# PHYSICS

# BOOKS - FULL MARKS PHYSICS (TAMIL ENGLISH)

# PROPERTIES OF MATTER

## In Text Solved Examples

**1.** With in the elastic limit, the stretching strain produced in wires A,B and C due to stress is

shown in the figure. assume the load applied are the same and discussed the elastic property of material. Write down the elastic modulus in ascending order.

**2.** A wire 10 m long has a cross-sectional area $1.25 \times 10^{-4} m^2$. It is subjected to a load of 5 kg. If Young's modulus of the material is $4 \times 10^{10} Nm^{-2}$, calculate the elongation produced in the wire. Take $g = 10 ms^{-2}$

3. A metallic cube of side 100 cm is subjected to a uniform force acting normal to the whole surface of the cube. The pressure is $10^6$ pascal. If the volume change by $1.5 \times 10^{-5} m^3$, calculate the bulk modulus of the material .

4. A metal cube of side 0.20 m is subjected to a shearing force of 4000 N. The top surface is

displaced through 0.50 cm with respect to the bottom. Calculate the shear modulus of elasticity of the metal.

**5.** A wire of length 2 m with the area of cross section $10^{-6}m^2$ is used to suspend a load of 980 N. Calculate (i) The stress developed in the wire (ii) the strain and (iii) the energy stored . Given $Y = 12 \times 10^{10} Nm^{-2}$.

**6.** A solid sphere has a radius of 1.5 cm and a mass of 0.038 kg. Calculate the specific gravity or relative density of the sphere.

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**7.** Two piston of a hydraulic lift have diameters of 60 cm and 5 cm. What is the force exerted by the larger piston when 50 N is placed on the smaller piston ?

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**8.** A cube of wood floating in water supports a 300 g mass at the centre of its top face. When the mass is removed, the cube rises by 3 cm. Determine the volume of the cube.

**9.** Calculate the speed of sound in a steel rod whose Young's modulus $Y = 2 \times 10^{11} Nm^{-2}$ and $\rho = 7800 kgm^{-3}$

**10.** Let $2.4 \times 10^{-4}J$ of work is done to increase the area of a film of soap bubble from $50cm^2$ to $100cm^2$. Calculate the value of surface tension of soap solution.

**11.** If excess pressure is balanced by a column of oil (with specific gravity 0.8) 4 mm high,

where R = 2.0 cm, Find the surface tension of the soap bubble.

12. Water rises in a capillary tube to a height of 2.0 cm. In another capillary tube whose radiuus is one third of it, how much the water will rise?

**13.** The angle of contact of mercury with soda lime glass is $140°$. A capillary tube of radius 1.0 mm is dipped in a trough containing mercury. By what amount does the mercury dip down in the tube relative to the liquid surface outside? Surface tension of mercury $= 0.465 Nm^{-1}$

Density of mercury $= 13.6 \times 10^3 kgm^{-3}$

**14.** In a normal adult, the average speed of the blood through the aorta (radius r = 0.8 cm) is $0.33 ms^{-1}$. From the aorta, the blood goes into major arteries, which are 30 in number, each of radius 0.4 cm. Calculate the speed of the blood through the arteries.

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**1.** Consider two wires X and Y. The radius of wire X is 3 times the radius of Y. If they are stretched by the same load then the stress on Y is

