GPLUS EDUCATION

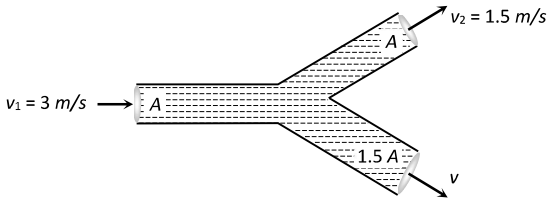
Date :
Time : **PHYSICS**
Marks :

MECHANICAL PROPERTIES OF FLUIDS

Single Correct Answer Type

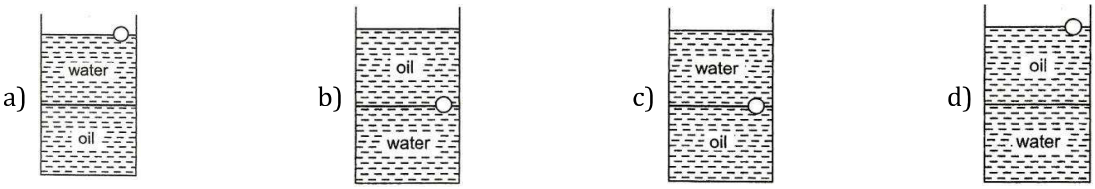
1. A thin uniform cylindrical shell, closed at both ends, is partially filled with water. It is floating vertically in water in half-submerged state. If ρ_c is the relative density of the material of the shell with respect to water, then the correct statement is that the shell is
   a) More than half filled if ρ_c is less then 0.5
   b) More than half filled if ρ_c is less then 1.0
   c) Half filled if ρ_c is less then 0.5
   d) Less than half filled if ρ_c is less then 0.5
2. A container with square base of side a hight H with a liquid. A hole is made at a depth h from the free surface of water. With what acceleration the container must be accelerated, so that the water does not come out?
   a) G
   b) $\frac{g}{2}$
   c) $\frac{2gH}{2}$
   d) $\frac{2gh}{a}$
3. From a steel wire of density ρ is suspended a brass block of densityρ_B. The extension of steel wire comes to l. If the brass block is now fully immersed in a liquid of density ρ_L, the extension becomes l'. The ratio l/l' will be
   a) $\frac{\rho_B - \rho}{\rho_L - \rho}$
   b) $\frac{\rho_L}{\rho_B - \rho_L}$
   c) $\frac{\rho_B - \rho_L}{\rho_B}$
   d) $\frac{\rho_B}{\rho_B - \rho_L}$
4. The pressure on a swimmer 20 m below the surface of water at sea level is
   a) 1.0 atm
   b) 2.0 atm
   c) 2.5 atm
   d) 3.0 atm
5. Bernoulli's principle is not involved in the working/explanation of
   a) Movement of spinning ball
   b) Carburetor of automobile
   c) Blades of a kitchen mixer
   d) Heart attack
6. A soap bubble A radius 0.03 and another bubble B of radius 0.04 m are brought together so that the combined bubble has a common interface of radius r, then the value of r is
   a) 0.24 m
   b) 0.48 m
   c) 0.12 m
   d) None of these
7. A large tank is filled with water to a height H. A small hole is made at the base of the tank. It takes T_1 time to decrease the height of water to $\frac{H}{\eta}(\eta > 1)$: and it takes T_2 time to take out the rest of water. If $T_1 = T_2$, then the value of η is
   a) 2
   b) 3
   c) 4
   d) $2\sqrt{2}$
8. A piece of wax weighs 18.03 g in air. A piece of metal is found to weigh 17.03 g in water. It is tied to the wax and both together weigh 15.23 g in water. Then, the specific gravity of wax id
   a) $\frac{18.03}{17.03}$
   b) $\frac{17.03}{18.03}$
   c) $\frac{18.03}{19.83}$
   d) $\frac{15.03}{17.03}$
9. A small sphere of mass m is dropped from a great height. After it has fallen 100 m, it has attained its terminal velocity and continues to fall at that speed. The work done by air friction against the sphere during the first 100 m of fall is
   a) Greater than the work done by air friction in the second 100 m
   b) Less than the work done by air friction in the second 100 m
   c) Equal to 100 mg
   d) Greater than 100 mg
10. If a drop of water is broken in to smaller drops the surface energy
    a) Increases
    b) Decreases
    c) Remains unchanged
    d) Can increases as well as decreases

11. A boat carrying a number of large stones is floating in a water tank. What would happen to the water level, if a few stones are unloaded into water?
    a) Rises
    b) Falls
    c) Remains unchanged
    d) Rises till half the number of stones are unloaded and the begins to fall
12. An incompressible liquid flows through a horizontal tube as shown in the following fig. Then the velocity v of the fluid is



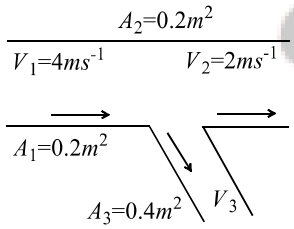
    a) $3.0\ m/s$ b) $1.5\ m/s$ c) $1.0\ m/s$ d) $2.25\ m/s$
13. Determine the energy stored in the surface of a soap bubble of radius 2.1 cm if its surface tension is $4.5 \times 10^{-2}\ \mathrm{Nm^{-1}}$.
    a) 8 mJ b) 2.46 mJ c) 4.93×10^{-4} J d) None of these
14. At a given place where acceleration due to gravity is $g\ \mathrm{ms^{-2}}$, a sphere of lead of density $d\ \mathrm{kgm^{-3}}$ is gently released in a column of liquid of density $\rho\ \mathrm{kg\ m^{-3}}$. If $d > \rho$, the sphere will
    a) Fall vertically with an acceleration $g\ \mathrm{ms^{-2}}$ b) Fall vertically with no acceleration
    c) Fall vertically with an acceleration $g\left(\frac{d-\rho}{d}\right)$ d) Fall vertically with an acceleration $g\left(\frac{\rho}{d}\right)$
15. If the velocity head of a stream of water is equal to 10 cm, then its speed of flow is ($g = 10\ \mathrm{ms^{-2}}$)
    a) $10\ \mathrm{ms^{-1}}$ b) $140\ \mathrm{ms^{-1}}$ c) $1.4\ \mathrm{ms^{-1}}$ d) $0.1\ \mathrm{ms^{-1}}$
16. A vertical glass capillary tube, open at both ends, contains some water. Which of the following shapes may be taken by the water in the tube?

17. If pressure at half the depth of a lake is equal to 2/3 pressure at the bottom of the lake then what is depth of the lake
    a) $10\ m$ b) $20\ m$ c) $60\ m$ d) $30\ m$
18. A ball is made of a material of density ρ where $\rho_{oil} < \rho < \rho_{water}$ with ρ_{oil} and ρ_{water} respectively. The oil and water are immiscible. If the above ball is in equilibrium in mixture of this oil and water, which of the following pictures represents its equilibrium position?



19. For a liquid which is rising in a capillary, the angle of contact is
    a) Obtuse b) 180° c) Acute d) 90°
20. The fraction of a floating object of volume V_0 and density d_0 above the surface of a liquid of density d will be
    a) $\frac{d_0}{d}$ b) $\frac{dd_0}{d+d_0}$ c) $\frac{d-d_0}{d}$ d) $\frac{dd_0}{d-d_0}$

21. The relative velocity of two parallel layers of water is 8 cms^{-1}. If the perpendicular distance between the layers is 0.1 cm, then velocity gradient will be
    a) 40 s^{-1} b) 50 s^{-1} c) 60 s^{-1} d) 80 s^{-1}
22. An inverted bell lying at the bottom of a lake 47.6 m deep has 50 cm^3 of air trapped in it. The ball is brought to the surface of the lake. The volume of the trapped air will be (atmospheric pressure = 70 cm of Hg and density of $Hg = 13.6\ g/cm^3$)
    a) 350 cm^3 b) 300 cm^3 c) 250 cm^3 d) 22 cm^3
23. Eight drops of a density ρ and each of radius a are falling through air with a constant velocity 375cm s^{-1}. When the eight drops coalesce to from a single drop the terminal velocity of the new drop will be
    a) 1.5×10^{-2} ms^{-1} b) 2.4×10^{-2} ms^{-1} c) 0.75×10^{-2} ms^{-1} d) 15×10^{-2} ms^{-1}
24. An aeroplane of mass 3×10^4 kg and total wing area of 120 m^2 is in a level flight at some height. The difference in pressure between the upper and lower surface of its wings in kilo pascals is ($g = 10\ ms^{-2}$)
    a) 2.5 b) 5.0 c) 10.0 d) 12.5
25. In which one of the following cases will the liquid flow in a pipe be most streamlined
    a) Liquid of high viscosity and high density flowing through a pipe of small radius
    b) Liquid of high viscosity and low density flowing through a pipe of small radius
    c) Liquid of low viscosity and low density flowing through a pipe of large radius
    d) Liquid of low viscosity and high density flowing through a pipe of large radius
26. A horizontal pipe of non-uniform cross-section allows water to flow through it with a velocity 1 ms^{-1} when pressure is 50 kPa at a point. If the velocity of flow has to be 2 ms^{-1} at some other point, the pressure at that point should be
    a) 50 kPa b) 100 kPa c) 48.5 kPa d) 24.25 kPa
27. The height of a mercury barometer is 75 cm at sea level and 50 cm at the top of a hill. Ratio of density of mercury to that of air is 10^4. The height of the hill is
    a) 250 m b) 2.5 km c) 1.25 km d) 750 m
28. In the figure, the velocity V_3 will be



    a) Zero b) $4ms^{-1}$ c) $1ms^{-1}$ d) $3ms^{-1}$
29. With the increase in temperature, the angle of contact
    a) Decreases b) Increases
    c) Remains constant d) Sometimes increases and sometimes decreases
30. An air-tight cage with a parrot sitting in it is suspended from the spring balance. The parrot starts flying. The reading of the spring balance will
    a) Increase b) Decrease c) Not change d) Be zero
31. At critical temperature, the surface tension of a liquid is
    a) Zero b) Infinity
    c) The same as that at any other temperature d) Cannot be determined
32. A metal plate of area 10^3 cm^2 rests on a layer of oil 6 mmType equation here. thick. A tangential force of 10^{-2} N is applied on it to move it with a constant velocity of 6 cms^{-1}. The coefficient of viscosity of the liquid is
    a) 0.1 poise b) 0.5 poise c) 0.7 poise d) 0.9 poise
33. If two soap bubble of different radii are connected by a tube
    a) Air flows from the bigger bubble to the smaller bubble till the sizes become equal
    b) Air flows from bigger bubble to the smaller bubble till the sizes are interchanged

c) Air flows from the smaller bubble to the bigger
d) There is no flow of air

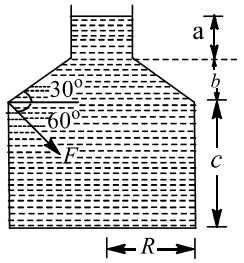
34. The meniscus of mercury in a capillary glass tube, is
a) Concave b) Plane c) Cylindrical d) convex

35. A glass tube 80 cm long and open at both ends is half immersed in mercury. Then the top of the tube is closed and it is taken out of the mercury. A column of mercury 20 cm long then remains in the tube. The atmospheric pressure (in cm of Hg) is
a) 90 b) 75 c) 60 d) 45

36. A triangular lamina of area A and height h is immersed in a liquid of density ρ in a vertical plane with its base on the surface of the liquid. The thrust on the lamina is
a) $\frac{1}{2}A\rho gh$ b) $\frac{1}{3}A\rho gh$ c) $\frac{1}{6}A\rho gh$ d) $\frac{2}{3}A\rho gh$

37. A small spherical ball of steel falls through a viscous medium with terminal velocity$v$. If a ball of twice the radius of the first one but of the same mass is dropped through the same method, it will fall with a terminal velocity (neglect buoyancy)
a) $\frac{v}{2}$ b) $\frac{v}{\sqrt{2}}$ c) v d) $2v$

38. A jar shown in figure is filled with a liquid of density ρ. The jar is placed in vacuum. Cross-section of the jar is circular and base is having a radius R. The force exerted by the liquid column on the base of the jar is



a) $\rho\ g(a+b+c)\pi R^2$ b) Less than $\rho\ g(a+b+c)\pi R^2$
c) Greater than $\rho\ g(a+b+c)\pi R^2$ d) $2\rho\ g(a+b+c)\pi R^2$

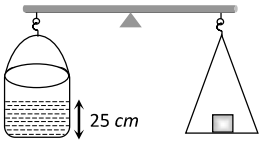
39. A sniper fires a rifle bullet into a gasoline tank making a hole 53.0 m below the surface of gasoline. The tank was sealed at 3.10 atm. The stored gasoline has a density of 660 kgm^{-3}. The velocity with which gasoline begins to shoot out of the hole is
a) $27.8ms^{-1}$ b) $41.0ms^{-1}$ c) $9.6ms^{-1}$ d) $19.7ms^{-1}$

40. The work done in increasing the size of a rectangular soap film with dimensions 8cm × 3.75 cm to 10cm × 6cm is 2×10^{-4} J. The surface tension of the film in Nm^{-1} is
a) 1.65×10^{-2} b) 3.3×10^{-2} c) 6.6×10^{-2} d) 8.25×10^{-2}

41. Water rises in a capillary tube to a height$h$. Choose the false statement regarding rise from the following
a) On the surface of Jupiter, height will be less than h
b) In a lift, moving up with constant acceleration, height is less than h
c) On the surface of the moon, the height is more than h
d) In a lift moving down with constant acceleration height is less than h

42. If a ball of steel density $\rho = 7.8\ g\ cm^{-3}$) attains a terminal velocity of $10 cms^{-1}$ when falling in a tank of water (coefficient of viscosity $\eta_{water} = 8.5\times10^{-4}\ Pa-s$) then its terminal velocity in glycerine ($\rho = 12\ g\ cm^{-3}, \eta = 13.2\ Pa-s$) would be nearly
a) $1.06\times10^{-5}\ cms^{-1}$ b) $6.25\times10^{-4}\ cms^{-1}$ c) $6.45\times10^{-4}\ cms^{-1}$ d) $1.5\times10^{-5}\ cms^{-1}$

43. A cylinder containing water upto a height of 25 cm has a hole of cross-section 1/4 cm^2 in its bottom. It is counterpoised in a balance. What is the initial change in the balancing weight when water begins to flow out



a) Increase of 12.5 gm-wt b) Increase of 6.25 gm-wt
c) Decrease of 12.5 gm-wt d) Decrease of 6.25 gm-wt

44. The height of the dam, in an hydroelectric power station is 10 m. In order to generate 1 MW of electric power, the mass of water (in kg) that must fall per second on the blades of the turbine is
a) 10^6 b) 10^5 c) 10^3 d) 10^4

45. A water film is formed between two parallel wires of 10 cm length. The distance of 0.5 cm between the wires is increased by 1 mm. Which will be the work done?
(Surface tension of water $=72\ \text{Nm}^{-1}$)
a) 288 erg b) 144 erg c) 72 erg d) 36 erg

46. Two metal spheres are falling through a liquid of density $2 \times 10^3 kg/m^3$ with the same uniform speed. The material density of sphere 1 and sphere 2 are $8 \times 10^3\ kg/m^3$ and $11 \times 10^3 kg/m^3$ respectively. The ratio of their radii is
a) $\frac{11}{8}$ b) $\sqrt{\frac{11}{8}}$ c) $\frac{3}{2}$ d) $\sqrt{\frac{3}{2}}$

47. A sphere of radius R is gently dropped into liquid of viscosity η in a vertical uniform tube. It attains a terminal velocity v. Another sphere of radius $2R$ when dropped into the same liquid, will attains its terminal velocity
a) v b) $2v$ c) $4v$ d) $9v$

48. Two cylinders of same cross-section and length L but made of two material of densitites ρ_1 and ρ_2 (in CGS units) are cemented together to form a cylinder of length2 L. If the combination floats in water with a length $L/2$ above the surface of water and $\rho_1 < \rho_2$, then
a) $\rho_1 > 1$ b) $\rho_1 < 3/4$ c) $\rho_1 > 1/2$ d) $\rho_1 > 3/4$

49. A block of steel of size $5\ cm \times 5\ cm \times 5\ cm$ is weighed in water. If the relative density of steel is 7, its apparent weight is
a) $6 \times 5 \times 5 \times 5\ gf$ b) $4 \times 4 \times 4 \times 7\ gf$ c) $5 \times 5 \times 5 \times 7\ gf$ d) $4 \times 4 \times 4 \times 6\ gf$

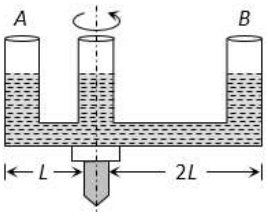
50. A block of aluminium of mass 1 kg and volume $3.6 \times 10^{-4} m^3$ is suspended from a string and then completely immersed in a container of water. The decrease in tension in the string after immersion is
a) 9.8 N b) 6.2 N c) 3.6 N d) 1.0 N

51. A large ship can float but a steel needle sinks because of
a) Viscosity b) Surface tension c) Density d) None of these

