

12. A company makes drinks containers out of metal.

The containers are modelled as closed cylinders with base radius  $r$  cm and height  $h$  cm and the capacity of each container is  $355 \text{ cm}^3$

The metal used

- for the circular base and the curved side costs  $0.04 \text{ pence/cm}^2$
- for the circular top costs  $0.09 \text{ pence/cm}^2$

Both metals used are of negligible thickness.

(a) Show that the total cost,  $C$  pence, of the metal for one container is given by

$$C = 0.13\pi r^2 + \frac{28.4}{r} \quad (4)$$

(b) Use calculus to find the value of  $r$  for which  $C$  is a minimum, giving your answer to 3 significant figures. (4)

(c) Using  $\frac{d^2C}{dr^2}$  prove that the cost is minimised for the value of  $r$  found in part (b). (2)

(d) Hence find the minimum value of  $C$ , giving your answer to the nearest integer. (2)