   A. equal to that on X

   B. thrice that on X

   C. nine times that on X

   D. Half that on X

**Answer: C**

**2.** If a wire is stretched to double of its original

length, then the strain in the wire is

A. 1

B. 2

C. 3

D. 4

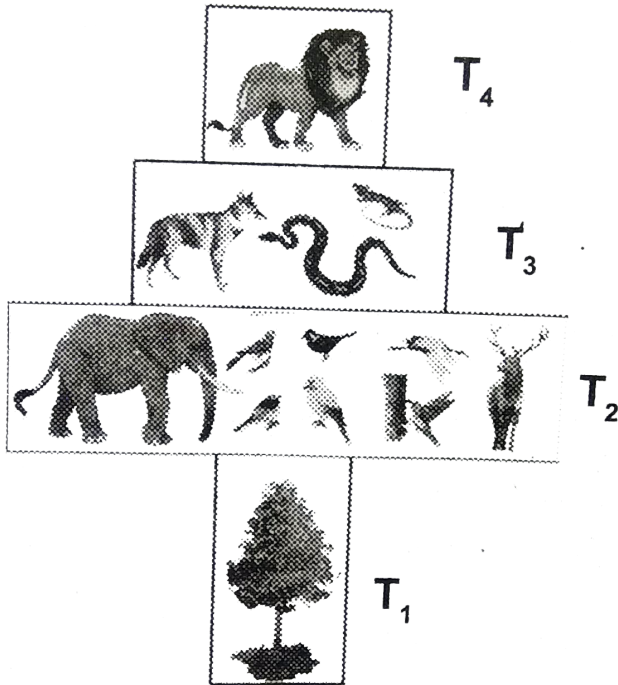**Answer: A**

**3.** The following diagram represents



$T_4$

$T_3$

$T_2$

$T_1$

A. wire 1

B. wire 2

C. wire 3

D. all of them have same thickness

**Answer: A**

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**4.** For a given material, the rigidity modulus is $\left(\dfrac{1}{3}\right)^{rd}$ of Young's modulus. Its Poisson's ratio is

A. 0

B. 0.25

C. 0.3

D. 0.5

**Answer: D**

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**5.** A small sphere of radius 2 cm falls from rest in a viscous liquid. Heat is produced due to viscous force. The rate of production of heat

when the sphere attains its terminal velocity is

proportional to

A. $2^2$

B. $2^3$

C. $2^4$

D. $2^5$

**Answer: D**

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**6.** Two wires are made of the same material and have the same volume. The area of cross sections of the first and the second wires are A and 2A respectively. If the length of the first wire is increased by $\Delta l$ on applying a force F, how much force is needed to stretch the second wire by the same amount ?

A. 2

B. 4

C. 8

D. 16

**Answer: B**

**7.** With an increase in temperature, the viscosity of liquid and gas, respectively will

    A. increase and increase

    B. increase and decrease

    C. decrease and increase

D. decrease and decrease

**Answer: C**

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**8.** The Young's modulus for a perfect rigid body is

A. 0

B. 1

C. 0.5

D. Infinity

**Answer: D**

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**9.** Which of the following is not a scalar ?

A. viscosity

B. surface tension

C. pressure

D. stress

Answer: D

10. If the temperature of the wire is increased, then the Young's modulus will

    A. remain the same

    B. decrease

    C. increase rapidly

    D. increase by very a small amount

**Answer: B**

**11.** Copper of fixed volume V is drawn into a wire of length l. When this wire is subjected to a constant force F, the extension produced in the wire is $\Delta l$. If Y represents the Young's modulus, then which of the following graphs is a straight line?

A. $\Delta l$ versus V

B. $\Delta l$ versus Y

C. $\Delta l$ versus F

D. $\Delta l$ versus $\dfrac{1}{l}$

**Answer: C**

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**12.** A certain number of spherical drops of a liquid of radius R coalesce to form a single drop of radius R and volume V. If T is the surface tension of the liquid, then

A. energy = $4VT\left(\dfrac{1}{r} - \dfrac{1}{R}\right)$ is released

B. energy = $3VT\left(\dfrac{1}{r} + \dfrac{1}{R}\right)$ is absorbed

C. energy = $3VT\left(\dfrac{1}{r} - \dfrac{1}{R}\right)$ is released

D. energy is neither released nor absorbed

**Answer: C**

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**13.** The following four wires are made of the same material. Which of these will have the

largest extension when the same tension is applied ?