52. A film of water is found between two straight parallel wires of length 10 cm each separated by 0.2 cm. If their separation is increased by 1 mm, while still maintaining their parallelism, how much work will have to be done? (surface tension of water is $7.2 \times 10^{-2}\ \text{Nm}^{-1}$)
a) 7.22×10^{-6} J b) 1.44×10^{-5} J c) 2.88×10^{-5} J d) 5.76×10^{-5} J

53. A wooden ball of density ρ is immersed in water of density ρ_0 to depth h and then released. The height H above the surface of water upto which the ball jump out of water is
a) Zero b) h c) $\frac{\rho_0 h}{\rho}$ d) $\left(\frac{\rho_0}{\rho} - 1\right) h$

54. A given shaped glass tube having uniform cross section is filled with water and is mounted on a rotatable shaft as shown in figure. If the tube is rotated with a constant angular velocity ω then



a) Water levels in both sections A and B go up
b) Water level in Section A goes up and that in B comes down
c) Water level in Section A comes down and that in B it goes up
d) Water levels remains same in both section

55. An adulterated sample of milk has density of 1032 kg m^{-3}, while pure milk has a density of 1080 kg m^{-3}. Then the volume of pure milk in a sample of 10 L of adulterated milk is
a) 0.5 L b) 1.0 L c) 2.0 L d) 4.0 L

56. Angle of contact of a liquid with a solid depend on
a) solid only b) liquid only
c) both on solid and liquid d) orientation of the solid surface in liquid

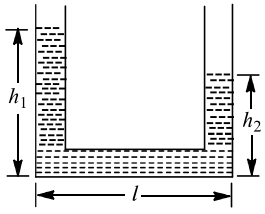
57. The glycerin of density 1.25×10^3 kgm^{-3} is flowing through a conical tube with end radii 0.1 m and 0.04 m respectively. The pressure difference across the ends is 10 Nm^{-2}. The rate of flow of glycerine through the tube is
a) 6.4×10^{-2} m^2s^{-1} b) 6.4×10^{-4} m^3s^{-1} c) 12.8×10^{-2} m^3s^{-1} d) 12.8×10^3 m^3s^{-1}

58. Water is flowing through a horizontal pipe of non-uniform cross-section. At the extreme narrow portion of the pipe, the water will have
a) Maximum speed and least pressure b) Maximum pressure and least speed
c) Both pressure and speed maximum d) Both pressure and speed least

59. A river of salty water if flowing with a velocity 2 ms^{-1}. If the density of the water is 1.2 gcc^{-1}, then the kinetic energy of each cubic meter of water is
a) 2.4 J b) 24 J c) 2.4 Kj d) 4.8 kJ

60. The cylindrical tube of spray pump has a cross-section of 8 cm^2, one end of which has 40 fine holes each of area 10^{-8} m^2. If liquid flows inside the tube with a speed of 0.15 m min^{-1}, the speed with which the liquid is ejected through the hole is
a) 50 ms^{-1} b) 5 ms^{-1} c) 0.05 ms^{-1} d) 0.5 ms^{-1}

61. A liquid of density ρ is filled in a U-tube is accelerated with an acceleration a so that the height of liquid in its two vertical arms are h_1 and h_2 as shown in the figure. If l is the length of horizontal arm of the tube, the acceleration a is

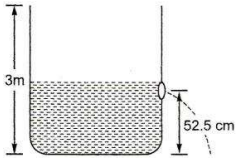


a) $\frac{g(h_1-h_2)}{2l}$ towards right b) $\frac{g(h_1-h_2)}{2l}$ towards left
c) $\frac{g(h_1-h_2)}{l}$ towards right d) $\frac{g(h_1-h_2)}{l}$ towards left

62. A liquid is allowed into a tube of truncated cone shape. Identify the correct statement from the following.
a) The speed is high at the wider end and low at the narrow end
b) The speed is low at the wider end and high at the narrow end
c) The speed is same at both end in a streamline flow
d) The liquid flows with uniform velocity in the tube

63. A cube floats in water with 1/3rd parts is outside the surface of water and it floats in liquid with 3/4th part is outside the liquid then the density of liquid is
a) 8/3 b) 2/3 c) 4/3 d) 5/3

64. Water is filled in a cylindrical container to a height of 3m. The ratio of the cross-sectional area of the orifice and the beaker is 0.1 The square of the speed of the liquid coming out from the orifice is($g = 10\text{ms}^{-2}$)



a) 50 m^2s^{-2} b) 50.5 m^2s^{-2} c) 51 m^2s^{-2} d) 52 m^2s^{-2}

65. An air bubble of radius 10^{-2} m is rising up at a steady rate of 2×10^{-3} ms^{-1} through a liquid of density 1.5×10^3 kg m^{-3} , the coefficient of viscosity neglecting the density of air, will be ($\text{g} = 10\ \text{ms}^{-2}$)
a) 23.2 units b) 83.5 units c) 334 units d) 167 units

66. A water tank, open to the atmosphere, has a leak in it, in the form of a circular hole, located at a height h below the open surface of water. The velocity of the water coming out of the hole is
a) $\sqrt{gh/2}$ b) $\sqrt{gh}$ c) $\sqrt{2gh}$ d) $2\sqrt{gh}$

67. A frame made of metallic wire enclosing a surface area A is covered with a soap film. If the area of the frame of metallic wire is reduced by 50% , the energy of the soap film will be changed by
a) 100% b) 75% c) 50% d) 25%

68. When a pinch of salt or any other salt which is soluble in water is added to water, its surface tension
a) Increases b) Decreases
c) May increase or decrease depending upon salt d) None of the above

69. What is velocity v of a metallic ball of radius r falling in a tank of liquid at the instant when its acceleration is one-half that of the freely falling body?
(The densities of metal and of liquid areρ and σ respectively, and the viscosity of the liquid is η)
a) $\frac{r^2 g}{9\eta}(\rho - 2\sigma)$ b) $\frac{r^2 g}{9\eta}(2\rho - \sigma)$ c) $\frac{r^2 g}{9\eta}(\rho - \sigma)$ d) $\frac{2r^2 g}{9\eta}(\rho - \sigma)$

70. The pressure inside two soap bubble is 1.01 and 1.02 atm respectively. The ratio of their respective volume is
a) 2 b) 4 c) 6 d) 8

71. A glass flask having mass 390 g and an interior volume of 500 cm^3 floats on water when it is less than half filled with water. The density of the material of the flask is
a) 0.8 g cc^{-1} b) 2.8 g cc^{-1} c) 1.8 g cc^{-1} d) 0.28 g cc^{-1}

72. One drop of soap bubble of diameter D breaks into 27 drops having surface tension . The change in surface energy is
a) $2\pi TD^2$ b) $4\pi TD^2$ c) πTD^2 d) $8\pi TD^2$

73. A small iron sphere is dropped from a great height. It attains its terminal velocity after having fallen 32 m. Then, it covers the rest of the path with terminal velocity only. The work done by air friction during the first 32 m of fall is W_1. The work done by air friction during the subsequent 32 m fall isW_2. Then
a) $W_1 > W_2$ b) $W_1 < W_2$ c) $W_1 = W_2$ d) $W_2 = 32\ W_1$

74. A solid sphere of volume $V$and density ρ floats at the interface of two immiscible liquids of densities ρ_1 and ρ_2 respectively. If $\rho_1 < \rho < \rho_2$, then the ratio of volume of the parts of the sphere in upper and lower liquid is
a) $\frac{\rho - \rho_2}{\rho_2 - \rho}$ b) $\frac{\rho_2 - \rho}{\rho - \rho_1}$ c) $\frac{\rho + \rho_1}{\rho + \rho_2}$ d) $\frac{\rho + \rho_2}{\rho + \rho_1}$

75. A wooden ball of density $D$is immersed in water of density $d$to a depth $h$below the surface of water and then released. Upto what height will then ball jump out of water?
a) $\frac{d}{D}h$ b) $\left(\frac{d}{D} - 1\right)h$ c) h d) Zero

76. A hollow sphere of volume V is floating on water surface with $half$ immersed in it. What should be the minimum volume of water poured inside the sphere so that the sphere now sinks into the water
a) $V/2$ b) $V/3$ c) $V/4$ d) V

77. A rain drop of radius 0.3 mm has a terminal velocity in air $= 1\ \text{ms}^{-1}$. The viscous force on it is
a) 101.73×10^{-4} dyne b) 101.73×10^{-5} dyne c) 16.95×10^{-4} dyne d) 16.95×10^{-5} dyne

78. The density of ice and water are respectively g cm^{-3}. If m gram of ice melts , then change in its volume is
a) $y - \frac{x}{m}$ b) $m(y-x)$ c) $\frac{m}{y} - \frac{m}{x}$ d) my

79. Two rain drops of same radii $'r'$, falling with terminal velocity $'v'$ merge and form a bigger drops of radius R. The terminal velocity of the bigger drop is
a) $v\frac{R}{r}$ b) $v\frac{R^2}{r^2}$ c) v d) $2v$

80. Water is flowing through a tube of non-uniform cross-section. Ratio of the radius at entry and exit end of the pipe is 3:2. Then the ratio of velocities at entry and exit of liquid is
a) 4 : 9 b) 9 : 4 c) 8 : 27 d) 1 : 1

81. Density of ice is ρ and that of water is σ. What will be the decrease in volume when a mass M of ice melts
a) $\frac{M}{\sigma - \rho}$ b) $\frac{\sigma - \rho}{M}$ c) $M\left[\frac{1}{\rho} - \frac{1}{\sigma}\right]$ d) $\frac{1}{M}\left[\frac{1}{\rho} - \frac{1}{\sigma}\right]$

82. The excess pressure inside a spherical drop of water is four time that of another drop. Then their respective mass ratio is
a) 1:16 b) 8:1 c) 1:4 d) 1:64

83. The rate of flow of liquid through a capillary tube of radius r is V when the pressure difference across the two ends of the capillary is p. If pressure is increased by 3 p and radius is reduced to $r/2$, then the rate of flow becomes
a) $V/9$ b) $3V/8$ c) $V/4$ d) $V/3$

84. Air is streaming past a horizontal air plane wing such that its speed is $120\ \text{ms}^{-1}$ over the upper surface and $90\ \text{ms}^{-1}$ at the lower surface. If the density of air is $1.3\ \text{kgm}^{-3}$, what will be the gross life on the wing? If the wing is 10 m long and has an average width of 2 m,
a) 81.9 N b) 8.19 kN c) 81.9 kN d) 819 kN

85. Two solid pieces, one of steel and the other of aluminum when immersed completely in water have equal weights. When the solid pieces are weighed in air
a) the weight of aluminium is half the weight of steel
b) steel piece will weigh more
c) they have the same weight
d) aluminium piece will weigh more

86. Two rain drops reach the earth with different terminal velocities having ratio 9:4. Then the ratio of their volume is
a) 3:2 b) 4:9 c) 9:4 d) 27:8

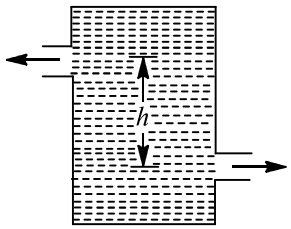
87. An incompressible fluid flows steadily through a cylindrical pipe which has radius $2r$ at point A and radius r at B further along the flow direction. If the velocity at point A is v, its velocity at point B is
a) $2v$ b) v c) $v/2$ d) $4v$

88. The rate of flow of liquid through an orifice of a tank does not depend upon
a) the size of orifice b) density of liquid
c) the height of fluid column d) acceleration due to gravity

89. A wooden lock is taken to the bottom of a deep calm lake of water and then released. It rises up with a
a) constant acceleration b) decreasing acceleration
c) constant velocity d) decreasing velocity

90. By inserting a capillary tube upto a depth l in water, the water rises to a height$h$. If the lower end of the capillary tube is closed inside water and the capillary is taken out and closed end opened, to what height the water will remain in the tube, when $l > h$?
a) Zero b) $l + h$ c) $2\,h$ d) h

91. There are two identical small holes on the opposite sides of a tank containing a liquid. The tank is open at the top. The difference in height between the two holes is h. As the liquid comes out of the two holes, the tank will experience a net horizontal force proportional to



a) $h^{1/2}$ b) $h^{3/2}$ c) h d) h^2

92. A bigger drop of radius R is converted into n smaller drops of radius r, the required energy is
a) $(4\,\pi r^2 n - 4\,\pi\,R^2)T$ b) $\left(\frac{4}{3}\,\pi r^2 n - \frac{4}{3}\,\pi\,R^3\right)T$ c) $(4\,\pi R^2 - 4\,\pi\,r^2)nT$ d) $(n4\,\pi r^2 - n4\,\pi\,R^2)T$

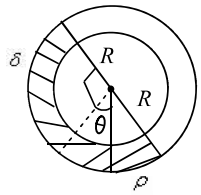
93. Why the dam of water reservoir is thick at the bottom
a) Quantity of water increases with depth b) Density of water increases with depth
c) Pressure of water increases with depth d) Temperature of water increases with depth

94. A spherical drop of water has 1 mm radius. If the surface tension of water is 70×10^{-3} $\mathrm{Nm^{-1}}$, then the difference of pressure between inside and outside of the spherical drop is
a) 35 $\mathrm{Nm^{-2}}$ b) 70 $\mathrm{Nm^{-2}}$ c) 140 $\mathrm{Nm^{-2}}$ d) Zero

95. The level of water in a tank is 5 m high. A hole of area 10 $\mathrm{cm^2}$ is made in the bottom of the tank. The rate of leakage of water from the hole is
a) $10^{-2}\mathrm{m^3s^{-1}}$ b) $10^{2}\mathrm{m^3s^{-1}}$ c) $10\ \mathrm{m^3s^{-1}}$ d) $10^{-2}\mathrm{m^{-3}s^{-1}}$

96. One end of a uniform glass capillary tube of radius $r = 0.025$ cm is immersed vertically in water to a depth $h = 1$ cm. The excess pressure in $\mathrm{Nm^{-2}}$ required to blow an air bubble out of the tube (Surface tension of water $= 7 \times 10^{-2}$ $\mathrm{Nm^{-1}}$, Density of water $= 10^3$ $\mathrm{kg\ m^{-3}}$, Acceleration due to gravity$= 10\mathrm{ms^{-2}}$)
a) 0.0048×10^5 b) 0.0066×10^5 c) 1.0048×10^5 d) 1.0066×10^5

97. A uniform long tube is bent into a circle of radius R and it lies in a vertical plane. Two liquids of same volume but densities ρ and δ fill half the tube. The angle θ is



a) $\tan^{-1}\left(\frac{\rho-\delta}{\rho+\delta}\right)$ b) $\tan^{-1}\frac{\rho}{\delta}$ c) $\tan^{-1}\frac{\delta}{\rho}$ d) $\tan^{-1}\left(\frac{\rho+\delta}{\rho-\delta}\right)$

98. A piece of wood if floating in water. When the temperature of water rises, the apparent weight of the wood will
a) Increase b) Decrease
c) may increase or decrease d) remain same

99. The surface tension of a liquid is 5 $\mathrm{Nm^{-1}}$. If a film is held on a ring of area 0.02 $\mathrm{m^2}$, its total surface energy is about
a) 2×10^{-2} J b) 2.5×10^{-2} J c) 2×10^{-1} J d) 3×10^{-1} J

100. Two pieces of metal when immersed in a liquid have equal upthrust on them; then
a) Both pieces must have equal weights b) Both pieces must have equal densities

c) Both pieces must have equal volumes
d) Both are floating to the same depth

101. If the work done in blowing a bubble of volume V is W, then the work done in blowing a soap bubble of volume $2V$ will be
a) W b) $2W$ c) $\sqrt{2}\,W$ d) $4^{1/3}W$

102. A cylinder drum, open at the top, contains 15 L of water. It drains out through a small opening at the bottom. 5 L of water comes out in time t_1, the next 5 L in further time t_2 and the last 5 L in further time t_3. Then
a) $t_1 < t_2 < t_3$ b) $t_1 > t_2 > t_3$ c) $t_1 = t_2 = t_3$ d) $t_1 > t_2 = t_3$

103. A weightless bag is filled with 5 kg of water and then weighed in water. The reading of spring balance is
a) 5 kgf b) 2. 5 kgf c) 1.25 kgf d) Zero

104. With an increase in temperature, surface tension of liquid (except molten copper and cadmium)
a) increases
b) remain same
c) decreases
d) first decrease and then increases

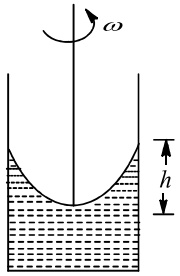
105. If the length of tube is less and cannot accommodate the maximum rise of liquid then
a) liquid will form fountain
b) liquid will not rise
c) the meniscus will adjust itself so that the water does not spill
d) none of the above

106. Two capillaries of radii r_1 andr_2, length l_1 and l_2 respectively are in series. A liquid of viscosity η is flowing through the combination under a pressure difference p. What is the rate of volume flow of liquid?
a) $\frac{\pi p}{8\eta}\left(\frac{l_4}{r_1^4}+\frac{l_4}{r_2^4}\right)^{-1}$ b) $\frac{8\pi p}{\eta}\left(\frac{l_1}{r_1^4}+\frac{l_2}{r_2^4}\right)$ c) $\frac{\pi p}{8\eta}\left(\frac{r_1^4}{l_1}+\frac{r_2^4}{l_2}\right)^{-1}$ d) $\frac{\pi p}{8\eta}\left(\frac{l_1}{r_1^4}+\frac{l_2}{r_2^4}\right)^{-1}$

107. Two spherical soap bubbles of radii r_1 and r_2 in vacuum combine under isothermal conditions. The resulting bubble has radius equal to
a) $\frac{r_1+r_2}{2}$ b) $\frac{r_1 r_2}{r_1+r_2}$ c) $\sqrt{r_1 r_2}$ d) $\sqrt{r_1^2+r_2^2}$

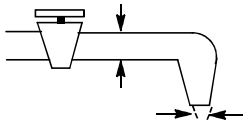
108. A marble of mass x and diameter $2\,r$ is gently released a tall cylinder containing honey. If the marble displaces mass $y(< x)$ of the liquid, then the terminal velocity is proportional to
a) $(x+y)$ b) $(x-y)$ c) $\frac{x+y}{r}$ d) $\frac{(x-y)}{r}$

109. A liquid is kept in a cylindrical vessel which is rotated along its axis. The liquid rises at the sides (figure). If the radius of the vessel is 0.05 m and the sped of rotation is 2 rad s^{-1}, find the difference in the height of the liquid at the centre of the vessel and its sides



a) 20 cm b) 4 cm c) 2 cm d) 0.2 cm

110. Water flowing out of the mouth of a tap and falling vertically in streamline flow forms a tapering column, *ie* the area of cross-section of the liquid column decreases as it moves down. Which of the following is the most accurate explanation for this?



