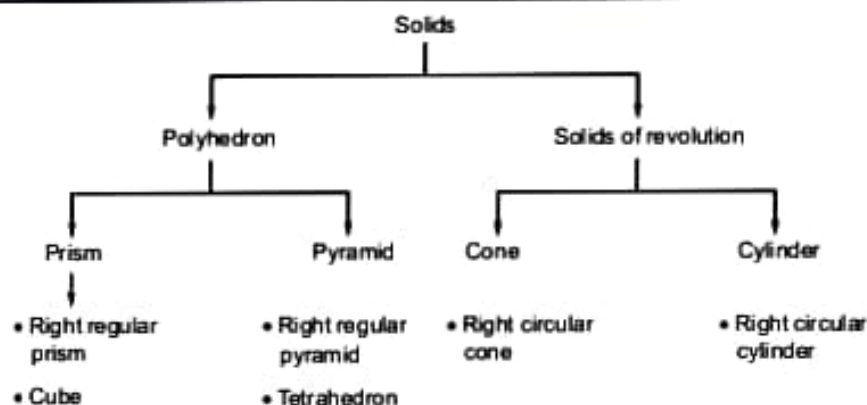


PROJECTIONS OF SOLIDS

4.1 INTRODUCTION

- In orthographic projection solid are represented with the help of minimum two views.
- Solids consist of three dimensions i.e. length, width and height.

4.2 TYPES OF SOLIDS



4.2.1 Polyhedrons

1. Prism :

- It has two equal bases and joined by faces, which are rectangles. The imaginary line joining the centres of the bases is called the axis. All its faces are equal rectangles.

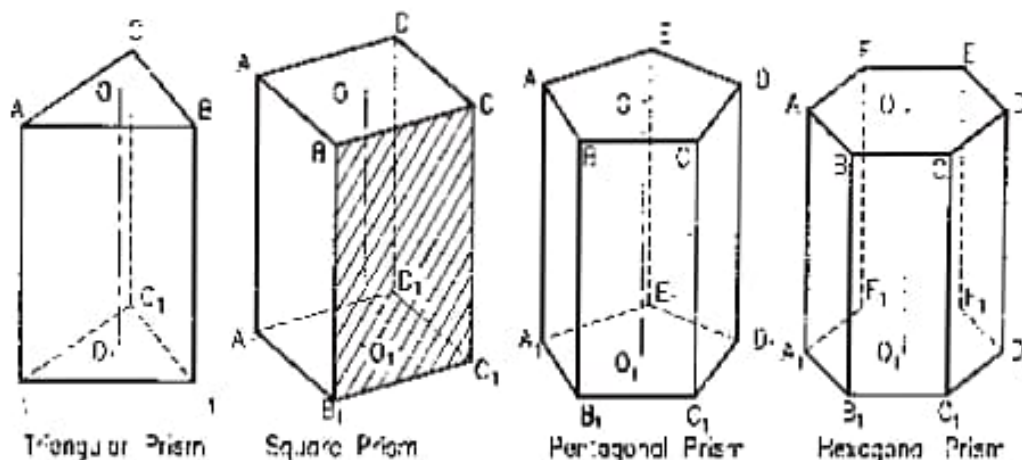
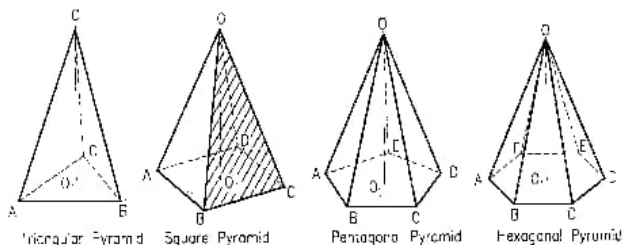


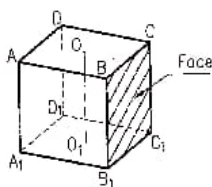
Fig. 4.1

Terminology :

- OO_1 : Axis of a prism, and perpendicular to the base
 AA_1 : Edge of the face; parallel to the axis.
 AB : Edge of the base
 $\square A A_1 B_1 B$: Face of the prism, rectangle and parallel to the axis of the prism.
 $\triangle ABC, \square ABCD$: Base of the prism equilateral triangle, square, pentagon or hexagon.
 $\triangle ABCDE, \square ABCDEF$

2. Pyramids**Fig. 4.2****Terminology :**

- OO_1 : Axis of a pyramid, and perpendicular to the base
 OA : Slant edge of a pyramid
 AB : Edge of the base
 $\triangle OAB$: Face of the pyramid, is isosceles triangle and inclined to the base of pyramid.
 $\triangle ABC, \square ABCD, \triangle ABCDE, \square ABCDEF$

3. Cube**Fig. 4.3****Terminology :**

- OO_1 : Axis of a cube, and perpendicular to base.
 AA_1 : Edge of the face; parallel to the axis.
 AB : Edge of the base
 $\square B B_1 C_1 C$: Base of a cube, square and parallel to the axis of a cube.
 $\square ABCD$: Base of a cube, square.

4. Tetrahedron :

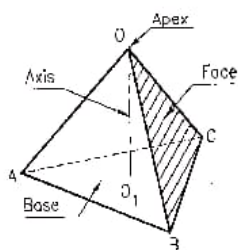


Fig. 4.4

4.2.2 Solids of Revolution

1. Cylinder :

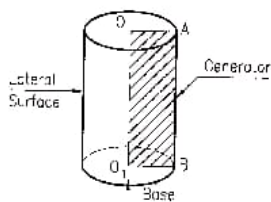


Fig. 4.5

A cylinder is a solid generated by the revolution of a rectangle, OO_1BA about one of its sides OO_1 which remains fixed. It has two circular base.

2. Cone :

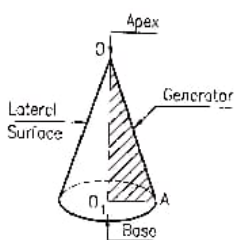


Fig. 4.6

A cone is a solid generated by the revolution of a right-angled triangle OO_1A about its perpendicular sides

Terminology :

- O : Apex of a tetrahedron
- OO_1 : Axis of a tetrahedron, and perpendicular to base.
- OA : Slant edge of a tetrahedron
- AB : Edge of the base
- ΔOBC : Face of a tetrahedron, equilateral triangle and inclined to the base.
- ΔABC : Base of a tetrahedron, equilateral triangle.

Terminology :

- OO_1 : Axis of a cylinder, perpendicular to the base of a cylinder.
- AB : Generator of a cylinder, parallel to the axis of a cylinder.
- Bases : These are circles.