A. length = 200 cm, diameter = 0.5 mm

B. length = 200 cm , diameter = 1 mm

C. length = 200 cm , diameter = 2 mm

D. length = 200 cm, diameter = 3 m

Answer: A

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**14.** The wettability of a surface by a liquid depends primarily on

    A. viscosity

    B. surface tension

    C. density

    D. angle of contact between the surface and the liquid

**Answer: D**

**15.** In a horizontal pipe of non-uniform cross section, water flows with a velocity of $1ms^{-1}$ at a point where the diameter of the pipe is 20 cm. The velocity of water $(1.5ms^{-1})$ at a point where the diameter of the pipe is (in cm)

A. 8

B. 16

C. 24

D. 32

**Answer: B**

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**1.** Define stress and strain.

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**2.** State Hooke's law of elasticity.

**3.** Define Poisson's ratio.

**4.** Explain elasticity using intermolecular forces.

**5.** Which one of these is more elastic, steel or rubber ? Why ?

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**6.** A spring balance shows wrong readings after using for a long time. Why ?

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**7.** What is effect of temperature on elasticity ?

**8.** Write down the expression for the elastic potential energy of a stretched wire .

**9.** State Pascal's lae in fluids.

**10.** State Archimedes principle.

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**11.** What do you mean by upthrust or buoyancy

?

▶ **Watch Video Solution**

**12.** State law of floatation.

▶ **Watch Video Solution**

**13.** Define coefficient of viscosity of a liquid.

▶ **Watch Video Solution**

**14.** Distinguish between streamlined and turbulent flow.

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**15.** What is Reynold's number ? Give its significance.

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**16.** Define terminal velocity.

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**17.** Write down the expression for the Stoke's force and explain the symbols involved in it.

**18.** State Bernoulli's theorem.

**19.** What are the energies possessed by a liquid ? Write down their equations.

**20.** Two streamlines cannot cross each other.

Why ?

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**21.** Define surface tension of a liquid. Mention

its S.I. unit and dimension.

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**22.** How is surface tension related to surface energy?

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**23.** Define angle of contact for a given pair of solid and liquid.

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**24.** Distinguish between cohesive and adhesive forces.

▶ **Watch Video Solution**

**25.** What are the factors affecting the surface tension of a liquid?

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**26.** What happens to the pressure inside a soap bubble when air is blown into it ?

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**27.** What do you mean by capillarity or capillary action ?

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**28.** A drop of oil placed on the surface of water spreads out. But a drop of water place on oil contracts to a spherical shape. Why ?

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**29.** State the principle and usage of Venturimeter.

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**1.** State Hooke's law of elasticity.

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**2.** Explain the different types of modulus of elasticity.

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**3.** Derive an expression for the elastic energy stored per unit volume of a wire.

**4.** The pressure in a liquid at a given depth below the surface ............. .

**5.** State and prove Pascal's law in fluids.

**6.** State and prove Archimedes principle.

**7.** Derive the expression for the terminal velocity of a sphere moving in a high viscous fluid using stokes force.

**8.** Derive Poiseuille's formula for the volume of a liquid flowing per second through a pipe under streamlined flow.

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**9.** Obtain an expression for the excess of pressure inside a (i) liquid drop (ii) liquid bubble (iii) air bubble.

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**10.** What is capillarity? Obtain an expression for the surface tension of a liquid by capillary rise method.

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**11.** Obtain an equation of continuity for a flow of fluid on the basis of conservation of mass.

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**12.** State and prove Bernoulli's theorem for a flow of incompressible, non-viscous, and streamlined flow or fluid.

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**13.** Explain the construction and working of transformer.

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**Textual Evaluation Solved Numerical Problems**

**1.** A cappilary of diameter d mm is dipped in water such that the water rises to a height of 30 mm. If the radius of the capillary is made $\left(\dfrac{2}{3}\right)$ of its previous value, then compute the height up to which water will rise in the new capillary ?

