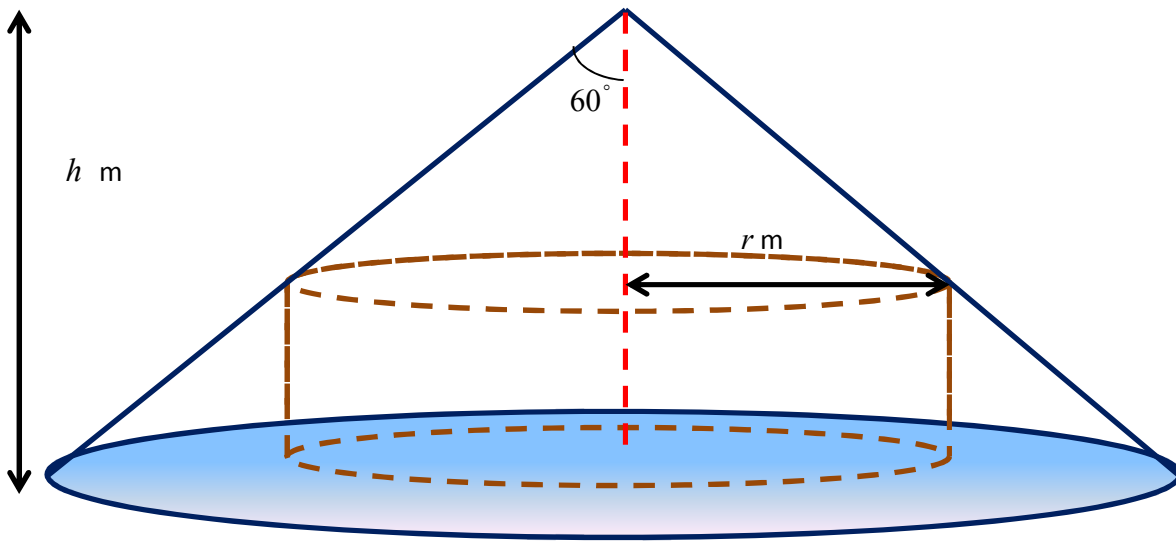
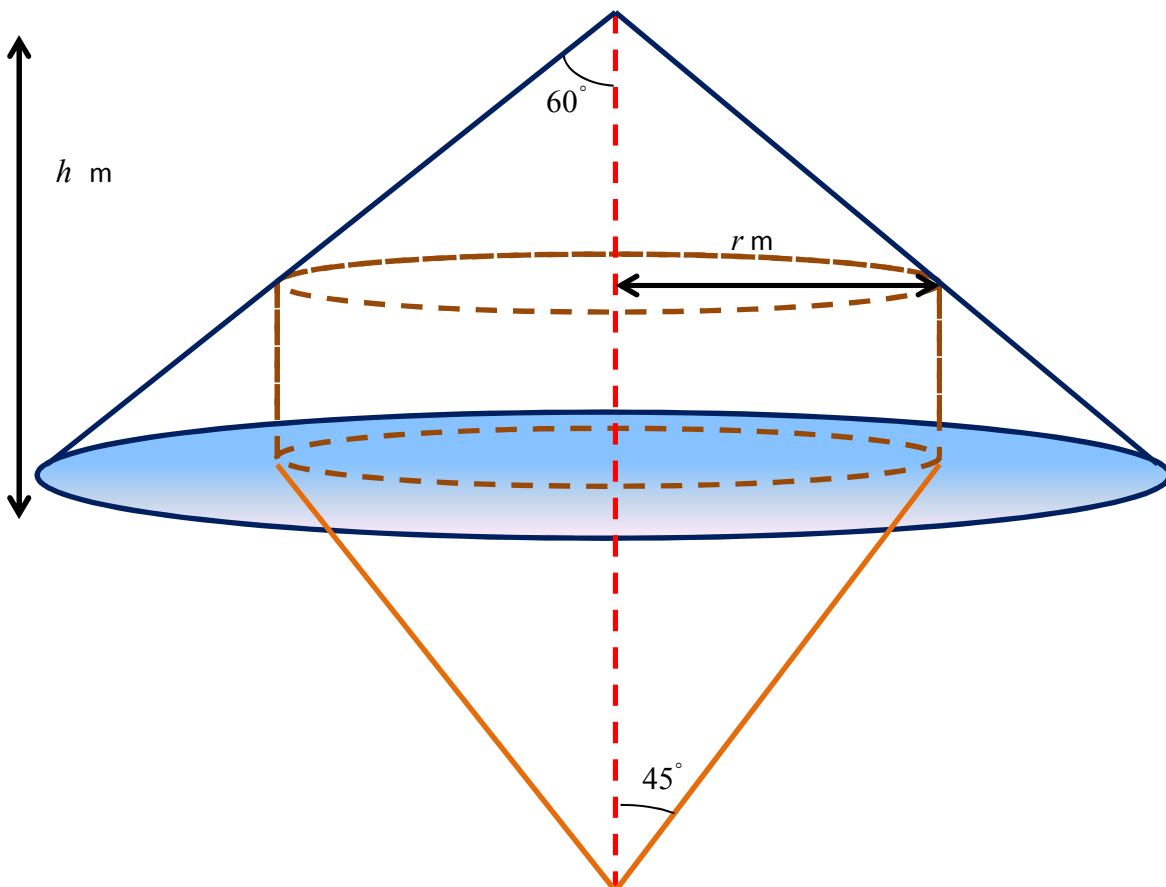


## Extreme Problem 7



A right circular cone-shaped structure of fixed height  $h$  m and semi-vertical angle of  $60^\circ$  is erected on flat ground. A cylindrical tank of radius  $r$  m, which is fully filled with test liquid chemical, is inscribed inside the cone.

(i) Find, in terms of  $h$ , the value of  $r$  when the cylindrical tank has a maximum volume.



If a crack is discovered at the centre of the base of the cylindrical tank and the liquid chemical is leaking into the inverted cone at a rate of  $0.3 \text{ m}^3 / \text{min}$ ,

(ii) find the exact rate of change of **the lateral surface area** of the liquid chemical in the inverted cone half an hour later after the leaking starts.