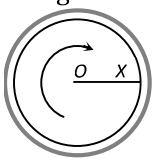
a) Falling water tries to reach a terminal velocity and hence, reduces the area of cross-section to balance upward and downward forces

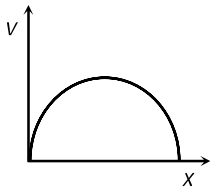
b) As the water moves down, its speed increases and hence, its pressure decreases. It is then compressed by atmosphere

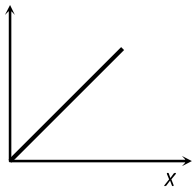
c) The surface tension causes the exposed surface area of the liquid to decrease continuously
The mass of water flowing out per second through any cross-section must remain constant. As the

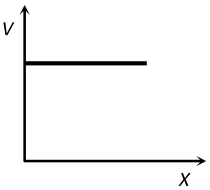
d) water is almost incompressible, so the volume of water flowing out per second must remain constant. As this is equal to velocity × area, the area decreases as velocity increases

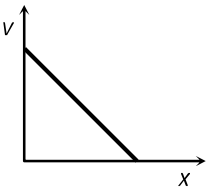
111. The diagram shows a cup of tea seen from above. The tea has been stirred and is now rotating without turbulence. A graph showing the speed v with which the liquid is crossing points at a distance X from O along a radius XO would look like



a) 

b) 

c) 

d) 

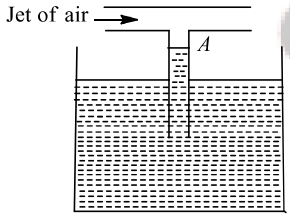
112. A sphere of mass M and radius R is dropped in a liquid, then terminal velocity of sphere is proportional to

a) R b) $\frac{1}{R}$ c) R^2 d) $\frac{1}{R^2}$

113. Streamline flow is more likely for liquid with

a) high density and low viscosity
b) low density and high viscosity
c) high density and high viscosity
d) low density and low viscosity

114. Water stands at level A in the arrangement shown in the figure. What will happen if a jet of air is gently blown into the horizontal tube in the direction shown in the figure?



a) Water will rise above A in the capillary tube
b) Water will fall below A in the capillary tube
c) There will be no effect on the level of water in the capillary tube
d) Air will emerge from end B in the form of bubbles

115. Work done forming a liquid drop of radius R is W_1 and that of radius $3R$ is W_2. The ratio of work done is

a) 1:3 b) 1:2 c) 1:4 d) 1:9

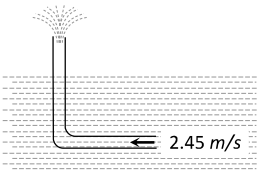
116. Two bodies are in equilibrium when suspended in water from the arms of a balance. The mass of one body is 36 g and its density 9 g/cm^3. If the mass of the other is 48 g, its density in g/cm^3 is

a) $\frac{4}{3}$ b) $\frac{3}{2}$ c) 3 d) 5

117. The working of an atomizer depends upon

a) Bernoulli's theorem
b) Boyle's law
c) Archimedes principle
d) Newton's law of motion

118. An L-shaped tube with a small orifice is held in a water stream as shown in fig. The upper end of the tube is 10.6 cm above the surface of water. What will be the height of the jet of water coming from the orifice? Velocity of water stream is 2.45 m/s



a) Zero b) 20.0 cm c) 10.6 cm d) 40.0 cm

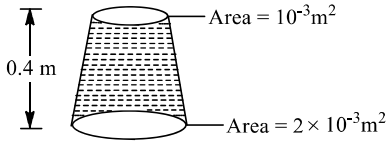
119. The surface energy of a liquid drop is u. It is sprayed into 1000 equal droplets. Then its surface energy becomes

a) u b) 10 u c) 100 u d) 1000 u

120. In making an alloy, a substance of specific gravity s_1 and mass m_1 is mixed with another substance of specific gravity s_2 and mass m_2 : then the specific gravity of the alloy is

a) $\left(\frac{m_1+m_2}{s_1+s_2}\right)$ b) $\left(\frac{s_1 s_2}{m_1+m_2}\right)$ c) $\frac{m_1+m_2}{\frac{m_1}{s_1}+\frac{m_2}{s_2}}$ d) $\frac{\frac{m_1}{s_1}+\frac{m_2}{s_2}}{m_1+m_2}$

121. A uniform tapering vessel shown in figure is filled with liquid of density 900 kgm^{-3}. The force that acts on the base of the vessel due to liquid is (take g =10 ms^{-2})



a) 3. 6 N b) 7.2 N c) 9. 0 N d) 12. 0 N

122. Two capillary tubes of radii 0.2 cm and 0.4 cm are dipped in the same liquid. The ratio of heights through which liquid will rise in the tubes is

a) 1 : 2 b) 2 : 1 c) 1 : 4 d) 4 : 1

123. The water flows from a tap of diameter 1.25 cm with a rate of $5 \times 10^{-5} m^3 s^{-1}$. The density and coefficient of viscosity of water are $10^3 kg\ m^{-3}$ and 10^{-3} Pas, respectively. The flow of water is

a) Steady with Reynolds number 5100 b) Turbulent with Reynolds number 5100
c) Steady with Reynolds number 3900 d) Turbulent with Reynolds number 3900

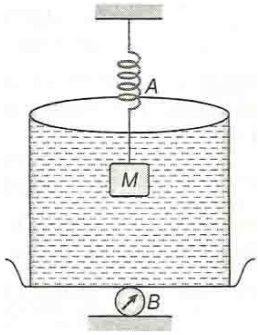
124. If there were no gravity, which of the following will not be there for fluid?

a) Viscosity b) Surface tension
c) Pressure d) Archimedes' upward thrust

125. A cylindrical tank has a hole of 1 cm^2 in its bottom. If the water is allowed to flow into the tank from a tube above it at the rate of 70 cm^3/sec. then the maximum height up to which water can rise in the tank is

a) 2.5 cm b) 5 cm c) 10 cm d) 0.25 cm

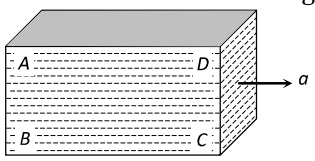
126. The spring balance A reads 2 kg with a block of mass m suspended from it. A balance B reads 5 kg when a beaker with liquid is put on the pan of the balance. The two balances are now so arranged that the hanging mass is inside the liquid in a beaker as shown in figure



a) The balance A will read more than 2 kg
b) The balance B will read less than 5 kg
c) The balance A will read less than 2 kg and B will read more than 5 kg
d) The balance A will read more than 2 kg and B will read less than 5 kg

127. If the rise in height of capillary of two tubes are 6.6 cm and 2.2 cm, then the ratio of the radii of tubes is
a) 1:3 b) 3:1 c) 1:2 d) 1:6

128. A closed rectangular tank is completely filled with water and is accelerated horizontally with an acceleration a towards right. Pressure is (i) maximum at, and (ii) minimum at



a) (i) B (ii) D b) (i) C (ii) D c) (i) B (ii) C d) (i) B (ii) A

129. Two pieces of glass plate one upon the other with a little water in between them cannot be separated easily because of
a) Inertia b) Pressure c) Surface tension d) Viscosity

130. Two rain drops falling through air have radii in the ratio 1:2. They will have terminal velocity in the ratio
a) 4 : 1 b) 1 : 4 c) 2 : 1 d) 1 : 2

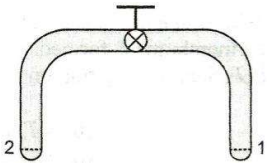
131. At which of the following temperatures, the value of surface tension of water is minimum?
a) 4°C b) 25°C c) 50°C d) 75°C

132. A vessel, whose bottom has round holes with diameter 0.1 mm is filled with water. The maximum height upto which water can be filled without leakage is (Surface tension = 75 dyne cm^{-1} and g = 1000 cms^{-2})
a) 100 cm b) 75 cm c) 60 cm d) 30 cm

133. A horizontal pipe of cross-sectional diameter 5 cm carries water at velocity of 4 ms^{-1}. The pipe is connected to a smaller pipe with a cross-sectional diameter 4 cm. the velocity of water through the smaller pipe is
a) 6.25 ms^{-1} b) 5.0 ms^{-1} c) 3.2 ms^{-1} d) 2.56 ms^{-1}

134. We have two (narrow) capillary tubes T_1 and T_2. Their lengths are l_1 and l_2 and radii of cross-section are r_1 and r_2 respectively. The rate of flow of water under a pressure difference P through tube T_1 is $8cm^3/sec$. If $l_1 = 2l_2$ and $r_1 = r_2$, what will be the rate of flow when the two tubes are connected in series and pressure difference across the combination is same as before ($= P$)
a) 4 cm^3/sec b) $(16/3)cm^3/sec$ c) $(8/17)cm^3/sec$ d) None of these

135. A glass tube of uniform internal radius r has a valve separating the two identical ends. Initially, the valve is in a tightly closed position. End 1 has a hemispherical soap bubble of radius r. End 2 has sub-hemispherical soap bubble as shown in figure. Just after opening the valve.



a) Air from end 1 flows towards end 2. No change in the volume of the soap bubbles
b) Air from end 1 flows towards end 2. Volume of the soap bubble at end 1 decreases
c) No change occurs
d) Air from end 2 flows towards end 1. Volume of the soap bubble at end increases

136. Water from a tap emerges vertically downwards with an initial speed of 1.0 ms^{-1}. The cross-sectional area of the tap is 10^{-4} m^2. Assume that the pressure is constant throughout the stream of water and that the flow is steady. The cross-sectional area of the stream 0.15 m below the tap is
a) $1.0 \times 10^{-5} m^2$ b) $2 \times 10^{-5} m^2$ c) $5 \times 10^{-5} m^2$ d) $5 \times 10^{-4} m^2$

137. Two substances of densities ρ_1 and ρ_2 are mixed in equal volume and the relative density of mixture is 4. When they are mixed in equal masses, the relative density of the mixture is 3. The values of ρ_1 and ρ_2 are
a) $\rho_1 = 6$ and $\rho_2 = 2$ b) $\rho_1 = 3$ and $\rho_2 = 5$ c) $\rho_1 = 12$ and $\rho_2 = 4$ d) None of these

138. A tank is filled with water of density 1 g cm^{-3} and oil of density 0.9 g cm^{-3} . The height of water layer is 100 cm and of oil layer is 400 cm. If g = 980 cm s^{-2} , then the velocity of efflux from an opening in the bottom of the tank is

a) $\sqrt{900 \times 980}$ cms^{-1} b) $\sqrt{1000 \times 980}$ cms^{-1} c) $\sqrt{920 \times 980}$ cms^{-1} d) $\sqrt{950 \times 980}$ cms^{-1}

139. A rectangular plate 2m × 3m is immersed in water in such a way that its greatest and least depth are 6m and 4m respectively from the water surface. The total thrust on the plate is

a) 294×10^3 N b) 294 N c) 100×10^3 N d) 400×10^3 N

140. A cylinder is filled with liquid of density d upto a height h. If the cylinder is at rest, then the mean pressure of the walls is

a) $hdg/4$ b) $hdg/2$ c) $2\,hdg$ d) hdg

141. Water falls from a tap , down the streamline

a) Area decreases b) Area increases

c) Velocity remains same d) Area remains same

142. A vessel of area of cross-section A has liquid to a height H. There is a hole at the bottom of vessel having area of cross-section a. The time taken to decrease the level from H_1 to H_2 will be

a) $\frac{A}{a}\sqrt{\frac{2}{g}}[\sqrt{H_1} - \sqrt{H_2}]$ b) $\sqrt{2gh}$ c) $\sqrt{2gh(H_1 - H_2)}$ d) $\frac{A}{a}\sqrt{\frac{g}{2}}[\sqrt{H_1} - \sqrt{H_2}]$

143. The total weight of a piece of wood is 6 kg. In the floating state in water its $\frac{1}{3}$ part remains inside the water. On this floating solid, what maximum weight is to be put such that the whole of the piece of wood is to be drowned in the water?>

a) 12 kg b) 10 kg c) 14 kg d) 15 kg

144. A soap bubble in air (two surface) has surface tension 0.03Nm^{-1}. Find the gauge pressure inside a bubble of diameter 30 mm.

a) 2 Pa b) 4 Pa c) 16 Pa d) 8 Pa

145. A capillary tube of radius R and length L is connected in series with another tube of radius $R/2$ and length$L/4$. If the pressure difference across the two tubes taken together is p, then the ratio of pressure difference across the first tube to that across the second tube is

a) 1 : 4 b) 1 : 1 c) 4 : 1 d) 2 : 1

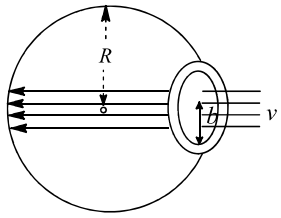
146. A body floats in water with one-third of its volume above the surface of water. If it is placed in oil, it floats with half of its volume above the surface of the oil. The specific gravity of the oil is

a) $\frac{5}{3}$ b) $\frac{4}{3}$ c) $\frac{3}{2}$ d) 1

147. The excess pressure inside one soap bubble is three times that inside a second soap bubble, then the ratio of their surface areas is

a) 1:9 b) 1:3 c) 3:1 d) 1:27

148. A streamline body with relative density ρ_1 falls into air from a height h_1 on the surface of a liquid of relative densityρ_2, where$p_2 > p_1$. The time of immersion of the body into the liquid will be



a) $\sqrt{2\,h_1/g}$ b) $\sqrt{2\,h_1/g} \times \frac{\rho_1}{\rho_2}$ c) $\sqrt{\frac{2h_1}{g}} \times \frac{\rho_1}{\rho_2}$ d) $\sqrt{\frac{2h_1}{g}} \times \frac{\rho_1}{(\rho_2 - \rho_1)}$

149. A liquid does not wet the sides of a solid, if the angle of contact is

a) Obtuse b) 90° c) acute d) Zero

150. A log of wood of mass 120 kg floats in water. The weight that can be put on raft to make it just sink, should be (density of wood = 600 kg/m^3)
a) 80 kg b) 50 kg c) 60 kg d) 30 kg

151. Typical silt(hard mud) particle of radius 20μm is on the top of lake water, its density is 2000 kg m^{-3} and the viscosity of lake water is 1.0 mPa, density is 1000 kg m^{-3}. If the lake is still(has no internal fluid motion). The terminal speed with which the particle hits the bottom of the lake is ……. mms^{-1}
a) 0.67 b) 0.77 c) 0..87 d) 0.97

152. Water rises in a capillary tube to a height h. Choose false statement regarding capillary rise from the following.
a) On the surface of Jupiter, height will be less than h
b) In a lift moving up with constant acceleration height is less than h
c) On the surface of moon the height is more than h
d) In a lift moving down with constant acceleration height is less than h

153. A horizontal pipe line carries water in streamline flow. At a point where the cross-sectional area is 10 cm^2 the water velocity is 1 ms^{-1} and pressure is 2000 Pa. The pressure of water at another point where the cross-sectional area is 5 cm^2, is
a) 200 Pa b) 400 Pa c) 500 Pa d) 800 Pa

154. Radius of an air bubble at the bottom of the lake is r and it becomes $2r$when the air bubble rises to the top surface of the lake. If ρ cm of water be the atmospheric pressure, then the depth of lake is
a) $2p$ b) $8p$ c) $4p$ d) $7p$

