Q.1 The principle of continuity is consequence of
(A) Law of conservation of energy
(B) Law of conservation of moments of liquids flow
(C) Law of equipartition of energy
(D) Law of conservation of mass

Q.2 Which of the following assumptions regarding an ideal fluid flow holds true for which Bernoulli's principle is valid?
(A) Steady –state flow **(B)** Incompressible **(C)** Non-viscous flow **(D)** All of these

Q.3 The lift of an airplane is based on
(A) Torricelli's theorem **(B)** Bernoulli's theorem
(C) Law of gravitation **(D)** Conservation of linear momentum

Q.4 Water is flowing at the rate of 500 cm^3/s in a horizontal pipe of uniform cross-section area of 25 cm^2. The velocity of flow of water in cm/s is

(A) 25 cm/s **(B)** 15 cm/s **(C)** 20 cm/s **(D)** 50 cm/s

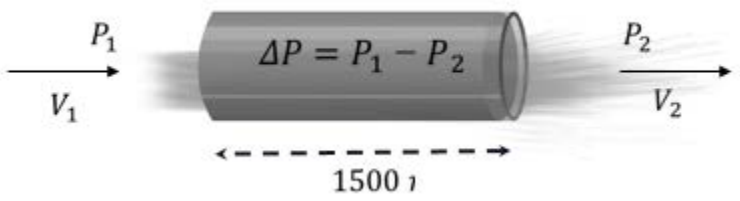
Q.5 A liquid flowing with speed v through a horizontal pipe of cross-sectional area A enters into another pipe of double the area of cross section. Now, the speed of the liquid is

(A) v **(B)** $2v$ **(C)** $v/3$ **(D)** $v/4$

Q.6 Water is flowing in a horizontal pipe of uniform cross-section. At some place, the pipe becomes narrow, then the pressure of water at this place

(A) remains same **(B)** may increase or decrease
(C) increases **(D)** decreases

Q.7 In a horizontal pipeline of uniform area of cross-section, 2 × 10-2J/kg is the change in kinetic energy per kg of the kerosene oil flowing through the pipe of length 1500 m. What will be the pressure drop between the end points of the pipe? (Take density of kerosene oil as 850 kg/m^3)

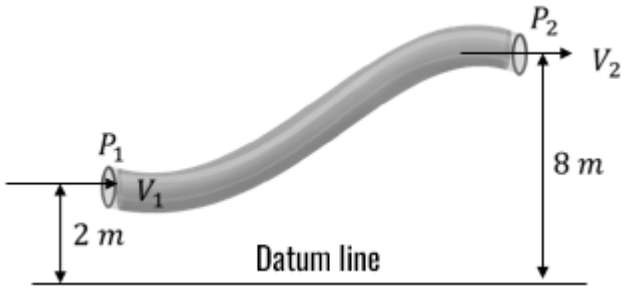


(A) 8N/m^2 **(B)** 10N/m^2 **(C)** 17N/m^2 **(D)** 1.34N/m^2

Q.8 Air streams flows horizontally past an airplane. The speed over the top surface is 50 m/s and that under the bottom surface is 40 m/s. If the density of air is 1.2 kg/m^3, then the difference in pressure across the

(A) 1160N/m^2 **(B)** 540N/m^2 **(C)** 280N/m^2 **(D)** 12.84N/m^2

Q.9 Kerosene oil is flowing through a pipe having constant cross section area with diameter 2.5 cm, at a rate of 10 liter/sec. The height of bottom and top end is 2 m and 8 m respectively from the datum line. Find the pressure at the lower end, if the pressure at the other end is 25×10^4 N/m^2. (Density of kerosene $= 850$ kg/m^3) .