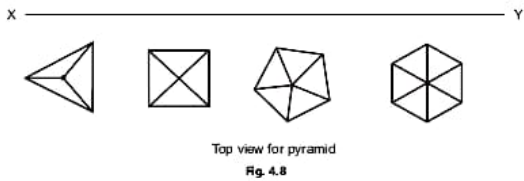
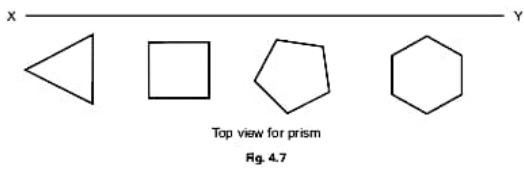
Terminology :

- O : Apex of a Cone.
- OO_1 : Axis of a cone, perpendicular to the base of a cone.
- OA : Generator of a cone, inclined to the axis of a cone.
- Base : Circle.

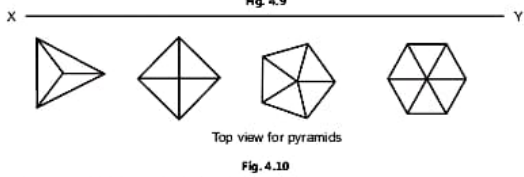
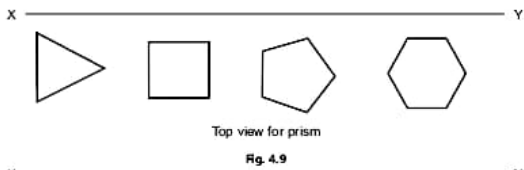
4.3 TRUE SHAPES FOR DIFFERENT SOLIDS IN STAGE I

- Position of True shape in stage I when solid is resting on HP.
- True shape will appear below XY line.

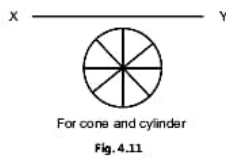
4.3.1 Resting on Side Condition



4.3.2 Resting on Corner



4.3.3 True Shape for Cone and Cylinder when Resting on HP



4.4 STEPS TO SOLVE THE PROBLEMS FOR DIFFERENT CONDITIONS

Steps to solve the problems for different

Conditions :

1. When ' θ ' is given

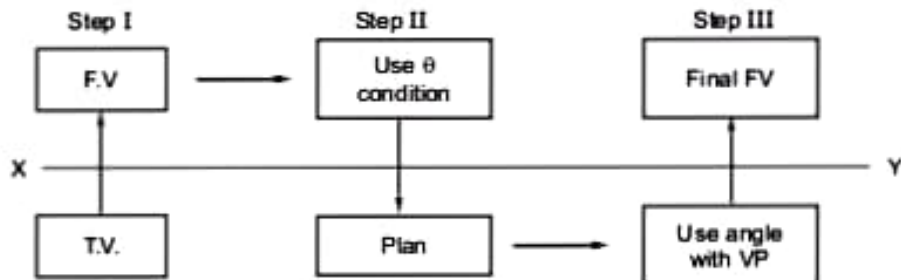


Fig. 4.12

2. When 'Above HP' is given

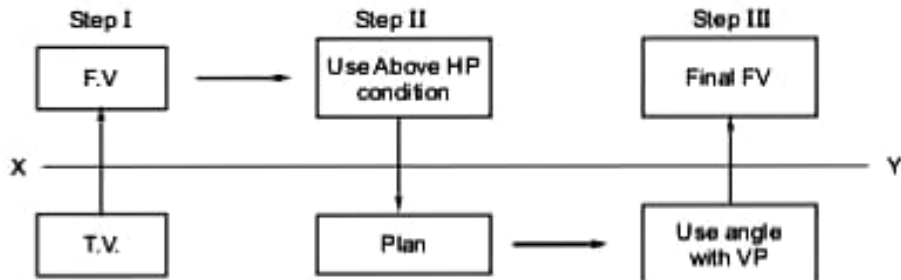


Fig. 4.13

3. When 'Information above TV' is given

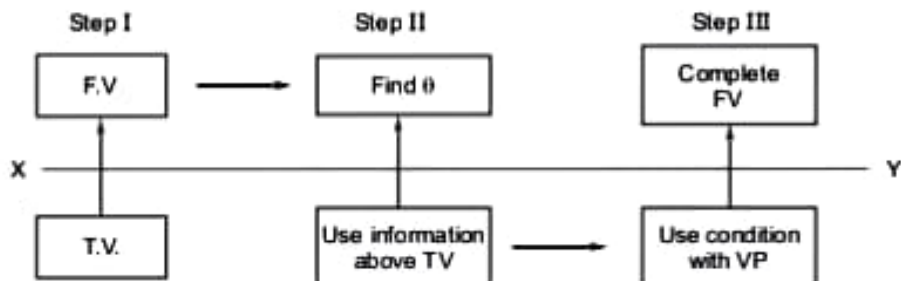


Fig. 4.14

Problems Based On Prism

Problem 4.1 : A triangular prism 20 mm side of base and 60 mm long rests with one of its shorter edge on ground such that the rectangular face containing that edge on which the prism rests is inclined at 30° to the ground. The edge on which the prism rests is inclined at 60° to the V.P. Draw its projections.

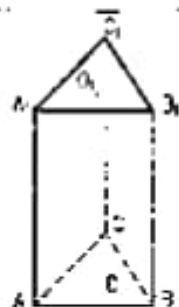


Fig. 4.15

Solution :

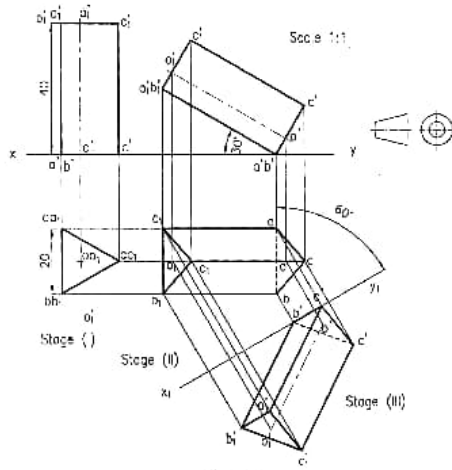


Fig. 4.16

Problem 4.2 : Draw the projections of a square prism resting on an edge of base in H.P. The axis makes an angle of 30° with V.P. and 45° with H.P. Take edge of base equal to 25 mm and axis length equal to 125 mm.