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**2.** A cylinder of length 1.5 m and diameter 4 cm is fixed at one end. A tangential force of

$4 \times 10^5 N$ is applied at the other end. If the rigidity modulus of the cylinder is $6 \times 10^{10} Nm^{-2}$ then, calculate the twist produce in the cylinder.

**3.** A spherical soap bubble A of radius 2 cm is formed inside another bubble B of radius 4 cm. Show that the radius of a single soap bubble which maintance the same pressure difference as inside the smaller and outside

the larger soap bubble is lesser than radius of both soap bubbles A and B.

**4.** A block of Ag of mass x kg hanging from a string is immersed in a liquid of relative density 0.72. If the relative density of Ag is 10 and tension in the string is 37.12 N then compute the mass of Ag block.

**5.** The reading of pressure meter attached with a closed pipe is $5 \times 10^5 Nm^{-2}$. On opening the valve of the pipe, the reading of the pressure meter is $4.5 \times 10^5 Nm^{-2}$. Calculate the speed of the water flowing in the pipe.

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**Textual Evaluation Solved Conceptual Questions**

**1.** Why coffee runs up into a sugar lump (a small cube of sugar) when one corner of the sugar lump is held in the liquid?

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**2.** Why two holes are made to empty an oil tin ?

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**3.** We can cut vegetables easily with a sharp knife as compared to a blunt knife. Why ?

**4.** Why the passengers are advised to remove the ink from their pens while going up to in an aeroplane ?

**5.** We use straw to suck soft drinks, why ?

## Additional Questions Solved Choose The Correct Answers

**1.** The force required to stretch a steel wire $1 cm^2$ in cross section to double its length is (given $Y = 2 \times 10^{11} Nm^{-2}$) ............. .

   A. (a) $10^7 N$

B. (b) $2 \times 10^7 N$

C. (c) $10^{11} N$

D. $(d) 2 \times 10^{11} N$

**Answer: B**

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**2.** The fractional change in volume per unit increase in pressure is called ............ .

A. Pressure co-efficient

B. Volume co-efficient

C. Bulk modulus

D. Compressiblity

**Answer: D**

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**3.** The modulus of rigidity of a liquid is ...............
.

A. zero

B. 1

C. infinite

D. none of these

**Answer: A**

**4.** The Young's modulus of a wire of length L and radius r is Y. If the length is reduced to $\dfrac{L}{2}$ and radius to $\dfrac{r}{2}$, its Youn's modulus will be ............ .

A. $\dfrac{Y}{2}$

B. $Y$

C. $2Y$

D. $4Y$

**Answer: B**

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5. If a spherical ball contract in volume by 1% under a normal uniform pressure of 200 atmophere, then the compressibility of the

material of the ball is

(1 atmosphere $= 10^5 Nm^{-2}$)

A. $1 \times 10^{12}$

B. $10 \times 10^{12}$

C. $100 \times 10^{12}$

D. $2 \times 10^{11}$

**Answer: A**

**6.** Poisson's ratio cannot have the value ........... .

A. 0 and 1

B. $-0.5$ and $1$

C. $0$ and $0.5$

D. $-1$ and $1$

**Answer: C**

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**7.** Poisson's ratio cannot have the value ........... .

A. 0.1

B. 0.2

C. 0.5

D. 0.7

**Answer: D**

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**8.** The bulk modulus for an incompressible fluid is ………………… .

    A. zero

    B. 1

    C. $\infty$

    D. between 0 and 1

**Answer: C**

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**9.** The breaking stress of a wire depends upon

.............. .

A. length of the wire

B. material of the wire

C. radius of the wire

D. shape of the cross-section

**Answer: B**

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**10.** Shearing stress causes change in ................

A. length

B. breadth

C. shape

D. volume

**Answer: C**

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**11.** A certain force increases the length of a wire by 1 mm. The force required to increases its length by 2 mm is ............... .