(A) 2.51×10^4 N/m^2 **(B)** 1.51×10^5 N/m^2 **(C)** 2×10^5 N/m^2 **(D)** 3.01×10^5 N/m^2

Q.10 A plane is in a level flight at a constant speed and each of its two wings has an area of 50 m^2. If the speed of air is 180 km/h over the lower wing surface and 252 km/h over the upper wing surface, the plane's mass is [Lift force on the wings = weight of plane]
(Take density of air = 1 kg/m^3 and g = 10 m/s^2)

(A) 2.4×10^4 kg **(B)** 4.4×10^4 kg **(C)** 1.2×10^4 kg **(D)** 3.6×10^4 kg

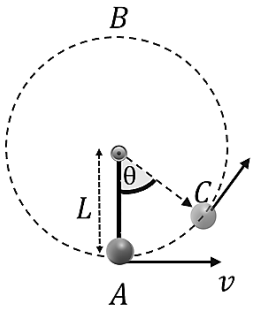
WORK SHEET

Q.1 A person of mass 40 kg is inside a lift of mass 960 kg and presses the button on the control panel. The lift starts moving upwards with an acceleration$2\text{m}/s^2$. Ifg $= 10\ \text{m}/s^2$, the tension in the supporting cable is

(A)8600 N **(B)** 12000 N

(C) 11000 N **(D)** 2000 N

Q.2 A bob of mass M is suspended through a massless string of length L. The horizontal velocity at position A is sufficient to make it reach at point B. The angle at which the speed of bob is half of that at A, satisfies



(A)$\theta = \frac{\pi}{4}$ **(B)** $\boldsymbol{\frac{\pi}{4} < \theta < \frac{\pi}{2}}$ **(C)** $\frac{\pi}{2} < \theta < \frac{3\pi}{4}$ **(D)** $\boldsymbol{\frac{3\pi}{4} < \theta < \pi}$

Q.3 A bomb kept at rest on a smooth horizontal surface, suddenly explodes then identify the correct statement:

(A)COM of bomb will remain at rest.

(B)COM of bomb will move along the surface with a constant Velocity after the explosion.

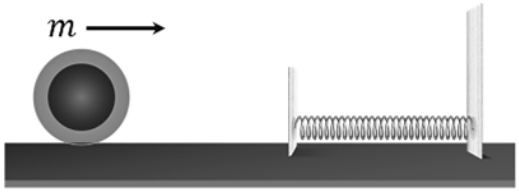
(C) After explosion, all the fragments of bomb will fly in vertically upwards direction.

(D) Explosion of bomb will cause the center of mass of bomb to accelerate.

Q.4 A particle of mass m moving eastwards with a speed v collides with another particle of same mass moving northwards with same speed v. The two particles coalesce on collision. Then, the new particle of mass 2 m will move with velocity:

(A) $\frac{v}{2}$ North $-$ East **(B)** $\frac{v}{\sqrt{2}}$ South $-$ West **(C)** $\frac{v}{2}$ North $-$ West **(D)** $\frac{v}{\sqrt{2}}$ North $-$ East

Q.5 A solid cylinder of mass 3 kg is rolling without slipping on a smooth horizontal surface with velocity 4 m/s. It collides with a horizontal spring of spring constant 200 Nm^{-1}. The maximum compression produced in the spring will be



(A) 0.7 m **(B)** 0.2 m **(C)** 0.5 m **(D)** 0.6 m

Q.6 A hollow cylinder and a solid cylinder of same mass and same external radius are rolling without slipping down an inclined plane of inclination θ from horizontal. If both of them are released at the same time, then which one reaches the bottom first?

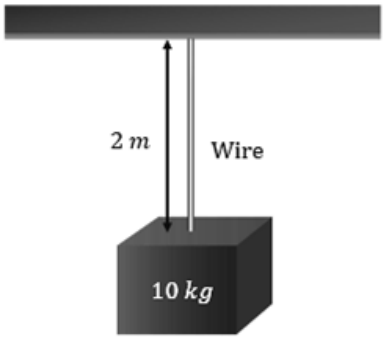
(A) Solid cylinder **(B)** Hollow cylinder

(C) Both reaches simultaneously **(D)** Can't say anything

Q.7 A point P is the contact point of wheel on the ground which rolls on ground without slipping. Find the value of displacement of the point P when wheel completes half revolution. Radius of the wheel is 1 m.

