

7. The volume of ice is given by the product of the semicircular surface area and the thickness. The semicircle area is $A = \pi r^2/2$, where r is the radius. Therefore, the volume is

$$V = \frac{\pi}{2} r^2 z$$

where z is the ice thickness. Since there are 10^3 m in 1 km and 10^2 cm in 1 m, we have

$$r = (2000 \text{ km}) \left(\frac{10^3 \text{ m}}{1 \text{ km}} \right) \left(\frac{10^2 \text{ cm}}{1 \text{ m}} \right) = 2000 \times 10^5 \text{ cm} .$$

In these units, the thickness becomes

$$z = (3000 \text{ m}) \left(\frac{10^2 \text{ cm}}{1 \text{ m}} \right) = 3000 \times 10^2 \text{ cm} .$$

Therefore,

$$V = \frac{\pi}{2} (2000 \times 10^5 \text{ cm})^2 (3000 \times 10^2 \text{ cm}) = 1.9 \times 10^{22} \text{ cm}^3 .$$