

E5.4 Surface area and volume

Name: _____ Class: _____ Date: _____

Total: 13 marks

Objective

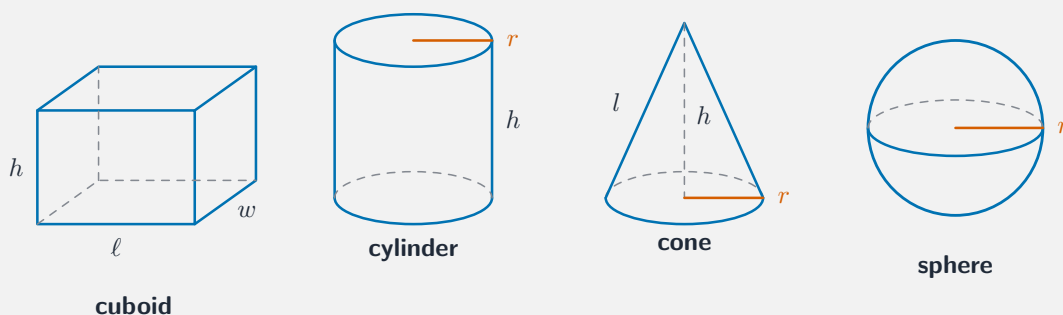
Build the skills to answer Extended exam questions on **surface area and volume** 表面积和体积—the **cylinder, cone and sphere** 圆柱、圆锥和球, and parts of solids such as a **hemisphere** 半球.

You must be able to:

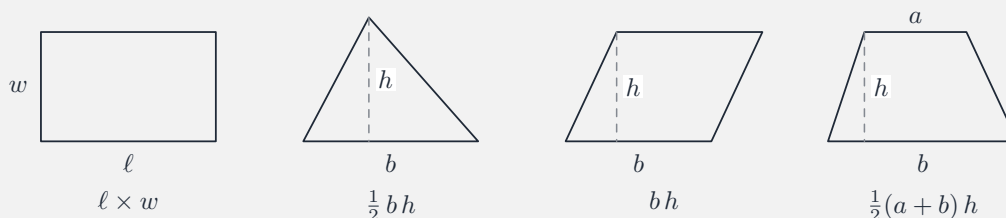
- find the volume of a cylinder, cone, sphere and pyramid
- find the surface area of a cylinder and cone
- work with parts of solids (hemispheres)

1 Worked examples

■ Volumes and surface areas



Learn the key formulas —some are on the formula list



Face areas build up the surface area of a solid

$$\text{cylinder: } V = \pi r^2 h, \quad \text{SA} = 2\pi rh + 2\pi r^2 \quad \text{cone: } V = \frac{1}{3}\pi r^2 h$$

sphere: $V = \frac{4}{3}\pi r^3$, $SA = 4\pi r^2$ hemisphere: $V = \frac{2}{3}\pi r^3$

- **Worked (cylinder $r = 5$, $h = 10$):** $V = \pi(25)(10) = 250\pi$; $SA = 100\pi + 50\pi = 150\pi \text{ cm}^2$.

Answer shapes: **M1** a correct method, **A1** the correct answer.

2 Practice

2.1 Find the volume of a cuboid 4 cm by 3 cm by 5 cm. [1]

2.2 Find the volume of a cylinder of radius 3 cm and height 10 cm, in terms of π . [2]

2.3 Find the volume of a sphere of radius 3 cm, in terms of π . [2]

3 Exam-style questions

3.1 A cone has radius 6 cm and height 8 cm. Find its volume, in terms of π . [2]

3.2 Find the total surface area of a cylinder of radius 4 cm and height 9 cm, in terms of π . [3]

3.3 A solid hemisphere has radius 6 cm. Find its volume, in terms of π . [2]

4 Go further

You are now ready for the real exam questions on this subtopic. Open the **E5.4 Surface area and volume** past-paper sheet in the Library, or try these in **Practice mode**:

- 0580/41 N25 —Q14 (volume / surface area)
- 0580/41 J25 —Q20 (solids)

Solutions

Marking: **M1** a correct method, **A1** the correct answer.

2.1 $4 \times 3 \times 5 = 60 \text{ cm}^3$.

2.2 $\pi \times 3^2 \times 10 = 90\pi \text{ cm}^3$.

2.3 $\frac{4}{3}\pi \times 3^3 = \frac{4}{3}\pi \times 27 = 36\pi \text{ cm}^3$.

3.1 $\frac{1}{3}\pi \times 6^2 \times 8 = \frac{1}{3}\pi \times 288 = 96\pi \text{ cm}^3$.

3.2 $\text{SA} = 2\pi(4)(9) + 2\pi(4)^2 = 72\pi + 32\pi = 104\pi \text{ cm}^2$.

3.3 $\frac{2}{3}\pi \times 6^3 = \frac{2}{3}\pi \times 216 = 144\pi \text{ cm}^3$.