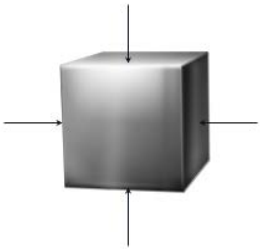
(A) $2\ m$ **(B)** $\sqrt{\pi^2+4}\ m$ **(C)** $\pi\ m$ **(D)** $\sqrt{\pi^2+2}\ m$

Q.8 A massless wire $2\ m$ in length suspended vertically stretches by $10\ mm$ when mass of $10\ kg$ is attached to the lower end. The elastic potential energy gained by the wire is (Take $g = 10\ m/s$)



(A)0.5 J **(B)** 5 J **(C)**50 J **(D)** 500 J

Q.9 A solid copper cube of edge $10\ cm$ is subjected to a hydraulic pressure of $7 \times 10^6\ Pa$. If compressibility of copper is $\frac{1}{140}\ GPa^{-1}$, then contraction in its volume will be



(A)$5 \times 10^{-8}\ m^3$ **(B)**$4 \times 10^{-8}\ m^3$ **(C)**$2 \times 10^{-8}\ m^3$ **(D)**$10^8\ m^3$

Q.10 The work done per unit volume to stretch the length of area of cross-section 2 mm^2 by 2% will be [Take the Young's modulus of material as$Y = 8 \times 10^{10}\ \mathrm{N/m^2}$]

(B) 40 $\mathrm{MJ/m^3}$ **(B)** 16 $\mathrm{MJ/m^3}$ **(C)** 64 $\mathrm{MJ/m^3}$ **(D)** 32 $\mathrm{MJ/m^3}$

Q.11 Choose the correct option

Assertion: Bernoulli's equation holds for non - steady and compressible flow.

Reason: For non - steady flow, velocity and pressure are constant with time.

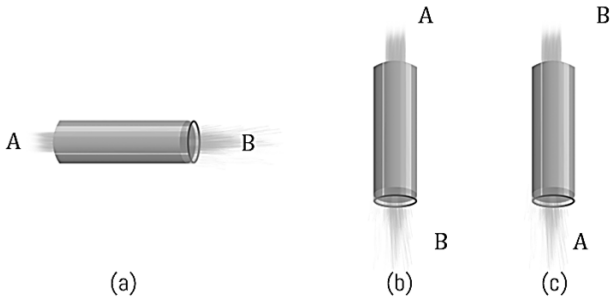
(A) If both assertion and reason are true and reason is the correct explanation of assertion

(B) If both assertion and reason are true but reason is not the correct explanation of assertion

(C) If assertion is true but reason is false

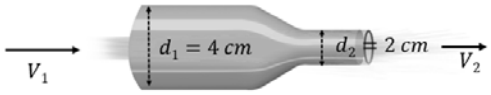
(D) If both assertion and reason are false

Q.12 Water enters through an end A with speed v_1 and leaves through end B with speed of v_2 of a cylindrical tubeAB. The tube is always filled completely with water. In case I tube is horizontal, in case II it is vertical with end A upwards and in case III it is vertical with end B upwards. We have $v_1 = v_2$ for



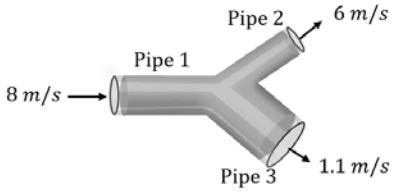
(A) Case I **(B)**Case II **(C)**Case III **(D)**Each case

Q.13 A liquid flows in the tube, left to right as shown in figure. d_1 and d_2 are the diameter of tube as shown in figure. Find the ratio of speed,v_1/v_2 .



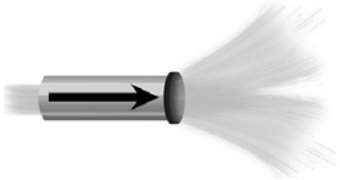
(A)$\frac{1}{2}$ **(B)**$\frac{1}{8}$ **(C)** $\frac{1}{4}$ **(D)** $\frac{1}{16}$

Q.14 An incompressible liquid is flowing through the horizontal pipe as shown in the figure. Pipe 1 is connected to the pipe 2 and pipe 3. The flow of liquid through the pipe 1, pipe 2 and pipe 3 are 8 m/s, 6 m/s and 1.1 m/s respectively. If cross-section area of pipe 1 and pipe 2 are 1 m2 and 0.8 m2, find the area of cross-section of pipe 3.



(A)5.8 m^2 **(B)**4.6 m^2 **(C)**16.5 m^2 **(D)**2.9 m^2

Q.15 The cylindrical tube of spray pump has a cross-section of 10 cm^2, one end of which has 50 fine holes each of area $10^{-8}m^2$. If liquid flows inside the tube with a speed of0.3 m/min, find the speed with which the liquid is ejected through the holes.



