



4.12H Surface Area: Higher Tier Practice

EDEXCEL Edexcel 1MA1 · Calculator allowed · about 70 minutes

Total Marks

Name: _____ Date: ____ / ____ / ____

Answer ALL questions. Show all your working.

- 1** A cube has side length 7 cm. Work out the total surface area of the cube.

(Total for Question 1 is 2 marks)

- 2** A closed rectangular box has exterior dimensions 12 cm by 8 cm by 5 cm. Calculate the surface area of the box.

(Total for Question 2 is 3 marks)

- 3** A closed cylinder has radius 3 cm and height 10 cm. Work out the total surface area. Give your answer in terms of π .

(Total for Question 3 is 3 marks)

- 4 A solid is made by attaching a right circular cone to one circular face of a closed cylinder so that their bases coincide. The cylinder has radius 4 cm and height 9 cm. The cone has the same radius 4 cm and sloping height (l) 5 cm. Calculate the total surface area of the solid (do not include the area of the circle where they join). Give your answer in terms of π .

(Total for Question 4 is 4 marks)

- 5 A regular square pyramid has base side 10 cm and sloping height 13 cm. Calculate the total surface area of the pyramid.

(Total for Question 5 is 4 marks)

- 6 Show that if the dimensions of a solid are all multiplied by 3, its total surface area is multiplied by 9. You may use a cube or any prism as an example and justify your scaling step.

(Total for Question 6 is 3 marks)

- 7 A closed cylinder has total surface area $154\pi \text{ cm}^2$ and radius 7 cm. Find its height. Give your answer in cm, correct to 1 decimal place if necessary.

(Total for Question 7 is 4 marks)

- 8** A solid model is made by placing a hemisphere on top of a right circular cone so that the flat face of the hemisphere rests on the cone base. The hemisphere has radius r , and the cone has the same base radius r and sloping height l . The curved surface area of the hemisphere is $2\pi r^2$ and the curved surface area of the cone is $\pi r l$. Given $r = 6$ cm and $l = 10$ cm, calculate the total exposed surface area of the model (do not include the circular area where they meet). Give your answer in terms of π .

(Total for Question 8 is 7 marks)

Mark scheme · 4.12H Surface Area: Higher Tier Practice

Question 1

- **M1** method for surface area $6 \times \text{side}^2$ or show 6×7^2
- **A1** 294 cm^2 cao
- **Answer: 294 cm^2**

Question 2

- **M1** method: $2(ab + ac + bc)$ or substitution $2(12 \times 8 + 12 \times 5 + 8 \times 5)$
- **M1** arithmetic for the three products summed ($96 + 60 + 40 = 196$) or equivalent
- **A1** 392 cm^2 cao
- **Answer: 392 cm^2**

Question 3

- **M1** method: total area $= 2(\pi r^2) + 2(\pi r h)$ or substitute $\pi(2 \times r^2 + 2 \times r \times h)$
- **M1** substitute $r=3$, $h=10$ to get $2(\pi \times 9) + 2(\pi \times 3 \times 10) = 18\pi + 60\pi$
- **A1** $78 \pi \text{ cm}^2$ cao
- **Answer: $78 \pi \text{ cm}^2$**

Question 4

- **M1** identify surfaces: curved surface of cylinder $2 \pi r h_{\text{cyl}}$ and curved surface of cone $\pi r l$, and one circular base of cylinder
- **M1** substitute $r=4$, $h_{\text{cyl}}=9$, $l=5$: cylinder curved $= 2 \pi \times 4 \times 9 = 72 \pi$; cone curved $= \pi \times 4 \times 5 = 20 \pi$; one base $= \pi \times 4^2 = 16 \pi$
- **M1** sum areas: $72 \pi + 20 \pi + 16 \pi$
- **A1** $108 \pi \text{ cm}^2$ cao
- **Answer: $108 \pi \text{ cm}^2$**

Question 5

- **M1** identify base area and 4 triangular faces: base $= 10^2 = 100$, each triangle area $= \frac{1}{2} \times \text{base side} \times \text{sloping height}$
- **M1** triangle area $= \frac{1}{2} \times 10 \times 13 = 65$, total for four faces $= 4 \times 65 = 260$
- **M1** sum base + faces $= 100 + 260$
- **A1** 360 cm^2 cao
- **Answer: 360 cm^2**

Question 6

- **M1** state surface area scales as length^2 so factor becomes k^2 when lengths scaled by k
- **M1** substitute $k=3$ to get scaling factor $3^2 = 9$
- **A1** conclusion: total surface area multiplied by 9 with justification oe
- **Answer: Surface area scale factor $= 3^2 = 9$, so total surface area is multiplied by 9.**

Question 7

- **M1** use formula $2 \pi r^2 + 2 \pi r h = \text{total surface area}$ and substitute $r=7$
- **M1** substitute $2 \pi \times 7^2 + 2 \pi \times 7 \times h = 154 \pi$, cancel π and compute $98 + 14 h = 154$
- **M1** solve $14 h = 56$ so $h = 4$
- **A1** $h = 4 \text{ cm}$ cao
- **Answer: 4 cm**

Question 8

- **M1** identify curved areas: hemisphere $2\pi r^2$ and cone πrl and note base circle is hidden
- **M1** substitute $r=6$, $l=10$: hemisphere $= 2\pi * 36 = 72\pi$, cone $= \pi * 6 * 10 = 60\pi$
- **M1** sum curved areas $72\pi + 60\pi = 132\pi$
- **M1** consider whether the flat circular face is exposed; state it is not included
- **A1** $132\pi \text{ cm}^2$ cao
- **SC1** alternative correct working showing hemisphere area as $2\pi r^2$ and cone area and summing to 132π
- **SC1** final answer stated in terms of π
- **Answer: $132\pi \text{ cm}^2$**