Solution :

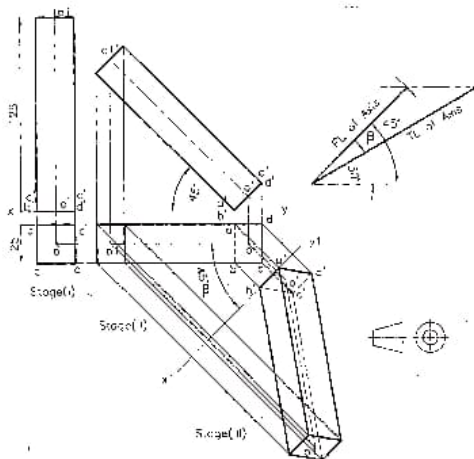


Fig. 4.17

Problem 4.3 : A pentagonal prism of base 30 mm side and axis 60 mm long is resting on a corner of its base on the ground with a longer edge containing that corner inclined at 45° to the H.P. and vertical plane containing that edge and the axis inclined at 30° to the V.P. Draw its projections.

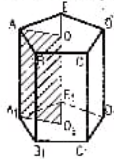


Fig. 4.18

Solution :

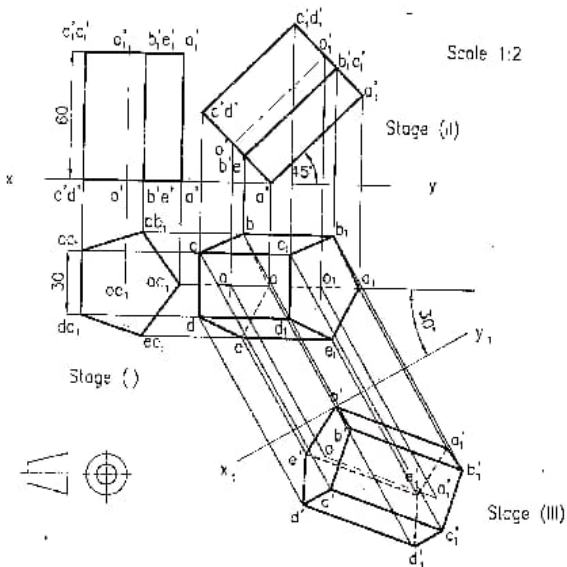


Fig. 4.19

Problem 4.4 : A pentagonal prism, side of base 40 mm and height 60 mm is resting on one of its corners with a longer edge containing this corner is inclined at 45° to H.P. and 30° to V.P. Draw the projections of the prism. Also, draw its side view.

Problem 4.6 : A pentagonal pyramid, base 40 mm side and height 75 mm rests on one edge of its base on the ground so that the highest point in the base is 25 mm above the ground. Draw its projections when the axis is parallel to the V.P. Draw another front view on an auxiliary vertical plane inclined at an angle of 30° to the edge on which it is resting so that the base is visible.

Solution :

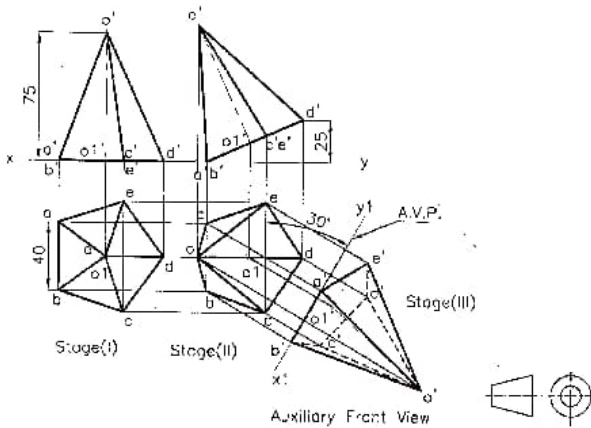


Fig. 4.22

Problem 4.7 : Draw the projections of a pentagonal pyramid, side of base 40 mm and height 70 mm resting on the corner of its base. The slant edge containing that corner makes an angle of 60° to the H.P. Plane containing the axis and that slant edge makes an angle of 45° with the V.P.

Solution :

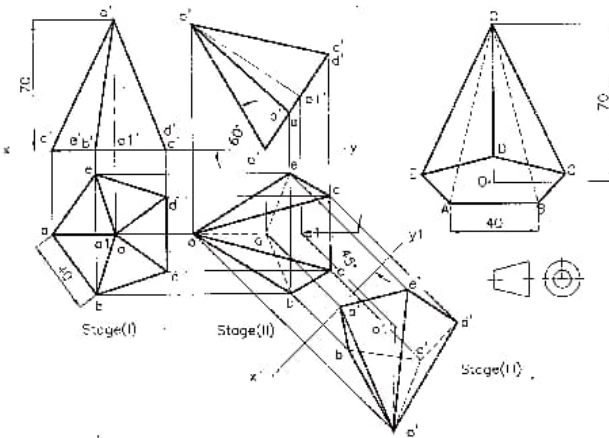


Fig. 4.23

Problem 4.8 : A hexagonal pyramid, side of base 50 mm and height 80 mm rests on one of the edges of its base on H.P. the base being tilted up until the vertex is 60 mm above the H.P. Draw the projections of the pyramid with an edge on which it is resting made inclined at 60° to the V.P. Draw its projections.



Fig. 4.24

Solution :

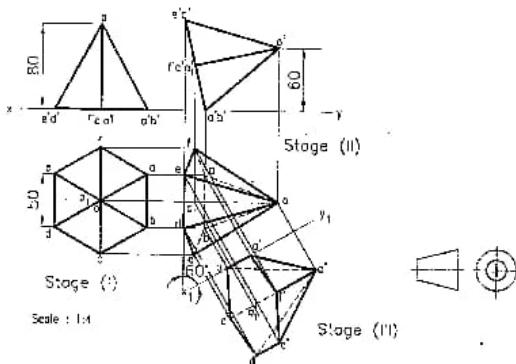


Fig. 4.25

Problem 4.9 : A hexagonal pyramid of 35 mm side of the base and 70 mm length of axis is having a corner of its base on ground. The axis makes 40° with H.P. The plane containing the axis and corner of base on ground is perpendicular to H.P. and is inclined at 45° with V.P. Draw the projections of the pyramid as the apex is away from the observer.



Fig. 4.26

Solution :

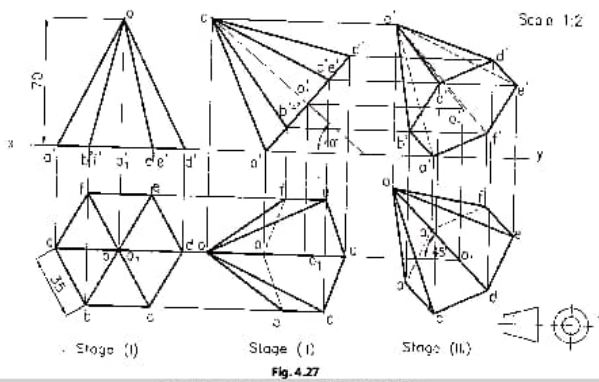


Fig. 4.27

Problem Based on Cylindrical Disc

Problem 4.10 : A cylindrical disc of 70 mm diameter and 30 mm length of axis, has its axis inclined at 30° to the H.P. and plan of axis 40° to the V.P. Draw its projections.

