

A cube of ice melts without changing its shape at the uniform rate of $4 \text{ cm}^3/\text{min}$. The rate of change of the surface area of the cube, in cm^2/min , when the volume of the cube is 125 cm^3 , is

a. -4

b. $-16/5$

c. $-16/6$

d. $-8/15$

b. $\frac{dV}{dt} = -4 \text{ cm}^3/\text{min}; \frac{dS}{dt} = ?$ when $V = 125 \text{ cm}^3$

$$V = x^3; S = 6x^2$$

$$\therefore \frac{dV}{dt} = 3x^2 \frac{dx}{dt}$$

$$\text{or } -4 = 3x^2 \frac{dx}{dt}$$

$$\text{Also, } \frac{dS}{dt} = 12x \frac{dx}{dt} = -\frac{16}{x}$$

$$\text{When } V = 125 = x^3, x = 5$$

$$\text{or } \left(\frac{dS}{dt} \right)_{x=5} = -\frac{16}{5} \text{ cm}^2/\text{min}$$