    A. 2F

    B. 4 F

    C. 8 F

    D. 16 F

**Answer: A**

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**12.** Two wires of same material , having cross-sectional areas in the ratio 1 : 2 and lengths in the ratio 1 : 4 are stretched by the same force. The ratio of the stresses in the wires will be .............. .

   A. 1 : 2

   B. 2 : 1

   C. 1 : 4

   D. 4 : 1

**Answer: B**

13. If the tension on a wire is removed at once, then .............. .

    A. it will break

    B. its temperature will reduce

    C. there will be no change in its temperature

    D. its temperature will increase

**Answer: D**

**14.** In steel, the Young's modulus and the strain at the breaking point are $2 \times 10^{11} Nm^{-2}$ and 0.15 respectively. The stress at the breaking point for steel is therefore.............. .

    A. $2 \times 10^8 Nm^{-2}$

    B. $3 \times 10^{10} Nm^{-2}$

C. $3 \times 10^{12} Nm^{-2}$

D. none of these

Answer: B

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15. The pressure in a liquid at a given depth below the surface ............. .

A. is always exerted downward

B. is the same in all directions

C. equals the total weight of liquids above

that depth

D. depends upon the amount of liquid

below that depth

Answer: B

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16. The pressure at the bottom of a liquid tank

does not depends on ............ .

A. acceleration due to gravity

B. density of the liquid

C. height of the liquid

D. area of the liquid surface

Answer: D

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17. The pressure of the Earth's atmosphere at sea level is due to the .............. .

A. gravitational attraction of the Earth for the atmosphere

B. evaporation of water from the seas and oceans

C. fact that most living things constantly breathe air

D. heating of the atmosphere by the Sun

**Answer: A**

**18.** The operating principle of a hydraulic press is ............... .

    A. Pascal's Law

    B. Archimedes principle

    C. Newton's law of gravitation

    D. Boyle's law

**Answer: A**

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**19.** A floating body always diplaces its own

............. .

A. mass of liquid

B. volume of liquid

C. weight of liquid

D. none of these

**Answer: C**

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**20.** The pressure in a water tap at the base of a building is $3 \times 10^6$ dynes$/cm^2$ and on its top it is $1.6 \times 10^6$ dynes$/cm^2$. The height of the building approximately .............. .

    A. 7 m

    B. 14 m

    C. 70 m

    D. 140 m

**Answer: B**

**21.** The weight of a body in air is 100 N. How much will it weight in water, if it displaces 400 cc of water ?

A. 96 N

B. 94 N

C. 98 N

D. none of these

**Answer: D**

**22.** A body is floating in a liquid with $\frac{1}{5}$ of its volume outside the liquid. If the relative density of the body is 0.9, that of the liquid is ............ .

A. $0.9 \times 5$

B. $0.9 \times \frac{5}{4}$

C. $0.9 \times \frac{4}{5}$

D. $0.9 \times 4$

**Answer: B**

23. A boat having length 3 m and breadth 2 m is floating on a lake. It sinks by 1 cm when a man gets on it. The mass of the man is ...............

.

    A. 60 kg

    B. 55 kg

    C. 65 kg

D. 70kg

Answer: A

**24.** A bird weighs 2 kg and is inside an airtight cage of 1 kg. If its starts to fly, then what is the weight of the bird and cage assembly?

A. 3 kg

B. 2 kg

C. 1 kg

D. none of these

Answer: A

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25. Two light balls are suspended as shown in the figure. When a stream of air passes through the space between them , the distance between the balls will ............ .

A. increase

B. decrease

C. remain the same

D. may increase or decrease depending on

the speed of air

**Answer: B**

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**26.** The rate of leak from a hole in a tank is ................... .

