5.16 Spheres and Cones: 30-minute Pack

EDEXCEL 1MA1 · Calculator allowed · about 30 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

Formulae You May Need

Revision Library formulae reminder, styled on Edexcel 1MA1 formulae-sheet conventions; wording is original.

Volume of a sphere = (4/3) x pi x r^3

Surface area of a sphere = 4 x pi x r^2

Volume of a cone = (1/3) x pi x r^2 x h

Curved surface area of a cone = pi x r x l (l = slant height)

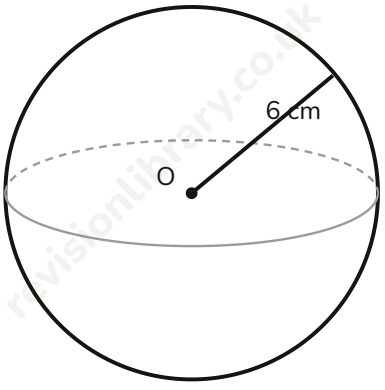
Volume of a hemisphere = (2/3) x pi x r^3

Total surface area of a solid hemisphere = 3 x pi x r^2

Note: the surface area formulae for spheres and cones are supplied in relevant Edexcel questions.

1 A sphere has radius 6 cm. Calculate the volume of the sphere. Give your answer correct to 3 significant figures.

Diagram NOT accurately drawn

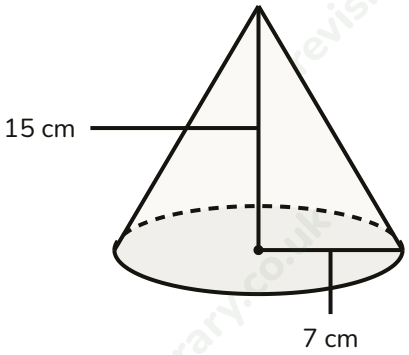


(Total for Question 1 is 2 marks)

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2 A cone has base radius 7 cm and perpendicular height 15 cm. Work out the volume of the cone. Give your answer correct to 3 significant figures.

Diagram NOT accurately drawn

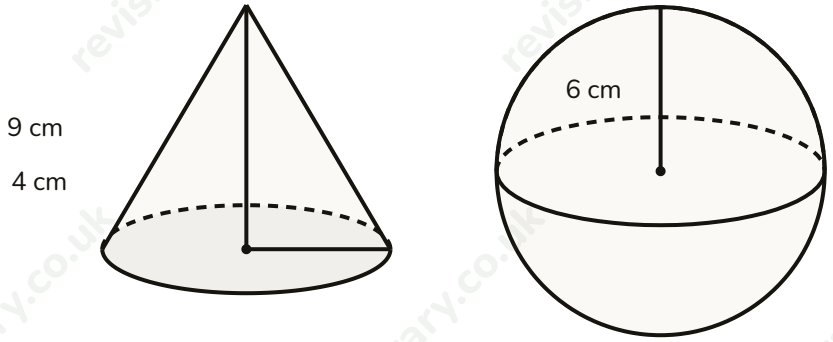


(Total for Question 2 is 2 marks)

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3 A toy cone and a toy sphere are made from the same material. The cone has radius 4 cm and height 9 cm. The sphere has radius 6 cm. Which object has the larger volume and by how much? Give your answer to 1 decimal place.

Diagram NOT accurately drawn

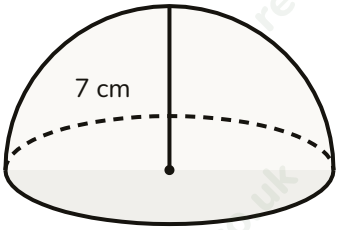


(Total for Question 3 is 3 marks)

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4 A hemisphere is half of a sphere. A hemisphere has radius 7 cm. Calculate its curved surface area (not including the base). Give your answer to 1 decimal place. Use the curved surface area of a sphere = $4 \pi r^2$, so hemisphere curved area = $2 \pi r^2$.

Diagram NOT accurately drawn

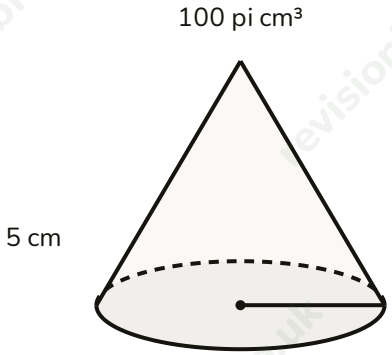


(Total for Question 4 is 4 marks)

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5 A cone has base radius 5 cm and volume 100π cm^3. Find the perpendicular height of the cone.

Diagram NOT accurately drawn

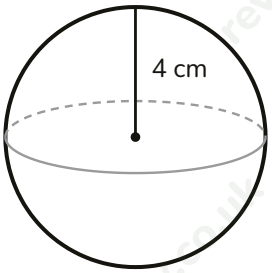


(Total for Question 5 is 3 marks)

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6 A solid sphere of radius 4 cm is made from metal with density 8.9 g/cm^3. Calculate the mass of the sphere in kilograms. Give your answer correct to 3 significant figures.