Solution :

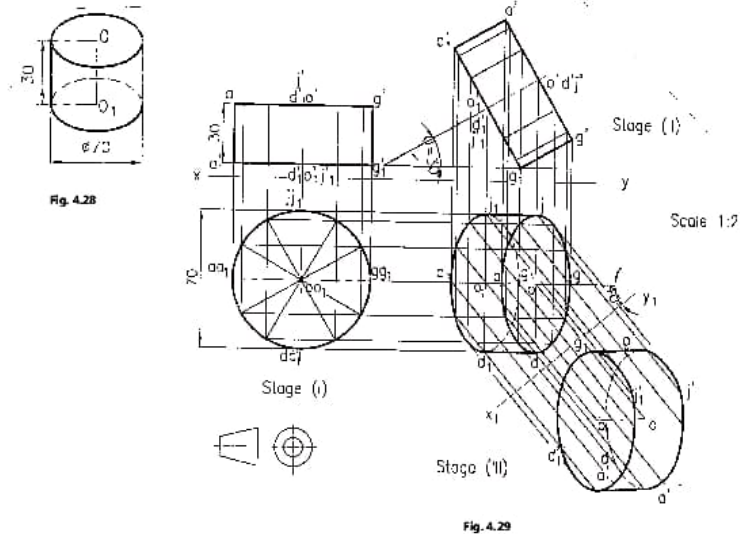


Fig. 4.29

Problem Based on Circular Cylinder

Problem 4.11 : Draw the plan and elevation of a right circular cylinder 50 mm diameter of base and 100 mm long, when its axis is inclined at 50° to V.P. and 17° to H.P. Assume the object in the first quadrant.

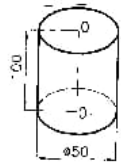
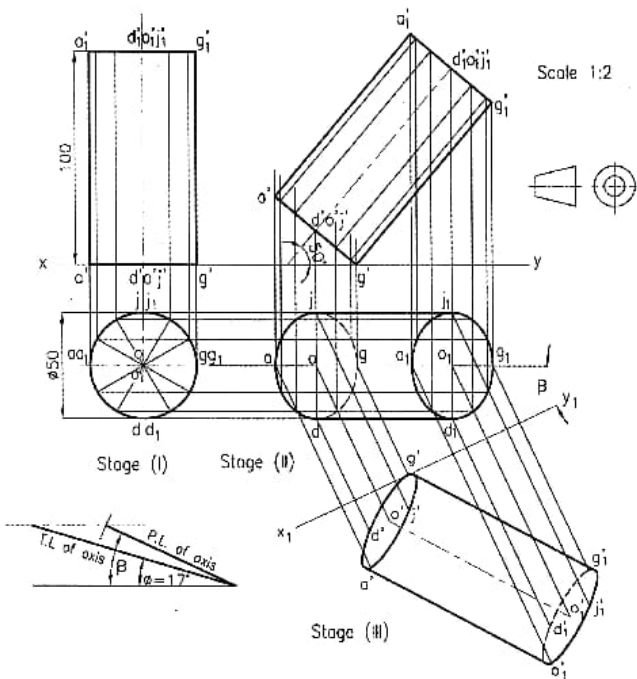


Fig. 4.30

Solution :



Problem Based on Cone

Problem 4.12 : A cone, 60 mm diameter of base and 70 mm height has one of its generators in the H.P. and making an angle of 45° with the V.P. The apex is towards observer. Draw the projections of the solid.

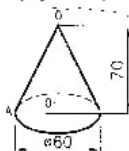


Fig. 4.32

Solution :

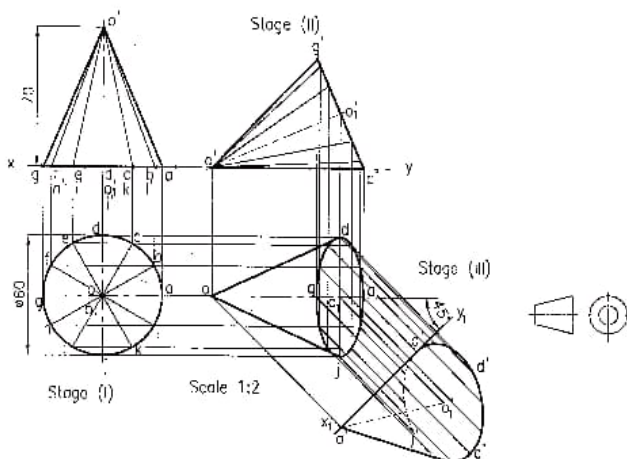


Fig. 4.33

Problem 4.13 : A right circular cone, diameter of base circle is 60 mm and having 80 mm height rests on its rim on ground with the vertex 55 mm above the ground. The axis of the cone makes an angle of 45° with the V.P. Draw its projections when vertex is in V.P.

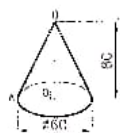


Fig. 4.34

Solution :

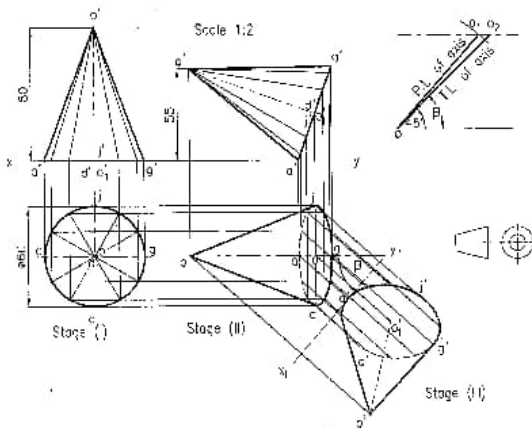


Fig. 4.35

Problem 4.14 : A cone diameter of base 80 mm and 70 mm length of axis is resting on one of its generators, while its axis is inclined at 45° to the V.P. and the apex is nearer to observer. Draw the projections of this cone if the generators of this cone are inclined at 60° to the base.

