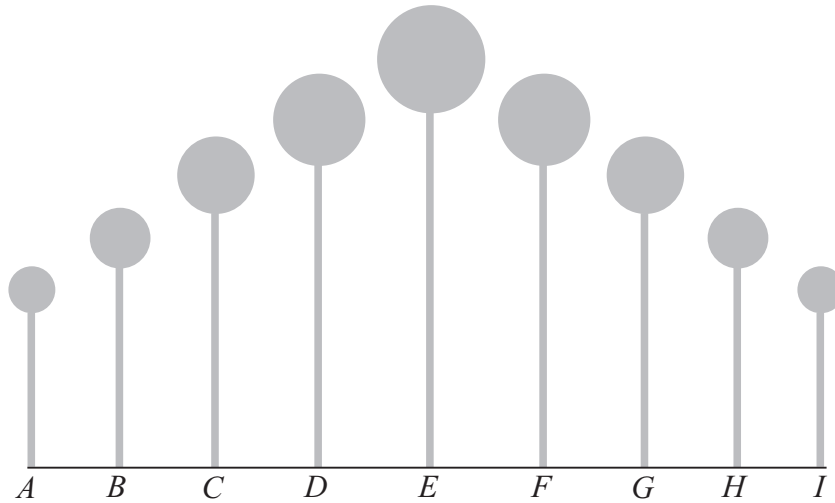


LC 2018: PAPER 2

QUESTION 7 (50 MARKS)

Question 7 (a)



Volume of sphere A: $V = \frac{4}{3}\pi(3)^3 = 36\pi \text{ cm}^3$

Geometric sequence: $36\pi, 36\pi \times 1.75, 36\pi \times 1.75^2, \dots$

$a = 36\pi, r = 1.75, n = 5$

$$S_5 = \frac{36\pi(1-1.75^5)}{1-1.75} = 2324 \text{ cm}^3$$

MARKING SCHEME NOTES

Question 7 (a) [Scale 10D (0, 3, 5, 8, 10)]

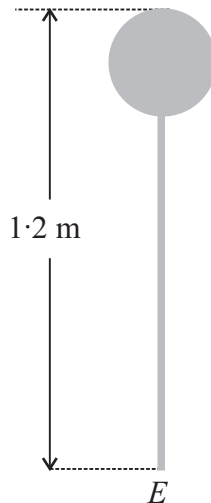
- 3: • Volume formula with some substitution
- 5: • Volume of 2 spheres
• GP formula with some substitution
- 8: • Volume of 5 spheres
• GP formula fully substituted

Question 7 (b)

(i) Surface area $A = 4\pi r^2 = 503 \text{ cm}^2$

$$r = \sqrt{\frac{503}{4\pi}} = 6.33 \text{ cm}$$

Height = $120 - 2(6.33) = 107.3 \text{ cm}$



(ii) Bar A: $r = 1 \text{ cm}, V = 71.3\pi \text{ cm}^3$

$$\pi(1)^2 h = 71.3\pi \Rightarrow h = 71.3 \text{ cm}$$

Arithmetic sequence: $71.3, 71.3 + d, 71.3 + 2d, 71.3 + 3d, 71.3 + 4d$

$$\therefore 71.3 + 4d = 107.3 \Rightarrow d = 9$$

A: $h = 71.3 \text{ cm}, B: h = 80.3 \text{ cm}, C: h = 89.3 \text{ cm}, D: h = 98.3 \text{ cm}, E: h = 107.3 \text{ cm}$

