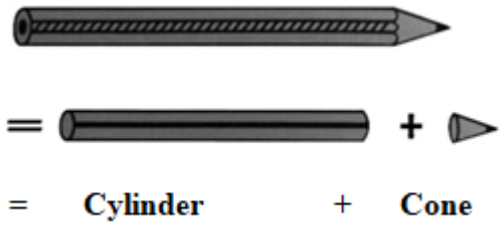
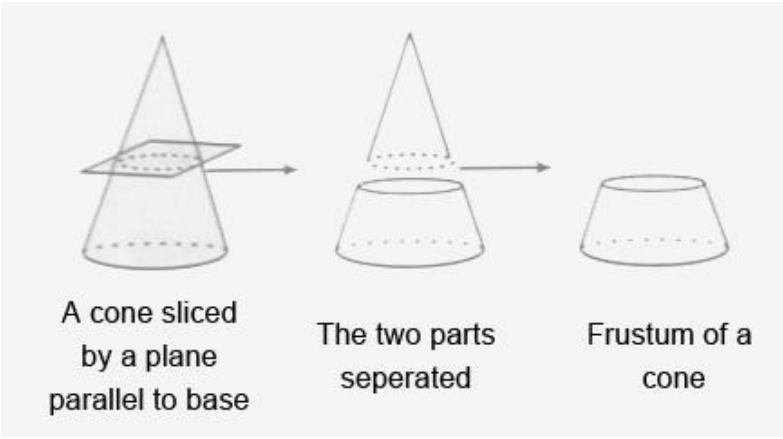
1. A cylindrical pencil sharpened at one edge is the combination of
(A) a cone and a cylinder (B) frustum of a cone and a cylinder
(C) a hemisphere and a cylinder (D) two cylinders.

Answer: (A)
Explanation: The shape of a sharpened pencil is :



2. A cone is cut through a plane parallel to its base and then the cone that is formed on one side of that plane is removed. The new part that is left over on the other side of the plane is called
(A) a frustum of a cone (B) cone
(C) cylinder (D) sphere

Answer: (A)
Explanation: Observe figure



3. During conversion of a solid from one shape to another, the volume of the new shape will
(A) increase (B) decrease
(C) remain unaltered (D) be doubled

Answer: (C)
Explanation: During conversion of one solid shape to another, the volume of the new shape will remain unaltered.

4. A right circular cylinder of radius r cm and height h cm (h>2r) just encloses a sphere of diameter

(A) r cm (B) 2r cm
(C) h cm (D) 2h cm

Answer: (B)
Explanation: Because the sphere is enclosed inside the cylinder, therefore the diameter of sphere is equal to the diameter of cylinder which is $2r$ cm.

5. A hollow cube of internal edge 22cm is filled with spherical marbles of diameter 0.5 cm and it is assumed that 1/8th space of the cube remains unfilled. Then the number of marbles that the cube can accommodate is

(A) 142244 (B) 142396
(C) 142496 (D) 142596

Answer: (A)
Explanation:

$$\text{Volume of cube} = (22)^3$$
$$= 10648\,\text{cm}^3$$
$$\text{Volume of a marble} = \frac{4}{3}\pi r^3$$
$$= \frac{4}{3}\times\frac{22}{7}\times\left(\frac{0.5}{2}\right)^3$$
$$= 0.0655\,\text{cm}^3$$
$$\text{Filled space of cube} = \text{Volume of cube} - \frac{1}{8}\times\text{Volume of cube}$$
$$= 10648 - \frac{10648}{8}$$
$$= 9317\,\text{cm}^3$$
$$\text{Required number of marbles} = \frac{9317}{0.0655}$$
$$= 142244$$

6. A metallic spherical shell of internal and external diameters 4 cm and 8 cm respectively, is melted and recast into the form of a cone with base diameter 8cm. The height of the cone is

