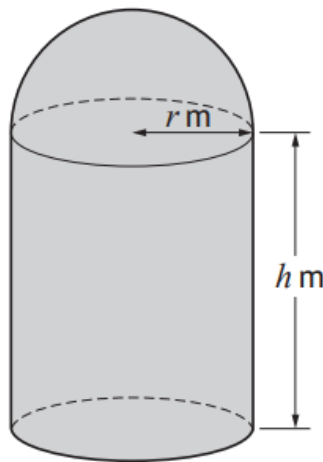A design for a new grain container is in the shape of a cylinder with a hemispherical roof and a flat circular base. The radius of the cylinder is r metres, and the height is h metres.

The volume of the **cylindrical** part of the container needs to be 100 cubic metres.

(a) Given that the curved surface area of a hemisphere of radius r is $2\pi r^2$ show that the surface area of metal needed to build the grain container is given by:

$$A = \frac{200}{r} + 3\pi r^2 \text{ square metres}$$ **3**

(b) Determine the value of r which minimises the amount of metal needed to build the container. **6**

Answers:

(a) Use volume = 100 to obtain an expression for h in terms of r. Substitute and simplify.

(b) $r \approx 2 \cdot 20$