HIGHER

4.14H Cylinders: Higher Tier Practice

Total Marks

EDEXCEL Edexcel 1MA1 · Calculator allowed · about 65 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Work out the volume of a cylinder with radius 7 cm and height 10 cm. Give your answer in terms of π.

(Total for Question 1 is 2 marks)

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2 Calculate the total surface area of a closed cylinder with radius 5 cm and height 12 cm. Give your answer in terms of π.

(Total for Question 2 is 3 marks)

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3 A metal rod is made by drilling a cylindrical hole through the centre of a solid cylinder. The original cylinder has radius 8 cm and height 15 cm. The hole is a cylinder of radius 3 cm drilled along the full height. Work out the volume of metal remaining, giving your answer in terms of π.

(Total for Question 3 is 3 marks)

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4 A cylinder has height 20 cm and volume 8000 π cm^3. Work out the radius of the cylinder.

(Total for Question 4 is 3 marks)

5 Show that if every linear dimension of a cylinder is multiplied by a factor k then its volume is multiplied by k^3. Write down any algebraic steps you use.

(Total for Question 5 is 4 marks)

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6 A cylindrical column has radius 0.4 m and height 2.5 m. Only the curved surface is to be painted. One litre of paint covers 6 m^2. Calculate how many litres of paint are needed. Give your answer to the nearest whole litre.

(Total for Question 6 is 3 marks)

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7 A cylinder has the property that its curved surface area is equal to the combined area of its two circular bases. If its volume is 4500 π cm^3, find the radius and height of the cylinder. Give answers to 2 decimal places.

(Total for Question 7 is 4 marks)

Mark scheme · 4.14H Cylinders: Higher Tier Practice

Question 1

- **M1** use $V = \pi * r^2 * h$ with $r = 7$, $h = 10$
- **A1** $490\ \pi\ cm^3$ cao
- **Answer: $490\ \pi\ cm^3$**

Question 2

- **M1** calculate curved surface area $2 * \pi * r * h = 2 * \pi * 5 * 12 = 120\ \pi$
- **M1** calculate area of two bases $2 * \pi * r^2 = 2 * \pi * 25 = 50\ \pi$
- **A1** $170\ \pi\ cm^2$ cao
- **Answer: $170\ \pi\ cm^2$**

Question 3

- **M1** volume of original cylinder $\pi * 8^2 * 15 = 960\ \pi$
- **M1** volume of drilled cylinder $\pi * 3^2 * 15 = 135\ \pi$
- **A1** remaining volume $= 960\ \pi - 135\ \pi = 825\ \pi\ cm^3$ cao
- **Answer: $825\ \pi\ cm^3$**

Question 4

- **M1** use $V = \pi * r^2 * h$ and rearrange to $r^2 = V / (\pi * h)$
- **M1** substitute $V = 8000\ \pi$ and $h = 20$ to get $r^2 = 8000 / 20 = 400$
- **A1** $r = 20$ cm cao
- **Answer: 20 cm**

Question 5

- **M1** start with $V = \pi * r^2 * h$ and substitute $r' = k\ r$, $h' = k\ h$ giving $V' = \pi * (k\ r)^2 * (k\ h)$
- **M1** simplify to $V' = \pi * k^2 * r^2 * k * h$
- **A1** simplify to $V' = k^3 * (\pi * r^2 * h)$
- **B1** conclude $V' = k^3\ V$, stating that volume is multiplied by k^3 oe
- **Answer: $V' = k^3\ V$, so the volume is multiplied by k^3.**

Question 6

- **M1** calculate curved surface area $2 * \pi * r * h = 2 * \pi * 0.4 * 2.5 = 2\ \pi\ m^2$
- **M1** divide by coverage: litres $= (2\ \pi) / 6 = \pi / 3$
- **A1** $\pi/3$ approx 1.05 so 1 litre to the nearest whole litre awrt
- **Answer: 1 litre**

Question 7

- **M1** state equation curved area = area of two bases so $2 * \pi * r * h = 2 * \pi * r^2$ and deduce $h = r$
- **M1** use volume $V = \pi * r^2 * h$ and substitute $h = r$ to get $V = \pi * r^3$
- **M1** rearrange $r^3 = 4500$ and take cube root
- **A1** $r = 16.51$ cm, $h = 16.51$ cm (both to 2 d.p.) cao
- **Answer: r = 16.51 cm, h = 16.51 cm**