

5) The cylinder tube of a spray pump has a radius R , one end of which has 'n' number of fine uniform holes, each of radius 'r'. If the speed of flow of the fluid in the tube is v_1 , the speed of ejection of the liquid through the holes is

- a. $\frac{v}{n} \left(\frac{R}{r} \right)^2$ b. $\frac{v}{n} \left(\frac{R}{r} \right)$ c. $\frac{v}{n} \left(\frac{R}{r} \right)^{3/2}$ d. $\frac{v}{n} \left(\frac{R}{r} \right)^{3/4}$

6) In a test experiment on a model aeroplane in a wind tunnel, the flow speeds on the lower and upper surface of the wings are 'v' and $\sqrt{2}v$ respectively. If the density of air is ' ρ ' and the surface area of the wing is given.

- a. $\frac{1}{\sqrt{2}} \rho v^2 A$ b. $\frac{1}{2} \rho v^2 A$ c. $\sqrt{2} \rho v^2 A$ d. $2 \rho v^2 A$

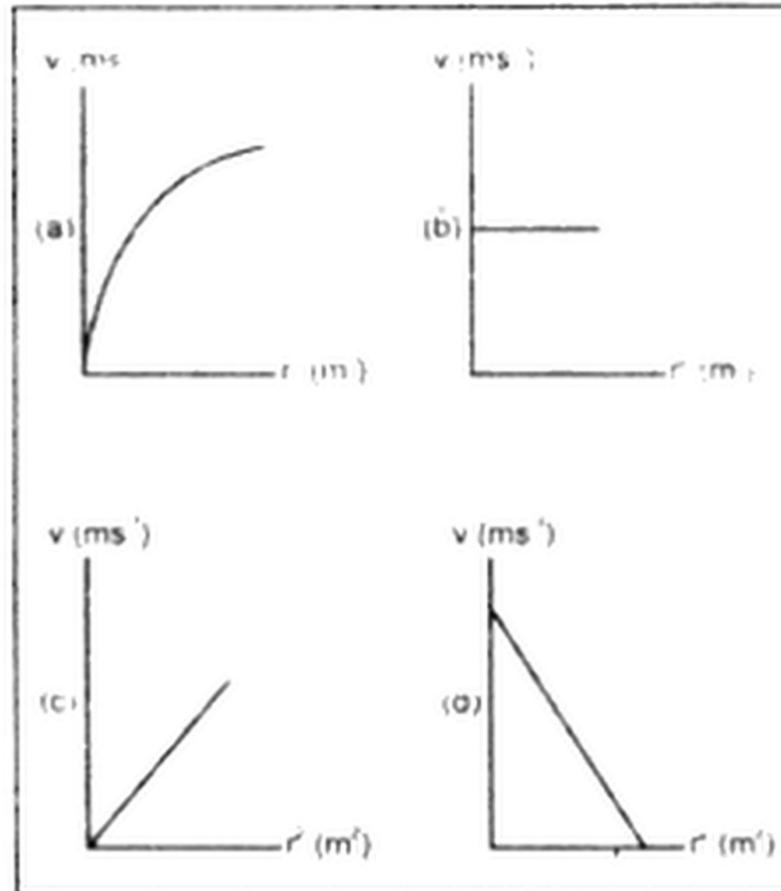
7) A rectangular tank is filled completely with water. When a hole at its bottom is unplugged, the tank is emptied in time T . If the tank is half filled with water, it will be emptied in time.

- a. $\frac{T}{\sqrt{2}}$ b. $\frac{T}{\sqrt{3}}$ c. $\frac{T}{2}$ d. $\frac{T}{2\sqrt{2}}$

8) Two capillary tubes A and B of equal radii $r_a = r_b = r$ and equal length $l_a = l_b = l$ are held horizontally. When the same pressure difference P is maintained across each tube, the rate of flow of water in each is Q . If the tubes are connected series and the same pressure difference P is maintained across the combination, the rate of flow through the combination will be

- a. $\frac{Q}{2}$ b. Q c. $2Q$ d. $\sqrt{2}Q$

9) For spherical objects of uniform density made of same material but of different radii. Which of the following graphs can best represents the relationship between terminal velocity and radius of the sphere, if each time allowed to fall through same fluid from different heights?



10) A person standing near the track of a fast-moving train has tendency to fall towards it because of

- Vibration due to motion of train.
- Gravitation force of attraction between person and trains.
- The high speed of train.
- Some other effect.

