

'Storing Sequestrates'

$$\text{a) Volume of tank} = \text{Volume of cylinder} + \text{volume of hemisphere} = \pi r^2 h + \frac{1}{2} \times \frac{4}{3} \pi r^3$$

$$\text{Surface Area} = 2\pi r h + \pi r^2 + \frac{1}{2} \times 4\pi r^2$$

$$h = \frac{6 \frac{2}{3} \pi r^3}{\pi r^2}$$

$$\text{S. A.} = 2\pi r \times \frac{6 \frac{2}{3} \pi r^3}{\pi r^2} + \pi r^2 + 2\pi r^2$$

$$\text{S. A.} = \frac{12}{r} + \frac{5}{3} \pi r^2 \quad (\text{as needed})$$

[4 marks]

$$\text{b) } S = \frac{12}{r} + \frac{5}{3} \pi r^2$$

$$\frac{dS}{dr} = \frac{10}{3} \pi r - \frac{12}{r^2} \quad (= 0)$$

$$\frac{12}{r^2} = \frac{10}{3} \pi r$$

$$\frac{18}{5\pi} = r^3$$

$$r = \sqrt[3]{\frac{18}{5\pi}}$$

[4 marks]

$$\text{c) } S = \frac{12}{r} + \frac{5}{3} \pi r^2$$

$$S = \frac{12}{\sqrt[3]{\frac{18}{5\pi}}} + \frac{5}{3} \pi \left(\sqrt[3]{\frac{18}{5\pi}} \right)^2$$

$$S = 17 \text{ m}^2 \quad (\text{nearest integer})$$

[2 marks]