Diagram NOT accurately drawn



(Total for Question 6 is 3 marks)

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7 A solid wooden hemisphere has radius 10 cm. A cone-shaped hole of radius 6 cm and depth 8 cm is drilled out of the flat face, with the apex of the cone pointing into the hemisphere. Work out the volume of wood remaining. Give your answer correct to 3 significant figures.

Diagram NOT accurately drawn

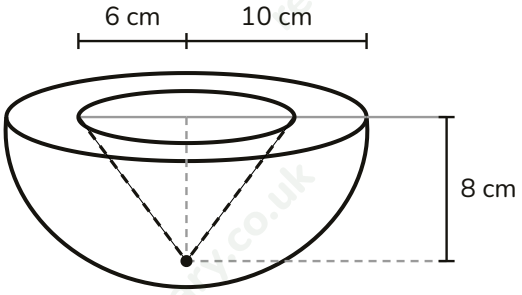


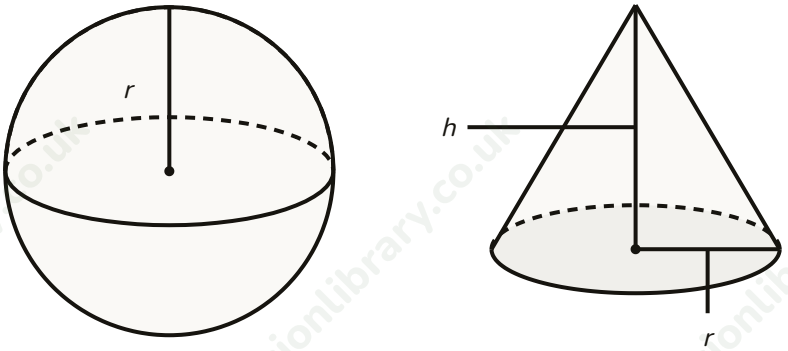
Diagram not drawn accurately

(Total for Question 7 is 4 marks)

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8 A sphere and a cone both have radius r. The volume of the sphere is exactly twice the volume of the cone. Show that the perpendicular height of the cone, h, satisfies h = 2r.

Diagram NOT accurately drawn



(Total for Question 8 is 3 marks)

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Mark scheme · 5.16 Spheres and Cones: 30-minute Pack

A correct answer earns full marks unless the question asks for working, a method, proof or explanation.

Question 1

$4/3 \times \pi \times 6^3$ oe (288 π seen)	**M1**
awrt 905	**A1**

Answer: 905 cm^3 (3 sf)

Question 2

correct substitution into $V = (1/3) \times \pi \times r^2 \times h$, e.g. $(1/3) \times \pi \times 7^2 \times 15$ (oe)	**M1**
awrt 770 cm^3 (cao)	**A1**

Answer: 770 cm^3 (3 s.f.)

Question 3

calculate cone volume: $(1/3)\ \pi\ (4^2) * 9 = 48\ \pi$	**M1**
calculate sphere volume: $(4/3)\ \pi * 6^3 = 288\ \pi$	**M1**
sphere larger by 240 π = 754.0 cm^3 awrt	**A1**

Answer: The sphere is larger by 754.0 cm^3 (to 1 d.p.)

Question 4

use hemisphere curved area = $2\ \pi\ r^2$ with r=7	**M1**
compute $2 * \pi * 49 = 98\ \pi$	**M1**
convert to decimal using π: $98 * \pi = 307.87608...$	**M1**
307.9 cm^2 awrt	**A1**

Answer: 307.9 cm^2

Question 5

sets $100\ \pi = 1/3 \times \pi \times 5^2 \times h$ and begins to rearrange	**M1**
h = 100 x 3 / 25 oe (dep)	**M1**
h = 12 cm cao	**A1**

Answer: h = 12 cm

Question 6

$4/3 \times \pi \times 4^3$ oe (volume = 268.08... cm^3)	**M1**
their volume x 8.9 (mass in grams, dep)	**M1**
awrt 2.39 (kg), correctly converted from grams	**A1**

Answer: 2.39 kg (3 sf)

Question 7

$2/3 \times \pi \times 10^3$ oe (hemisphere volume = 2000 π/3 cm^3, approximately 2094.395 cm^3)	**M1**
$1/3 \times \pi \times 6^2 \times 8$ oe (cone volume = 96 π, awrt 302)	**M1**
subtracts cone volume from hemisphere volume (dep)	**M1**
awrt 1790	**A1**

Answer: 1790 cm^3 (3 sf)

Question 8

correct equation formed: $(4/3) \times \pi \times r^3 = 2 \times (1/3) \times \pi \times r^2 \times h$ (oe)	**M1**
correct algebraic simplification, e.g. divides both sides by $(1/3) \times \pi \times r^2$ to reach 4r = 2h (oe)	**M1**
h = 2r fully shown with no errors (cso)	**A1**

Answer: h = 2r (shown)

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