A. independent of its height from the bottom

B. more if situated near the bottom

C. more if situated near its top

D. more at midway between top and bottom

Answer: B

**27.** When a fluid passes through the constricted part of a pipe, its.............. .

A. velocity and pressure decreases

B. velocity and pressure increase

C. velocity decreases and pressure increases

D. velocity increases and pressure decreases

**Answer: D**

**28.** Bernoulli's principle does not explain

...................... .

A. curved path of a spinning ball

B. surviving of a fish in a lake

C. working of a paint sprayer

D. automatic blowing off the roofs of

house during blizzard in hilly areas

**Answer: B**

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**29.** An ideal liquid flows through a horizontal

tube of variable diameter. The pressure is

lowest where the ............... .

A. velocity is hightest

B. velocity is lowest

C. diameter is largest

D. none of these

**Answer: A**

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**30.** Bernoulli's equation is applicable in the

case of ............ .

A. streamlined flow of compressible fluids

B. streamlined flow of incompressible fluids

C. turbulent flow of compressible fluids

D. turbulent flow of incompressible fluids

Answer: B

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**31.** Bernoulli theorem is based on conservation

of

A. mass

B. momentum

C. energy

D. all of the above

**Answer: C**

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**32.** Bernoulli's theorem is applicable to ................

.

A. flow of liquids

B. viscosity

C. surface tension

D. static fluid pressure

**Answer: A**

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**33.** The working of an atomiser depends on

............. .

A. Bernoulli's principle

B. Boyle's law

C. Archimedes principle

D. Pascal's law

**Answer: A**

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**34.** Dynamic lift' is related to ............. .

A. Bernoulli's principle

B. Archimedes principle

C. Equation of continuity

D. Pascal's law

**Answer: A**

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**35.** A gale blows over a house. The force due to the gale on the roof is ............. .

A. in the downward direction

B. zero

C. in the upward direction

D. horizontal

**Answer: C**

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36. If a stream of air is blown under one of the pans of a physical balance in equilibrium, then the pan will ............... .

A. go up

B. go down

C. not be affected

D. go up or down depending on the

velocity of the stream

**Answer: B**

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**37.** Water venturimeter works on the principle

of ............. .

A. Newton's third law of motion

B. Stokes's formula

C. Bernoulli's theorem

D. Hook's law

**Answer: C**

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**38.** Aeroplanes are made to run on runway before take - off because it ........................ .

A. decreases friction

B. decrease viscous drag of air

C. decreases atmospheric pressure

D. provides required life to the aeroplane

**Answer: D**

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**39.** When the terminal velocity is reached, the acceleration of a body moving through a viscous medium is ............... .

A. zero

B. positive

C. negative

D. either (b) or (c ) depending upon other

factors

Answer: A

**40.** If a raindrop with a mass of 0.05 g falls with constant velocity, the retarding force of atmospheric friction is (neglect density of air) ............... .

A. zero

B. 49 dynes

C. 490 dynes

D. none of these

Answer: B

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**41.** If temperature rises, the coefficient of viscosity of a liquid ............ .

A. decreases

B. increase

C. remain unchanged

D. increases for some liquids and decreases for others

**Answer: A**

**42.** The velocity of a rain drop attains constant

value because of ............. .

A. surface tension

B. upthrust of air

C. viscous force exerted by air

D. air currents

**Answer: C**

**43.** With an increase in temperature, the viscosity of liquid and gas, respectively will

    A. a gas decreases and a liquid increases

    B. a gas increases and a liquid decreases

    C. both gases and liquid decreases

    D. both gases and liquid increase

**Answer: B**

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**44.** Two small spheres of radii r and 2r fall through a viscous liquid with the same constant speed. The viscous forces experienced by them are in the ratio ............. .

A. $1:2$

B. $2:1$

C. $1:4$

D. $4:1$

Answer: A

**45.** Viscosity is the property of liquids by virtue

of which they ............. .