155. Water is flowing through a horizontal pipe of varying cross-section. If the pressure of water equals 2 cm of mercury, where the velocity of the flow is 32 cm s^{-1}, what is the pressure at another point, where the velocity of flow is 65 cm s^{-1} ?
a) 1.02 cm of Hg b) 1.88 cm of Hg c) 2.42 cm of Hg d) 1.45 cm of Hg

156. A vessel whose bottom has round hole with diameter of 1 mm is filled with water. Assuming that surface tension acts only at hole, then the maximum height to which the water can be filled in vessel without leakage is(surface tension of water = 7.5×10^{-2} Nm^{-1} and g = $10ms^{-2}$)
a) 0.3 cm b) 3 mm c) 3 cm d) 3 m

157. In a capillary rise experiment, the water level rises to a height of 5 cm. If the same capillary tube is placed in water such that only 3 cm of the tube projects outside the water level, then
a) water will begin to overflow through the capillary
b) angle of contact decreases
c) angle of contact increases
d) water will rise to a level less than 3 cm

158. Two stretched membranes of area 2 cm^2 and 3 cm^2 are placed in a liquid at the same depth. The ratio of pressure on them is
a) 1 : 1 b) 2 : 3 c) 3 : 2 d) $2^2 : 3^2$

159. A balloon of volume 1500 m^3 and weighing 1650 kg with all its equipment is filled with He (density0.2 kg m^{-3}). If the density of air be 1.3 kgm^{-3}, the pull on the rope tied to the balloon will be
a) 300 kg b) 1950 kg c) 1650 kg d) Zero

160. A steel ball is dropped in oil then,
a) the ball attains constant velocity after some time b) the ball stops
c) the speed of ball will keep on increasing d) None of the above

161. A manometer connected to a close tap reads 3.5×10^5 Nm^{-2}. When the valve is opened, the reading of manometer falls to 3.0×10^5 Nm^{-2} , then velocity of flow of water is
a) 100 ms^{-1} b) 10 ms^{-1} c) 1 ms^{-1} d) $10\sqrt{10}$ ms^{-1}

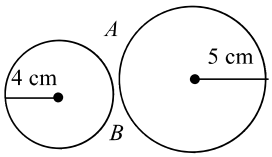
162. The volume of an air bubble becomes three times as it rises from the bottom of a lake to its surface. Assuming atmospheric pressure to be 75 cm of Hg and the density of water to be 1/10 of the density of mercury, the depth of the lake is

a) $5\ m$ b) $10\ m$ c) $15\ m$ d) $20\ m$

163. A uniform rod of density ρ is placed in a wide tank containing a liquid $\sigma(\sigma > \rho)$. The depth of liquid in the tank is half the length of the rod. The rod is in equilibrium, with its lower end resting on the bottom of the tank. In this position, the rod makes an angle θ with the horizontal. Then sin θ is equal to

a) $\frac{1}{2}\sqrt{\frac{\sigma}{\rho}}$ b) $\frac{1}{2}\frac{\sigma}{\rho}$ c) $\sqrt{\frac{\rho}{\sigma}}$ d) $\sqrt{\frac{\sigma}{\rho}}$

164. Two soap bubbles of radii r_1 and r_2 equal to 4 cm and 5 cm respectively are touching each other over a common surface AB (shown in figure). Its radius will be



a) 4 cm b) 4.5 cm c) 5 cm d) 20 cm

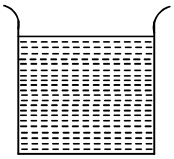
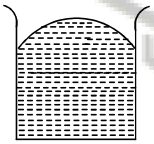
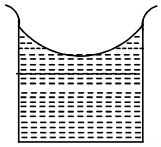
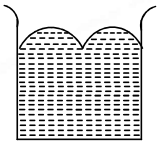
165. A 10 cm^3 cube floats in water with a height of 4 cm^3 remaining above the surface. The density of the material form which the cube is made is

a) 0.6 g cm^{-3} b) 1.0 g cm^{-3} c) 0.4 g cm^{-3} d) 0.24 g cm^{-3}

166. A sphere liquid drop of radius R is divided into eight equal to droplets. If surface tension is T, then the work done in this process will be

a) $2\pi R^2 T$ b) $3\pi R^2 T$ c) $4\pi R^2 T$ d) $2\pi R T^2$

167. If a liquid is placed in a vertical cylindrical vessel and the vessel is rotated about its axis, the liquid will take the shape of figure

a)  b)  c)  d) 

168. The neck and bottom of a bottle are 3 cm and 15 cm in radius respectively. If the cork is pressed with a force 12 N in the neck of the bottle, then force exerted on the bottom of the bottle is

a) 30 N b) 150 N c) 300 N d) 600 N

169. A piston of cross-section area 100 cm^2 is used in a hydraulic press to exert a force of 10^7 dynes on the water. The cross-sectional area of the other piston which supports an object having a mass 2000 kg. is

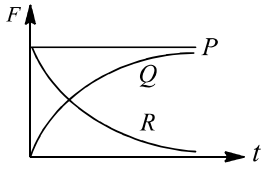
a) 100 cm^2 b) $10^9\ cm^2$ c) $2 \times 10^4\ cm^2$ d) $2 \times 10^{10}\ cm^2$

170. A spherical ball is dropped in a long column of viscous liquid. Which of the following graphs represent the variation of

(i)gravitational force with time

(ii) viscous force with time

(iii) net force acting on the ball with time?



a) Q, R, P b) R, Q, P c) P, Q, R d) R, P, Q

171. The onset of turbulence in a liquid is determined by

a) Pascal's law b) Magnus effect c) Reynold's number d) Bernoulli's principle

172. An object weighs m_1 in a liquid of density d_1 and that in liquid of density d_2 is m_2. The density d of the object is

a) $d = \frac{m_2 d_2 - m_1 - d_1}{m_2 - m_1}$ b) $d = \frac{m_1 d_1 - m_2 - d_2}{m_2 - m_1}$ c) $d = \frac{m_2 d_1 - m_1 - d_2}{m_1 - m_2}$ d) $d = \frac{m_1 d_2 - m_2 - d_1}{m_1 - m_2}$

173. Water flows steadily through a horizontal pipe of variable cross-section. If the pressure of water is p at a point where flow speed is v, the pressure at another point where the flow of speed is $2v$, is (take density of water as ρ)

a) $p - \frac{3\rho v^2}{2}$ b) $p - \frac{\rho v^2}{2}$ c) $p - \frac{3\rho v^2}{4}$ d) $p - \rho v^2$

174. A cylindrical vessel is filled with equal amounts of weight of mercury on water. The overall height of the two layers is 29.2 cm, specific gravity of mercury is 13.6. Then the pressure of the liquid at the bottom of the vessel is

a) 29.2 cm of water
b) 29.2 /13.6 cm of mercury
c) 4 cm of mercury
d) 15.6 cm of mercury

175. When a glass capillary tube of radius 0.015 cm is dipped in water, the water rises to height of 15 cm within it. Assuming contact angle between water and glass to be 0°, the surface tension of water is [$\rho_{water} = 1000\ kg\ m^{-3}, g = 9.81\ ms^{-2}$]

a) $0.11 Nm^{-1}$ b) $0.7 Nm^{-1}$ c) $0.072\ Nm^{-1}$ d) None of these

176. The amount of work done in blowing a soap bubble such that its diameter increases from d to D is (S = surface tension of solution)

a) $\pi(D^2 - d^2)S$ b) $2\pi(D^2 - d^2)S$ c) $4\pi(D^2 - d^2)S$ d) $8\pi(D^2 - d^2)S$

177. A monometer connected to a closed tap reads $4.5 \times 10^5\ pascal$. When the tap is opened the reading of the monometer falls to $4 \times 10^5\ pascal$. Then the velocity of flow of water is

a) $7\ ms^{-1}$ b) $8\ ms^{-1}$ c) $9\ ms^{-1}$ d) $10\ ms^{-1}$

178. Soap bubbles can be formed floating in air by blowing soap solution in air, with the help of a glass tube but not water bubbles. It because

a) The excess pressure inside water bubble being more due to large surface tension
b) The excess pressure inside water bubble being less du large surface tension
c) The excess pressure inside water bubble being more due to large viscosity
d) The excess pressure inside water bubble being less due to less viscosity

179. A large open tank has two holes in its wall. One is a square hole of side a at a depth of x from the top and the other is a circular hole of radius r at a depth $4x$ from the top. When the tank is completely filled with water, the quantities of water flowing out per second from both holes are the same. Then r is equal to

a) $2\pi a$ b) A c) $\frac{a}{2\pi}$ d) $\frac{a}{\pi}$

180. If the atmospheric pressure is P_a, then the pressure P at depth h below the surface of a liquid of density ρ open to the atmosphere is

a) $P_a - \frac{\rho g h}{2}$ b) $P_a - \rho g h$ c) P_a d) $P_a + \rho g h$

181. A ball whose density is $0.4 \times 10^3 kg\ m^{-3}$ falls into water from a height of 9 cm. To what depth does the ball sink?

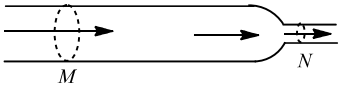
a) 9 cm b) 6 cm c) 4.5 cm d) 2.25 cm

182. Choose the correct statement(s) for a cricket ball that is spinning clockwise through air

S1 : Streamlines of air are symmetric around the ball
S2 : The velocity of air above the ball relative to it is larger than that below the ball
S3 : The velocity of air above the ball relative to it is smaller than that below the ball
S4 : There is a net upward force on the ball

a) S1, S2 and S4 b) S2 and S4 c) S4 only d) S3 only

183. Horizontal tube of non-uniform cross-section has radii of 0.1 m and 0.05 m respectively at M and N. For a streamline flow of liquid the rate of liquid flow is



a) Changing continuously with time
b) Greater at M than N
c) Greater at N than at M
d) Same at M and N

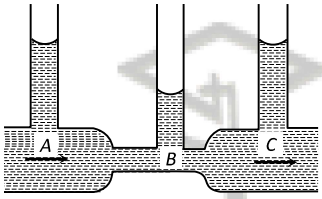
184. A piece of solid weighs 120 g in air, 80 g in water and 60 g in a liquid. The relative density of the solid and that of the liquid are respectively
a) 3,2 b) $2,\frac{3}{4}$ c) $\frac{3}{2},2$ d) 4,3

185. An aeroplane gets its upward lift due to phenomenon described by the
a) Archimedes' principle
b) Bernoulli's principle
c) Buoyancy principle
d) Pascal law

186. When a large bubble rises from the bottom of a lake to the surface. Its radius doubles. If atmospheric pressure is equal to that of column of water height H, then the depth of lake is
a) H b) $2H$ c) $7H$ d) $8H$

187. The velocity of a small ball of mass M and density d_1 when dropped in a container filled with glycerine becomes constant after some time. If the density of glycerine is d_2, the viscous force acting on the ball is
a) $Mg\left(1\frac{d_2}{d_1}\right)$ b) $Mg\frac{d_1}{d_2}$ c) $Mg(d_1-d_2)$ d) Mgd_1d_2

188. In the following fig. is shown the flow of liquid through a horizontal pipe. Three tubes A, B and C are connected to the pipe. The radii of the tubes A, B and C at the junction are respectively 2 cm, 1 cm and 2 cm. It can be said that the



a) Height of the liquid in the tube A is maximum
b) Height of the liquid in the tubes A and B is the same
c) Height of the liquid in all the three tubes is the same
d) Height of the liquid in the tubes A and C is the same

189. A drop of oil is placed on the surface of water then it will spread as a thin layer because
a) surface tension tends to give the oil a spherical surface
b) surface tension of water is greater than that of oil
c) both oil and water have nearly equal surface tension
d) oil is lighter than water

190. The excess pressure in a bubble of radius R of a gas in a liquid of surface tension S is
a) $\frac{2S}{R}$ b) $\frac{2R}{S}$ c) $\frac{2S}{R^2}$ d) $\frac{2R^2}{S}$

191. A U-tube is partially filled with water. Oil which does not mix with water is next poured into one side until water rises by 25 cm. On the other side, if the density of oil be 0.8, the oil level will stand higher than the water level by
a) 6.25 cm b) 12.50 cm c) 31.25 cm d) 62.50 cm

192. A tank of height H is fully filled with water. If the water rushing from a hole made in the tank below the free surface, strikes the floor at maximum horizontal distance, then the depth of the hole from the free surface must be
a) $\left(\frac{3}{4}\right)H$ b) $\left(\frac{2}{3}\right)H$ c) $\left(\frac{1}{4}\right)H$ d) $\left(\frac{1}{2}\right)H$

193. In a turbulent flow, the velocity of the liquid in contact with the walls of the tube is
a) Zero
b) maximum
c) in between zero and maximum
d) equal to critical velocity

194. Two mercury drop (each of radius r) merge to form a bigger drop, if T is the surface tension is
a) $2^{5/3}\,\pi r^2 T$ b) $4\,\pi r^2 T$ c) $2\pi r^2 T$ d) $2^{8/3}\,\pi r^2 T$

195. A ball of mass m and radius r is released in a viscous liquid. The value of its terminal velocity is proportional
a) $\frac{1}{r}$ b) $\frac{m}{r}$ c) $\sqrt{\frac{m}{r}}$ d) m only

196. 16 cm^3 Of water flows per sec through a capillary tube of radius a cm and of length l cm when connected to a pressure head of h cm of water. If a tube of the same length and radius $a/2$ cm is connected to the same pressure head, the quantity of water flowing through the tube per second will be
a) 16 cm^3 b) 1 cm^3 c) 4 cm^3 d) 8 cm^3

197. A drop of water breaks into two droplets of equal size. In this process, which of the following statements is correct?
a) The sum of the temperature of the two droplets together is equal to temperature of the original drop
b) The sum of the masses of the two droplets is equal to mass of drop
c) The sum of the radii of the two droplets is equal to the radius of the drop
d) The sum of the surface areas of the two droplets is equal to the surface area of the original drop

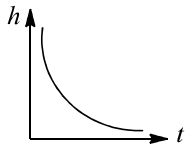
198. The excess pressure inside a spherical drop of radius r of a liquid of surface tension T is
a) Directly proportional to r and inversely proportional to T
b) Directly proportional to $T$and inversely proportional to r
c) Directly proportional to the product of $T$and r
d) Inversely proportional to the product of $T$and r

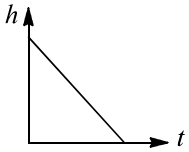
199. A trough contains mercury to a depth of 3.6 cm. If some amount of mercury is poured in it then height of mercury in the trough will be
a) 3.6 cm b) 7.2 cm c) 6 cm d) None of these

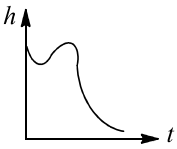
200. Surface tension of a liquid is due to
a) Gravitational force between molecules b) Electrical force between molecules
c) Adhesive force between molecules d) Cohesive force between molecules

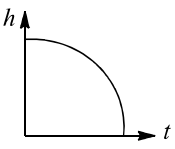
201. Surface tension vanishes at
a) absolute zero temperature b) transition temperature
c) critical temperature d) None of the above

202. Water in a vessel of uniform cross-section escapes through a narrow tube at the base of the vessel. Which graph given below represents the variation of the height h of the liquid with time$t$?

a) 

b) 

c) 

d) 

203. A block of ice floats on a liquid of density 1.2 in a beaker then level of liquid when ice completely melt
a) Remains same b) Rises c) Lowers d) (a), (b) or (c)

204. A drop of liquid of diameter 2.8 mm breaks up into 125 identical drops. The change in energy is nearly ($S = 75$ dyne cm^{-1})
a) Zero b) 19 erg c) 46 erg d) 74 erg

205. A ring is cut from a platinum tube 8.5 cm internal diameter and 8.7 cm external diameter. It is supported horizontally from a pan of a balance so, that it comes in contact with the water is in glass vessel. If an extra 3.47 g-wt is required to pull it away from water, surface tension of water is
a) 72.07 dyne cm^{-1} b) 70.80 dyne cm^{-1} c) 65.35 dyne cm^{-1} d) 60.00 dyne cm^{-1}

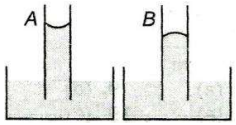
206. A square wire frame of size L is dipped in a liquid. On taking out a membrane is formed. If the surface tension of liquid is T, then the force acting on a frame will be
a) $2\,T/L$ b) $4T/L$ c) $8\,T/L$ d) $16\,T/L$

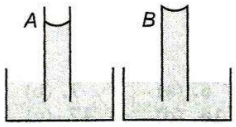
207. A barometer tube reds 76 cm of mercury. If the tube is gradually inclined at an angle of 60° with vertical, keeping the open end immersed in the mercury reservoir, the length of the mercury column will be
a) 152 cm b) 76 cm c) 38 cm d) $38\sqrt{3}cm$

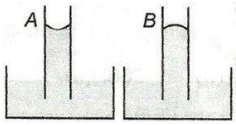
208. A frame made of a metallic wire enclosing a surface area A is covered with a soap film. If the area of the frame of metallic wire is reduced by 50%, the energy of the soap film will be changed by
a) 100% b) 75% c) 50% d) 25%