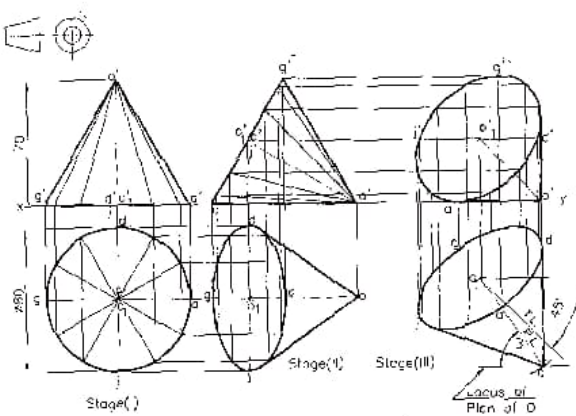


Fig. 4.36

Problem 4.15 : A cone of base 50 mm diameter and axis 70 mm long is lying on one of its generators on the ground with the top view of the axis making an angle of 45° with the V.P. Draw its projections.

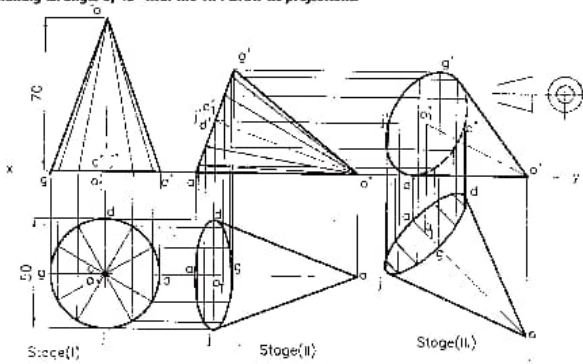


Fig. 4.37

Problem Based on Tetrahedron

Problem 4.16 : A tetrahedron of 80 mm long edges has one edge parallel to the H.P. and inclined at 45° to V.P. while the face containing that edge is vertical. Draw its projections.

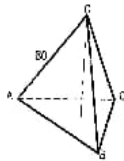


Fig. 4.38

Solution :

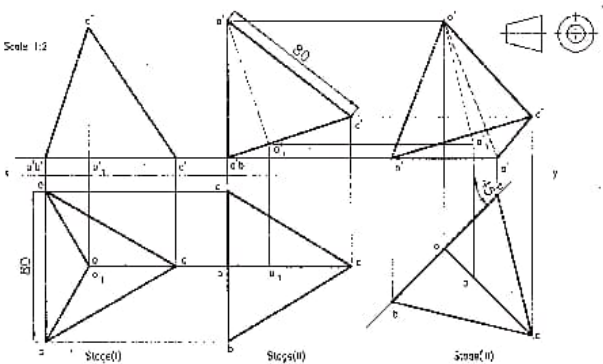


Fig. 4.39

Problem 4.17 : A tetrahedron of 75 mm long edge stands on one of its edges in the H.P. with its base making an angle of 35° with the H.P. The edge of the tetrahedron in the H.P. makes an angle of 35° to the V.P. Draw the projections of the tetrahedron.

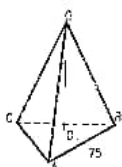


Fig. 4.40

Solution :

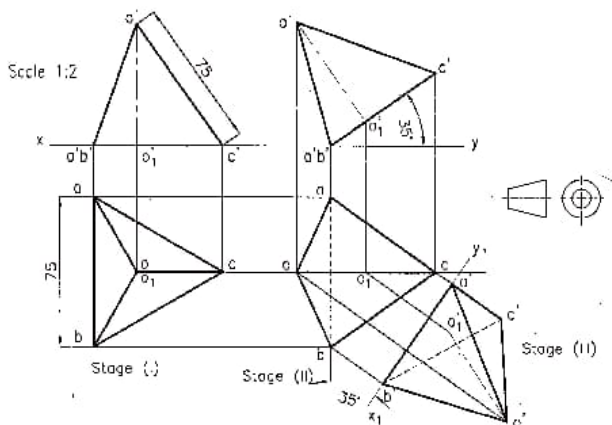


Fig. 4.41

Problem 4.18 : Draw the projections of a tetrahedron edge 60 mm long, resting on a corner on ground with opposite edge parallel to H.P. and inclined at 45° to V.P. The edge through the corner on ground is inclined at 45° to the H.P. Refer Fig. 4.29.

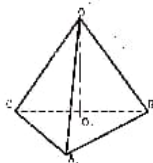


Fig. 4.42

Solution :

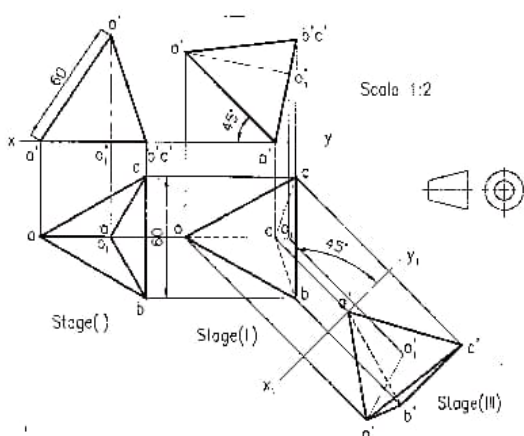


Fig. 4.43

Problem 4.19 : A tetrahedron of 75 mm long edges having one edge parallel to H.P. and inclined at 45° to the V.P. while a face containing that edge is vertical. Draw its three views.

Solution :

