Mensuration

Self-Evaluation Test

1. A polyhedron has 6 vertices and 12 edges. It is a

- (b) octahedron
- (c) icosahedron (d) dodecahedron
- (e) None of these

(a) tetrahedron

- 2. A room of the hall is such that the ratio of the height of the room to its semi perimeter is 6:10 and the cost of wall paper to cover the walls of the room is Rs. 1700, when the width of the paper is 100 cm at the rate of Rs. 10 per meter², except the door and window whose area is 40 m². The height of the room is:
 - (a) $2\sqrt{6}m$ (b) $6\sqrt{1.75}m$
 - (c) $4\sqrt{6}m$ (d) $5\sqrt{6}m$
 - (e) None of these
- 3. An ant is moving around a few food pieces of different shapes scattered on the floor. For which foodpiece would the ant have to take a longer round?



4. A flooring tile has the shape of a parallelogram whose base is 24 cm and the corresponding height is 10 cm. How many such tiles are required to cover a floor of area $1080 m^2$? (If required you can split the tiles in whatever way you want to fill up the corners).

(a) 30,000	(b) 40,000
(c) 45,000	(d) 60,000
(e) None of these	

- 5. A hall is 15 m long and 12 m broad. If the sum of the areas of the floor and the ceiling is equal to the sum of the areas of four walls, the volume of the hall is:
 - (a) $720m^3$
 - (b) $900 m^3$
 - (c) $1200m^3$
 - (d) $1800 m^3$
 - (e) None of these

6. A tool is made up of a cone on top of a cylinder as shown in the figure below. The cylinder has a height of 15 cm and a radius of 5 cm. The volume of the cone is $100 \pi cm^3$. If O is the vertex of the cone and AB is the diameter of the base of the cone and C is its centre. Points O, A, B and C are in the same plane. Calculate the lateral surface area of the tool.



- (a) $675.714 \, cm^2$ (b) $685.4 \, cm^2$
- (c) $695.4 \, cm^2$ (d) $775.4 \, cm^2$
- (e) None of these
- 7. The external diameter of an iron pipe is 25 cm and its length is 20 cm. If the thickness of the pipe is 1 cm, find the total surface area of the pipe.
 - (a) $3267 \, cm^2$ (b) $3384 \, cm^2$
 - (c) $3224 \, cm^2$ (d) $3168 \, cm^2$
 - (e) None of these

8. The length of a cylindrical metallic tube is one meter. Its thickness is 1 cm and its internal diametre is 12 cm. Find the weight of the tube if the density of the metal is 7.7 gram per cubic cm.

(a) 32.67 kg	(b) 33.84 kg	
(c) 32.24 kg	(d) 31.46 kg	

- (e) None of these
- 9. A hollow garden roller whose external diametre is 42 cm and has a length of 132 cm is made of 2 cm thick cast iron. Find the weight of the roller if 1 cm³ of iron weighs 10 gram.

(a) 331.89 kg	(b) 277.78 kg
(c) 279.78 kg	(d) 278.5 kg
(e) None of these	

10. A hollow iron pipe is 21 cm long and its external diameter is 8 cm. If the thickness of the pipe is 1 cm and iron weighs $8 \text{ g}/\text{cm}^3$, then the weight of the pipe is:

(a) 3.6 kg	(b) 3.696 kg
(c) 36 kg	(d) 36.9 kg
(e) None of these	

11. A metallic sheet is of rectangular shape with dimensions $48m \times 36m$. From each of its corners, a square is cut off so as to make an open box. If the length of the square is 8m, the volume of the box $(in m^3)$ is :

(a) 4830	(b) 5120
(c) 6420	(d) 8960
(e) None of these	

- 12. A large cube is formed from the material obtained by melting three smaller cubes of side 3, 4 and 5 cm. What is the ratio of the total surface areas of the smaller cubes and the large cube?
 - (a) 2:1 (b) 3:2
 - (c) 25:18 (d) 27:20
 - (e) None of these

13. The slant height of a right circular cone is 10m and its height is 8m. Find the area of its curved surface.

- (a) $30\pi m^2$ (b) $40\pi m^2$
- (c) $60\pi m^2$ (d) $80\pi m^2$
- (e) None of these

14. From a solid cylinder of height 4 cm and radius 3 cm, a conical cavity of height 4 cm and of base radius 3 cm is hollowed out. What is the total surface area of the remaining solid?

- (a) $15\pi \, sq\, cm$ (b) $22\pi \, sq\, cm$
- (c) $33\pi \, \text{sq}\,\text{cm}$ (d) $48\pi \, \text{sq}\,\text{cm}$
- (e) None of these

Answer Key

1. B	2. B	3. B	4. C	5. C
6. A	7 . D	8. D	9 . A	10. B
11. B	12 . C	13 . C	14. D	

Explanation

1. Explanation

Option (b) is correct. Using Euler's Formula, F+V-E=2 $\Rightarrow F+6-12=2$ $\Rightarrow F=2+12-6=8$ So, it is a octahedron.

2. Explanation

Option (b) is correct. Let the height of the room be 6x and its semi-perimeter be 10x. Area of the four wall $= 2 \times 6x \times 10x = 120x^2$

Area of the paper needed $= 120x^2 - 40$

Length of the paper needed $=\frac{120x^2-40}{1}$

Total cost of the paper = $10 \times (120 \text{ x}^2 - 40) = 1700$

$$\Rightarrow 120 x^2 = 210 \Rightarrow x^2 = \frac{210}{120} = 1.75 \Rightarrow x = \sqrt{1.75} m$$

Therefore, height of the room is $6\sqrt{1.75} m$.

