Chapter-19

Visualising shapes

Exercise 19.1

Q.1 What is the least number of planes that can enclose a solid? What is the name of the solid.

Sol: at least 4 planes that are required to enclose a solid.

The name of solid is tetrahedron.

Q.2 Can a polyhedron have for its faces:

(i) 3 triangles (ii) 4 triangles

(iii) a square and four triangles.

Sol: (i) 3 triangles: No, as polyhedron is a solid shape bounded by 4 polygons.

(ii) 4 Triangles: yes, as a tetrahedron as 4 triangles as its faces.

(iii) A square and four triangles: yes, as square pyramid have square and four triangles.

Q.3 Is it possible to have a polyhedron with any given number of faces?

Sol: yes, but number of faces should be more than four.

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Q.4 Is a square prism same as cube?

Sol: Yes, as square prism is a three dimensional shape with six rectangular shaped side, out of which two are squares. Cubes are of rectangular prism length, width and height of same measurement.

Q.5 Can a polyhedron have 10 faces, 20 edges and 15 vertices.

Sol: By Euler's formula

$$F+V-E=2$$

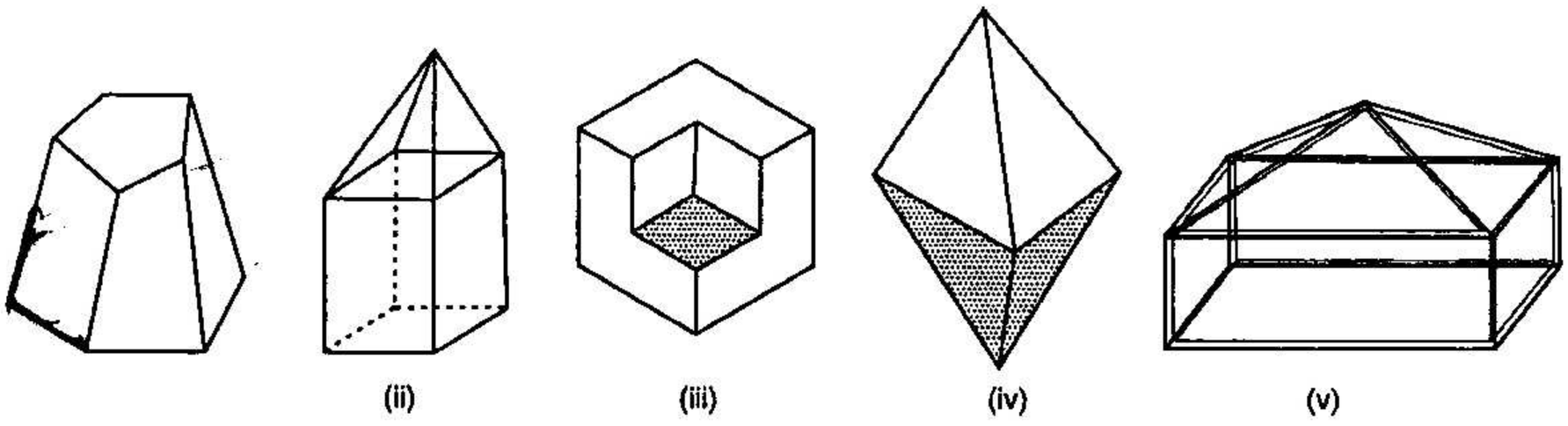
$$\Rightarrow 10+15-20$$

$$= 25-20$$

$$= 5 \neq 2$$

∴ This polyhedron is not possible.

Q.6 Verify Euler's formula for each of the following polyhedrons:



(ii) (iii) (iv) (v)

Fig. 19.26

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Solution (i) $V=10,\ F=7,\ E=15$

$$V+F=E+2$$
$$\Rightarrow 10+7=15+2$$
$$\Rightarrow 17=17$$

hence verified

(ii) $V=9,\ F=9,\ E=16$

$$V+F=E+2$$
$$\Rightarrow 9+9=16+2$$
$$\Rightarrow 18=18$$

hence verified.

(iii) $V=14,\ F=8,\ E=20$

By formula $V+F=E+2$

$$\Rightarrow 14+8=20+2$$
$$\Rightarrow 22=22$$

hence verified.

(iv) $V=6,\ F=8,\ E=12$

By formula, $V+F=E+2$

$$\Rightarrow 6+8=12+2$$
$$\Rightarrow 14=14$$, hence verified

(v) $V=9,\ F=9,\ E=16$

$\because\ V+F=E+2$

$$\Rightarrow 9+9=16+2$$
$$\Rightarrow 18=18$$, hence verified.

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Q.7 Using Euler's formula, Find the unknown

Faces	?	5	20
Vertices	6	?	12
Edges	12	9	?

Sol: (i) By Euler's formula

$V + F = E + 2$

$\Rightarrow 6 + F = 12 + 2$

$\Rightarrow F = 14 - 6 = 8$

(ii) $V + F = E + 2$

$\Rightarrow V + 5 = 9 + 2 \Rightarrow V = 11 - 5$

$= 6$

(iii) $V + F = E + 2$

$\Rightarrow 12 + 20 = E + 2$

$\Rightarrow 32 - 2 = E$

$\Rightarrow E = 30$

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