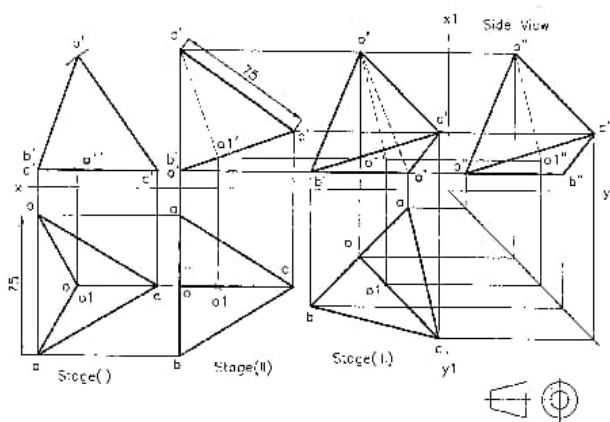


Fig. 4.44

PROBLEMS FOR PRACTICE**(A) Prism**

1. A triangular prism side of base 30 mm and axis length 50 mm is kept on HP on edge of its base in such a way its axis makes angle of 45° with HP. Draw the projections of the prism when longer edge opposite to the base edge on HP is inclined at 30° with the VP.
2. A triangular prism base side 50 mm and axis height 75 mm is resting in HP on one of its base side. Then it is inclined to HP in such a way that the base surface is inclined at an angle of 50° with HP. Draw the projection of solid, if the resting side is inclined at an angle of 45° with VP.
3. A square prism of base side 40 mm and axis height 70 mm is resting in HP on one of its base side. Draw the projections if its axis is inclined to HP and VP at 40° and 30° respectively.
4. A square prism of base side 40 mm and axis height 70 mm is resting in HP on one of its base side. Draw the projections if its axis is inclined to HP 40° and its TV axis makes 35° with VP.
5. A square prism of base side 40 mm and axis height 70 mm is resting in HP on its base side. Draw the projections if its axis is inclined to HP at 40° and the resting side is inclined to VP at 30° .
6. A square prism of base side 40 mm and axis height 70 mm is resting in HP on one of its base corner. Draw the projections if its axis is inclined to HP and VP at 40° and 30° respectively.
7. A square prism of base side 40 mm and axis height 70 mm is resting in HP on one of its base corner. Draw the projections if its axis is inclined to HP 40° and its TV axis makes 35° with VP.
8. A square prism of base side 40 mm and axis height 70 mm is resting in HP on one of its base side. The prism is inclined to HP so that its base polygon makes 40° with HP. Draw the projections if its axis is inclined to VP at 30° .
9. A square prism of base side 40 mm and axis height 70 mm is resting in HP on one of its base side. The prism is inclined to HP so that the base polygon side opposite to resting side is 20 mm above HP. Draw the projections if the resting side is inclined to VP at 30° .
10. A square prism of base side 40 mm and axis height 70 mm is resting in HP on one of its base side. The prism is inclined to HP so that the other side contained by a rectangular face of resting side is 50 mm above HP. Draw the projections if the resting side is inclined to VP at 30° .
11. A square prism of base side 40 mm and axis height 70 mm is resting in HP on one of its base side. The prism is inclined to HP so that the rectangular face contained by resting side appears as square in plan. Draw the projections if the resting side is inclined to VP at 30° .
12. A square prism, side of base 40 mm and height 75 mm is kept on the HP on one of its base edge in such a way that its axis makes an angle of 45° to the HP. Draw the projections of the prism when the side of base which is on the HP makes an angle of 30° with VP.
13. A square prism, side of base 40 mm and height 70 mm is kept on the HP on one of its base edge in such a way that its axis makes an angle of 60° to the HP. Draw the projections of the prism when plan of the axis makes an angle of 45° to the reference line.
14. A square prism, side of base 30 mm and height 60 mm is kept on the HP on a corner of its base such that its axis makes an angle of 30° to both HP and VP. Draw the projections of the prism.
15. A square prism, side of base 40 mm and axis length 60 mm is kept on the HP on a corner of its base in such a way that the longer edge passing through that corner makes an angle of 50° to the HP and 20° to VP. Draw the projections of the prism.
16. A square prism side of base 40 mm and axis height 80 mm is resting in HP on one of its base side. Then it is tilted so that the face contained by resting side is inclined to HP at 30° . Draw the projections, if its axis is inclined to VP at 40° .
17. A square prism of base side 50 mm and axis 80 mm is resting on HP on its base side. Its base surface is inclined to HP at 60° . Draw the projections, if its resting side is inclined to VP at 35° .
18. A regular pentagonal prism, base side 40 mm and axis 80 mm, is resting in HP on one its base corners. Draw the projections if edge containing the resting corner makes 40° with HP and 42° with VP.
19. A pentagonal prism, base side 20 mm and axis height 45 mm is resting on HP on one of its base side. Its axis is inclined to HP at an angle of 30° . Draw the projections, if the resting side is inclined to VP at an angle of 20° .

20. A pentagonal prism 25 mm side of base and 60 mm in height is held on a corner of its base on HP, such that its axis makes an angle of 30° with HP. Draw the projections of the prism when plan of axis is inclined at 45° with the XY line.
21. A pentagonal prism side of base 30 mm and axis length 60 mm is kept on HP on one of its base corners such that longer edge passing through that corner makes an angle of 45° with the HP. Draw the projections of prism when the top view of the vertical edge containing that corner is inclined at 30° to VP.
22. A pentagonal prism side of base 35 mm and axis length 60 mm is kept on the HP on one of its base edges such that the rectangular face containing that base edge appears as a square in elevation. Draw the projections of the prism.
23. A pentagonal prism ABCDE side of base 30 mm and axis length 60 mm is lying on the ground with base edge CD parallel to VP. Draw the development of lateral surface of pentagonal prism if base edge AE and AB are equally inclined to VP.
24. A pentagonal prism 50 mm side of base and 80 mm in height is held on a corner of its base on HP, such that the opposite rectangular face appears to be a square in plan. Draw the projections of prism when the vertical edge containing that corner is inclined at 30° to VP. Find the inclination of the prism with the HP. The top pentagonal face is towards the observer.
25. A pentagonal prism, side of base 35 mm and axis 75 mm and axis length 75 mm long is kept on the HP on one of its base edges such that the rectangular face containing that base edge appears as a rectangle of size (35 x 45) in the plan. Draw the projections of the prism when the axis makes an angle of 30° with VP.
26. A pentagonal prism side of base 35 mm and axis length 75 mm long is kept on the HP on one of its base edges such that the rectangular face containing that base edge appears as a rectangle of size (35 x 45) in the plan. Draw the Projections of the prism when the axis makes an angle of 30° with VP.
27. A pentagonal prism of base 30 mm side and axis 60 mm long is resting on a corner of its base on HP with a longer edge containing that corner inclined at 45° to the HP and vertical plane containing that edge and axis inclined at 30° to the VP. Draw its projection.
28. A hexagonal prism 20 mm side of base and 40 mm in height is kept on HP on one of its base edges such that rectangular face opposite to the base edge on HP makes an angle of 30° with HP. Draw the projections of prism when the base edge in HP makes an angle of 45° with VP.
29. A hexagonal prism of base 25 mm and 15 mm long is positioned with one of its base edges on HP such that the axis is inclined at 30° to HP and 45° to VP. Draw its projection.

(B) PYRAMIDS

30. A triangular pyramid of base side 50 mm and slant edge 70 mm is resting in HP on one of its base sides. Draw the projections if the pyramid is inclined to HP and VP so that the triangular face contained by resting side appears as equilateral triangle in elevation being apex away from the observer.
31. A square pyramid of base side 40 mm and axis height 70 mm is resting in HP on one of its base sides. Draw the projections if its axis is inclined to HP and VP at 40° and 30° respectively with apex away from the observer.
32. A square pyramid of base side 40 mm and axis height 70 mm is resting in HP on one of its base sides. Draw the projections if its axis is inclined to HP 40° and its TV axis makes 35° with VP with apex nearer the observer.
33. A square pyramid of base side 40 mm and axis height 70 mm is resting in HP on one of its base sides. Draw the projections if its axis is inclined to HP at 40° and the resting side is inclined to VP at 30° with apex away from the observer.
34. A square pyramid of base side 40 mm and axis height 70 mm is resting in HP on one of its base sides. The pyramid is inclined to HP so that its base polygon makes 40° with HP. Draw the projections if its axis is inclined to VP at 30° with apex away from the observer.
35. A square pyramid of base side 40 mm and axis height 70 mm is resting in HP on one of its base sides. The pyramid is inclined to HP so that the base polygon side opposite to resting side is 20 mm above HP. Draw the projections if the resting side is inclined to VP at 30° with apex away from the observer.
36. A square pyramid of base side 40 mm and axis height 70 mm is resting in HP on one of its base sides. The pyramid is inclined to HP so that the apex is 50 mm above HP. Draw the projections if the resting side is inclined to VP at 30° with apex away from the observer.
37. A square pyramid of base side 40 mm and axis height 70 mm is resting in HP on one of its base sides. The prism is inclined to HP so that the triangular face contained by resting side appears as equilateral triangle in plan. Draw the projections if the resting side is inclined to VP at 30° with apex nearer the observer.