(A)12cm (B) 14cm
(C) 15cm (D) 18cm

Answer: (B)
Explanation: Since volume will remain same, therefore,

$$\text{Volume of cone} = \text{Volume of spherical shell}$$

$$\Rightarrow \frac{1}{3}\pi r^2 h = \frac{4}{3}\pi\left(r_1^3 - r_2^3\right)$$

$$\Rightarrow \frac{1}{3}\pi(4)^2 h = \frac{4}{3}\pi\left(4^3 - 2^3\right)$$

$$\Rightarrow h = 14\text{cm}$$

7. A solid piece of iron in the form of a cuboid of dimensions 49cm × 33cm × 24cm, is moulded to form a solid sphere. The radius of the sphere is
(A) 21cm (B) 23cm
(C) 25cm (D) 19cm

Answer: (A)
Explanation: Since volume will remain the same, therefore,

$$\text{Volume of sphere} = \text{Volume of Cuboid}$$

$$\Rightarrow \frac{4}{3}\pi r^3 = l \times b \times h$$

$$\Rightarrow \frac{4}{3} \times \frac{22}{7} \times r^3 = 49 \times 33 \times 24$$

$$\Rightarrow r^3 = 21 \times 21 \times 21$$

$$\Rightarrow r = 21\text{cm}$$

8. If two solid hemispheres of same base radii r, are joined together along their bases, then curved surface area of this new solid is
(A) $4\pi r^2$ (B) $6\pi r^2$
(C) $3\pi r^2$ (D) $8\pi r^2$

Answer: (A)
Explanation: Because curved surface area of a hemisphere is $2\pi r$ and here we join two solid hemispheres along their bases of radii r, from which we get a solid sphere.
Hence the curved surface area of new solid = $2\pi r^2 + 2\pi r^2 = 4\pi r^2$

9. A solid cylinder of radius r and height h is placed over other cylinder of same height and radius. The total surface area of the shape so formed is
(A) $4\pi rh + 4\pi r^2$ (B) $4\pi rh - 4\pi r^2$
(C) $4\pi rh + 2\pi r^2$ (D) $4\pi rh - 2\pi r^2$

Answer: (C)
Explanation: Since the total surface area of cylinder of radius r and height h
$= 2\pi rh + 2\pi r^2$.
When one cylinder is placed over the otrher cylinder of same height and radius,
Then height of new cylinder = 2h
And radius of the new cylinder = r

Therefore total surface area of new cylinder

$= 2\pi r(2h) + 2\pi r^2$

$= 4\pi rh + 2\pi r^2$

10. The radii of the top and bottom of a bucket of slant height 45cm are 28cm and 7 cm respectively. The curved surface area of the bucket is:

(A) 4950 cm^2 (B) 4951 cm^2

(C) 4952 cm^2 (D) 4953 cm^2

Answer: (A)

Explanation:

$$\text{Curved surface area of the bucket} = \pi(R+r)l$$

$$\Rightarrow \text{Curved surface area of the bucket} = \pi(28+7)\times 45$$

$$\Rightarrow \text{Curved surface area of the bucket} = 4950\,\text{cm}^2$$

11. A medicine-capsule is in the shape of a cylinder of diameter 0.5 cm with two hemispheres stuck to each of its ends. The length of entire capsule is 2 cm. The capacity of the capsule is

(A) 0.36 cm^3 (B) 0.35 cm^3

(C) 0.34 cm^3 (D) 0.33 cm^3

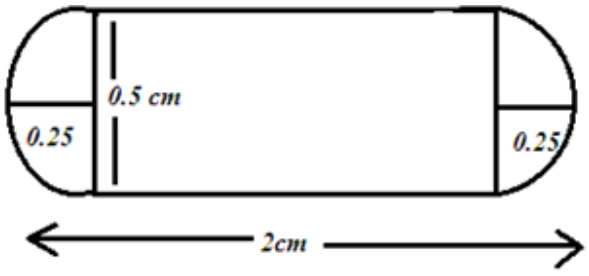
Answer: (A)

