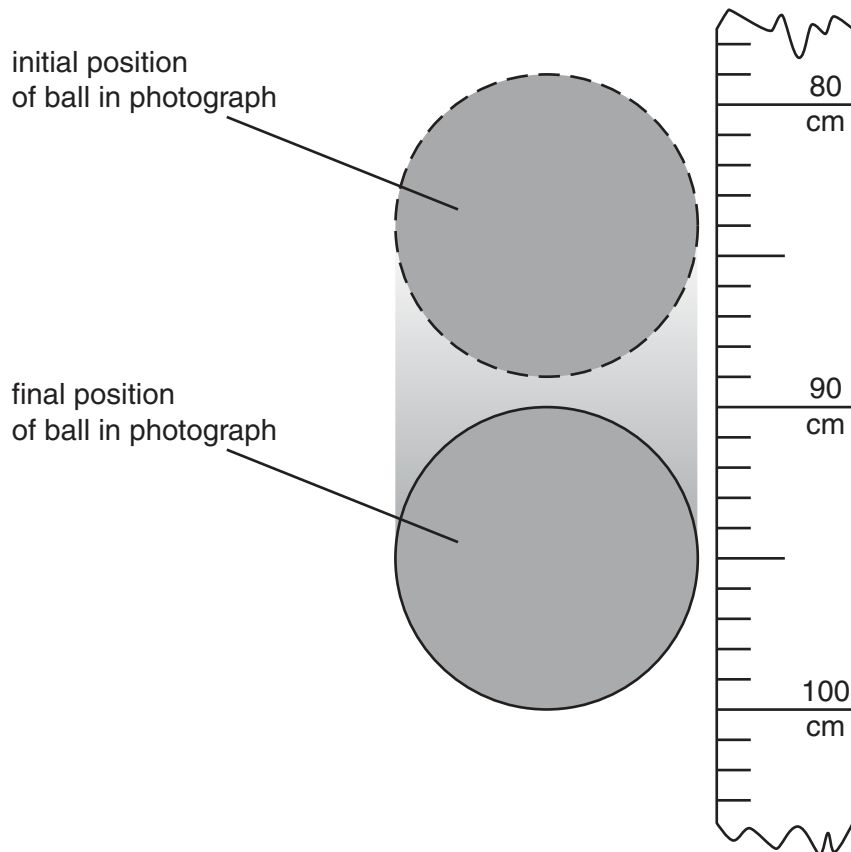
where  $a$  is the acceleration of the object.

State two conditions for this expression to apply to the motion of the object.

1. ....
2. ....

[2]

- (b) A student takes a photograph of a steel ball of radius 5.0 cm as it falls from rest. The image of the ball is blurred, as illustrated in Fig. 2.1. The image is blurred because the ball is moving while the photograph is being taken.



**Fig. 2.1**

The scale shows the distance fallen from rest by the ball. At time  $t = 0$ , the top of the ball is level with the zero mark on the scale. Air resistance is negligible.

Calculate, to an appropriate number of significant figures,

- (i) the time the ball falls before the photograph is taken,

time = ..... s [3]

- (ii) the time interval during which the photograph is taken.

time interval = ..... s [3]

- (c) The student in (b) takes a second photograph starting at the same position on the scale. The ball has the same radius but is less dense, so that air resistance is not negligible.

State and explain the changes that will occur in the photograph.

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..... [2]