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1. Find the volume of a sphere whose radius is
(i) 7 cm (ii) 0.63 m
(Assume π =22/7)

Solution:

(i) Radius of sphere, r = 7 cm
Using, Volume of sphere = (4/3) πr^3
= (4/3)×(22/7)×7^3
= 4312/3
Hence, volume of the sphere is 4312/3 cm^3

(ii) Radius of sphere, r = 0.63 m
Using, volume of sphere = (4/3) πr^3
= (4/3)×(22/7)×0.63^3
= 1.0478
Hence, volume of the sphere is 1.05 m^3 (approx).

2. Find the amount of water displaced by a solid spherical ball of diameter
(i) 28 cm (ii) 0.21 m
(Assume π =22/7)

Solution:

(i) Diameter = 28 cm
Radius, r = 28/2 cm = 14cm
Volume of the solid spherical ball = (4/3) πr^3
Volume of the ball = (4/3)×(22/7)×14^3 = 34496/3
Hence, volume of the ball is 34496/3 cm^3

(ii) Diameter = 0.21 m
Radius of the ball =0.21/2 m= 0.105 m
Volume of the ball = (4/3)πr^3
Volume of the ball = (4/3)× (22/7)×0.105^3 m^3
Hence, volume of the ball = 0.004851 m^3

3.The diameter of a metallic ball is 4.2cm. What is the mass of the ball, if the density of the metal is 8.9 g per cm^3? (Assume π=22/7)

Solution:

Given,
Diameter of a metallic ball = 4.2 cm
Radius(r) of the metallic ball, r = 4.2/2 cm = 2.1 cm
Volume formula = 4/3 πr^3
Volume of the metallic ball = (4/3)×(22/7)×2.1 cm^3
Volume of the metallic ball = 38.808 cm^3

Now, using relationship between, density, mass and volume,
Density = Mass/Volume
Mass = Density × volume
= (8.9×38.808) g
= 345.3912 g
Mass of the ball is 345.39 g (approx).

4. The diameter of the moon is approximately one-fourth of the diameter of the earth. What fraction of the volume of the earth is the volume of the moon?

Solution:

Let the diameter of earth be "d". Therefore, the radius of earth will be will be d/2
Diameter of moon will be d/4 and the radius of moon will be d/8

Find the volume of the moon :
Volume of the moon = (4/3) πr^3 = (4/3) π $(d/8)^3$ = 4/3π(d^3/512)

Find the volume of the earth :

Volume of the earth = (4/3) πr^3= (4/3) π $(d/2)^3$ = 4/3π(d^3/8)

Fraction of the volume of the earth is the volume of the moon

$$\text{Volume of the moon/ volume of the earth} = \frac{\frac{4}{3}\pi(\frac{d^3}{512})}{\frac{4}{3}\pi(\frac{d^3}{8})} = 8/512 = 1/64$$

Answer: Volume of moon is of the 1/64 volume of earth.

5. How many litres of milk can a hemispherical bowl of diameter 10.5cm hold? (Assume π = 22/7)

Solution:

Diameter of hemispherical bowl = 10.5 cm
Radius of hemispherical bowl, r = 10.5/2 cm = 5.25 cm
Formula for volume of the hemispherical bowl = (2/3) πr^3

Volume of the hemispherical bowl = (2/3)×(22/7)×5.25^3 = 303.1875
Volume of the hemispherical bowl is 303.1875 cm^3

Capacity of the bowl = (303.1875)/1000 L = 0.303 litres(approx.)
Therefore, hemispherical bowl can hold 0.303 litres of milk.

6. A hemi spherical tank is made up of an iron sheet 1cm thick. If the inner radius is 1 m, then find the volume of the iron used to make the tank. (Assume $\pi = 22/7$)

Solution:

Inner Radius of the tank, (r) = 1m
Outer Radius (R) = 1.01m

Volume of the iron used in the tank = (2/3) $\pi(R^3 - r^3)$
Put values,
Volume of the iron used in the hemispherical tank = (2/3)×(22/7)×$(1.01^3 - 1^3)$ = 0.06348
So, volume of the iron used in the hemispherical tank is 0.06348 m^3.

7. Find the volume of a sphere whose surface area is 154 cm^2. (Assume $\pi = 22/7$)

Solution:

Let r be the radius of a sphere.
Surface area of sphere = $4\pi r^2$
$4\pi r^2$ = 154 cm^2 (given)
r^2 = (154×7)/(4 ×22)
r = 7/2
Radius is 7/2 cm
Now,
Volume of the sphere = (4/3) πr^3

$$\text{Volume of the sphere} = (4/3)\times(22/7)\times(7/2)^3 = 179\frac{2}{3}$$

$$\text{Volume of the sphere is } 179\frac{2}{3}\ cm^3$$

8. A dome of a building is in the form of a hemi sphere. From inside, it was white-washed at the cost of Rs. 4989.60. If the cost of white-washing isRs20 per square meter, find the
(i) inside surface area of the dome (ii) volume of the air inside the dome
(Assume $\pi = 22/7$)

Solution:

(i) Cost of white-washing the dome from inside = Rs 4989.60
Cost of white-washing 1m^2 area = Rs 20

CSA of the inner side
of dome = 498.96/2 m^2 = 249.48 m^2
(ii) Let the inner radius of the hemispherical dome be r.
CSA of inner side of dome = 249.48 m^2 (from (i))
Formula to find CSA of a hemi sphere = $2\pi r^2$
$2\pi r^2$ = 249.48
$2\times(22/7)\times r^2$ = 249.48
r^2 = $(249.48\times7)/(2\times22)$
r^2 = 39.69
r = 6.3
So, radius is 6.3 m

Volume of air inside the dome = Volume of hemispherical dome
Using formula, volume of the hemisphere = $2/3\ \pi r^3$
= $(2/3)\times(22/7)\times6.3\times6.3\times6.3$
= 523.908
= 523.9(approx.)
Answer: Volume of air inside the dome is 523.9 m^3.

9. Twenty-seven solid iron spheres, each of radius r and surface area S are melted to form a sphere with surface area S'. Find the
(i) radius r' of the new sphere,
(ii) ratio of Sand S'.

Solution:

Volume of the solid sphere = $(4/3)\pi r^3$
Volume of twenty seven solid sphere = $27\times(4/3)\pi r^3 = 36\ \pi\ r^3$
(i) New solid iron sphere radius = r'
Volume of this new sphere = $(4/3)\pi(r')^3$
$(4/3)\pi(r')^3 = 36\ \pi\ r^3$
$(r')^3 = 27r^3$
r'= 3r
Radius of new sphere will be 3r (thrice the radius of original sphere)

ii) Surface area of iron sphere of radius r, S =$4\pi r^2$
Surface area of iron sphere of radius r'= $4\pi\ (r')^2$
Now
S/S' = $(4\pi r^2)/(4\pi\ (r')^2)$
S/S' = $r^2/(3r')^2$ = 1/9
The ratio of S and S' is 1: 9.

10. A capsule of medicine is in the shape of a sphere of diameter 3.5mm. How much medicine (in mm^3) is needed to fill this capsule? (Assume π = 22/7)

Solution:

Diameter of capsule = 3.5 mm
Radius of capsule, say r = diameter/ 2 = (3.5/2) mm = 1.75mm
Volume of spherical capsule = $4/3\ \pi r^3$
Volume of spherical capsule = $(4/3)\times(22/7)\times(1.75)^3 = 22.458$

Answer: The volume of the spherical capsule is 22.46 mm^3.