3. Explanation

Option (b) is correct.

(a) Perimeter $=\frac{\pi \times d}{2} + d = \frac{22}{7} \times \frac{2.8}{2} + 2.8 = 4.4 + 2.8 = 7.2 \, cm$

(b) Perimeter
$$=\frac{\pi \times d}{2} + 2$$
 breadth + length $= 4.4 + 3 + 2.8 = 10.2$ cm (perimeter of semicircular part is same as in

(a)

(c) Perimeter $=\frac{\pi \times d}{2} + 2$ slant height = 4.4 + 4 = 8.4 cm

So, the food shape in (b) requires the ant to cover the longest distance.

4. Explanation

Option (c) is correct. Area of the Parallelogram =base \times height=24 \times 10=240 sq cm

Required number of tiles $= \frac{Area \text{ of } Floor}{Area \text{ of } Tiles} = \frac{1080 \times 100 \times 100}{240} = 45000$

5. Explanation

Option (c) is correct. Area of walls = Area of floor + Area of ceiling

$$2h(\ell+b) = 360 \Rightarrow h(15+12) = 180 \Rightarrow h = \frac{20}{3}m$$

$$\therefore \text{ Volume } = \left(15 \times 12 \times \frac{20}{3}\right)m^3 = 1200m^3$$

6. Explanation

Option (a) is correct. Note that the radius of the cylinder and the radius of the base of the cone have the same size. We first use the formula of the volume of the cone to find its height H:

$$\left(\frac{1}{3}\right)\pi 5 \times^2 h = 100 \ \pi \Longrightarrow h = 12 \ cm$$
$$\ell^2 + h^2 + r^2 \Longrightarrow \ell = 13$$

The area of lateral surface of the cone and that of the cylinder is added to obtain the total area of the surface. So, lateral surface area of the figure

$$= 2\pi rh + \pi r\ell = \pi r (2h + \ell)$$
$$= \frac{22}{7} \times 5 (30 + 13) = 675.714 \, cm^2$$

7. Explanation

Option (d) is correct. Length of the pipe, h = 20 cm.

External radius of the pipe,
$$R = \frac{25}{2} = 12.5 \ cm$$

Thickness of pipe = 1 cm.

Internal radius of this pipe, r = (12.5 - 1) = 11.5 cm.

Total surface area of the pipe = $2\pi Rh + 2\pi rh + 2(\pi R^2 - \pi r^2) = 3168 \text{ cm}^2$.

8. Explanation

Option (d) is correct. Weight of $1 cm^3$ of metal = 7.7 gram

Volume of the tube
$$=\frac{22}{7} \times 100 \times 13$$

Weight of the tube $=\frac{22}{7} \times 100 \times 13 \times 7.7 = 31460$ gram

9. Explanation

Option (a) is correct. Volume of iron $= \pi h (R^2 - r^2) = \pi \times 132 (21^2 - 19^2) = 33188.57 \, cm^3$. Therefore, weight of the roller $= 33158.5710 = 331.89 \, kg$.

10. Explanation

Option (b) is correct. External radius = 4 cm. Internal radius = 3 cm,

Volume of iron
$$=\left(\frac{22}{7} \times [(4)^2 - (3)^2] \times 21\right) cm^3 = \left(\frac{22}{7} \times 7 \times 21\right) cm^3 = 462 cm^3$$

 \therefore Weight of iron = $(462 \times 8)gm = 3696 gm = 3.696 kg$

11. Explanation

Option (b) is correct. Clearly, l = (48-16)m = 32m, b = (36-16)m - 20m, h-8m

 \therefore Volume of the box = $(32 \times 20 \times 8)$ m³ = 5120 m³

12. Explanation

Option (c) is correct. Volume of the large cube $= (3^3 + 4^3 + 5^3) = 216 \text{ cm}^3$ Let the edge of the large cube be a

So, $a^3 = 216 \Longrightarrow a = 6 cm$

:. Required ratio =
$$\left(\frac{6 \times (3^2 + 4^2 + 5^2)}{6 \times 6^2}\right) = \frac{50}{36} = 25 : 18$$

13. Explanation

Option (c) is correct. l = 10 m, h = 8 m.

So,
$$r = \sqrt{\ell^2 - h^2} = \sqrt{(10)^2 - 8^2} = 6m$$

 \therefore Curved surface area = $\pi r \ell = (\pi \times 6 \times 10) m^2 = 60 \pi m^2$

14. Explanation

Option (d) is correct. The resulting solid look like as follows:



Here the unshaded portion is a hollow. Thus, total surface of remaining solid will be the bottom circle of cylindrical portion, curved surface of cylinder and the inner curved surface area of cone.

Now, surface area of bottom of circle $= \pi r^2 = 9\pi sq\ cm$ Curved surface area of cylinder $= 2\pi rh = 2\pi (3)(4) = 24\pi\ sq\ cm$ Slant height of cone $\ell = \sqrt{r^2 + h^2} = \sqrt{3^2 + 4^2} = 5\ cm$ Curved surface area of cone $= \pi r\ell = \pi (3)(5) = 15\pi\ sq\ cm$ Total surface area of resulting solid $= 9\pi + 24\pi + 15\pi = 48\pi\ sq\ cm$.