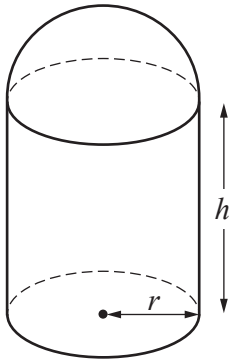
**8** In this question all lengths are in centimetres.

The volume of a cylinder with radius $r$ and height $h$ is $\pi r^2 h$ and its curved surface area is $2\pi rh$.
The volume of a sphere with radius $r$ is $\frac{4}{3}\pi r^3$ and its surface area is $4\pi r^2$.




The diagram shows a solid object in the shape of a cylinder of base radius $r$ and height $h$, with a hemisphere of radius $r$ on top. The total surface area of the object is $300\,\text{cm}^2$.

**(a)** Find an expression for $h$ in terms of $r$. [2]

**(b)** Show that the volume, $V$, of the object is $150r - \frac{5}{6}\pi r^3$. [3]

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**(c)** Find the maximum volume of the object as $r$ varies. [5]