

10

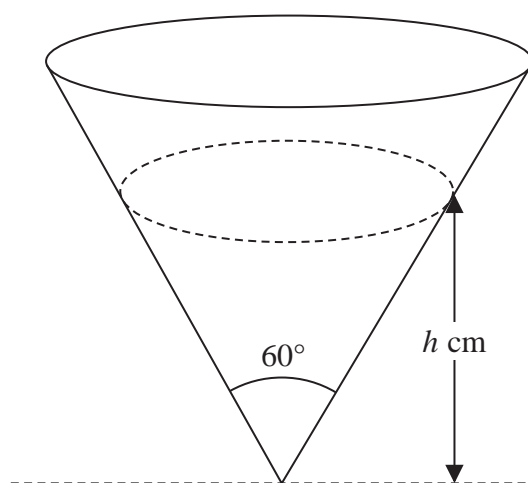
Diagram **NOT**  
accurately drawn

Figure 1

A conical container is fixed with its axis of symmetry vertical. Oil is dripping into the container at a constant rate of  $0.4 \text{ cm}^3/\text{s}$ . At time  $t$  seconds after the oil starts to drip into the container, the depth of the oil is  $h$  cm. The vertical angle of the container is  $60^\circ$ , as shown in Figure 1

When  $t = 0$  the container is empty.

(a) Show that  $h^3 = \frac{18t}{5\pi}$  (4)

Given that the area of the top surface of the oil is  $A \text{ cm}^2$

(b) show that  $\frac{dA}{dt} = \frac{4}{5h}$  (6)

(c) Find, in  $\text{cm}^2/\text{s}$  to 3 significant figures, the rate of change of the area of the top surface of the oil when  $t = 10$  (2)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



**Question 10 continued**

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



P 4 6 9 0 2 A 0 3 1 3 2

**Question 10 continued**

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

---

**(Total for Question 10 is 12 marks)**

---

**TOTAL FOR PAPER IS 100 MARKS**