38. A square pyramid of base side 40 mm and axis height 70 mm is resting in HP on one of its base side. Draw the projections if triangular face contained by resting side is inclined to HP at 40° and the resting side is inclined to VP at 30° with apex nearer the observer.
39. A square pyramid of base side 50 mm and slant edge 80 mm is resting in HP on its base side. Its base surface is inclined to HP at 60° . Draw the projections, if its resting side is inclined to VP at 35° , with its apex nearer the observer.
40. A square pyramid of 45 mm side of base and 70 mm height has its one of the side of base in HP and parallel to VP. Its axis makes an angle of 30° with VP and 60° with HP. Draw its projections.
41. A square pyramid side of base 40 mm and axis length is 60 mm kept on HP on one of its base edges in such way that its axis makes an angle of 30° with HP and 45° with VP. Draw projection pyramid keeping base of pyramid towards the observer.
42. A square pyramid side of base 40 mm and axis length is 55 mm kept on HP on one of its base corner in such way that its axis makes an angle of 30° with HP and 45° with VP. Draw projection pyramid keeping apex of pyramid away from the observer.
43. A square pyramid side of base 30 mm and axis length is 70 mm is kept on HP on an edge of its base in such way that triangular face containing that base edge appears as an isosceles triangle of altitude 50 mm in the plan. Draw the projection of pyramid when base on HP makes an angle 30° to VP.
44. A square pyramid side of base 30 mm and axis length is 70 mm is kept on HP on corner of its base in such way that slant edge opposite on HP is parallel to the HP and 35° to the VP. Draw projection of pyramid.
45. A square pyramid side of base 30 mm and axis length is 70 mm is kept on HP on corner of its base in such way that slant edge of to the corner of HP and perpendicular to VP. Draw projection of pyramid.
46. A square pyramid of 45 mm side of base and 70 mm height has its one side of base HP and parallel to VP. Its axis makes an angle of 30° with VP and 60° with HP. Draw the projection and obtains an auxiliary elevation on a plane inclined at 45° with reference VP.
47. A pentagonal prism of base side 35 mm and axis height 70 mm is resting in HP on one of its base side. Draw the projections if the prism is inclined to HP and VP so that the FV of rectangular face contained by resting side appears as square.
48. A pentagonal pyramid of base side 35 mm and slant edge 70 mm is resting in HP on one of its triangular face. Draw the projections if the resting side is inclined to VP at 30° with apex away from the observer.
49. A pentagonal pyramid of base side 35 mm and slant edge 70 mm is resting in HP on one of its slant edge. Draw the projections if the resting side is inclined to VP at 30° with apex nearer the observer.
50. A pentagonal pyramid, base 25 mm and axis height 40 mm, is resting on HP on its one of triangular face. Draw the projections, if its axis is inclined to VP at an angle of 20° .
51. A regular pentagonal pyramid of base 25 mm and axis length 65 mm is kept on HP on one of its on base edges in such way that the triangular face containing that base edge makes an angle of 50° to HP. Draw projection of pyramid when base edge on HP is parallel to VP.
52. A regular pentagonal pyramid side of base 25 mm and slant height 60 mm is kept on the HP on one of its base edge in such that its axis makes an angle of 30° with the HP. Draw the projection of pyramid when base edge opposite to the corner on HP is making an angle of 40° with VP.
53. A regular pentagonal pyramid of base 20 mm and axis length 65 mm is kept on HP on one of its on base corner in such way that triangular face opposite to that corner is making an angle of 45° to HP. Draw the projections of pyramid when one of the slant edges contained by that triangular face makes an angle of 30° to the VP.
54. A regular pentagonal pyramid of base 40 mm sides and height 70 mm rests on one of its slant edges on the horizontal plane. The view of the axis from above is inclined to the vertical plane at 30° . Its apex is nearer to the VP. Draw the view from above, the view from the front and view from the left.
55. A pentagonal pyramid side of base 40 mm and axis length 75 mm is kept on HP on one of side of base on HP such that triangular surface containing that edge on HP makes an angle of 40° to HP. Draw projection when axis makes an angle 30° to VP with its apex nearer to the observer.
56. A regular pentagonal pyramid, base edge 45 mm and length of axis 75 mm is held on a corner of its base on HP with the triangular face opposite to it, parallel to HP. Draw projections of the pyramid when the base edge contained by this triangular face is parallel to VP and the apex of the pyramid is towards the observer.

57. A pentagonal pyramid, side of base 30mm and length of axis 60 mm rests on one edge of its base on HP, such that the corner opposite to the said edge is 25 mm above the HP. Draw the projections of the pyramid when this edge makes 30° with VP and base is visible to the observer.
58. A hexagonal pyramid, side of base 30 mm and axis length 65 mm is kept on HP on one of its base edges in such way that the triangular face containing that base edge is vertical. Draw projection of pyramid when triangular face is vertical is parallel to VP and nearer to it.
59. A hexahedron of 50 mm side is resting in HP on one of its corner. It is inclined to HP in such a way that a solid diagonal passing through a corner opposite to resting corner is parallel to HP. Draw the projections if its TV axis is inclined at 35° with VP.
60. A hexagonal pyramid, base 25 mm side and axis 55 mm long has one of its slant edges on the ground. A plane containing that edge and axis is perpendicular to the ground & inclined at 45° to the VP. Draw its projections when the apex is nearer the VP than the base.
61. A hexagonal pyramid of base side 40mm and axis 80mm is resting in HP on one of its base side. Draw the projections if its axis is inclined to HP & VP at 30° and 40° . Apex is away from the observer.
62. A hexagonal pyramid side of base 30 mm and axis length 70 mm is resting on the HP on one of its base edges in such a way that its apex is 55 mm above the HP. Draw the projections of the pyramid when the base edge which is on the HP is parallel to VP. Keep apex of the solid in the VP.
63. A regular hexagonal pyramid side of base 25 mm and height 60 mm is resting on one of its corner on HP such that slant edge passing through the resting corner is perpendicular to HP and plan of axis is inclined at 45° to VP. Draw its projections when apex is towards the observer.
64. A hexagonal pyramid, side of base 30 mm and slant height 75 mm is resting on the HP on the one of its base edges in a such a way that axis makes an angle of 45° with the HP. Draw the projection of pyramid plan containing the axis makes an angle of 45° .

