

Mensuration and Solids

Review Exercise Questions

Level-1

Only Single Option Correct

Q1. The length of the longest pole which can be put in a room of dimensions $10\text{ m} \times 10\text{ m} \times 5\text{ m}$ is

- A. 12 m
- B. 15 m
- C. 20 m
- D. 25 m

Q2. The area of the base of a cylinder is 120 cm^2 , while its height is 50 cm. Its volume will be

- A. 3 L
- B. 4 L
- C. 5 L
- D. 6 L

Q3. The radius of a solid cylindrical rod is 80 cm, and it weighs 100 kg. If the material of the rod weighs 60 kg/m^3 , then the height of the rod is roughly

- A. 83 cm
- B. 87 cm
- C. 92 cm
- D. 99 cm

Q4. The ratio of the volumes of two cubes is k . What is the ratio of their surface areas?

- A. $\sqrt[3]{k}$
- B. $\sqrt[4]{k}$
- C. \sqrt{k}
- D. $\sqrt[3]{k^2}$

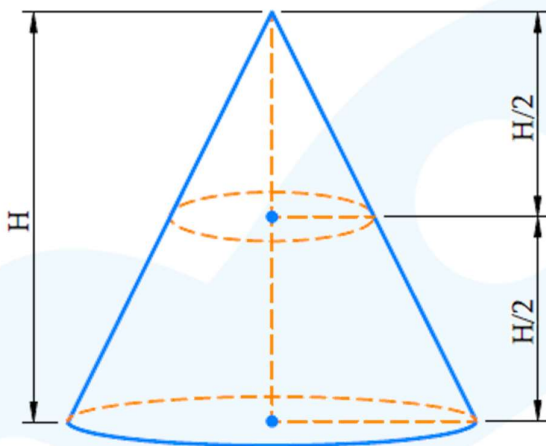
Q5. The radius of a sphere is doubled. Which of the following will increase by a factor of 4?

- A. Only the surface area
- B. Only the volume
- C. Both the surface area and the volume
- D. Neither

Q6. What is the volume of a hemispherical shell of outer radius r cm and thickness 1 cm?

- A. $\frac{2}{3}\pi(3r^2 - 2r + 1)\text{cm}^3$
 B. $\frac{2}{3}\pi(3r^2 - 3r + 1)\text{cm}^3$
 C. $\frac{2}{3}\pi(4r^2 - 3r + 1)\text{cm}^3$
 D. $\frac{2}{3}\pi(4r^2 - 3r + 2)\text{cm}^3$

Q7. For a cone of radius R , the ratio of its height to radius is 2 : 1. The cone is vertically halved:



The ratio of the volume of the bottom half to that of the top half will be

- A. 5 : 1
 B. 6 : 1
 C. 7 : 1
 D. 8 : 1

Integer Answers

Q8. The surface area of a sphere is 314 cm^2 . Its radius is approximately _____ cm.

Q9. A cylindrical iron rod of base radius 10 cm and height 30 cm is melted and reformed into a number of cylindrical pellets, each of base radius 1 cm and height 3 cm. The number of pellets so formed is _____.

Q10. The volume of a cuboid is 1536 m^3 . Its length is 16 m, and its breadth and height are in the ratio 3 : 2. Its total surface area is m^2 .

Q11. A conical beam 9 m long, and with base radius 50 cm, is made up of a material which weighs 50 kg/m^3 . The mass of the beam (to the nearest integer) is _____ kg.

Q12. The height of a cone is doubled, and its radius is tripled. Its volume will increase by a factor of _____.

Q13. A cube of side 4 cm is split into 64 identical cubes of side 1 cm. The total surface area of the 64 smaller cubes is larger by the surface area of the original cube by a factor of _____.

Q14. The dimensions of a cuboidal tank are $2.5 \text{ m} \times 1.5 \text{ m} \times 1.2 \text{ m}$. A cylindrical bucket has a base radius of 40 cm and a height of 60 cm. The bucket is used to fill water from a source and pour it into the tank. How many times (minimum) must this be done before the tank is full? _____

Q15. The height of a cone is 30 cm. A small cone is cut off at the top by a plane parallel to the base. If its volume is $1/27$ of the volume of the given cone, at what height above the base is the section made?

Q16. A closed cuboidal container has outside dimensions $80 \text{ cm} \times 60 \text{ cm} \times 40 \text{ cm}$. The thickness of its vertical walls is 4 cm. The thickness of its base is 12 cm, while the thickness of its lid is 3 cm. The container is used to store cuboidal metal bars, each of dimensions $18 \text{ cm} \times 13 \text{ cm} \times 5 \text{ cm}$. How many bars can the container hold?

