5.16 Spheres and Cones: 1-hour Pack

EDEXCEL 1MA1 · Calculator allowed · about 60 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)

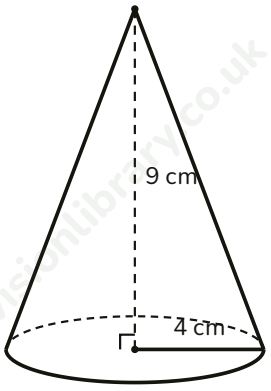
Volume of a hemisphere = (2/3) x pi x r^3

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 cone has base radius 4 cm and perpendicular height 9 cm. Calculate the volume of the cone. Give your answer correct to 3 significant figures.

Diagram NOT accurately drawn



(Total for Question 1 is 2 marks)

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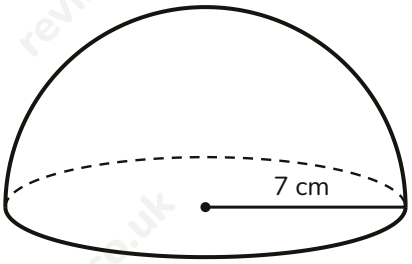
2 A metal ball has diameter 12 cm. Calculate the surface area of the ball. Give your answer in terms of π.

(Total for Question 2 is 2 marks)

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3 A solid hemisphere has radius 7 cm. Calculate the total surface area of the hemisphere (the curved surface area plus the flat circular face). Give your answer correct to 3 significant figures.

Diagram NOT accurately drawn

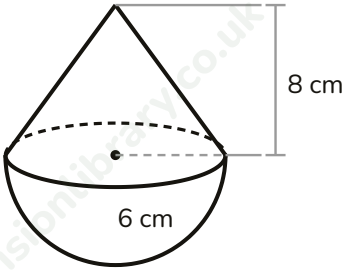


(Total for Question 3 is 3 marks)

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4 A toy is made from a cone of radius 6 cm and height 8 cm fixed on top of a hemisphere of radius 6 cm, so that the flat faces are joined together. Calculate the total volume of the toy. Give your answer correct to 3 significant figures.

Diagram NOT accurately drawn

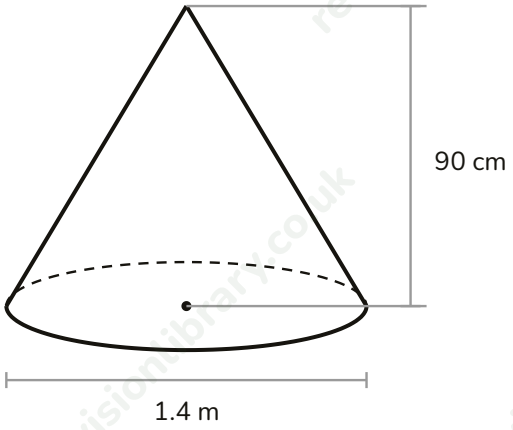


(Total for Question 4 is 4 marks)

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5 A cone has base diameter 1.4 m and perpendicular height 90 cm. Calculate the volume of the cone in cubic metres. Give your answer correct to 3 significant figures.

Diagram NOT accurately drawn

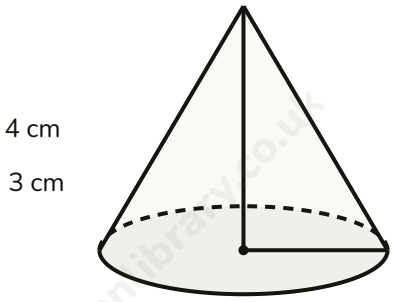


(Total for Question 5 is 3 marks)

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6 A cone has base radius 3 cm and perpendicular height 4 cm. Work out the area of the curved surface of the cone. Give your answer in terms of π.

Diagram NOT accurately drawn

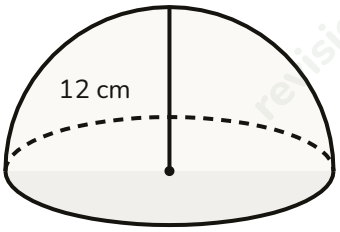


(Total for Question 6 is 3 marks)

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7 A solid hemisphere has radius 12 cm. Work out its volume. Give your answer in terms of π.

Diagram NOT accurately drawn

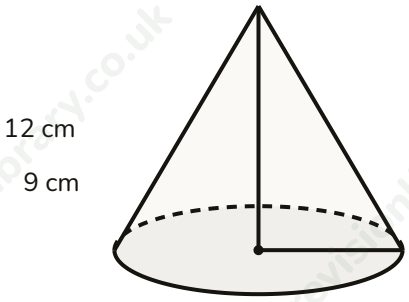


(Total for Question 7 is 2 marks)

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8 A cone has base radius 9 cm and perpendicular height 12 cm. Work out the volume of the cone. Give your answer in terms of π.