(C) CUBE

65. A cube of 50 mm side is resting in HP on one of its corner. It is inclined to HP in such a way that a solid diagonal passing through resting corner is perpendicular to HP. Draw the projections if its TV axis is inclined at 35° with VP.
66. A cube of 60 mm long edges is held on one of its corners on HP such that one of its solid diagonal is parallel to the HP and perpendicular to the VP. Draw the projections of the cube.
67. A cube of 60 mm side is resting in HP on its base corner with its faces equally inclined to VP. Its axis is inclined to HP at 35° . Draw the projections, if its axis is inclined to VP at 30° .

(D) CONE

68. A cone of base diameter 50 mm and axis 75 mm is resting in HP. Draw the projections if its axis is inclined to HP and VP at 40° and 30° respectively being apex nearer the observer.
69. A cone of base diameter 50 mm and generator 75 mm is resting in HP. Draw the projections if its axis is inclined to HP and VP at 40° and 30° respectively being apex away from the observer.
70. A cone of base diameter 50 mm and generator 75 mm is resting in HP. Draw the projections if its axis is inclined to HP 40° and its TV axis makes 35° with VP being apex nearer the observer.
71. A cone of base diameter 50 mm and generator 75 mm is resting in HP. Draw the projections if its base polygon is inclined to HP at 40° and its TV axis makes 35° with VP being apex nearer the observer.
72. A cone of base diameter 50 mm and generator 75 mm is resting in HP. Draw the projections if a generator passing through resting corner is inclined to HP at 40° and its axis makes 35° with VP with apex away from the observer.
73. A cone of base diameter 50 mm and generator 75 mm is resting in HP. Draw the projections if cone is inclined to HP so that its apex is at maxima and its TV axis makes 35° with VP being apex nearer the observer.
74. A cone of base diameter 50 mm and generator 75 mm is resting in HP. Draw the projections if cone is inclined to HP so that its apex is at minima and its axis makes 35° with VP being apex away from the observer.
75. A cone of base diameter 50 mm and generator 75 mm is resting in HP. The cone is inclined to HP so that its base appears as an ellipse of minor axis 30 mm in plan. Draw the projections if its TV axis makes 35° with VP being apex nearer the observer.
76. A cone of base diameter 50 mm and axis 75 mm is resting in HP on one of its generator. Draw the projections if its axis makes 35° with VP with apex away from the observer.

77. A cone of base diameter 30 mm and axis length 45 mm is resting on HP on its base point. Its generator passing through the resting point is perpendicular to HP. Draw the projections if its plan axis is inclined to VP at an angle of 20° .
78. A cone of base diameter 25 mm and axis length 60 mm is resting on HP on its base point in such a way that its apex is 40 mm above the HP. The view of the axis from top is inclined at 30° to VP. Draw its projections.
79. A cone of 70 mm height is lying on the HP on one of its generators with its axis making 40° with VP. Draw the projections of the cone when the apex of the cone away from VP.
80. A cone base diameter 60 mm and axis height 80 mm is resting in HP on one of its base circumference point. Then, it is inclined to HP such that the point opposite to resting point is 52 mm above HP. Draw the projections, if its axis is inclined to VP at 35° , with its apex away from the observer.
81. A cone of base diameter 50 mm and generator 75 mm is resting in HP. Draw the projections if cone is inclined to HP so that its apex is at maxima and its TV axis makes 35° with VP being apex nearer the observer.

(E) Tetrahedron

82. A tetrahedron of 50 mm side is resting in HP on one of its corner. Draw the projections if its axis is inclined to HP at 40° and its TV axis makes 35° with VP with apex nearer the observer.
83. A tetrahedron of 50 mm side is resting in HP on one of its side. Draw the projections if its axis is inclined to HP at 40° and VP at 35° being apex away from the observer.
84. A tetrahedron of 80 mm long edge is held on one of its edges on HP such that triangular face containing that edge is perpendicular to HP. Draw projection of the tetrahedron when the edge on HP is inclined to VP at 45° .
85. A tetrahedron PQRS of 50 mm long edges has edge PQ in HP. The edge RS is inclined at 30° and 45° to the HP and VP respectively. Draw its projection.
86. A tetrahedron of 70 mm long edges has one edge on the HP and inclined at 45° to VP. Draw the projections, if apex is 45 mm above HP.
87. A tetrahedron PQRS of 50 mm long edges has edge PQ in the HP. The edge RS is inclined at 45° to VP and 30° to HP. Draw its projection.
88. A tetrahedron PQRS of 60 mm long edge, PQ on HP and the end R 30 mm above the HP. Draw the projections if plan of the edge RS making an angle of 40° with the VP.
89. A Tetrahedron PQRS of 60 mm long edges, is resting on the edge PQ on HP and the end R is 30 mm Above the HP. Draw the projections, if plan of the edge RS making an angle of 40° with the VP.

(F) Cylinder

90. A cylinder of base diameter 50 mm and axis 75 mm is resting in HP. Draw the projections if its axis is inclined to HP and VP at 40° and 30° respectively.
91. A cylinder of base diameter 50 mm and generator 75 mm is resting in HP. Draw the projections if its axis is inclined to HP 40° and its TV axis makes 35° with VP.
92. A cylinder of base diameter 50 mm and generator 75 mm is resting in HP. Draw the projections if its base polygon is inclined to HP at 40° and its TV axis makes 35° with VP.
93. A cylinder of base diameter 50 mm and generator 75 mm is resting in HP. The cylinder is inclined to HP so that its base appears as an ellipse of minor axis 30 mm in plan. Draw the projections if its TV axis makes 35° with VP.
94. A cylinder base diameter 30 mm and height 60 mm is kept on HP on the point of its base circle in such a way that its axis makes an angle of 30° with HP. Draw the projections of the cylinder when plan of axis making 45° with VP.
95. A cylinder of base diameter 60 mm and axis height 80 mm is resting in HP on one of its base circumference point. Draw the projections if its axis is inclined to HP at 30° and VP at 35° .
96. A cylinder of base diameter 60 mm and axis height 80 mm is resting in HP. Then it is inclined to HP so that the generator passing through resting point is inclined to HP at an angle of 45° . Draw the projections if the plane containing the axis makes 45° with VP.

