20. Water discharges from a horizontal, cylindrical pipe at the rate of 465 cm^3s^{-1}. At a point in the pipe where the radius is 2.05 cm, the absolute pressure is 1.60 x 10^5 Pa. What is the pipe radius at a constriction if the pressure there is reduced to 1.20 x 10^5 Pa? [Ans: 0.41 cm]
21. Water is flowing in a circular pipe with varying cross-sectional area and at all points the water completely fills the pipe.
    i. At one point in the pipe, the radius is 0.150 m. What is the speed of the water at this point if the volume flow rate in the pipe is 1.20 m^3/s
    ii. At a second point in the pipe, the water speed is 3.8 m/s. What is the radius of the pipe at this point? [Ans: 17 ms^{-1}, 0.317 m]
22. At a certain point in a horizontal pipeline, the water's speed is 2.50 ms^{-1}, and the gauge pressure is 1.80 x 10^4 Pa. Find the gauge pressure at a second point in the line if the cross-sectional area at the second point is twice than at the first. [Ans: 2.03×10^4pa]
23. A golf course sprinkler system discharges water from a horizontal pipe at the rate of 7200 cm^3s^{-1} At one point in the pipe, where the radius is 4.00 cm, the water's absolute pressure is 2.40 x 10^5 Pa. At a second point in the pipe, the water passes through a constriction where the radius is 2.00 cm. What is the water's absolute pressure as it flows through this constriction? [Ans: 2.25 x 10^5 Pa]
24. Water flows through a pipe whose internal diameter 2x 10^{-2}m at a speed of 1 ms^{-1}. What should be the diameter of the nozzle if the water is to emerge at a speed of 4 ms^{-1}? [Ans: 1 $\times10^{-2}$ m]
25. Equation of continuity in liquid flow obeys the principle of conservation of mass.
    a. State the equation of continuity for steady flow of incompressible and non-viscous liquid. Draw nature of plot between A and v.
    b. How can this equation be applied in Bernoulli's theorem?
    c. Use the same principle to explain why the air blows faster in the narrow region between the hills.
    d. A shower head has 20 circular openings, each with radius 1.0 mm. The shower head is connected to a pipe with radius 0.80 cm. If the speed of water in the pipe is 3.0 ms^{-1}, what is its speed as it exits the shower-head openings? [Ans: 9.6 ms^{-1}]
26. In the given figure, the diameter of water from a tap can be observed decreasing as it falls towards the ground.
    a. Why does the diameter narrow as it falls.?
    b. Plot the graph of variation of velocity with cross section area of water flow.
    c. Suppose the water tap has faucet of cross-sectional area 20 cm^3, which allows water at 2 ms^{-1} down ward. If the water strikes the ground with velocity of 5 ms^{-1}, find the cross-section of water size during striking on ground.

27. In a test experiment on a model aero plane in a wind tunnel, the flow speeds on the lower and upper surfaces of the wing are v and $v\sqrt{2}$ respectively. If the density of air is ρ and the surface area of the wing is A, what is the dynamic lift on the wing of aero plane?
28. a. How is laminar line flow different from turbulent flow? Derive the expression for continuity equation.
    b. Explain why the equation is valid only for steady, non-viscous and incompressible fluid.
    c. Figure shows a liquid of density 1200 kg/m^3 flowing steadily in a tube of varying cross section. The cross section at a point A is 10 cm and that at B is 20 mm^2, the points A and B are in the same horizontal plane. The speed of the liquid at A is 10 cm/s. Calculate the difference in pressures at A and B.