NCERT Solutions Class 9 Maths
Chapter 11: Surface Areas and Volumes
EXERCISE 11.4

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Quick Summary: In NCERT Solutions Class 9 Maths Chapter 11 Exercise 11.4, students learn to calculate the volume of spheres and hemispheres using the fundamental formula V = (4)/(3)π r^3. This exercise covers practical applications like finding volumes of spherical objects, water displacement, and mass calculations using density, which are essential topics for CBSE Class 9 board exams and form the foundation for advanced 3D geometry.

Key Takeaways:

- Volume of sphere formula: V = (4)/(3)π r^3 where r is the radius
- Volume of hemisphere is half the volume of sphere: V = (2)/(3)π r^3
- Water displacement by a solid sphere equals the volume of that sphere
- Converting between units (cubic cm to litres) and using volume-density-mass relationships in real-world problems

Complete Solutions

Question 1

QUESTION

Find the volume of a sphere whose radius is:

(i) 7 cm (ii) 0.63 m

SOLUTION

This question asks us to calculate the volume of a sphere given its radius. We will use the formula for the volume of a sphere, which is , where is the radius.

(i) Radius = 7 cm

Step 1: Write down the formula for the volume of a sphere.

The volume of a sphere with radius is given by:

Step 2: Substitute the given value of the radius.

Here, cm. Substituting this into the formula, we get:

Step 3: Simplify the expression.

Step 4: Convert to mixed fraction.

Dividing 4312 by 3, we get 1437 as the quotient and 1 as the remainder. Therefore:

Final Answer: The volume of the sphere with radius 7 cm is .

(ii) Radius = 0.63 m

Step 1: Write down the formula for the volume of a sphere.

The volume of a sphere with radius is given by:

Step 2: Substitute the given value of the radius.

Here, m. Substituting this into the formula, we get:

Step 3: Simplify the expression.

Final Answer: The volume of the sphere with radius 0.63 m is approximately .

ANSWER

(i) 1437 1/3 cm^3 (ii) 1.05 m^3 (approx.)

Question 2

QUESTION

Find the amount of water displaced by a solid spherical ball of diameter:

(i) 28 cm (ii) 0.21 m

SOLUTION

This question asks us to find the volume of water displaced by a solid spherical ball, which is equivalent to finding the volume of the sphere. We will use the formula for the volume of a sphere, , where is the radius of the sphere.

(i) Diameter = 28 cm

Step 1: Find the radius

The radius is half of the diameter. Therefore,

cm

Step 2: Apply the volume formula

The volume of the sphere is given by:

Substituting cm and :

Step 3: Simplify and calculate

cm

Answer: The amount of water displaced is cm.

(ii) Diameter = 0.21 m

Step 1: Find the radius

The radius is half of the diameter. Therefore,

m

Step 2: Apply the volume formula

The volume of the sphere is given by:

Substituting m and :

Step 3: Simplify and calculate

m

Answer: The amount of water displaced is m.

ANSWER

(i) 11498 2/3 cm^3 (ii) 0.004851 m^3

Question 3

QUESTION

The diameter of a metallic ball is 4.2 cm. What is the mass of the ball, if the density of the metal is 8.9 g per cm^3?

SOLUTION

This question involves finding the volume of a sphere and then using the density to calculate its mass. We will use the formula for the volume of a sphere and the relationship between density, mass, and volume.

Step 1: Find the radius of the ball

The diameter of the ball is given as 4.2 cm. The radius is half of the diameter.

Step 2: Calculate the volume of the ball

The ball is a sphere, so we use the formula for the volume of a sphere:

Substituting the value of cm:

Step 3: Calculate the mass of the ball

We are given the density of the metal as 8.9 g/cm^3. We know that:

Therefore,

Step 4: Round to two decimal places (approximate)

Final Answer: The mass of the ball is approximately 345.39 g.

ANSWER

345.39 g (approx.)

Question 4

QUESTION

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

This question asks us to find the ratio of the volume of the moon to the volume of the earth, given a relationship between their diameters. It tests our understanding of volume calculations for spheres.

Step 1: Define variables

Let the diameter of the Earth be and the diameter of the Moon be . Let the radius of the Earth be and the radius of the Moon be . Let the volume of the Earth be and the volume of the Moon be .

Step 2: Express the given relationship mathematically

We are given that the diameter of the moon is one-fourth of the diameter of the earth. This can be written as:

Step 3: Relate radii

Since the radius is half of the diameter, we have . Therefore:

and

Substituting into the equation for , we get:

Since , we can write . Substituting this into the equation for , we get:

So,

Step 4: Calculate the volumes

The volume of a sphere is given by the formula . Therefore:

Step 5: Find the ratio of the volumes

We want to find the fraction . Substituting the expressions for and , we get:

Since , we have:

Final Answer: The volume of the moon is of the volume of the earth.

ANSWER

1/64

Question 5

QUESTION

How many litres of milk can a hemispherical bowl of diameter 10.5 cm hold?