A. oppose the relative motion of its parts

B. push neighbouring molecules

C. attract other molecules

D. become conducting

Answer: A

**46.** Streamlined flow is more likely for liquids with ............... .

    A. (a) high density and low viscosity

    B. (b) low density and high viscosity

    C. (c) high density and high viscosity

    D. (d) low density and low viscosity

**Answer: B**

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**47.** The dimensional formula of coefficient of viscosity is ............... .

A. $M^0 L^{-1} T^{-1}$

B. $M^0 L^2 T^{-1}$

C. $M L^2 T^{-1}$

D. $M L^{-1} T^{-1}$

**Answer: D**

**48.** A good lubricant should have ............. .

A. high viscosity

B. low viscosity

C. moderate viscosity

D. high density

**Answer: A**

**49.** If a liquid wets a solid surface, the angle of contact is ............ .

A. $0°$

B. $90°$

C. less than $90°$

D. greater than $90°$

**Answer: C**

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**50.** When some detergent is added to water, the surface tension .............. .

A. remain unaffected

B. increases

C. decreases

D. may increase or decrease

**Answer: C**

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**51.** Rain drops are spherical because of ............. .

A. gravitational force

B. surface tension

C. low viscosity of water

D. air resistance

**Answer: B**

**52.** At critical temperature the surface tension of a liquid ............. .

    A. is zero

    B. is the same as that at any other temperature

    C. is infinity

    D. cannot be determined

**Answer: A**

**53.** A liquid will not wet the surface of a solid if the angle of contact is ............... .

A. acute

B. obtuse

C. zero

D. $\dfrac{\pi}{2}$

**Answer: B**

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**54.** The surface tensions of soap solution is $25 \times 10^{-3} Nm^{-1}$. The excess pressure inside a soap bubble of diameter 1 cm is ............. .

A. 5 Pa

B. 10 Pa

C. 20 Pa

D. None of the above

**Answer: C**

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55. Surface tension does not depends on .......... .

A. (a) nature of the liquid

B. (b) temperature of the liquid

C. (c) atmospheric pressure

D. (d) presence of impurities

Answer: C

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**56.** Meniscus of mercury in a capillary is

................... .

A. concave

B. convex

C. plane

D. cylindrical

Answer: B

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**57.** The potential energy of a molecule on the surface of a liquid compared to that of a molecules inside the liquid is ................ .

A. (a) smaller

B. (b) the same

C. (c) greater

D. (d) zero

**Answer: C**

**58.** 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. $75°$

**Answer: D**

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**59.** If the surface tension of water is $0.06 Nm^{-1}$, then the capillary rise in a tube of diameter 1 mm is (angle of contact = $0°$) ............. .

A. 1.22 cm

B. 2.44 cm

C. 3.12 cm

D. 3.86 cm

**Answer: B**

**60.** The surface tension phenomenon is the result of the tendency of a system to ............... .

    A. conserve energy

    B. conserve volume

    C. keep potential energy minimum

    D. keep surface area minimum

**Answer: C**

**1.** What is meant by 'Mean positions of atoms' ?

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**2.** What is meant by 'Evaporation'?

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**3.** Give the physical states of matter.

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**4.** Define elasticity ? Give its example.

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**5.** Define deforming force ?

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**6.** Define 'Plasticity' ?

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**7.** Explain the classification of longitudinal stress?

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**8.** Define longitudinal strain.

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**9.** What is meant by the term elastic limit?

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**10.** What is meant by " tensile stress " ?

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**11.** Define compressibility.

> ▶ **Watch Video Solution**

**12.** Define Relative density or specific gravity.

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**13.** Define atmospheric pressure what is its value ?

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**14.** Explain hydrostatic paradox with suitable example.

**15.** Give three examples of floating bodies.

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**16.** Define 'Viscosity' ?

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**17.** Define tube of flow.

**18.** Write any three applications of viscosity.

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**19.** What is meant by 'Molecular range' ?

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**20.** Define the term sphere of influence.