Q17. A cuboidal bar of iron with dimensions $40 \text{ cm} \times 24 \text{ cm} \times 8 \text{ cm}$ will be melted to form spherical shells of outer radius 3 cm and uniform thickness of 0.5 cm for the walls. How many shells can be made from the bar?

Sol. Self-exercise. The answer can be obtained as the ratio of the volume of the bar to the volume of iron used to make one spherical shell. The answer is 161.

Miscellaneous

Q18. A hollow cone is cut by a plane parallel to the base and the upper portion is removed. If the curved surface of the remainder is $8/9$ of the curved surface of the whole cone, find the ratio of the line segments into which the altitude of the cone is divided by the plane.

Q19. What is the change in the volume of a cube if each of its side is (i) doubled (ii) tripled (iii) halved?

Q20. (a) On a given day, there is 2 cm of rainfall. Find the volume of water which falls on 5 hectares of land.

(b) A total of 6 lac liters of water fell as rain on a farm of area 2 hectares. Find the amount rainfall on that day (in cm).

Q21. (a) The surface area of a cuboid is 100 cm^2 . The length of each side of the cuboid is increased by 50%. Find the new surface area of the cuboid.

(b) The volume of a cuboid is 1 L. The length of each side of the cuboid is increased by 20%. Find the new volume of the cuboid.

(c) The volume of a cuboid is 1 L. The length and height of the cuboid are increased by 20%, while its breadth is decreased by 20%. Find the new volume of the cuboid.

Q22. Two cubes A and B have to be painted on all sides. A's side is 50% larger than B's side, but the paint to be used on A is 20% cheaper than the one to be used on B. If B's paint job costs INR 4000, how much will A's paint job cost?

Q23. What is the maximum number of planks of dimensions $4\text{ m} \times 5\text{ m} \times 2\text{ m}$ which can be stored in a pit of dimensions $40\text{ m} \times 12\text{ m} \times 16\text{ m}$? How will you store the planks to achieve this number?

Q24. A solid cylinder of diameter 12 cm and height 15 cm is melted and recast into 12 toys in the shape of a right circular cone mounted on a hemisphere. Find the radius of the hemisphere and the total height of the toy, if the height of the conical part is 3 times its radius.

Q25. An open cuboidal container has outer dimensions $50\text{ cm} \times 25\text{ cm} \times 12\text{ cm}$, and walls of thickness 3 cm. It also has two equally spaced partitions along the length, each of thickness 5 cm. What is the volume of water which this container can hold?

Q26. Through breathing, a typical person can use up all the useable oxygen in 1 m^3 of air in 2 hours (if he/she is not doing too much of exercising – in which case this time will be even lesser). 10 prisoners are imprisoned in a cylindrical room of radius 10 m and height 6 m, which has no windows. Approximately how long will it take for the prisoners to use up all the oxygen in the room?

Q27. A solid toy is in the form of a right circular cylinder with a hemispherical shape at one end and a cone at the other end. Their common diameter is 4.2 cm, and the heights of the cylindrical and conical portions are 12 cm and 7 cm respectively. Find the volume of the given toy.

Q28. Consider a hollow carton with (interior) base dimensions $80\text{ cm} \times 42\text{ cm}$ and height equal to 30 cm. This carton is to be packed with a certain kind of scientific instruments, each being enclosed in a box with base dimensions $6\text{ cm} \times 6\text{ cm}$ and height equal to 10 cm.

(a) What is the maximum number of instruments which can be packed into the carton? Describe how you can achieve this number of packing.

(b) Suppose that each instrument must be kept upright. What is the maximum number of instruments which can now be packed into the carton? How much volume (in liters) will be left in the carton?

Q29. Through a cylindrical pipe of cross-sectional radius 20 cm, water is flowing at the rate of 25 cm/sec. What is the volume of water (in liters) which comes out of the pipe's mouth per minute?

Q30. The cross-section of a pipe is 400 cm^2 . It is used to fill a hemispherical tank of radius 3 m. What must be the minimum flow rate of water in the pipe (in cm/sec) so that it can fill up the tank in less than 20 minutes?

Q31. A pipe of rectangular cross-sectional dimensions $12\text{ cm} \times 20\text{ cm}$ is used to fill up a conical tank of base radius 2 m and height 1 m. Water is flowing through the pipe at the rate of 50 cm/sec. Water is also leaking from the tank at the rate of 2 L/sec. How much time will it take to fill the tank?

Q32. A giant ancient spherical relic in a temple has a radius of 2 m. It is coated with a layer of gold 2 mm thick. A gang of robbers manages to take all this gold off the relic. The density of gold is 20 g/cm^3 , while the price of gold is INR 25,000 for 10 grams. How much money (in crores) will the robbers make selling all this gold?