MARKING SCHEME NOTES

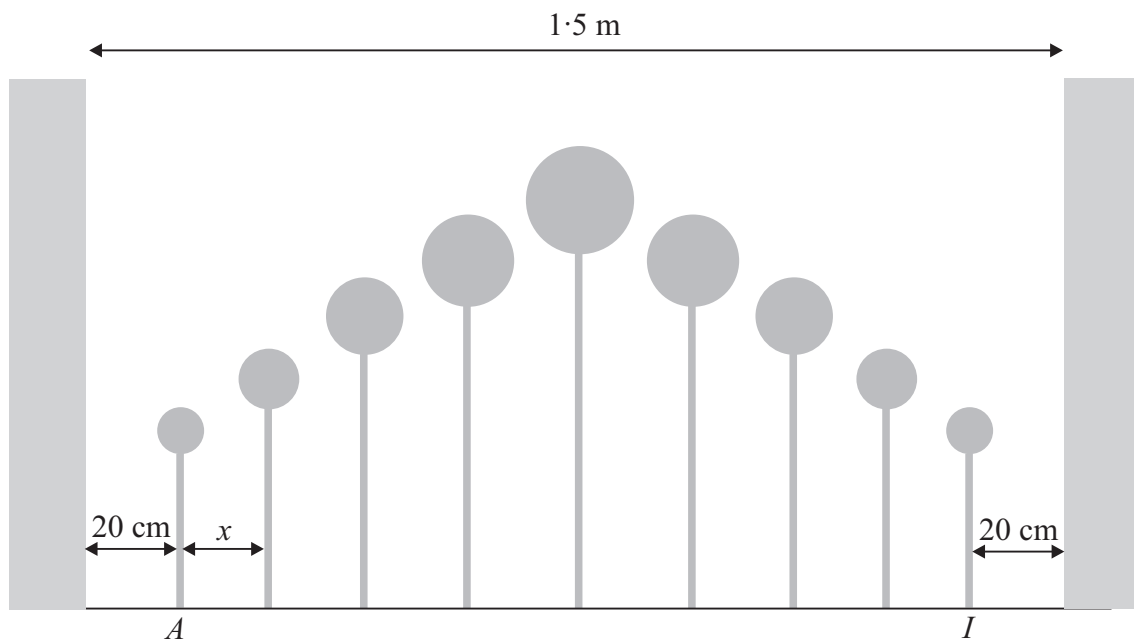
Question 7 (b) (i) [Scale 10C (0, 3, 7, 10)]

- 3: • $4\pi r^3 = 503$
 • $\frac{4}{3}\pi r^3 = \text{volume from (a)}$
 7: • r found

Question 7 (b) (ii) [Scale 10D (0, 3, 5, 8, 10)]

- 3: • Vol formula with some substitution
 • $\pi r^2 h = 71.3\pi$
 5: • Height of bar A
 8: • Difference in height between bar A and bar E

Question 7 (c)



$$150 = 40 + 9 \times 2 + 8x$$

$$92 = 8x$$

$$x = 11.5 \text{ cm}$$

MARKING SCHEME NOTES

Question 7 (c) [Scale 15C (0, 4, 11, 15)]

- 4: • Recognises 8 equal divisions
 • Indicates subtraction of one relevant length
 • 9×2
 11: • $150 - 40 - 18$ or equivalent

Question 7 (d)

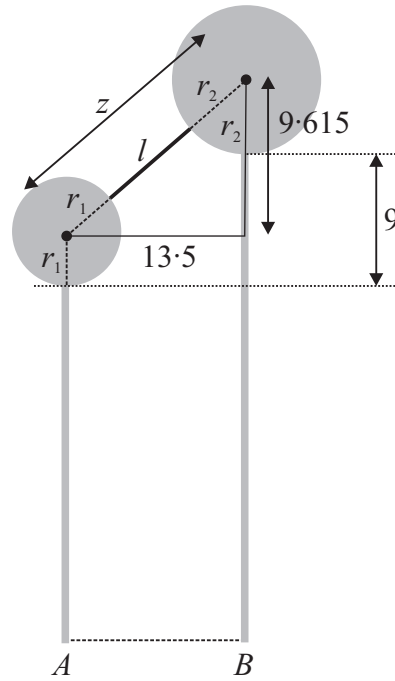
$$r_1 = 3 \text{ cm}$$

$$\frac{4}{3}\pi r_2^3 = 36\pi \times 1.75 \Rightarrow r_2^3 = 47.25$$

$$\therefore r_2 = 3.615 \text{ cm}$$

$$z = \sqrt{13.5^2 + 9.615^2} = 16.57 \text{ cm}$$

$$l = 16.57 - 3 - 3.615 = 9.955 \approx 10 \text{ cm}$$



MARKING SCHEME NOTES

Question 7 (d) [Scale 5B (0, 2, 5)]

- 2:
- V_B formulated with some substitution
 - $|XY|$ formulated
 - $|TW|$ evaluated
 - rod = $|TW| - r_b - r_a$ formulated with 2 relevant values