Rearranging Formulae

Sphere Vol $V = \frac{4}{3}\pi r^3$

$$3V = 4\pi r^3$$

$$\frac{3V}{4\pi} = r^3$$

$$\sqrt[3]{\frac{3V}{4\pi}} = r$$

Using this formula

A cylinder with radius 12cm and height 30cm is made out of solid metal. It is melted down and the liquid metal is used to make a solid sphere. What is the radius of the sphere

Vol of cylinder $= \pi r^2 h$

$$= \pi \times 12^2 \times 30$$

$$= 4320\pi$$

If this becomes volume of sphere

$$R = \sqrt[3]{\frac{3V}{4\pi}} = \sqrt[3]{\frac{3 \times 4320\cancel{\pi}}{4\cancel{\pi}}}$$

$$= \sqrt[3]{3240} = 14.8 \text{ cm}$$

Similar Question

A solid metal cylinder of radius 10 cm and height 35 cm is melted down and used to form spheres of radius 3 cm. How many spheres are made.

Vol of cylinder $= \pi r^2 h$

$= \pi \times 10^2 \times 35$

$= 3500\pi \text{ cm}^3$

Vol of a sphere $= \frac{4}{3}\pi R^3$

$= \frac{4}{3}\pi \times 3^3$

$= 36\pi \text{ cm}^3$

Number of spheres $= \frac{3500\cancel{\pi}}{36\cancel{\pi}} = 97.2$

so 97 small spheres

Sphere - Volume and Surface Area

For a sphere with radius r

Volume $= \frac{4}{3}\pi r^3$ Surface Area $= 4\pi r^2$

(Given on exam paper)

Exercise 4H

1c) Sphere diameter 20cm so radius 10cm

$$V = \frac{4}{3}\pi r^3 = \frac{4}{3}\pi \times 10^3 = \frac{4000\pi}{3} \text{ cm}^3$$

2c) Sphere diameter 14cm so radius 7cm

$$\text{Surface Area} = 4\pi r^2 = 4 \times \pi \times 7^2 = 196\pi \text{ cm}^2$$

Exercise

1a) Sphere radius 3cm

$$\text{Vol} = \frac{4}{3}\pi r^3$$

$$= \frac{4}{3}\pi \times 3^3 = 36\pi \text{ cm}^3$$

2a) Sphere radius 3cm

$$A = 4\pi r^2$$

$$= 4\pi \times 3^2 = 36\pi \text{ cm}^2$$

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3) Sphere diameter 50cm $\Rightarrow$ radius 25cm

$$V = \frac{4}{3}\pi r^3$$

$$= \frac{4}{3}\pi \times 25^3$$

$$= 65450 \text{ cm}^3$$

$$\text{Surface Area} = 4\pi r^2$$

$$= 4\pi \times 25^2$$

$$= 7854 \text{ cm}^2$$