## Additional Questions Solved Numerical Questions

**1.** Two steel wires of lengths 1 m and 2 m have diameters 1 mm and 2mm respectively . If they are stretched by force of 40 N and 80 N respectively, find the ratio of their elongations.

**2.** A wire of length 2m and cross-sectional area $2 \times 10^{-6} m^2$ is made of a material of Young's modulus $2 \times 10^{11} Nm^{-2}$. What is the work done in stretching it through 0.1 mm.

**3.** A wire is stretched by 0.01 m when it is stretched by certain force. Another wire of the same material but double the length and

double the diameter is stretched by the same

force. What is the elongation in metres ?

**4.** Two wires of same material and same

diameter have lengths in the ratio 2 : 5. They

are stretched by same force. Calculate the

ratio of workdone in stretching them.

**5.** The approximate depth of an ocean is 2700m. The compressibility of water is $45.4 \times 10^{-11}$ Pa and density of water is $10^3$ kg. What fractional compression of water will be obtained the bottom of the ocean?

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**6.** An iceberg of density $900 kgm^{-3}$ is floating in water of density $1000 kgm^{-3}$. What is the

percentage of volume of iceberg outside the water ?

**7.** A cubical copper block has eahc side 2.0 cm. It is suspended by a string and submerged in oil of density $820 kgm^{-3}$. Calculate the tension in the string.

(density of copper = $8920 kgm^{-3}$)

**8.** By sucking through a straw, a student can reduce the pressure in his lungs to 750 mm of Hg (density $= 13.6 gcm^{-2}$). Using the straw, he can drink water from a glass upto a maximum depth of.

**9.** A sphere made of a material of specific gravity 8 has a concentric spherical cavity and just sinks in water. Calculate the ratio of the

radius of the cavity to that of the outer radius of the sphere.

10. A solid floats in liquid A with half its volume immersed and in liquid B with $\dfrac{2}{3}$ of its volume immersed. The densities of the liquids A and B are in the ratio.

**11.** An ideal liquid is flowing in a cylindrical tube of internal diameter 4 cm with a velocity of $5ms^{-1}$. If this tube is connected to another tube of internal diameter 2 cm, then the velocity of the liquid in the second tube will be ?

**12.** The cylindrical tube of a spray pump has radius R, one end of which has 'n' fine holes,

each of radius r. If the speed of the liquid in the tube is V, what is the speed of the ejection of the liquid through the holes.

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**13.** What is the pressure on a swimmer 10 m below, the surface of a lake ?

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**14.** A square metal plate of 10 cm side moves parallel to another plate with a velocity of $10 cms^{-1}$ , both plates immersed in water. If the viscous force is 200 dyne and viscosity of water is 0.01 poise. What is their distance apart ?

**15.** Find the terminal velocity of a steel ball 2 mm in diameter falling through glycerine.

Relative density of steel is 8, relative density of glycerine is 1.3 and viscosity of glycerine is 8.3 poise.

16. The terminal velocity of a copper ball of radius 2 mm falling through a tank of oil at $20°C$ is $6.5cms^{-1}$. Compute the viscosity of the oil at $20°C$ . Density of oil $= 1.5 \times 10^3 kgm^{-3}$ density of copper is $8.9 \times 10^3 kgm^{-3}$.

**17.** Water is flowing in a pipe of radius 1.5 cm with an average velocity of $15 cms^{-1}$ . What is the nature flow ? Given coefficient of viscosity of water is $10^{-3} kgm^{-1}s^{-1}$ and its density is $10^3 kgm^{-3}$.

**18.** Water is flowing with a speed of $2ms^{-1}$ in a horizontal pipe with cross-sectional area

decreasing from $2 \times 10^{-2} m^2$ to $0.01 m^2$ at pressure $4 \times 10^4 Pa$. What will be the pressure at small cross-section ?

**19.** Calculate the height to which water will rise in capillary tube of 1.5 mm diameter. Surface tension of water is $7.4 \times 10^{-3} Nm^{-1}$.