Diagram NOT accurately drawn

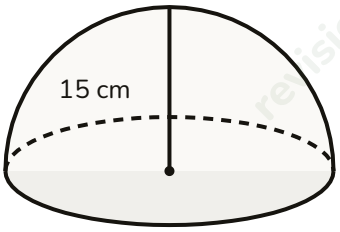


(Total for Question 8 is 2 marks)

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9 A solid hemisphere has radius 15 cm. Work out its volume. Give your answer in terms of π.

Diagram NOT accurately drawn

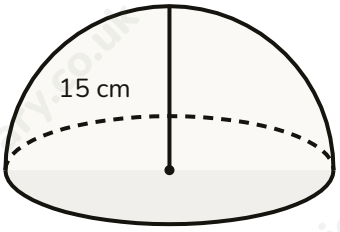


(Total for Question 9 is 2 marks)

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10 A solid hemisphere has radius 15 cm. Work out the total surface area of the hemisphere. Give your answer in terms of π.

Diagram NOT accurately drawn

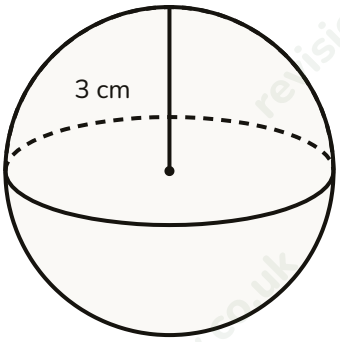


(Total for Question 10 is 3 marks)

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11 A solid sphere has radius 3 cm. Work out its volume. Give your answer in terms of π.

Diagram NOT accurately drawn

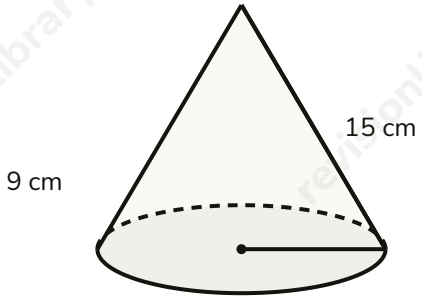


(Total for Question 11 is 2 marks)

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12 A cone has base radius 9 cm and slant height 15 cm. Work out the volume of the cone. Give your answer in terms of π.

Diagram NOT accurately drawn

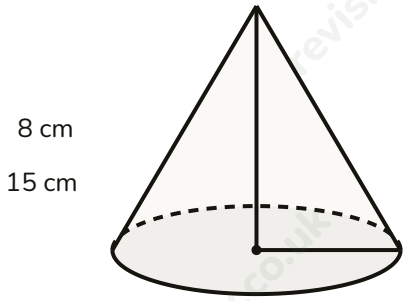


(Total for Question 12 is 4 marks)

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13 A cone has base radius 15 cm and perpendicular height 8 cm. Work out the area of the curved surface of the cone. Give your answer in terms of π.

Diagram NOT accurately drawn



(Total for Question 13 is 3 marks)

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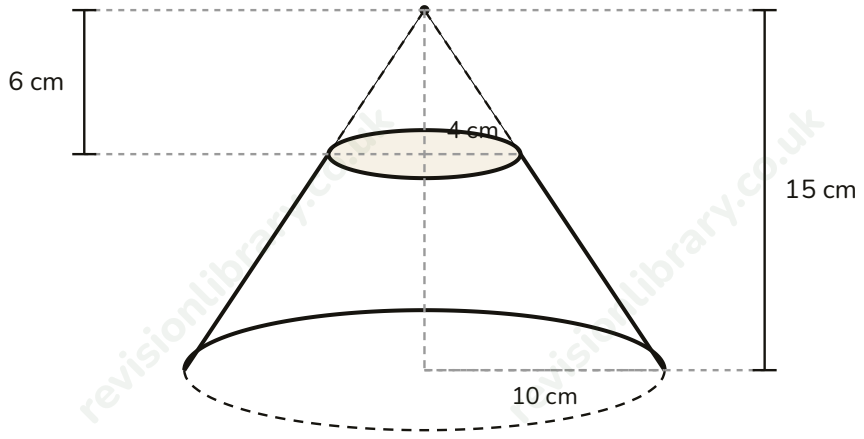
14 Two similar spherical balloons have radii in the ratio 2:5. The volume of the smaller balloon is 32 cm^3. Work out the volume of the larger balloon.

(Total for Question 14 is 3 marks)

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15 A large cone has base radius 10 cm and perpendicular height 15 cm. A smaller, similar cone of radius 4 cm and height 6 cm is removed from the vertex end, leaving a frustum. Work out the volume of the frustum. Give your answer correct to 3 significant figures.