11) With the increase of temperature viscosity

- Increase
- Decrease
- Remains same
- Double

12) According to Stoke's law, drag force depends on

- a. Initial velocity
 b. Final velocity
 c. Instantaneous velocity
 d. Terminal velocity

13) The smooth or steady stream - line flow is known as

- a. Laminar flow b. Turbulent flow c. Both a and b d. None

14) Blood has a density

- a. Nearly equal b. Greater than water c. Lesser than water d. None

15) The pressure will be low where the speed of the fluid is

- a. Zero b. High c. Low d. Constant

16) Bernoulli's equation is based upon law of conservation of

- a. Mass b. Momentum c. Energy d. None

17) The rain drop falling from the sky reach the ground with

- a. Constant terminal velocity b. Constant gravitational acceleration
 c. variable acceleration d. Acceleration greater than g

Answers:

1.	(a)	2.	(c)	3.	(c)	4.	(a)	5.	(b)
6.	(b)	7.	(a)	8.	(c)	9.	(a)	10.	(c)
11.	(b)	12.	(c)	13.	(a)	14.	(a)	15.	(b)
16.	(c)	17.	(a)	-	-	-	-	-	-

Write the short answer of the following:

1) Smoke rises in a chimney faster when a breeze is blowing. Use Bernoulli principal to explain this phenomenon.

Answer

According to Bernoulli principal where the speed of the fluid is high, pressure will be low & vice versa.

When a breeze is blowing. This makes the stream lines of air closer to each other. So, speed of fluid is high at the top which reduces pressure at that point. As pressure is high at the bottom of chimney which results smoke rises in a chimney faster.

2) Why do many trailer trucks use wind deflectors on the top of their cabs? How do such devices reduce fuel consumption?

Answer

Trailer trucks use wind deflectors on the top of their cabs such that the air around the trailer trucks to be streamlined for high speeds. So, it helps for the smooth running of the trucks & the reduction of drag force. When drag force is reduced its considerable reduces fuel consumption.

3) Consider the cross section of the wing on an aeroplane. The wing is designed such that the air travels faster over the top than the bottom. Explain why there is net upward force on the wing due to Bernoulli's effect.

Answer

The aeroplane wings is designed in such a way to deflect the air so that the stream lines are closer together above the wing than below it. So, air is travelling faster through the upper side of wing than on the lower. So according to Bernoulli's effect, the pressure will be lower at the top than on the lower side. Due to pressure difference, the wing will be forced upward.

4) When a fast moving train passes a man standing on the platform at rest. He is likely to be drawn towards train. Explain your answer using Bernoulli's effect.

Answer

When fast moving train passes a man standing on the platform, then the speed of the fluid increases, since according to Bernoulli's effect where the speed is high the pressure will be low. So, increase in speed results in decrease of the pressure. Hence a large pressure behind the person, pushes him towards the train.

5) If you suddenly turn on your shower water at full speed, why the shower curtain pushed inward.

Answer

When you suddenly turn on your shower water at full speed, it reduces pressure there, so outside pressure becomes high which pushes the curtain inward.

6) A baseball moves fast an observer from left to right spinning counter clockwise. In which direction will the ball tend to deflect?

Answer

If the baseball spinning counter clockwise from left to right. The ball tends to deflect in upward direction, because it squeezes the air at the top, so therefore streamlines air closer which reduces pressure & increases the speed of the fluid. Hence a force exerts from high pressure to low pressure. So, the baseball will be deflected in upward direction.

7) A spherical body is dropped in two different fluids and their terminal velocity is found to be different. Give reasons.

Answer

Since terminal velocity is given by the expression:

$$v_t = \frac{2\zeta r^2}{9\eta} \quad \dots\dots(1)$$

From equation (1), it is clear that terminal velocity of the object depends on density of the object & viscosity of the fluid.

Since the viscosity of each fluid is different that is why terminal velocities are different.

8) A liquid passed through a pipe and it was found that the rate of influx was equal to the rate of efflux. What information do you get about the liquid?

Answer

According to the equation of continuity, $A_1v_1 = A_2v_2$ which shows that if area of the pipe is constant then the rate of influx will also be equal to rate of efflux.

9) An incompressible liquid is passed through a horizontal pipe and it is absence that the speed of a mass of liquid when emerges is greater than its speed when it enters the pipe. How can it be possible?

Answer

It is possible if the area of the pipe at the end where mass of liquid enters is greater resulting a slow speed than the area of the pipe at the end where mass of liquid emerges out resulting higher greater speed according to equation of continuity.

10) Why does the pipe of paper squeezes when air is blown through it.

Answer

When air is blown through the pipe of paper, speed of air inside increases & hence pressure is reduced. Since outside of atmospheric pressure is high which squeezes the pipe of paper.

11) When water falls from a tap, its cross-sectional area decreases as it comes down. Explain why?

Answer

When water falls from a tap, its cross-sectional area decreases & speed increases as mandated by the equation of continuity.

12) Why a car has oblong shape design?

Answer

Cars are streamlined for giving an oblong shape to ensure that flow of air around the car is stream lined even when the car moves at a very high speed.

13) How do the pulsations in pulse show the heart beat?

Answer

When heart pumps into the blood, it squeezes and pressure in arteries rise momentarily up to 120 (Hg). After that the heart relaxes and so the pressure decreases to about 80mm. This periodic rise and fall of the pressure is called pulse.

14) Describe the working of an engine carburetor and paint spray?

Answer

The carburetor of a car uses a Venturi duct to feed the correct mixture of air and petrol to the cylinders. Air is drawn through duct along a pipe to the cylinders. A tiny inlet at the side of the duct is fed with petrol. A fast-moving duct air creates a low-pressure drawing petrol.