SOLUTION

This question asks us to find the volume of a hemispherical bowl given its diameter, and then convert that volume to litres.

Step 1: Find the radius of the hemispherical bowl

The diameter of the bowl is given as 10.5 cm. The radius is half of the diameter.

cm

Step 2: Calculate the volume of the hemispherical bowl

The formula for the volume of a hemisphere is .

Substitute cm and :

Simplify:

Step 3: Convert the volume from cm^3 to litres

We know that 1 litre = 1000 cm^3.

Therefore, to convert cm^3 to litres, we divide by 1000.

Step 4: Round to three decimal places

Rounding 0.3031875 to three decimal places gives 0.303.

Final Answer: The hemispherical bowl can hold approximately 0.303 l of milk.

ANSWER

0.303 l (approx.)

Question 6

QUESTION

A hemispherical tank is made up of an iron sheet 1 cm thick. If the inner radius is 1 m, find the volume of the iron used to make the tank.

SOLUTION

This question involves finding the volume of iron used to make a hemispherical tank, given its inner radius and the thickness of the iron sheet.

Step 1: Identify the given information

Inner radius, m

Thickness of the iron sheet, cm m (converting to meters)

Step 2: Calculate the outer radius

The outer radius, , is the sum of the inner radius and the thickness:

m

Step 3: Calculate the volume of the iron used

The volume of the iron is the difference between the volume of the outer hemisphere and the volume of the inner hemisphere.

Volume of outer hemisphere

Volume of inner hemisphere

Volume of iron

Substitute the values of and :

Volume of iron

Step 4: Simplify and calculate

Volume of iron

Using :

Volume of iron

Step 5: Round to the required accuracy

Volume of iron m

Final Answer: The volume of the iron used to make the tank is approximately 0.06348 m³.

ANSWER

0.06348 m^3 (approx.)

Question 7

QUESTION

Find the volume of a sphere whose surface area is 154 cm^2.

SOLUTION

We need to find the volume of a sphere given its surface area. This problem tests our understanding of the formulas for the surface area and volume of a sphere.

Step 1: Recall the formula for the surface area of a sphere

The surface area (SA) of a sphere is given by:

, where is the radius of the sphere.

Step 2: Find the radius of the sphere

We are given that the surface area is 154 cm^2. So, we have:

Substitute :

Taking the square root of both sides:

cm

Step 3: Recall the formula for the volume of a sphere

The volume (V) of a sphere is given by:

Step 4: Calculate the volume of the sphere

Substitute and into the volume formula:

cm^3

cm^3

Final Answer: The volume of the sphere is cm^3.

ANSWER

179 2/3 cm^3

Question 8

QUESTION

A dome of a building is in the form of a hemisphere. From inside, it was white-washed at the cost of ₹4989.60. If the cost of white-washing is ₹20 per square metre, find the:

(i) inside surface area of the dome

(ii) volume of the air inside the dome

SOLUTION

This question involves finding the surface area and volume of a hemispherical dome, given the cost of white-washing.

(i) Finding the inside surface area of the dome

Step 1: Understand the given information

The total cost of white-washing the dome from the inside is ₹4989.60.

The cost of white-washing is ₹20 per square meter.

Step 2: Calculate the inside surface area

Since the cost per square meter is given, we can find the total surface area by dividing the total cost by the cost per square meter.

Answer (i): The inside surface area of the dome is 249.48 m².

(ii) Finding the volume of the air inside the dome

Step 1: Relate surface area to the radius

The dome is hemispherical, so its curved surface area is given by , where is the radius of the hemisphere.

We know that the inside surface area is 249.48 m², so:

Step 2: Solve for the radius

Using :

Step 3: Calculate the volume of the hemisphere

The volume of a hemisphere is given by .

Answer (ii): The volume of the air inside the dome is approximately 523.9 m³.

ANSWER

(i) 249.48 m² (ii) 523.9 m³ (approx.)

Question 9

QUESTION

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 S and S'

SOLUTION

This question involves finding the radius and surface area of a new sphere formed by melting and combining 27 smaller spheres. It tests the understanding of volume and surface area formulas for spheres.

(i) Finding the radius r' of the new sphere

Step 1: Calculate the total volume of the 27 spheres.

The volume of one sphere with radius is given by . Since there are 27 such spheres, the total volume is:

Step 2: Determine the volume of the new sphere.

The new sphere is formed by melting the 27 smaller spheres, so its volume is equal to the total volume of the smaller spheres:

Step 3: Relate the volume to the new radius r'.

The volume of the new sphere with radius is also given by . Therefore:

Step 4: Solve for r'.

Divide both sides by and multiply by :

Taking the cube root of both sides:

Therefore, the radius of the new sphere is .

(ii) Finding the ratio of S and S'

Step 1: Write the formula for the surface area of the original sphere.

The surface area of one sphere with radius is given by .

Step 2: Write the formula for the surface area of the new sphere.

The surface area of the new sphere with radius is given by .