Diagram NOT accurately drawn

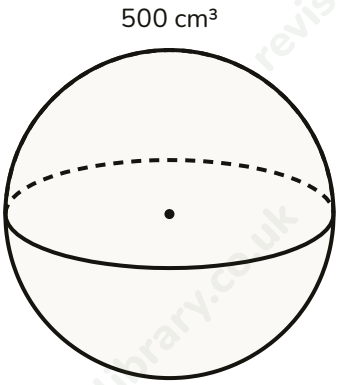


(Total for Question 15 is 5 marks)

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16 A solid sphere has volume 500 cm³. Calculate the surface area of the sphere. Give your answer correct to 3 significant figures.

Diagram NOT accurately drawn



(Total for Question 16 is 4 marks)

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Mark scheme · 5.16 Spheres and Cones: 1-hour Pack

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

Question 1

$1/3 \times \pi \times 4^2 \times 9$ oe (48 π seen)	**M1**
awrt 151	**A1**

Answer: 151 cm^3 (3 sf)

Question 2

use $A = 4 \pi r^2$ with r = 6 cm or equivalent method	**M1**
144 π cm^2 cao	**A1**

Answer: 144 π cm^2 (approx 452.39 cm^2)

Question 3

$2 \times \pi \times 7^2$ oe (curved surface area = 98 π)	**M1**
$\pi \times 7^2$ oe (flat face area = 49 π)	**M1**
awrt 462	**A1**

Answer: 462 cm^2 (3 sf)

Question 4

$1/3 \times \pi \times 6^2 \times 8$ oe (cone volume = 96 π)	**M1**
$2/3 \times \pi \times 6^3$ oe (hemisphere volume = 144 π)	**M1**
adds their two volumes (dep)	**M1**
awrt 754	**A1**

Answer: 754 cm^3 (3 sf)

Question 5

consistent units used, e.g. radius = 0.7 m and height = 0.9 m	**B1**
$1/3 \times \pi \times 0.7^2 \times 0.9$ oe (0.147 π seen)	**M1**
awrt 0.462	**A1**

Answer: 0.462 m^3 (3 sf)

Question 6

slant height $\sqrt{3^2 + 4^2}$	**M1**
l = 5	**A1**
15pi cm^2 cao	**A1**

Answer: 15pi cm^2

Question 7

$2/3 \times \pi \times 12^3$ oe	**M1**
1152pi cm^3 cao	**A1**

Answer: 1152pi cm^3

Question 8

volume = $1/3 \times \pi \times r^2 \times h$ oe	**M1**
324pi cm^3 cao	**A1**

Answer: 324pi cm^3

Question 9

$2/3 \times \pi \times 15^3$ oe	**M1**
2250pi cm^3 cao	**A1**

Answer: 2250pi cm^3

Question 10

curved surface $2 \times \pi \times 15^2$ oe or $4 \times \pi \times 15^2 / 2$	**M1**
adds flat circle $\pi \times 15^2$	**M1**
675pi cm^2 cao	**A1**

Answer: 675pi cm^2

Question 11

$4/3 \times \pi \times 3^3$ oe	**M1**
36pi cm^3 cao	**A1**

Answer: 36pi cm^3

Question 12

Pythagoras to find the height: $\sqrt{l^2 - r^2}$	**M1**
h = 12 seen	**A1**
$1/3 \times \pi \times 9^2 \times 12$	**M1**
324pi cm^3 cao	**A1**

Answer: 324pi cm^3

Question 13

slant height $\sqrt{15^2 + 8^2}$	**M1**
l = 17	**A1**
255pi cm^2 cao	**A1**

Answer: 255pi cm^2

Question 14

cubes the length ratio, $2^3 : 5^3$ oe (8:125 seen)	**M1**
sets up 32 / 8 x 125 oe (dep)	**M1**
500 cm^3 cao	**A1**

Answer: 500 cm^3

Question 15

recognises the small cone is similar to the large cone, e.g. identifies scale factor 4/10 or 6/15 (= 0.4)	**M1**
$1/3 \times \pi \times 10^2 \times 15$ oe (large cone volume = 500 π)	**M1**
$1/3 \times \pi \times 4^2 \times 6$ oe (small cone volume = 32 π)	**M1**
subtracts small cone volume from large cone volume (dep)	**M1**
awrt 1470	**A1**

Answer: 1470 cm^3 (3 sf)

Question 16

rearranges $V = (4/3) \times \pi \times r^3$ to $r^3 = 3V / (4 \times \pi)$ (oe)	**M1**
r = awrt 4.92 cm (unrounded value should be carried forward if possible)	**M1**
substitutes their r into $SA = 4 \times \pi \times r^2$ (ft)	**M1**
awrt 305 cm^2 (cao; accept awrt 304-305 depending on rounding of r)	**A1**

Answer: 305 cm^2 (3 s.f.)

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