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Class: 11
Subject: Physics
Topic: 9&10 Properties of solid and Liquid
No. of Questions: 20
Duration: 60 Min
Maximum Marks: 60

1. A steel and a copper wire have the same length but the diameter of the steel wire is twice that of copper wire. The ratio of Young's modulus for steel to that of copper wire is 2: 1. If they are stretched by the same force, their elongations will be in the ratio of

   A. 2: 1

   B. 4: 1

   C. 1: 8

   D. 8: 1

   Sol: C

   $$q = \frac{F/A}{\frac{\Delta \ell}{\ell}} = \frac{F.\ell}{\Delta \ell . A} \qquad \Rightarrow \qquad \Delta \ell = \frac{F.\ell}{A.q} = \frac{F.\ell}{\pi r^2.q}$$

   For same ℓ and F $\qquad \frac{\Delta \ell_s}{\Delta \ell_c} = \frac{r_c^2 \; q_c}{r_s^2 \; q_s} = \left(\frac{r}{2r}\right)^2 \left(.\frac{1}{2}\right) = \frac{1}{8}$

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

   A. 60 Kg

   B. 72 Kg

   C. 12 Kg

   D. 128 Kg

   Sol: A

3. If the change in value of g at a height h above the surface of the earth is same as at a depth x below it. When both x & h are muchsmaller than the radius of the earth, then

A. x = h
B. x = 2h
C. x = h/2
D. x = h^2

Sol: B

Comparing the expressions for 'g' at a height 'h' and at a depth 'x', it can be shown that x = 2h.

4. Fraction of iceberg above water is

A. $\frac{1}{9}th$ of its total volume

B. $\frac{8}{9}th$ of its total volume

C. $\frac{1}{3}rd$ of its total volume

D. $3/4$ of its total volume

Sol: A

5. One of the following statements is wrong, surface tension depends on

A. force per unit length
B. capillary rise in a capillary tube
C. density of the liquid
D. area of the surface

Sol: C

6. Water rises in plant fibres due to

A. osmosis
B. fluid pressure
C. viscosity
D. capillarity

Sol: D

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7. If the density of Earth's air decreases by 1/4th of its current value, Find the height above the Earth's Surface when pressure is 1000 Pascal.

   A. 4 cm
   B. 4 m
   C. 40 cm
   D. 25 cm
   Sol: A
   Pgh = 100000
   P'gh' = 1000
   So, h'/h = 4/100 = 4 cm

8. A wooden block is floating freely in water in a vessel. If the vessel falls freely, the upward thrust on the wooden block will be

   A. more than earlier
   B. same as before
   C. equal to the weight of block in air
   D. zero
   Sol: D
   In free fall,
   g_{eff} = g – g = 0
   Hence, Upward thrust = 0

9. Fishes can move easily through water because

   A. they have streamlined bodies
   B. they have small size
   C. the resistance to their motion through water is large
   D. they have smooth body surface
   Sol: A
   Hence they offer minimum resistance

10. The terminal velocity of a tiny droplet of radius r falling vertically downward through air is proportional to

   A.   r
   B. r^2
   C. r^3
   D.   1/r

Sol: D

F is proportional to r

dv/dt is proportional to r

When integrated,

v is proportional to r^2

11. A piece of is of floating in sea water (density 1.03 g/c.c) and density of ice is 0.92 g/c.c. The fraction of total volume of iceberg above the level of sea water is nearly

A. 8%

B. 11%

C. 3%

D. 1.8%

Sol: B

(V'-V)/V = density of ice/density of water

12. It is easier to spray water mixed with soap due to

A. increase of S.T

B. decrease of S.T

C. increase of density

D. none of these

Sol: B

13. Two stretched membranes of areas $4m^2$ and $6m^2$ are placed in liquid at same depth. The ratio of pressures on them is

A. 1: 1

B. 4: 6

C. 2: 3

D. 16: 36

Sol: A

Pressure at same depth is same

14. Hydraulic lifts work on

A. hydrostatic paradox

B. Bernoulli's principle

C. stokes law

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D. Pascal's law

Sol: D

15. A 20 cm cube floats in water with a height of 8 cm, remaining above the water surface. The density of the material from whichthe cube is made is

A. 0.06 g/cm^3
B. 1.0 g/cm^3
C. 0.6 g/cm^3
D. 0.24 g/cm^3

Sol: C

Weight of the liquid displaced (upthrust) = weight of the body

If 'V_b' is the volume of the body and V_ℓ is the volume inside the liquid, then

$$V_\ell o_\ell g = V_b o_b g$$

$$12 \times A \times 1 = 20 \times A \times \rho_b \text{ Where A is area of cross section}$$

$$\rho_b = \quad = 0.6. \text{ g/cm}^3 \text{ Answer}$$

16. The product of the cross-section area of the pipe and the fluid speed at any point along the pipe is

A. Zero
B. Variable
C. Flow rate
D. None of these

Sol: C

17. Instrument used for measuring the rate of flow of a liquid in a pipe is called

A. hydrometer
B. venturimeter
C. lactometer
D. carburetors

Sol: B

18. A satellite in a circular orbit of radius R has a period of 4 hours. A satellite with orbital radius of 3R around the same planet willhave a period

A. 16 hours
B. 4 hours
C. $4\sqrt{27}$ hours
D. $4\sqrt{8}$ hours

Sol: C

$$T^2 \alpha \ a^3.$$
$$I \ case : (4)^2 \alpha \ R^3.$$
$$II \ case : (T)^2 \alpha \ (3R)^3.$$
$$\frac{T^2}{4^2} = \left(\frac{3R}{R}\right)^3 \Rightarrow T^2 = 27 \times 16 \Rightarrow T = \sqrt{27} \times 4 \ hours$$

19. It is difficult to write on newspaper using ink pen because of

A. inertia
B. surface tension
C. capillarity
D. viscosity
Sol: C

20. The upthrust on a body immersed in a fluid is determined by

A. Density of the body
B. Density of the fluid
C. Depth below the surface
D. None of these

Sol: B