IB MATHS AI HL · UNIT 3

Volume and Surface Area: exam practice

10 questions · 30 marks · worked solutions and markschemes

Name _____ Date _____ Score / 30

- Answer every question before you look at the solutions. They start after the last question, with the marks for each line: M for method, A for accuracy, R for reasoning.
- Online, with more practice: ibmathrevision.com/hlai/volume-and-surface-area-exam-practice

1. **2 marks · Paper 2 style · calculator allowed**

A triangular prism is 15 cm long. Its cross-section is a triangle with base 8 cm and height 6 cm.

Find its volume. **[2]**

2. **2 marks · Paper 2 style · calculator allowed**

A hemispherical bowl has inner radius 11 cm.

Find the volume of water it holds when full, in litres. **[2]**

3. **3 marks · Paper 2 style · calculator allowed**

A sphere has volume $900\ \text{cm}^3$.

Find its radius and surface area. **[3]**

4. **3 marks · Paper 2 style · calculator allowed**

A square-based pyramid has base side 9 m and vertical height 12 m.

Find its volume and the slant height of a triangular face. **[3]**

5. **3 marks · Paper 2 style · calculator allowed**

A metal cube of side 10 cm is melted and recast into spheres of radius 1.5 cm.

Find the number of complete spheres that can be made. **[3]**

6. **3 marks · Paper 2 style · calculator allowed**

A tin of paint covers $12\ \text{m}^2$. A spherical water tower of diameter 8 m is painted.

Find the number of tins needed. **[3]**

7. **4 marks · Paper 2 style · calculator allowed**

A cylinder has radius 4.5 cm and height 12 cm.

Find the volume and the total surface area. **[4]**

8. **4 marks · Paper 2 style · calculator allowed**

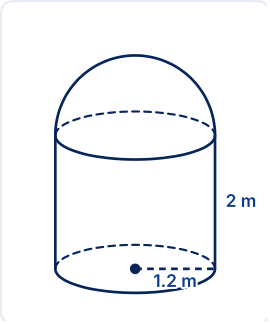
A cone has radius 6 cm and slant height 10 cm. (Curved surface area $= \pi r l$.)

Find its volume and total surface area. **[4]**

9. **3 marks · Paper 2 style · calculator allowed**

A water tank is a cylinder of radius 1.2 m and height 2 m with a hemispherical top.

Find the capacity of the tank in litres. **[3]**



Cylinder 1.2 m by 2 m with a hemispherical top

10. **3 marks · Paper 2 style · calculator allowed**

A cylinder of radius r cm has volume $500\ \text{cm}^3$ and height equal to its diameter.

Find r and the total surface area. **[3]**

Answers and worked solutions

Question 1 — 2 marks

Answer: $360\ \text{cm}^3$

$\frac{1}{2}(8)(6)(15)$ **M1**

$360\ \text{cm}^3$ **A1**

Question 2 — 2 marks

Answer: 2.79 litres

$\frac{2}{3}\pi(11^3)$ **M1**

2.79 litres **A1**

Question 3 — 3 marks

Answer: 5.99 cm; $451\ \text{cm}^2$

$\frac{4}{3}\pi r^3 = 900$ **M1**

$r = 5.99$ cm **A1**

$451\ \text{cm}^2$ **A1**

Question 4 — 3 marks

Answer: $324\ \text{m}^3$; $12.8\,m$

$\frac{1}{3}(81)(12) = 324\ \text{m}^3$ **A1**

$\sqrt{12^2 + 4.5^2}$ **M1**

$12.8\,m$ **A1**

Question 5 — 3 marks

Answer: 70

sphere volume $14.14\ \text{cm}^3$ **A1**

$\frac{1000}{14.14} = 70.7$ **M1**

70 **A1**

Question 6 — 3 marks

Answer: 17

$4\pi(4^2) = 201\ \text{m}^2$ **A1**

$\frac{201}{12} = 16.8$ **M1**

17 tins **A1**

Question 7 — 4 marks

Answer: $763\ \text{cm}^3$; $467\ \text{cm}^2$

$\pi(4.5^2)(12)$ **M1**

$763\ \text{cm}^3$ **A1**

$2\pi(4.5^2) + 2\pi(4.5)(12)$ **M1**

$467\ \text{cm}^2$ **A1**

Question 8 — 4 marks

Answer: $302\ \text{cm}^3$; $302\ \text{cm}^2$

height 8 cm **A1**

$V = 96\pi = 302\ \text{cm}^3$ **A1**

$\pi(36) + \pi(6)(10)$ **M1**

$302\ \text{cm}^2$ **A1**

Question 9 — 3 marks

Answer: $12\,700$ litres

$\pi(1.2^2)(2) + \frac{2}{3}\pi(1.2^3)$ $M1$**A1**

$12.7\ \text{m}^3 = 12\,700$ litres **A1**

Question 10 — 3 marks

Answer: 4.30 cm; $349\ \text{cm}^2$

$\pi r^2(2r) = 500$ **M1**

$r = 4.30$ cm **A1**

$6\pi r^2 = 349\ \text{cm}^2$ **A1**

Every solution is also on ibmathrevision.com/hlai/volume-and-surface-area-exam-practice
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