Step 3: Calculate the ratio S/S'.

The ratio of to is:

Therefore, the ratio of to is .

Final Answer: (i) (ii)

ANSWER

(i) 3r (ii) 1 : 9

Question 10

QUESTION

A capsule of medicine is in the shape of a sphere of diameter 3.5 mm. How much medicine (in mm^3) is needed to fill this capsule?

SOLUTION

This question asks us to find the volume of a sphere, given its diameter. We need to recall the formula for the volume of a sphere.

Step 1: Find the radius

The diameter of the spherical capsule is given as 3.5 mm. The radius is half of the diameter.

mm

Step 2: Recall the formula for the volume of a sphere

The volume of a sphere with radius is given by:

Step 3: Substitute the value of the radius into the formula

We have mm. Substituting this into the volume formula:

Step 4: Calculate the volume

Using :

Step 5: Round to two decimal places

Rounding to two decimal places, we get:

mm

Final Answer: The volume of medicine needed to fill the capsule is approximately 22.46 mm^3.

ANSWER

22.46 mm^3 (approx.)

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🔢 Key Formulas

Important Formulas for Exercise 11.4

Formula / Concept	Description
\textSurface Area of a Sphere = 4π r^2	Calculates the total surface area of a sphere where 'r' is the radius.
\textVolume of a Sphere = (4)/(3)π r^3	Calculates the volume of a sphere where 'r' is the radius.
\textCurved Surface Area of a Hemisphere = 2π r^2	Calculates the area of the curved surface of a hemisphere where 'r' is the radius.
\textTotal Surface Area of a Hemisphere = 3π r^2	Calculates the total surface area of a solid hemisphere, which includes the curved surface and the flat circular base. It is the sum of the curved surface area (2π r^2) and the area of the circular base (π r^2).
\textVolume of a Hemisphere = (2)/(3)π r^3	Calculates the volume of a hemisphere where 'r' is the radius.
Sphere	A sphere is a three-dimensional geometric object that is perfectly round, like a ball. It is the set of all points in three-dimensional space that are equidistant from a central point.
Hemisphere	A hemisphere is exactly half of a sphere.
Radius (r)	The distance from the center of the sphere to any point on its surface.
Diameter (d)	The distance across the sphere passing through the center. It is twice the radius (d = 2r).

Top FAQs

Q1. How many questions are in NCERT Solutions Class 9 Maths Chapter 11 Surface Areas and Volumes Exercise 11.4?

Exercise 11.4 of NCERT Solutions for Class 9 Maths Chapter 11 Surface Areas and Volumes contains exactly 10 questions. These questions focus on the surface area of spheres and hemispheres, which are crucial for CBSE board exam 2025-26. All solutions are provided with step by step explanations to help students understand the concepts thoroughly.

Q2. Where can I download free PDF of NCERT Solutions for Class 9 Maths Chapter 11 Surface Areas and Volumes Exercise 11.4?

You can download the free PDF of NCERT Solutions for Class 9 Maths Chapter 11 Surface Areas and Volumes Exercise 11.4 from official educational websites and CBSE-approved platforms. The PDF download includes step by step solutions for all 10 questions covering surface area and volume formulas for 3D shapes. These solutions are updated according to the CBSE board exam 2025-26 syllabus and are available at no cost.

Q3. How many marks does Surface Areas and Volumes Chapter 11 carry in CBSE Class 9 Maths board exam 2025-26?

Surface Areas and Volumes (Chapter 11) is part of Unit V - Mensuration which carries approximately 9 marks in CBSE Class 9 Maths board exam 2025-26. Exercise 11.4 specifically covers surface area of spheres and hemispheres, which are important topics for the examination. Students should practice all questions from NCERT Solutions for Class 9 Maths Chapter 11 to score well in this section.

Q4. Which is the most difficult question in Exercise 11.4 of NCERT Solutions Class 9 Maths Chapter 11 Surface Areas and Volumes?

Questions 9 and 10 in Exercise 11.4 of NCERT Solutions for Class 9 Maths Chapter 11 are considered the most challenging as they involve application-based problems on surface area and volume formulas for 3D shapes. These questions require students to apply multiple concepts and perform complex calculations involving spheres and hemispheres. Step by step solutions help students understand the problem-solving approach for CBSE board exam 2025-26 preparation.

Q5. What are the Surface Area and Volume Formulas for 3D Shapes covered in NCERT Class 9 Maths Chapter 11 Exercise 11.4?

Exercise 11.4 of NCERT Solutions for Class 9 Maths Chapter 11 Surface Areas and Volumes focuses on: Surface Area of Sphere = $4\pi r^2$, Curved Surface Area of Hemisphere = $2\pi r^2$, and Total Surface Area of Hemisphere = $3\pi r^2$. These formulas are essential for solving all 10 questions in this exercise and are frequently asked in CBSE board exam 2025-26. Understanding these volume formulas for 3D shapes is crucial for scoring full marks in mensuration problems.

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