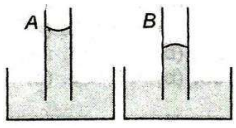
209. The terminal velocity of spherical ball of radius a falling through a viscous liquid is proportional to
a) a b) a^2 c) a^3 d) a^{-1}

210. The pressure at the bottom of a tank containing a liquid does not depend on
a) Acceleration due to gravity b) Height of the liquid column
c) Area of the bottom surface d) Nature of the liquid

211. A capillary tube (A) is dipped in water. Another identical tube (B) is dipped in a soap-water solution. Which of the following shows the relative nature of the liquid columns in the two tubes ?
a) 

b) 

c) 

d) 

212. Blood is flowing at the rate of 200 $cm^3\ s^{-1}$ in a capillary of cross sectional area 0.5 m^2. The velocity of flow, in mms^{-1}, is
a) 0.1 b) 0.2 c) 0.3 d) 0.4

213. Speed of 2 cm radius ball in a viscous liquid is 20 cms^{-1}. Then the speed of 1 cm radius ball in the same liquid is
a) 5 cms^{-1} b) 10 cms^{-1} c) 40 cms^{-1} d) 80 cms^{-1}

214. Three liquids of equal masses are taken in three identical cubical vessels A, B and C. Their densities are ρ_A, ρ_B and ρ_C respectively but $\rho_A < \rho_B < \rho_C$. below the force extract by the liquid on the base of cubical vessel is
a) maximum in vessel C b) maximum in vessel C
c) the same in all the vessels d) maximum in vessel A

215. A vessel whose bottom has round holes with diameter of 1 mm is filled with water. Assuming that surface tension acts only at holes, then the maximum height to which the water can be filled in vessel without leakage is (Surface tension of water is 75×10^{-3} Nm^{-1} and $g = 10\ ms^{-2}$)
a) 3 cm b) 0.3 cm c) 3 mm d) 3 m

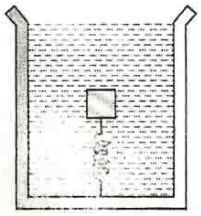
216. An ice block contains a glass ball when the ice melts within the water containing vessel, the level of water
a) Rises b) Falls
c) Unchanged d) First rises and then falls

217. Water is flowing through a pipe of constant cross-section. At some point the pipe becomes narrow and the cross-section is halved. The speed of water is
a) reduced to zero b) decreased by a factor of 2
c) increased by a factor of 2 d) unchanged

218. A fluid flows through a horizontal pipe having two different cross-sections of area A and2 A. If the pressure at the thin cross-section is p and fluid velocity is v, the velocity and pressure at the thicker cross-section is (take the density of fluid as ρ)
a) $\frac{v}{2}, p + \frac{1}{2}\rho\, v^2$ b) $\frac{v}{4}, p + \frac{3}{8}\rho\, v^2$ c) $\frac{v}{2}, p + \frac{3}{8}\rho\, v^2$ d) $v, p + \frac{3}{4}\rho\, v^2$

219. The density ρ of water of bulk modulus B at a depth y in the ocean is related to the density at surface ρ_0 by the relation
a) $\rho = \rho_0\left[1 - \frac{\rho_0 gy}{B}\right]$ b) $\rho = \rho_0\left[1 + \frac{\rho_0 gy}{B}\right]$ c) $\rho = \rho_0\left[1 + \frac{B}{\rho_0 hgy}\right]$ d) $\rho = \rho_0\left[1 - \frac{B}{\rho_0 gy}\right]$

220. A block is submerged in vessel filled with water by a spring attached to the bottom of the vessel. In equilibrium, the spring is compressed. The vessel now moves downwards with acceleration$a(< g)$. The spring length

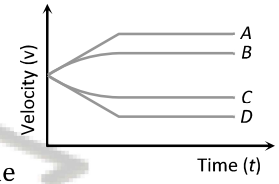


a) Will become zero
b) Will decrease but not zero
c) Will increase
d) May increase or decrease or remain constant

221. Two solids A and B float in water. It is observed that A floats with $\frac{1}{2}$ of its body immersed in water and B floats with $\frac{1}{4}$ of its volume above the water level. The ratio of the density of A to that of B is

a) 4 : 3 b) 2 : 3 c) 3 : 4 d) 1 : 2

222. A small spherical solid ball is dropped from a great height in a viscous liquid. Its journey in the liquid is best described in the diagram given below by the



a) Curve A b) Curve B c) Curve C d) Curve D

223. Calculate the force of attraction between two parallel plates separated by a distance 0.2 mm after a water drop of mass 80 mg is introduced between them. The wetting is assumed to be complete. (Surface tension of water is 0.07 Nm^{-1})

a) 0.14 N b) 0.28 N c) 0.42 N d) 0.56 N

224. Two helium filled balloons are floating next to each other at the ends of strings tied to a cable. The facing surfaces of the balloons are separated by 1 to 2 cm. If you blow through the opening between the balloons, then

a) They more away from each other
b) They move towards each other
c) They are unaffected
d) Nothing can be said about their separation

225. A hemispherical bowl just floats without sinking in a liquid of density1.2×10^3 kg m^{-3}. If outer diameter and the density of the bowl are 1 m and 2×10^4 kg m^{-3} respectively, then the inner diameter of the bowl will be

a) 0.94 m b) 0.96 m c) 0.98 m d) 0.99 m

226. A body of uniform cross-sectional area floats in a liquid of density thrice its value. The portion of exposed height will be

a) 2/3 b) 5/6 c) 1/6 d) 9/10

227. Work done in increasing the size of soap bubble from radius of 3 cm to 5 cm is nearly (surface tension of soap solution= $0.03 Nm^{-1}$)

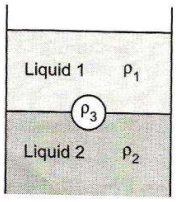
a) 0.2 π mJ b) 2 π mJ c) 0.4 π mJ d) 4 π mJ

228. Under a pressure head, the rate of orderly volume flow of liquid through a capillary tube is Q. If the length of capillary tube were doubled and the diameter of the bore is halved, the rate of flow would become

a) $\frac{Q}{4}$ b) 16 Q c) $\frac{Q}{8}$ d) $\frac{Q}{32}$

229. To what height should a cylindrical vessel be filled with a homogeneous liquid to make the force with which the liquid presses on the sides of the vessel equal to the force exerted by the liquid on the bottom of the vessel. If should be
a) Equal to the radius b) Less than radius c) More than radius d) Four times of radius

230. A jar id filled with two non-mixing liquids 1 and 2 having densities ρ_1 and ρ_2 respectively. A solid ball, made of a material of density ρ_3, is dropped in the jar. It comes to equilibrium in the position shown in the figure. Which of the following is true for ρ_1, ρ_2 and ρ_3?



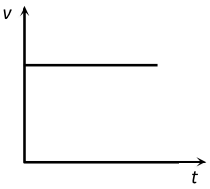
a) $\rho_3 < \rho_1 < \rho_2$ b) $\rho_1 < \rho_3 < \rho_2$ c) $\rho_1 < \rho_2 < \rho_3$ d) $\rho_1 < 3 < \rho_2$

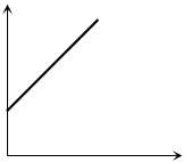
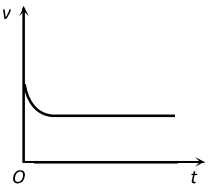
231. A vessel contains oil (density 0.8 g cm^{-3}) over mercury (density 136 g cm^{-3}). A homogenous sphere floats with half volume immersed in mercury and the other half in oil. The density of the material of the sphere in g cm^{-3} is
a) 12.8 b) 7.2 c) 6.4 d) 3.3

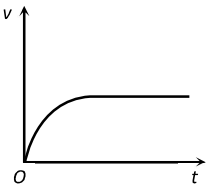
232. If two ping pong ball are suspended near each other and a fast stream of air is produced within the space of the balls, the balls
a) Come nearer to each other b) Move away from each other
c) Remain in their original positions d) Move far away

233. The rate of flow of water in a capillary tube of length l and radius r is V. The rate of flow in another capillary tube of length $2l$ and radius $2r$ for same pressure difference would be
a) 16 V b) 9 V c) 8 V d) 2 V

234. A block of wood weighs $4N$ in air and $3N$ when immersed in a liquid. The buoyant force in newton is
a) Zero b) 1 c) 3/4 d) 4/3

235. From amongst the following curves, which one shows the variation of the velocity v with time t for a small sized spherical body falling vertically in a long column of a viscous liquid
a) 

b) 
c) 

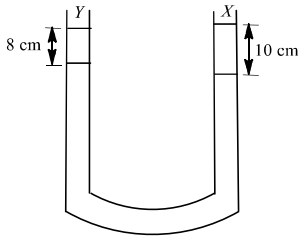
d) 

236. The weight of an aeroplane flying in the air is balanced by
a) Vertical component of the thrust created by air currents striking the lower surface of the wings
b) Force due to reaction of gases ejected by the revolving propeller
c) Upthrust of the air which will be equal to the weight of the air having the same volume as the plane
d) Force due to the pressure difference between the upper and lower surfaces of the wings created by different air speeds on the surfaces

237. An iceberg is floating in water. The density of ice in the iceberg is 917 kg m^{-3} and the density of water is 1024 kg m^{-3}
a) 5% b) 10% c) 12% d) 8%

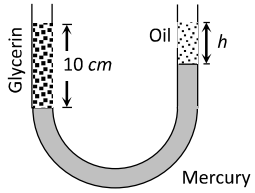
238. Two tubes A and B are in series. Radius of A is R and that of B is $2R$. If water flows through A with velocity then velocity of water through B is
a) $\frac{v}{2}$ b) v c) $\frac{v}{4}$ d) $\frac{v}{8}$

239. A liquid X of density 3.36 g cm^{-3} is poured in a U-tube, which contains Hg. Another liquid Y is poured in left arm with height 8 cm, upper levels of X and Y are same. What is density of Y?



a) 0.8 gcc^{-1} b) 1.2 gcc^{-1} c) 1.4 gcc^{-1} d) 1.6gcc^{-1}

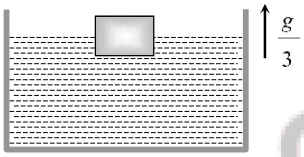
240. A vertical U-tube of uniform inner cross section contains mercury in both sides of its arms. A glycerin (density = 1.3 g/cm^3) column of length 10 cm is introduced into one of its arms. Oil of density 0.8 gm/cm^3 is poured into the other arm until the upper surfaces of the oil and glycerin are in the same horizontal level. Find the length of the oil column. Density of mercury = 13.6 g/cm^3



a) 10.4 cm b) 8.2 cm c) 7.2 cm d) 9.6 cm

241. On the surface of the liquid in equilibrium, molecules of the liquid possess
a) maximum potential energy b) maximum potential energy
c) maximum kinetic energy d) minimum kinetic energy

242. A cubical block is floating in a liquid with half of its volume immersed in the liquid. When the whole system accelerates upwards with acceleration of $g/3$, the fraction of volume immersed in the liquid will be



a) $\frac{1}{2}$ b) $\frac{3}{8}$ c) $\frac{2}{3}$ d) $\frac{3}{4}$

243. The heat evolved for the rise of water when one end of the capillary tube of radius r is immersed vertically into water is (Assume surface tension $=T$ and density of water $=\rho$)
a) $\frac{2\pi T}{\rho g}$ b) $\frac{\pi T^2}{\rho g}$ c) $\frac{2\pi T^2}{\rho g}$ d) None of these

244. What change in surface energy will be noticed when a drop of radius R splits up into 1000 droplets of radius$r$, surface tension$T$?
a) $4\,\pi\,R^2T$ b) $7\,\pi\,R^2T$ c) $16\,\pi\,R^2T$ d) $36\,\pi\,R^2T$

245. Two soap bubbles A and B are formed at the two open ends of a tube. The bubble A is smaller than bubble$B$. Valve and air can flow freely between the bubbles, then
a) There is no change in the size of the bubbles
b) The two bubbles will become of equal size
c) A will become smaller and B will become larger
d) B will become smaller and A will become larger

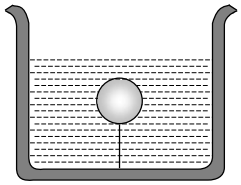
246. A raindrop with radius 1.5 mm falls from a cloud at a height 1200 m from ground. The density of water is 1000 kg/m^3 and density of air is 1.2kg/m^3. Assume the drop was spherical throughout the fall and there is no air drag. The impact speed of the drop will be
a) 27 km/h b) 550 km/h c) Zero d) 129 km/h

247. A metallic sphere of mass M falls through glycerine with a terminal velocity v. If we drop a ball of mass 8 M of same metal into a column of glycerine, the terminal velocity of the ball will be
a) 2 v b) 4 v c) 8 v d) 16 v

248. For a ball falling in a liquid with constant velocity, ratio of the resistance force due to the liquid to that due to gravity is

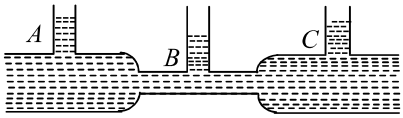
a) 1 b) $\frac{2a^2\rho\, g}{9\,\eta^2}$ c) $\frac{2a^2(\rho-\sigma)g}{9\,\eta}$ d) None of these

249. A solid sphere of density $\eta(>1)$ times lighter than water is suspended in a water tank by a string tied to its base as shown in fig. If the mass of the sphere is m then the tension in the string is given by



a) $\left(\frac{\eta-1}{\eta}\right)mg$ b) ηmg c) $\frac{mg}{\eta-1}$ d) $(\eta-1)mg$

250. Three tubes A, B and C are connected to a horizontal pipe in which liquid is flowing. The radii of pipe at the joints of A, B and C are 2 cm, 1 cm and 2 cm respectively. The height of liquid



a) In A is maximum b) In A and B is equal c) Is same in all three d) In A and C is same

251. Water is flowing continuously from a tap having an internal diameter 8×10^{-3} m. The water velocity as it leaves the tap is 0.4 m/s. The diameter of the water stream at a distance 2×10^{-1} m below the tap is close to

a) 7.5×10^{-3} m b) 9.6×10^{-3} m c) 3.6×10^{-3} m d) 5.0×10^{-3} m

252. The excess of pressure inside the first soap bubble is three times that inside the second bubble is

a) 1:3 b) 1:9 c) 1:7 d) 9:1

253. A spherical ball of radius r and relative density 0.5 is floating in equilibrium in water with half of it immersed in water. The work done in pushing the ball down so that whole of it is just immersed in water is : (where ρ is the density of water)

a) $\frac{5}{12}\pi r^4\rho g$ b) $0.5\rho rg$ c) $\frac{4}{3}\pi r^3\rho g$ d) $\frac{2}{3}\pi r^4\rho g$

254. A open U-tube contains mercury. When 11.2 cm of water is poured into one of the arms of the tube, how high dose the mercury rise in the other arm from its initial unit?

a) 0.56 cm b) 1.35 cm c) 0.41 cm d) 2.32 cm

255. An iron sphere of mass 20×10^{-3}kg falls through a viscous liquid with terminal velocity 0.5 ms^{-1}. The terminal velocity (in ms^{-1}) of another iron sphere of mass 54×10^{-2} kg is

a) 4.5 b) 3.5 c) 2.5 d) 1.5

256. When the temperature increases, the viscosity of

a) gas decreases and liquid increases b) gas increases and liquid decreases
c) gas and liquid increases d) gas and liquid decreases

257. What is the ratio of surface energy of 1 small drop and 1 large drop if 1000 drops combined to form 1 large drop?

a) 100 : 1 b) 1000 : 1 c) 10 : 1 d) 1 : 100

258. For flow of a liquid to be streamline, the following condition (s) apply

a) Fluid should have high viscosity b) Critical velocity should be large
c) Diameter of the tube should be small d) All of the above

259. Radius of one arm of hydraulic lift is four times of radius of other arm. What force should be applied on narrow arm to lift 100kg?

a) 26.5 N b) 62.5 N c) 6.25 N d) 8.3 N

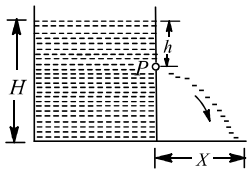
260. A denotes the area to the right on the cube h the depth of an orifice of area of cross-section$A$, below the liquid surface. The velocity of the liquid flowing through the orifice is

a) $\sqrt{2\,gh}$ b) $\sqrt{2\,gh}\sqrt{\left(\frac{A^2}{A^2-a^2}\right)}$ c) $\sqrt{2\,gh}\sqrt{\left(\frac{A}{A-a}\right)}$ d) $\sqrt{2\,gh}\sqrt{\left(\frac{A^2-a^2}{A^2}\right)}$