(A)5 m/s **(B)**20 m/s **(C)** 10 m/s **(D)** 2.5 m/s

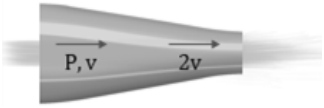
Q.16 In the case of motion of a fluid in a tube where area of cross-section is maximum,
(A) velocity is maximum **(B)** pressure is maximum
(C) velocity is minimum **(D)** pressure is minimum

(A) b, c are correct **(B)**a, d are correct **(C)**a, b are correct **(D)**c, d are correct

Q.17 Calculate the speed (in mm/s) of flow of glycerin at the inlet of the conical section of a pipe. If its inlet and outlet radius are 0.2 m and 0.05 m, respectively. The pressure drop across its length is $10N/m^2$ and density of glycerin is 1.25×10^3 kg/m^3.

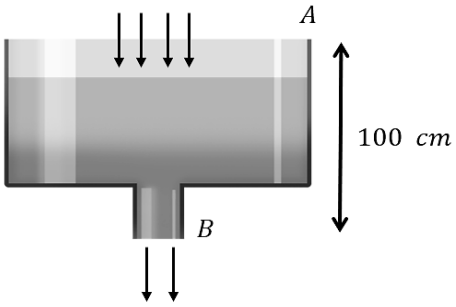
(A)64.4 **(B)**32.6 **(C)** 10 **(D)**2.6

Q.18 Water flows steadily through a horizontal tube of variable cross-section. If the pressure of water is Pat a point where the velocity of flow is v, what is the pressure at another point where the velocity of flow is 2v; ρ being the density of water?



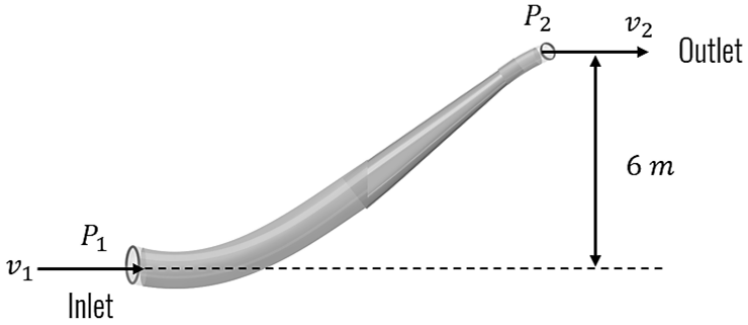
(A)$P-\frac{3}{2}\rho v^2$ **(B)** $P+\frac{3}{2}\rho v^2$ **(C)** $P-2\rho v^2$ **(D)**$P+\frac{1}{2}\rho v^2$

Q.19 Water flows through a vertical tube of variable cross section. The area of cross-section at A and B are 6 mm^2 and 3 mm^2 respectively. If 12 cm^3 of water enters per second through A, find the pressure difference $|P_A - P_B|$. The separation between the cross-section at A and B is 100 cm. (Take density of water as 1000 kg/m^3 and $g = 10\ m/s^2$)



(A)7000 N/m^2 **(B)**3000 N/m^2 **(C)**6000 N/m^2 **(D)**4000 N/m^2

Q.20 Water enters a pipe with inlet diameter of 1.5 cm at an absolute pressure of 5×10^3 Pa. The outlet of the pipe is 1 cm in diameter and is at height of 6 m above the inlet. When the flow speed at the inlet pipe is 2 m/s.Find the flow speed (m/s) and pressure (Bar) at the outlet of the pipe.
(Take $g = 10\ m/s^2$)



(A) 4.5 m/s, 4.3 Bar **(B)**9 m/s, 4.3 Bar **(C)**4.5 m/s, 8.6 Bar **(D)**9 m/s, 8.6 Bar

ANSWER KEY

Q.	1	2	3	4	5	6	7	8	9	10
Sol.	(D)	(D)	(B)	(C)	(C)	(D)	(C)	(B)	(D)	(C)
WORK SHEET										
Q.	1	2	3	4	5	6	7	8	9	10
Sol.	(B)	(D)	(A)	(D)	(D)	(A)	(B)	(A)	(A)	(B)
Q.	11	12	13	14	15	16	17	18	19	20
Sol.	(D)	(D)	(C)	(D)	(C)	(A)	(B)	(A)	(D)	(A)