A spherical balloon is being inflated at the rate of 35cc/min. The rate of increase in the surface area (in cm^2/min.) of the balloon when its diameter is 14 cm, is :

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(a) 10

(b) $\sqrt{10}$

(c) 100

(d) $10\sqrt{10}$

(a) Volume of sphere $V = \frac{4}{3}\pi r^3$

$$\frac{dV}{dt} = \frac{4}{3} . \pi . 3r^2 . \frac{dr}{dt}$$

$$35 = 4\pi r^2 . \frac{dr}{dt} \text{ or } \frac{dr}{dt} = \frac{35}{4\pi r^2} \quad ...(i)$$

Surface area of sphere = $S = 4\pi r^2$

$$\frac{dS}{dt} = 4\pi \times 2r \times \frac{dr}{dt} = 8\pi r . \frac{dr}{dt}$$

$$\frac{dS}{dt} = \frac{70}{r} \quad \text{(By using (i))}$$

Now, diameter = 14 cm, $r = 7$

$$\therefore \quad \frac{dS}{dt} = 10$$