261. Water flows in a streamlined manner through a capillary tube of radius a, the pressure difference being P and the rate of flow Q. If the radius is reduced to $a/2$ and the pressure increased to $2P$, the rate of flow becomes

a) $4Q$ b) Q c) $\frac{Q}{4}$ d) $\frac{Q}{8}$

262. A tank is filled with water upto a height$H$. Water is allowed to come out of a hole P in one of the walls at a depth h below the surface of water (see figure). Express the horizontal distance X in terms of H and h



a) $X=\sqrt{h(H-h)}$ b) $X=\sqrt{\frac{h}{2}(H-h)}$ c) $X=2\sqrt{h(H-h)}$ d) $X=4\sqrt{(H-h)}$

263. Two drops of the same radius are falling through air with a steady velocity of 5 cm per sec. If the two drops coalesce, the terminal velocity would be

a) 10 cm per sec b) 2.5 cm per sec c) $5\times(4)^{1/3}cm$ per sec d) $5\times\sqrt{2}\ cm$ per sec

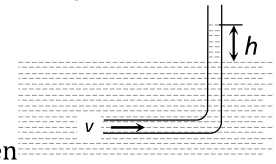
264. The reading of spring balance when a block is suspended from it in air is 60N. This reading is changed to 40N when the block is submerged in water. The specific gravity of the block must therefore

a) 3/2 b) 6 c) 2 d) 3

265. The viscous force acting on a rain drop of radius 0.35 mm falling through air with a velocity of 1 ms^{-1}, is ($\eta=2\times10^{-4}$ N s m^{-2})

a) 6.6×10^{-6} N b) 6.6×10^{-5} N c) 1.32×10^{-7} N d) 13.2×10^{-7} N

266. An L-shaped glass tube is just immersed in flowing water such that its opening is pointing against flowing water. If the speed of water current is v, then



a) The water in the tube rises to height $\frac{v^2}{2g}$ b) The water in the tube rises to height $\frac{g}{2v^2}$

c) The water in the tube does not rise at all d) None of these

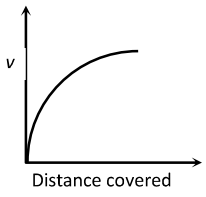
267. An object of weight w and density ρ is submerged in a fluid of density ρ_1. Its apparent weight will be

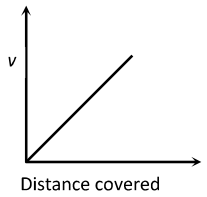
a) $w(\rho-\rho_1)$ b) $(\rho-\rho_1)/w$ c) $w\left(1-\frac{\rho_1}{\rho}\right)$ d) $w(\rho_1-\rho)$

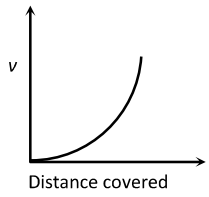
268. A rectangular vessel when full of water, takes 10 min to be emptied through an orifice in its bottom. How much time will take to be emptied when half filled with water?

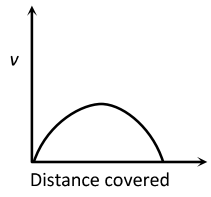
a) 9 min b) 7 min c) 5 min d) 3 min

269. A lead shot of 1mm diameter falls through a long column of glycerine. The variation of its velocity v. with distance covered is represented by

a) 

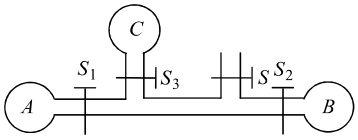
b) 

c) 

d) 

270. There are two holes one each along the opposite sides of a wide rectangular tank. The cross-section of each hole is 0.01m^2 and the vertical distance between the holes is one meter. The tank is filled with water flows out of the holes is (density of water= $1000\ \text{kgm}^{-3}$)
a) 100 b) 200 c) 300 d) 400

271. The diagram shows three soap bubbles A, B and C prepared by blowing the capillary tube fitted with stop cocks S, S_1, S_2 andS_3. With stop cock S closed and stop cocks S_1, S_2 andS_3. Opened



a) B will start collapsing with volumes of A and C increasing
b) C will start collapsing with volume of A and B increasing
c) Volume of A, B and C will become equal in equilibrium
d) C and A will both start collapsing with volume of B increasing

272. A hydraulic lift is designed to life cars of maximum mass of 3000 kg. The area of cross-section of the piston carrying the load is$4.25 \times 10^{-12}\ \text{m}^2$. What maximum pressure the smaller piston have to bear?
a) $6.92 \times 10^5\ \text{Nm}^{-2}$ b) $7.82 \times 10^7\ \text{Nm}^{-2}$ c) $9.63 \times 10^9\ \text{Nm}^{-2}$ d) $13.76 \times 10^{11}\ \text{Nm}^{-2}$

273. A capillary tube is attached horizontally to a constant head arrangement. If the radius of the capillary tube is increased by 10% then the rate of flow of liquid will change nearly by
a) $+10\%$ b) $+46\%$ c) -10% d) -40%

274. Bernoulli's theorem is a consequence of the law of conservation of
a) Momentum b) Mass c) Energy d) angular momentum

275. A rectangular block is 5 cm $\times$ 5cm $\times$ 10cm in size. The block is floating in water with 5 cm side vertical. If it floats with 10 cm side vertical, what change will occur in the level of water?
a) No change
b) It will rise
c) It will fall
d) It may rise or fall depending on the density of block

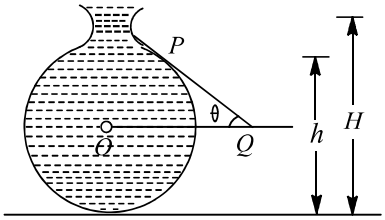
276. Two soap bubbles combine to form a single bubble. In this process, the change in volume and surface area are respectively $V$and A. If $p$is the atmospheric pressure, and $T$is the surface tension of the soap solution, the following relation is true.
a) $4pV + 3TA = 0$ b) $3pV - 4TA = 0$ c) $4pV - 3TA = 0$ d) $3pV + 4TA = 0$

277. A cubical block of wooden edge I and a density ρ floats in water of density2ρ. The lower surface of cube just touches the free end of a massless spring of force constant k fixed at the bottom of the vessel. The weight w put over the block so that it is completely immersed in water without wetting the weight is
a) $a(l\,\rho\,\text{g} + k)$ b) $a(l^2\,\rho\,\text{g} + k)$ c) $a\left(\frac{l\,\rho\,\text{g}}{2} + 2k\right)$ d) $a\left(l^2\,\rho\,\text{g} + \frac{k}{2}\right)$

278. The flow of liquid is laminar or steam line is determined by
a) rate of flow of liquid
b) density of fluid
c) radius of the tube
d) coefficient of viscosity of liquid

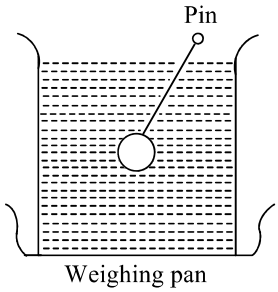
279. A rain drop of radius 1.5 mm, experiences a drag force $F = (2 \times 10^{-5}\ v)$ N, while falling through air from a height 2 km, with a velocity$v$. The terminal velocity of the rain drop will be nearly (use $\text{g} = 10\ \text{ms}^{-2}$)
a) $200\ \text{ms}^{-1}$ b) $80\ \text{ms}^{-1}$ c) $7\ \text{ms}^{-1}$ d) $3\ \text{ms}^{-1}$

280. Figure shows the vertical cross section of a vessel filled with a liquid of densityρ. The normal thrust per unit area on the walls of the vessel at point P, as shown will be



a) $h\,\rho\,g$ b) $H\,\rho\,g$ c) $(H-h)\rho\,g$ d) $(H-h)\rho\,g\cos\theta$

281. A vessel with water is placed on a weighing pan and it reads 0.8 gcc^{-1} is sunk into the water with a pin of negligible volume as shown in figure keeping it sunk. The weighing pan will show a reading



a) 600 g b) 632 g c) 642 g d) 640 g

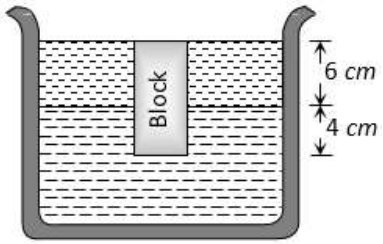
282. A body floats in a liquid contained in a beaker. If the whole system falls under gravity, them the upthrust on the body due to liquids is
a) equal to the weight of the body in air
b) equal to the weight of the body in liquid
c) zero
d) equal to the weight of the immersed part of the body

283. A vessel contains oil (density0.8 gcc^{-1}) over mercury (density13.6 gcc^{-1}). A homogeneous sphere floats with half its volume immersed in mercury and the other half in oil. The density of the material of the sphere in gcc^{-1} is
a) 3 b) 6.4 c) 7.2 d) 12.8

284. Two drops of equal radius coalesce to form a bigger drop. What is ratio of surface energy of bigger drop to smaller one?
a) $2^{1/2}:1$ b) $1:1$ c) $2^{1/3}:1$ d) None of the above

285. A mercury drop of radius 1.0 cm is sprayed in to 10^6 droplets of equal size. The energy expended in this process is (surface tension of mercury is equal to $32\times10^{-2}\ Nm^{-1}$)
a) 3.98×10^{-4} J b) 8.46×10^{-4} J c) 3.98×10^{-2} J d) 3.98×10^{-2} J

286. A cubical block of wood 10 cm on a side floats at the interface between oil and water with its lower surface horizontal and 4 cm below the interface. The density of oil is $0.6gcm^{-3}$. The mass of block is



a) 706 g b) 607 g c) 760 g d) 670 g

287. A mercury drop of radius 1 cm is broken into 10^6 droplets of equal size. The work done is ($S=35\times10^{-2}\ Nm^{-1}$)
a) 4.35×10^{-2} J b) 4.35×10^{-3} J c) 4.35×10^{-6} J d) 4.35×10^{-8} J

288. If two soap bubbles of different radii are connected by a tube
   a) air flows from the bigger bubble to the smaller bubble till the sizes become equal
   b) air flows from bigger bubble to the smaller bubble till the sizes are interchanged
   c) air flows from the smaller bubble to the bigger
   d) there is no flow of air

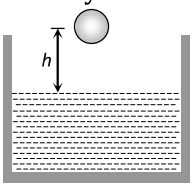
289. A beaker containing water is balance on the pan of a common balance. A solid of specific gravity 1 and mass 5 g is tied to the arm of the balance and immersed in water contained in the beaker. The scale pan with the beaker
   a) Goes down b) Goes up c) Remains unchanged d) None of these

290. An aquarium tank is in the shape of a cube with one side a 4m tall glass wall. When the tank is half filled and the water is 2 m deep, the water exerts a force F on the wall. What force does the water exerts on the wall when the tank is full and the water is 4 m drop?
   a) $1/2\ F$ b) F c) $2\ F$ d) $4\ F$

291. Water flows through a vertical tube of variable cross-section. The area of cross-section at A and B are 6 and 3 mm^2 respectively. If 12 cc of water enters per second through A, find the pressure difference $p_A - p_B$ ($g = 10\ ms^{-2}$) The separation between cross-section at A and B is 100 cm
   a) 1.6×10^5 dyne cm^{-2} b) 2.29×10^5 dyne cm^{-2} c) 5.9×10^5 dyne cm^{-2} d) 3.9×10^5 dyne cm^{-2}

292. The density of ice is 0.9 gcc^{-1} and that of sea water is1.1 gcc^{-1}. An ice berg of volume V is floating in sea water. The fraction of ice berg above water level is
   a) $1/11$ b) $2/11$ c) $3/11$ d) $4/11$

293. A ball of radius r and density ρ falls freely under gravity through a distance h before entering water. Velocity of ball does not change even on entering wate r. If viscosity of water is η, the value of h is given by



   a) $\frac{2}{9}r^2\left(\frac{1-\rho}{\eta}\right)g$ b) $\frac{2}{81}r^2\left(\frac{\rho-1}{\eta}\right)g$ c) $\frac{2}{81}r^4\left(\frac{\rho-1}{\eta}\right)^2 g$ d) $\frac{2}{9}r^4\left(\frac{\rho-1}{\eta}\right)^2 g$

294. A small tiny lead shot is gently dropped on the surface of a viscous liquid
   a) The lead shot will fall with an acceleration equal to g at that place
   b) The velocity of lead shot will decrease with time
   c) The velocity of lead shot will increase continuously
   d) The velocity of lead shot will reach steady value after sometime

295. Two very wide parallel glass plates are held vertically at a small separation r, and dipped in water of surface tension S. Some water climbs up in the gap between the plates. If p_0 is the atmospheric pressure, then the pressure of water just below the water surface in the region between the two plates is
   a) $p_0 - \frac{2\,S}{r}$ b) $p_0 + \frac{2\,S}{r}$ c) $p_0 - \frac{4\,S}{r}$ d) $p_0 + \frac{4\,S}{r}$

296. At what speed, the velocity head of water is equal to pressure head of 40 cm of Hg?
   a) 10.3 ms^{-1} b) 2.8 ms^{-1} c) 5.6 ms^{-1} d) 8.4 ms^{-1}

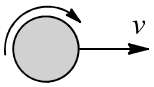
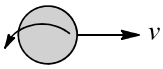
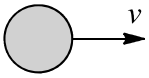
297. A parrot sitting on the floor of a wire cage which is being carried by a boy, starts flying. The boy will feel that the cage is now
   a) Heavier b) Lighter
   c) Shows no change in weight d) Lighter in the beginning and heavier later

298. What is the radius of the biggest aluminium coin of thickness t and densityρ, which will still be able to float on the water surface of surface tension$S$?
   a) $\frac{4\,S}{3\rho\,g\,t}$ b) $\frac{3\,S}{4\rho\,g\,t}$ c) $\frac{2\,S}{\rho\,g\,t}$ d) $\frac{S}{\rho\,g\,t}$

299. Two communicating vessels contain mercury. The diameter of one vessel is n times larger than the diameter of the other. A column of water of height h is poured into the left vessel. The mercury level will rise in the right-hand vessel (s = relative density of mercury and ρ = density of water) by

a) $\frac{n^2h}{(n+1)^2s}$ b) $\frac{h}{(n^2+1)s}$ c) $\frac{h}{(n+1)^2s}$ d) $\frac{h}{n^2s}$

300. To get the maximum flight, a ball must be thrown as

a)  b)  c)  d) None of these

301. By sucking through a straw, a student can reduce the pressure in his lungs to 750 mm of Hg (density = 13.6 g cm^{-3}). Using the straw, he can drink water from a glass upto a maximum depth of
a) 10 cm b) 75 cm c) 13.6 cm d) 1.36 cm

302. A water drop of 0.05 cm^3 is squeezed between two glass plates and spreads into area of 40 cm^2. If the surface tension of water is 70 dyne cm^{-1} then the normal force required to separate the glass plates from each other will be
a) 22.5 N b) 45 N c) 90 N d) 450 N

303. A metal ball immersed in alcohol weighs W_1 at 0°C and W_2 at 59°C. The coefficient of cubical of cubical expansion of the metal is less than that of alcohol. Assuming that the density of the metal is large compared to that of alcohol, it can be shown that
a) $W_1 > W_2$ b) $W_1 < W_2$ c) $W_1 = W_2$ d) $W_1 = 2W_2$

304. The potential energy of molecule on the surface of a liquid compared to one inside the liquid is
a) Zero b) Lesser c) Equal d) Greater

305. A concrete sphere of radius R has a cavity of radius r which is packed with sawdust. The specific gravities of concrete and sawdust are respectively 2.4 and 0.3 for this sphere to float with its entire volume submerged under water. Ratio of mass of concrete to mass of sawdust will be
a) 8 b) 4 c) 3 d) Zero

306. Water in river 20 m deep is flowing at a speed of 10 ms^{-1}. The shearing stress between the horizontal layers of water in the river in N m^{-2} is (coefficient of viscosity of water= 10^{-3} SI units)
a) 1×10^{-2} Nm^{-2} b) 0.5×10^{-2} Nm^{-2} c) 1×10^{-3} Nm^{-2} d) 0.5×10^{-3} Nm^{-2}

307. A liquid of density 800 kg m^3 is filled in a tank open at the top. The pressure of the liquid at the bottom of the tank is 6.4 atm. The velocity of efflux through a hole at the bottom is(1 atm = 10^5 Nm^{-2})
a) 10 ms^{-1} b) 20 ms^{-1} c) 30 ms^{-1} d) 40 ms^{-1}

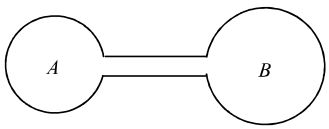
308. A spherical drop of water has radius 1 mm if surface tension of water is 70×10^{-3} Nm^{-1}, difference of pressure between inside and outside of the spherical drop is
a) 35 Nm^{-2} b) 70 Nm^{-2} c) 140 Nm^{-2} d) Zero

309. When two soap bubbles of radius r_1 and r_2 ($r_2 > r_1$) coalesce, the radius of curvature of common surface is
a) $(r_2 - r_1)$ b) $(r_2 + r_1)$ c) $\frac{r_2 - r_1}{r_1 r_2}$ d) $\frac{r_2 r_1}{r_2 - r_1}$

