Case Study 3

Case Study Paragraph: A company is manufacturing ice-cream cones with a hemispherical scoop on top. The cone has a height of 9 cm and a radius of 3.5 cm. Each ice-cream scoop is placed perfectly on top of the cone, forming a solid consisting of a cone and a hemisphere. The company wants to know the surface area of this combination for designing wrappers, and the volume of the ice-cream for production estimates. Additionally, they want to calculate the total ice-cream produced if 500 such cones are prepared in a day. Based on this scenario, answer the following questions.

MCQ Questions

1. The volume of the cone is:

   (a) $115.5\,cm^3$
   (b) $115\,cm^3$
   (c) $120\,cm^3$
   (d) $110\,cm^3$

   Answer: (a) $115.5\,cm^3$
   Solution: Volume of cone $= \frac{1}{3}\pi r^2 h = \frac{1}{3} \times \frac{22}{7} \times (3.5)^2 \times 9 = 115.5\,cm^3$.

2. The volume of the hemisphere is:

   (a) $89.8\,cm^3$
   (b) $90\,cm^3$
   (c) $88\,cm^3$
   (d) $92\,cm^3$

   Answer: (a) $89.8\,cm^3$
   Solution: Volume of hemisphere $= \frac{2}{3}\pi r^3 = \frac{2}{3} \times \frac{22}{7} \times (3.5)^3 = 89.8\,cm^3$.

3. The total volume of ice-cream in one cone with scoop is:

   (a) $200\,cm^3$
   (b) $205.3\,cm^3$
   (c) $210\,cm^3$
   (d) $215\,cm^3$

   Answer: (b) $205.3\,cm^3$
   Solution: Total volume $= 115.5 + 89.8 = 205.3\,cm^3$.

4. The total ice-cream produced in 500 cones is:

   (a) $102,650\,cm^3$
   (b) $100,000\,cm^3$
   (c) $101,000\,cm^3$
   (d) $105,000\,cm^3$

   Answer: (a) $102,650\,cm^3$
   Solution: $205.3 \times 500 = 102,650\,cm^3$.

5. The curved surface area of cone plus curved surface of hemisphere is:

(a) $225\,cm^2$

(b) $214.5\,cm^2$

(c) $220\,cm^2$

(d) $230\,cm^2$

Answer: (b) $214.5\,cm^2$
Solution: CSA of cone $= \pi rl$, with $l = \sqrt{r^2 + h^2} = \sqrt{(3.5)^2 + 9^2} = 9.66\,cm$. CSA of cone $= \pi \times 3.5 \times 9.66 = 106.2\,cm^2$. CSA of hemisphere $= 2\pi r^2 = 2 \times \frac{22}{7} \times (3.5)^2 = 77\,cm^2$. Total $= 183.2\,cm^2$. None of the given options match exactly. Suggested correction: Option should be around $183\,cm^2$.