Explanation:

Since diameter of the cylinder = diameter of the hemisphere = 0.5cm

Radius of cylinder r = radius of hemisphere r = 0.5/2 = 0.25 cm

Observe the figure,



Total length of capsule = 2cm

Capacity of capsule is:

$$= \text{Voulme of cylindrical part} + 2 \times \text{volume of hemisphere}$$

$$= \pi r^2 h + 2 \times \frac{2}{3} \pi r^3$$

$$= \pi (0.25)^2 \left(1.5 + \frac{4}{3} \times 0.25 \right)$$

$$= 0.36 \, \text{cm}^3$$

12. Twelve solid spheres of the same size are made by melting a solid metallic cylinder of base diameter 2 cm and height 16 cm. The diameter of each sphere is

(A) 4 cm (B) 3 cm

(C) 2 cm (D) 6 cm

Answer: (C)

Explanation:

$$\text{Since, Voulme of 12 solid spheres} = \text{volume of Cylinder}$$

$$\Rightarrow 12 \times \frac{4}{3} \pi r^3 = \pi r^2 h$$

$$\Rightarrow 16 \pi r^3 = \pi (1)^2 16$$

$$\Rightarrow r^3 = 1$$

$$\Rightarrow r = 1 \text{cm}$$

Therefore diameter of each solid sphere = 2cm

13. The diameters of the two circular ends of the bucket are 44 cm and 24 cm. The height of the bucket is 35 cm. The capacity of the bucket is

(A) 32.7 litres (B) 33.7 litres

(C) 34.7 litres (D) 31.7 litres

Answer: (A)

Explanation: Since shape of bucket is like Frustum,

Therefore, volume of bucket

$$= \frac{1}{3} \pi h \left[R^2 + r^2 + rR \right]$$

$$= \frac{1}{3} \times \frac{22}{7} \times 35 \left[22^2 + 12^2 + 22 \times 12 \right]$$

$$= 32706.6 \, \text{cm}^3$$

$$= 32.7 \, \text{L}$$

14. Volumes of two spheres are in the ratio 64:27. The ratio of their surface areas is:
(A) 3 : 4 (B) 4 : 3
(C) 9 : 16 (D) 16 : 9

Answer: (D)
Explanation: According to question,

$$\frac{V_1}{V_2} = \frac{\frac{4}{3}\pi r_1^3}{\frac{4}{3}\pi r_2^3}$$
$$\Rightarrow \frac{64}{27} = \frac{r_1^3}{r_2^3}$$
$$\Rightarrow \frac{r_1}{r_2} = \frac{4}{3}$$

Therefore ratio of surface area is:

$$\frac{S_1}{S_2} = \frac{4\pi r_1^2}{4\pi r_2^2}$$
$$\Rightarrow \frac{S_1}{S_2} = \left(\frac{r_1}{r_2}\right)^2$$
$$\Rightarrow \frac{S_1}{S_2} = \left(\frac{4}{3}\right)^2$$
$$\Rightarrow \frac{S_1}{S_2} = \frac{16}{9}$$

15. A mason constructs a wall of dimensions 270cm× 300cm × 350cm with the bricks each of size 22.5cm × 11.25cm × 8.75cm and it is assumed that 1/8 space is covered by the mortar. Then the number of bricks used to construct the wall is:
(A) 11100 (B) 11200
(C) 11000 (D) 11300

Answer: (B)
Explanation: According to question,

$$\text{Volume of wall covered with bricks} = \text{Volume of wall} - \frac{1}{8} \times \text{Volume of wall}$$
$$= 270 \times 300 \times 350 - \frac{270 \times 300 \times 350}{8}$$
$$= 24806250\,\text{cm}^3$$

$$\text{Therefore, required number of bricks} = \frac{\text{volume of wall with bricks}}{\text{volume of one brick}}$$

$$= \frac{24806250}{22.5 \times 11.25 \times 8.75}$$

$$= 11200$$