310. With rise in temperature, density of a given body changes according to one of the following relations
a) $\rho = \rho_0[1 + \gamma d\theta]$ b) $\rho = \rho_0[1 - \gamma d\theta]$ c) $\rho = \rho_0 \gamma d\theta$ d) $\rho = \rho_0/\gamma d\theta$

311. The rate of flow of liquid in a tube of radius r, length l, whose ends are maintained at a pressure difference P is $V = \frac{\pi Q P r^4}{\eta l}$ where η is coefficient of the viscosity and Q is
a) 8 b) $\frac{1}{8}$ c) 16 d) $\frac{1}{16}$

312. The working of venturimeter is based on
    a) Torricelli's law
    b) Pascal's law
    c) Bernoulli's theorem
    d) Archimede's principle
313. Velocity of water in a river is
    a) Same everywhere
    b) More in the middle and less near its banks
    c) Less in the middle and more near its banks
    d) Increase from one bank to other bank
314. A body weight 50 g in air and 40 g in water. How much would it weigh in a liquid of specific gravity 1.5?
    a) 30 g
    b) 35 g
    c) 65 g
    d) 45 g
315. A spherical solid ball of volume V is made of a material of density $\rho_2 (\rho_2 < \rho_1)$. [Assume that the liquid applies a viscous force on the ball that is proportional to the square of its speed$v$, $ie, F_{\text{viscous}} = -kv^2 (k > 0)$]. The terminal speed of the ball is
    a) $\sqrt{\frac{Vg(\rho_2 < \rho_2)}{k}}$
    b) $\frac{Vg\rho_1}{k}$
    c) $\sqrt{\frac{Vg\rho_1}{k}}$
    d) $\frac{Vg(\rho_1 < \rho_2)}{k}$
316. Water rises in a capillary tube to a height$h$. It will rise to a height more than h
    a) On the surface of sun
    b) In a life moving down with an acceleration
    c) At the poles
    d) In a lift moving up with an acceleration
317. A hollow cylinder of mass m made heavy at its bottom is floating vertically in water. It is tilled from its vertical position through an angle θ and is left. The restoring force acting on it is
    a) $mg\cos\theta$
    b) $mg\sin\theta$
    c) $mg\left[\frac{1}{\cos\theta} - 1\right]$
    d) $mg\left[\frac{1}{\cos\theta} + 1\right]$
318. A beaker of radius 15 cm is filled with a liquid of surface tension 0.75 Nm^{-1}. Force across an imaginary diameter on the surface of the liquid is
    a) 0.075 N
    b) 1.5×10^{-2} N
    c) 0.225 N
    d) 2.25×10^{-2} N
319. Construction of submarines is based on
    a) Archimedes principle
    b) Bernoulli's theorem
    c) Pascal's law
    d) Newton's laws
320. Two capillary tubes of same radius r but of lengths l_1 and l_2 are fitted in parallel to the bottom of a vessel. The pressure head is P. What should be the length of a single tube that can replace the two tubes so that the rate of flow is same as before
    a) $l_1 + l_2$
    b) $\frac{1}{l_1} + \frac{1}{l_2}$
    c) $\frac{l_1 l_2}{l_1 + l_2}$
    d) $\frac{1}{l_1 + l_2}$
321. The surface tension of soap solution is 0.03 Nm^{-1}. the work done in blowing to from a soap bubble of surface area 40 cm^2, (in J), is
    a) 1.2×10^{-4}
    b) 2.4×10^{-4}
    c) 12×10^{-4}
    d) 24×10^{-4}
322. Water is flowing in a pipe of diameter 4 cm with a velocity 3 ms^{-1}. The water then enters in to a pipe of diameter 2 cm. the velocity of water in the other pipe is
    a) 3 ms^{-1}
    b) 6 ms^{-1}
    c) 12 ms^{-1}
    d) 8 ms^{-1}
323. There is a small bubble at one end and bigger bubble at other end of a rod. What will happen?



    a) Smaller will grow until they collapse
    b) Bigger will grow until they collapse
    c) Remain in equilibrium
    d) None of the above
324. When a number of small droplets combine to form a large drop, then
    a) energy is absorbed
    b) energy is liberated
    c) energy is neither liberated nor absorbed
    d) process is independent of energy
325. According to Bernoulli's equation

$\frac{P}{\rho g} + h + \frac{1}{2}\frac{v^2}{g} = \text{constant}$

The terms A, B and C are generally called respectively

a) Gravitational head, pressure head and velocity head

b) Gravity, gravitational head and velocity head

c) Pressure head, gravitational head and velocity head

d) Gravity, pressure and velocity head

326. Water rises in plant fibres due to

a) Capillarity b) Viscosity c) fluid pressure d) Osmosis

327. An ice berg of density 900 kg/m^3 is floating in water of density 1000 kg/m^3. The percentage of volume of ice-cube outside the water is

a) 20% b) 35% c) 10% d) 25%

328. Two spherical soap bubbles of radii a and b in vacuum coalesce under isothermal conditions. The resulting bubble has a radius given by

a) $\frac{(a+b)}{2}$ b) $\frac{ab}{a+b}$ c) $\sqrt{a^2+b^2}$ d) $a+b$

329. The velocity of the surface layer of water in a river of depth 10 m is 5 m s^{-1}. The shearing stress between the surface layer and the bottom layer is (Coefficient of viscosity of water, $\eta = 10^{-3}$ SI units)

a) 0.6×10^{-3}N m^{-2} b) 0.8×10^{-3}N m^{-2} c) 0.5×10^{-3}N m^{-2} d) 10^{-3}N m^{-2}

330. If the excess pressure inside a soap bubble is balanced by oil column of height 2 mm, then the surface tension of soap solution will be ($r = 1$ cm and density $d = 0.8$ g $cc^{-1)}$

a) 3.9 Nm^{-1} b) 3.9×10^{-1} Nm^{-1} c) 3.9×10^{-2} Nm^{-1} d) 3.9 dyne m^{-1}

331. A hole is made at the bottom of the tank filled with water (density 1000 kg/m^3). If the total pressure at the bottom of tank is 3 atm (1 atm = 10^5 N/m^2), then the velocity of efflux is

a) $\sqrt{200}$ m/s b) $\sqrt{400}$ m/s c) $\sqrt{500}$ m/s d) $\sqrt{800}$ m/s

332. In a hydraulic press the small cylinder has a diameter of $'d_1' cm$, while the large piston has a diameter of $'d_2' cm$. If a force $'F_1'$ is applied to a small piston, the force on the large piston $'F_2'$ is given by

a) $F_2 = \frac{d_2^2}{d_1^2}F_1$ b) $F_2 = \frac{d_1^2}{d_2^2}F_1$ c) $F_2 = \frac{d_1^2}{d_2^2}\frac{1}{F_1}$ d) $F_2 = \frac{d_2^2}{d_1^2}\frac{1}{F_1}$

333. Water is in streamline flow along a horizontal pipe with nonuniform cross-section. At a point in the pipe where the area of cross-section is 10 cm^2, the velocity of water is 1 ms^{-1} and the pressure is 2000 Pa. The pressure at another point where the cross-sectional area is 5 cm^2 is

a) 4000 Pa b) 2000 Pa c) 1000 Pa d) 500 Pa

334. Air is blown through a hole on a closed pipe containing liquid. Then the pressure will

a) Increase on sides b) Increase downwards

c) Increase in all directions d) Never increases

335. When water flows at a rate Q through a tube of radius r placed horizontally, a pressure difference p develops across the ends of the tube. If the radius of the tube is doubled and the rate of flow halved, the pressure difference will be

a) 8 p b) p c) $p/8$ d) $p/32$

336. Two cubes each weighing 22 g exactly are taken. One is of iron ($d = 8 \times 10^3$ kg m^{-3}) and the other is of marble($D = 3 \times 10^3$ kg m^{-3}). They are immersed in alcohol and then weighed again

a) Iron cube weighs less b) Iron cube weighs more

c) Both have equal weight d) Nothing can be said

337. Two soap bubbles A and B are kept in a closed chamber where the air is maintained at pressure 8 Nm^{-2}. The radii of bubbles is 0.04Nm^{-1}. Find the ratio $\frac{n_B}{n_A}$, where n_A and n_B are the number of moles of air in bubbles A and B, respectively. [Neglect the effect of gravity]

a) 4 b) 6 c) 7 d) 8

338. A solid of density D is floating in a liquid of density$d$. If v is the volume of solid submerged in the liquid and V is the total volume of the solid, then v/V is equal to

a) $\frac{d}{P}$ b) $\frac{D}{d}$ c) $\frac{D}{(D+d)}$ d) $\frac{D+d}{D}$

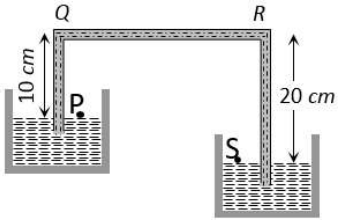
339. Two solid spheres of same metal but of mass M and $8M$ fall simultaneously on a viscous liquid and their terminal velocities are v and nv, then value of n is

a) 16 b) 8 c) 4 d) 2

340. A body of density d_1 is counterpoised by Mg of weights of density d_2 in air of density d. Then the true mass of the body is

a) M b) $M\left(1-\frac{d}{d_2}\right)$ c) $M\left(1-\frac{d}{d_1}\right)$ d) $\frac{M(1-d/d_2)}{(1-d/d_1)}$

341. A siphon in use is demonstrated in the following figure. The density of the liquid flowing in siphon is 1.5 gm/cc. The pressure difference between the point P and S will be



a) $10^5\ N/m$
b) $2\times10^5 N/m$
c) Zero
d) Infinity

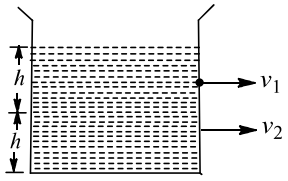
342. A water film is made between two straight parallel wires of length 10 cm separated by 5 mm from each other. If the distance between the wires is increased by 2 mm. How much work will be done? Surface tension for water is 72 dyne cm^{-1}

a) 288 erg b) 72 erg c) 144 erg d) 216 erg

343. There is a hole of area A at the bottom of a cylindrical vessel. Water is filled upto a height h and water flows out in t sec. If water is filled to a height 4 h, then it will flow out in time

a) 2 t b) 4 t c) 16 t d) 7/4 t

344. Equal volumes of two immiscible liquids of densities ρ and 2 ρ are filled in a vessel as shown in figure. Two small holes are made at depth $h/2$ and 3 $h/2$ from the surface of lighter liquid. If v_1 and v_2 are the velocities of efflux at these two holes, then v_1/v_2 is



a) $\frac{1}{\sqrt{2}}$ b) $\frac{1}{4}$ c) $\frac{1}{2}$ d) $\frac{1}{2\sqrt{2}}$

345. A cylinder of height 20 m is completely filled with water. The velocity of efflux of water (in ms^{-1}) through a hole on the side wall of the cylinder near its bottom, is

a) 10 b) 20 c) 25.5 d) 5

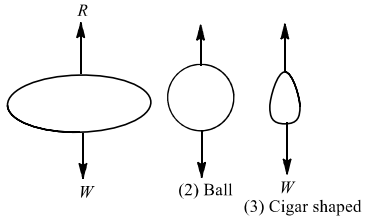
346. A wooden piece can float both in mercury (of density 13.6 gm/cc) and in water (of density 1 gm/cc). The ratio of mass of mercury displaced to the mass of water displaced is

a) 1 b) 13.6 c) $\frac{1}{13.6}$ d) $\frac{12.6}{13.6}$

347. If W be the weight of a body of density ρ in vacuum then its apparent weight in air of density σ is

a) $\frac{W\rho}{\sigma}$ b) $W\left(\frac{\rho}{\sigma}-1\right)$ c) $\frac{W}{\rho}\sigma$ d) $W\left(1-\frac{\sigma}{\rho}\right)$

348. When a body falls in air, the resistance of air depends to a great extent on the shape of the body. 3 different shapes are given. Identify the combination of air resistances which truly represents the physical situation? (The cross-sectional areas are the same)



a) 1<2<3 b) 2<3<1 c) 3<2<1 d) 3<1<2

349. A square plate of 0.1 m side moves parallel to a second plate with a velocity of 0.1 m/s, both plates being immersed in water. If the viscous force is 0.002 N and the coefficient of viscosity is 0.01 poise, distance between the plates in m is

a) 0.1 b) 0.05 c) 0.005 d) 0.0005

350. A body floats in water with 40% of its volume outside water. When the same body floats in an oil, 60% of its volume remains outside oil. The relative density of oil is

a) 0.9 b) 1.0 c) 1.2 d) 1.5

351. A bird is sitting in a large closed cage which is placed on a spring balance. It records a weight of 5N. The bird of mass 0.5 kg files upward in the cage with an acceleration of 2 ms^{-2}. The spring balance will now record a weight of

a) 4 N b) 5 N c) 6 N d) 7 N

352. Water rises to a height of 10 cm in a capillary tube and mercury falls to a depth of 3.42 cm in the same capillary tube. If the density of mercury and water are 135° and 0° respectively, the ratio of surface tension of water and mercury is

a) 1 : 0.15 b) 1 : 3 c) 1 : 6.5 d) 1.5 : 1

353. Three capillaries of length L, $L/2$ and L/3 are connected in series. Their radii are $r, r/2$ and r/3 respectively. Then, if stream-line flow is to be maintained and the pressure across first capillary is p, then the

a) pressure difference across the end of second capillary is $8p$
b) pressure difference across the third capillary is $43p$
c) pressure difference across the end of second capillary is $16p$
d) pressure difference across the third capillary is $56p$

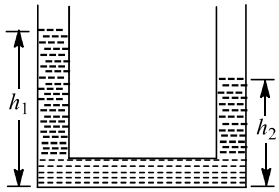
354. The top surface of an incompressible liquid is open to the atmosphere. The pressure at a depth P_1. How does the pressure P_2 at depth $h_2 = 2h_1$ compare with P_1?

a) $P_2 > 2P_1$ b) $P_2 = 2P_1$ c) $P_2 < 2P_1$ d) $P_2 = P_1$

355. Surface tension of a soap solution is able of 2.0 cm diameter will be

a) $7.6 \times 10^{-6}\ \pi$ J b) $15.2 \times 10^{-6}\ \pi$ J c) $1.9 \times 10^{-6}\ \pi$ J d) $1 \times 10^{-4}\ \pi$ J

356. The U-tube has a uniform cross-section as shown in figure. A liquid is filled in the two arms upto heights h_1 and h_2 and then the liquid is allowed to move. Neglect viscosity and surface tension. When the level equalize in the two arms, the liquid will



a) Be at rest

b) Be moving with an acceleration of g $\left(\frac{h_1-h_2}{h_1+h_2+2}\right)$

c) Be moving with a velocity of $(h_1 - h_2)\sqrt{\frac{g}{2(h_1+h_2+2)}}$

d) Exert a net force to the right on the cube

357. An ice block floats in a liquid whose density is less than water. A part of block is outside the liquid. When whole of ice has melted, the liquid level will

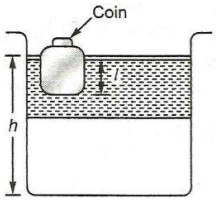
a) Rise b) Go down

c) Remain same d) First rise then go down

358. Two different liquids are flowing in two tubes of equal radius. The ratio of coefficients of viscosity of liquids is 52:49 and the ratio of their densities is 13:1. then the ratio of their critical velocities will be

a) 4 : 49 b) 49 : 4 c) 2 : 7 d) 7 : 2

359. A wooden black, with a coin placed on its top, flats in water as shown in the figure. The distance h and l are shown there. After sometime, the coin falls into the water, then



a) both $l$and h increace

b) both l and h decrese

c) l decrease and h increase

d) l increase and h decrease

360. A streamlined body falls through air from a height h on the surface of a liquid. If d and $D(D > d)$ represents the densities of the material of the body and liquid respectively, then the time after which the body will be instantaneously at rest, is

a) $\sqrt{\frac{2h}{g}}$ b) $\sqrt{\frac{2h}{g}\cdot\frac{D}{d}}$ c) $\sqrt{\frac{2h}{g}\cdot\frac{d}{D}}$ d) $\sqrt{\frac{2h}{g}}\left(\frac{d}{D-d}\right)$

361. The terminal velocity v of a spherical ball of lead of radius R falling through a viscous liquid varies with R such that

a) $\frac{v}{R}$ = constant b) vR = constant c) v = constant d) $\frac{v}{R^2}$ = constant

362. Consider the following equation of Berouilli's theorem.

$P + \frac{1}{2}\rho V^2 + \rho g h = K$ (constant)

The dimensions of K/P are same as that of which of the following

a) Thrust b) Pressure c) Angle d) Viscosity

363. The coefficient of viscosity for hot air is

a) Greater than the coefficient of viscosity of cold air

b) Smaller than the coefficient of viscosity for cold air

c) Same as the coefficient of viscosity for cold air

d) Increases or decrease depending on the external pressure

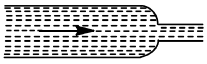
364. Two capillaries of same length and radii in the ratio 1:2 are connected in series. A liquid flows through them in streamlined condition. If the pressure across the two extreme ends of the combination is 1 m of water, the pressure difference across first capillary of

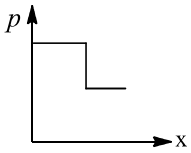
a) 9.4 m b) 4.9 m c) 0.49 m d) 0.94 m

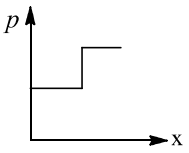
365. Let W be the work done, when a bubble of volume V is formed from a given solution. How much work is required to be done to form a bubble of volume 2 V?

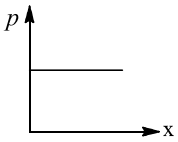
a) W b) $2W$ c) $2^{1/3}\,W$ d) $4^{1/3}\,W$

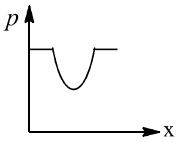
366. Water flows through a frictionless tube with a varying cross-section as shown in Fig (i). Pressure p at points along the y-axis is represented by



a) 

b) 

c) 

d) 

367. Water rises to a height of 16.3 cm in a capillary of height 18 cm above the water level. If the tube is cut at a height of 12 cm in the capillary tube,
   a) Water will come as a fountain from the capillary tube
   b) Water will stay at a height of 12 cm in the capillary tube
   c) The height of water in the capillary tube will be 10.3 cm
   d) Water height flow down the sides of the capillary tube

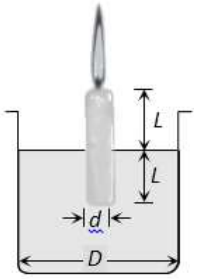
368. A wooden block of volume 1000 cm^3 is suspended from a spring balance. It weighs 12 N in air. It is suspended in water such that half of the block is below the surface of water. The reading of the spring balance is
   a) 10 N b) 9 N c) 8 N d) 7 N

369. A cork is submerged in water by a spring attached to the bottom of a bowl. When the bowl is kept in an elevator moving with acceleration downwards, the length of spring
   a) Increases b) Decreases c) Remains unchanged d) None of these

370. A liquid does not wet the solid surface if the angle of contact is
   a) Zero b) equal to 45° c) equal to 90° d) greater than 90°

371. A cylindrical vessel of height 500 mm has an orifice (small hole) at its bottom. The orifice is initially closed and water is filled in it up height H. Now the top is completely sealed with a cap and the orifice at the bottom is opened. Some water comes out from the orifice and the water level in the vessel becomes steady with height of water column being 200 mm. Find the fall in height (in mm) of water level due to opening of the orifice
   (Take atmospheric pressure $= 1.0 \times 10^5 N/m^2$, density of water $= 1000\ kg/m^3$ and $g = 10\ m/s^2$. Neglect any effect of surface tension)
   a) 5 mm b) 6 mm c) 2 mm d) 1 mm

372. A candle of diameter d is floating on a liquid in a cylindrical container of diameter $D(D >> d)$ as shown in figure. If it is burning at the rate of $2cm/hour$ then the top of the candle will

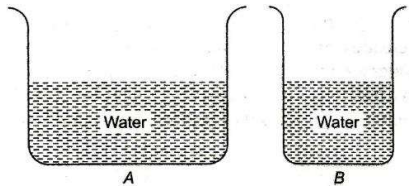


   a) Remain at the same height b) Fall at the rate of 1 $cm/hour$
   c) Fall at the rate of 2 $cm/hour$ d) Go up the rate of 1 $cm/hour$

373. A tank 5m high is half filled with water and then is filled to the top with oil of density0.85 gcm^{-3}. The pressure at the bottom of the tank, due to these liquids is
   a) 1.85 g $dynecm^{-3}$ b) 89.25 g $dynecm^{-3}$ c) 462.5 g $dynecm^{-3}$ d) 500 g $dynecm^{-3}$

374. The terminal speed of a sphere of gold (density = 19.5 kg m^{-3}) is 0.2 ms^{-1} in a viscous liquid (density = 1.5 kg m^{-3}). Then the terminal speed of a sphere of silver (density = 10.5 kg m^{-3}) of the same size in the same liquid is
   a) 0.1 ms^{-1} b) 1.133 ms^{-1} c) 0.4 ms^{-1} d) 0.2 ms^{-1}

375. From the adjacent figure, the correct observation is



a) the pressure on the bottom of the tank A is greater than at the bottom of B
b) the pressure on the bottom of the tank A smaller than at the bottom of B
c) the pressure depends on the shape of the container
d) the pressure on the bottom of A and B is the same

376. A 20 cm long capillary tube is dipped in water. The water rises upto 8 cm. If the entire arrangement is put in a freely falling elevator, the length of water column in the capillary tube will be
a) 8 cm b) 10 cm c) 4 cm d) 20 cm

377. 10 cm long wire is placed horizontally on the surface of water and is gently pulled up with a force of 2×10^{-2} N to keep the wire in equilibrium. The surface tension of water in Nm^{-1} is
a) 0.002 b) 0.001 c) 0.2 d) 0.1

378. A liquid flows through a pipe of non-uniform cross-section. If A_1 and A_2 are the cross-sectional area of the pipe at two points, the ratio of velocities of the liquid at these points will be
a) A_1A_2 b) $\frac{A_1}{A_2}$ c) $\frac{A_2}{A_1}$ d) $\frac{1}{A_1A_2}$

379. Ice pieces are floating in beaker A containing water also in a beaker B containing miscible liquid of specific gravity 1.2. When ice melts, the level of
a) water increases in A b) water decreases in A
c) liquid in B decreases d) liquid in B increases

380. A liquid is flowing in a horizontal uniform capillary tube under a constant pressure difference P. The value of pressure for which the rate of flow of the liquid is doubled when the radius and length both are doubled is
a) P b) $\frac{3P}{4}$ c) $\frac{P}{2}$ d) $\frac{P}{4}$

381. Two liquid drops have diameters of 1 cm and 1.5 cm. The ratio of excess of pressure inside them is
a) 1:1 b) 5:3 c) 2:3 d) 3:2

382. The rate of steady volume flow of water through a capillary tube of length l and radius r, under a pressure difference of p si V. This tube is connected with another tube of the same length but half the radius, in series. Then the rate of steady volume flow through them is (The pressure difference across the combination is p)
a) $\frac{V}{16}$ b) $\frac{V}{17}$ c) $\frac{16V}{17}$ d) $\frac{17V}{16}$

383. Aerofils are so designed that the speed of air
a) On top side is more than on lower side b) On top side is less than on lower side
c) Is same on both sides d) Is turbulent

384. Two capillaries of length L and 2L and of radii R and 2R respectively are connected in series. The net rate of flow of fluid through them will be (Given, rate of the flow through single capillary, $X = \pi pR^4/8\eta L$)
a) $\frac{8}{9}X$ b) $\frac{9}{8}X$ c) $\frac{5}{7}X$ d) $\frac{7}{5}X$

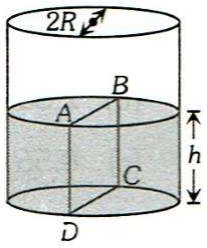
385. A body of density ρ is dropped from rest at a height h into a lake of density σ, where $\sigma > \rho$. Neglecting all dissipative forces, calculate the maximum depth to which the body sinks before returning to float on the surface
a) $\frac{h}{\sigma - \rho}$ b) $\frac{h\rho}{\sigma}$ c) $\frac{h\rho}{\sigma - \rho}$ d) $\frac{h\,\sigma}{\sigma - \rho}$

386. An application of Bernoulli's equation for fluid flow is four in

a) Dynamic lift of an aeroplane
b) Viscosity meter
c) Capillary rise
d) Hydraulic press

387. Eight equal drops of water are falling through air with a steady velocity of 10 cms^{-1}. if the drops combine to form a single drop big size, then the terminal velocity of this big drop is
a) 80 cms^{-1} b) 30 cms^{-1} c) 10 cms^{-1} d) 40 cms^{-1}

388. Water is filled up to a height h in a beaker of radius R as shown in the figure. The density of water is ρ, the surface tension of water is T and the atmospheric pressure is P_0. Consider a vertical section $ABCD$ of the water column through a diameter of the beaker. The force on water on one side of this section by water on the other side of this section has magnitude



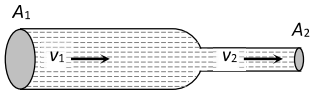
a) $|2P_0Rh + \pi R^2\rho gh - 2RT|$
b) $|2P_0Rh + R\rho gh^2 - 2RT|$
c) $|P_0\pi R^2 + R\rho gh^2 - 2RT|$
d) $|P_0\pi R^2 + R\rho gh^2 + 2RT|$

389. The relative velocity of two consecutive layers is 8 cm/s. If the perpendicular distance between the layers is 0.1 cm, then the velocity gradient will be
a) $8sec^{-1}$ b) 80 sec^{-1} c) 0.8 sec^{-1} d) 0.08 sec^{-1}

390. On which of the following, the terminal velocity of a solid ball in a viscous fluid is independent?
a) Area of cross-section b) Height of the liquid c) Density of the ball d) Density of the liquid

391. Spherical ball of radius R are falling in a viscous fluid of viscosity ɳ with a velocity v. The retarding viscous force acting on the spherical ball is
a) directly proportional to R but inversely proportional to$v$
b) directly proportional to both radius R and velocity v
c) inversely proportional to both radius R and velocity$v$
d) inversely proportional to R but directly proportional to velocity v

392. A liquid flows in a tube from left to right as shown in figure A_1 and A_2 are the cross-sections of the



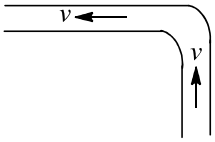
portions of the tube as shown. Then the ratio of speeds v_1/v_2 will be
a) A_1/A_2 b) A_2/A_1 c) $\sqrt{A_2}/\sqrt{A_1}$ d) $\sqrt{A_1}/\sqrt{A_2}$

393. The surface area of air bubble increases four times when it rises from bottom to top of a water tank where the temperature is uniform. If the atmospheric pressure is 10 m of water, the depth of the water in the tank is
a) 30 m b) 40 m c) 70 m d) 80 m

394. Consider an iceberg floating in sea water. The density of sea water is1.03 g cc^{-1} and that ice is 0.92 g cc^{-1} The fraction of total volume of iceberg above the level of sea water is nearby
a) 1.8% b) 3% c) 8% d) 11%

395. A layer of glycerine of thickness 1 mm is present between a large surface area and a surface area of 0.1 m^2. With what force the small surface is to be pulled, so that it can move with a velocity of 1 ms^{-1}? (Given that coefficient of viscosity = 0.07 kg m^{-1} s^{-1})
a) 70 N b) 7 N c) 700 N d) 0.70 N

396. A fire hydrant delivers water of density ρ at a volume rate$L$. The water travels vertically upwards through the hydrant and then does 90° turn to emerge horizontally at speed$v$. The pipe and nozzle have uniform cross-section throughout. The force exerted by water on the corner of the hydrant is



a) Zero b) pvL c) $\sqrt{2}\,pvL$ d) $2\,pvL$

397. A cylinder of mass m and density ρ hanging from a string is lowered into a vessel of cross-sectional area A containing a liquid of density $\sigma(<\rho)$ until it is fully immersed. The increase in pressure at the bottom of the vessel is

a) Zero b) $\frac{mg}{A}$ c) $\frac{mg\,\rho}{\sigma A}$ d) $\frac{m\,\sigma\,g}{\rho\,A}$

398. In a streamline flow if the gravitational head is$h$. The kinetic and pressure heads are

a) v^2/g and p/ρ b) $v^2/2g$ and $p/\rho\,g$ c) $v^2/2g$ and p/ρ d) $v^2/2$ and $p/\rho\,g$

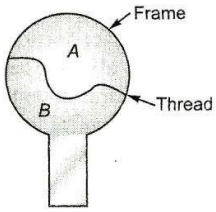
399. A soap film is made by dipping a circular frame of radius b in soap solution. A bubble is formed by blowing air with speed v in the form of cylinder. The radius of the bubble formed $R \gg b$ so that the air is incident normally on the surface of bubble. Air stops after striking surface of soap bubble. Density of air is ρ. The radius R of the bubble when the soap bubble separates from the ring is (surface tension of liquid is S)

a) $\frac{S}{\rho\,v^2}$ b) $\frac{4\,S}{\rho\,v^2}$ c) $\frac{S\,b}{\rho\,v}$ d) $\frac{4\,Sb}{\rho\,v^2}$

400. A large tank filled with water to a height h is to be emptied through a small hole at the bottom. The ratio of times taken for the level of water to fall from h to $h/2$ and $h/2$ to zero is

a) $\sqrt{2}$ b) $\frac{1}{\sqrt{2}}$ c) $\sqrt{2}-1$ d) $\frac{1}{\sqrt{2-1}}$

401. A thread is tied slightly loose to a wire frame as in figure and the frame is dipped into a soap solution and taken out. The frame is completely covered with the film. When the portion A is punctured with a pin, the thread



a) Becomes concave towards A
b) Becomes convex towards A
c) Either (a) or (b) depending on the size of A with respect to B
d) Remain in the initial position

402. In stream line flow of liquid, the total energy of liquid is constant at

a) all points b) inner points c) outer points d) None of these

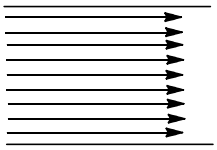
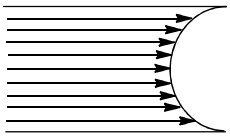
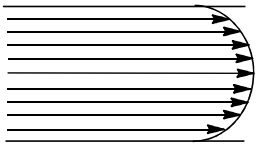
403. Two capillary of length L and $2L$ and of radii R and $2R$ are connected in series. The net rate of flow of fluid through them will be (given rate of the flow through single capillary, $X=\frac{\pi pR^4}{8\eta L}$)

a) $\frac{8}{9}X$ b) $\frac{9}{8}X$ c) $\frac{5}{7}X$ d) $\frac{7}{5}X$

404. Water is moving with a speed of 5.18 ms^{-1} through a pipe with a cross-sectional area of 4.20 cm^2 . The water gradually descend 9.66 m as the pipe increase in area to 7.60 cm^2 . The speed of flow at the lower level is

a) 3.0 ms^{-1} b) 5.7 ms^{-1} c) 3.82 ms^{-1} d) 2.86 ms^{-1}

405. A viscous fluid is flowing through a cylindrical tube. The velocity distribution of the fluid is best represented by the diagram

a)  b)  c)  d) None of these

406. An engine pumps water continuously through a hose. Water leaves the hose with a velocity v and m is the mass per unit length of the water jet. What is the rate at which kinetic energy is imparted to water
a) $\frac{1}{2}mv^3$ b) mv^3 c) $\frac{1}{2}mv^2$ d) $\frac{1}{2}m^2v^2$

407. Under a constant pressure head, the rate of flow of liquid through a capillary tube is V. If the length of the capillary is doubled and the diameter of the bore is halved, the rate of flow would become
a) $V/4$ b) $16\,V$ c) $V/8$ d) $V/32$

408. A hole in the bottom of the tank having water. If total pressure at bottom is 3 atm (1 atm $= 10^5$ Nm^{-2}), then velocity of water flowing from hole is
a) $\sqrt{400}$ ms^{-1} b) $\sqrt{600}$ ms^{-1} c) $\sqrt{60}$ ms^{-1} d) None of these

409. Two water pipes P and Q having diameter 2×10^{-2} m and 4×10^{-2} m respectively are joined in series with the main supply line of water. The velocity f water flowing in pipe P is
a) 4 times that of Q b) 2 times that of Q c) 1/2 times that of Q d) 1/4 times that of Q

410. A body is just floating on the surface of a liquid. The density of the body is same as that of the liquid. The body is slightly pushed down. What will happen to the body
a) It will slowly come back to its earlier position b) It will remain submerged, where it is left
c) It will sink d) It will come out violently

411. A man is carrying a block of a certain substance (of density 1000 kgm^{-3}) weighing 1 kg in his left hand and a bucket filled with water and weighing 10 kg in the right hand. He drops the block into the bucket. How much load does he carry in his right hand now
a) 9 kg b) 10 kg c) 11 kg d) 12 kg

412. A small spherical ball falling through a viscous medium of negligible density has terminal velocity v. Another ball of the same mass but of radius twice that of the earlier falling through the same viscous medium will have terminal velocity
a) v b) $\frac{v}{4}$ c) $\frac{v}{2}$ d) $2v$

413. In Poiseuilli's method of determination of coefficient of viscosity, the physical quantity that requires greater accuracy in measurement is
a) Pressure difference b) Volume of the liquid collected
c) Length of the capillary tube d) Inner radius of the capillary tube

414. A piece of ice is floating in a jar containing water. When the ice melts, then the level of water
a) rises b) Falls c) remains unchanged d) rises or falls

415. A container of height 10 m which is open at the top, has water to its full height. Two small openings are made on the walls of the container one exactly at the middle and the other at the bottom. The ratio of the velocities with which water comes out from the middle and the bottom region respectively is
a) 2 b) $\frac{1}{2}$ c) $\sqrt{2}$ d) $\frac{1}{\sqrt{2}}$