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Class: 11
Subject: Physics
Topic: Mechanical properties of fluids
No. of Questions: 30

Q1. Bernoulli's principle is based on the law of conservation of _____

a. energy

b. mass

c. momentum

d. none of these

Q2. Radius of an air bubble at the bottom of a lake is r and it becomes 2r when the air bubble rises to the surface of the lake. If P is the atmospheric pressure of water, then the depth (in cm) of the lake is

a. 2P

b. 8P

c. 4P

d. 7P

Q3. Radius of one arm of a hydraulic lift is four times the radius of the other arm. What force should be applied on the narrow arm to lift 100 kg?

a. 26.5 N

b. 62.5 N

c. 6.25 N

d. 8.3 N

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Q4. A liquid drop of radius 'R' breaks into 64 tiny drops each of radius 'r'. If the surface tension of the liquid is 'T', then the gain in energy is

a. $48\pi R^2T$

b. $12\pi r^2 T$

c. $96\pi R^2T$

d. $192\pi r^2T$

Q4. A liquid drop of radius 'R' breaks into 64 tiny drops each of radius 'r'. If the surface tension of the liquid is 'T', then the gain in energy is

a. 2.012×10^5 N/m^2

b. 2.012×10^4 N/m^2

c. 1.027×10^5 N/m^2

d. 1.027×10^4 N/m^2

Q6. The increase in pressure (in k Pa) required to decrease 200 litres volume of a liquid by 0.004% is (Bulk modulus of the liquid = 2100 MPa)

a. 8.4

b. 84

c. 92.4

d. 168

Q7. A spinner swings a cricket ball due to

a. Boyle's law

b. Magnus effect

c. Viscosity

d. Surface tension

Q8 If the radius of a soap bubble is four times that of another, then the ratio of their excess pressure will be

a. 1 : 4

b. 8 : 1

c. 16 : 1

d. 5 : 1

Q9. In streamline flow of liquid, the total energy of liquid is constant at

a. all points

b. inner points

c. outer points

d. none of these

Q10. The radii of the two columns in a U-tube are 'r_1' and 'r_2' ($r_1 > r_2$). When a liquid of density 'ρ' (angle of contact is 0^o) is filled in it, the level difference of the liquid in the two arms is 'h'. The surface tension of the liquid is
(g = acceleration due to gravity)

a. $\frac{\rho g h r_1 r_2}{2(r_1 - r_2)}$

b. $\frac{\rho g h (r_1 - r_2)}{r_1 r_2}$

c. $\frac{2(r_1 - r_2)}{\rho g h r_1 r_2}$

d. $\frac{\rho g h}{2(r_2) - r_1}$

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Q11. A horizontal pipe of cross-sectional diameter 5 cm carries water at a velocity of 4 m/s. The pipe is connected to a smaller pipe with a cross-sectional diameter 4 cm. What is the velocity of water through the smaller pipe?

a. 6.25 m/s

b. 5.0 m/s

c. 3.2 m/s

d. 2.56 m/s

Q12. At a given place where acceleration due to gravity is 'g' m/s2, a sphere of lead of density 'd' kg/m3 is gently released in a column of liquid of density ‘’ kg/m3. If d > , The sphere will

a. fall vertically with an acceleration ‘g’ m/s^2

b. fall vertically with no acceleration

c. fall vertically with an acceleration g(d – ρ)/d

d. fall vertically with an acceleration g(ρ/d)

Q13. When a drop of radius R splits into n number of smaller drops, then

a. surface area of liquid increases

b. volume of liquid increases

c. surface area of liquid decreases

d. nothing can be said

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Q14. The pressures inside two soap bubbles are 1.01 and 1.02 atm. The ratio of their volumes is

a. 16 : 1

b. 8 : 1

c. 4 : 1

d. 2 : 1

Q15. A square wire frame of size L is dipped in a liquid. On taking out, a membrane is formed. If the surface tension of the liquid is T, then the force acting on the frame will be

a. 2 TL

b. 4 TL

c. 8 TL

d. 10 TL

Q16. Two small drops of mercury each of radius 'r' form a single large drop. The ratio of surface energy before and after this change will be

a. $1 : 2^{1/3}$

b. $2^{1/3} : 1$

c. 2 : 1

d. 1 : 2

Q17. In a stationary lift, a man is standing with a bucket full of water, having a hole at its bottom. The rate of flow of water through this hole is R_0. If the lift starts to move up and down with the same acceleration such that the water flows at the rate of R_u and R_d, then

a. $R_0 > R_u > R_d$

b. $R_u > R_0 > R_d$

c. $R_d > R_0 > R_u$

d. $R_u > R_d > R_0$

Q18. If a liquid does not wet a glass, then its angle of contact is

a. zero

b. acute

c. obtuse

d. right angle

Q19. Two small drops of mercury each of radius 'r' form a single large drop. The ratio of surface energy before and after this change will be

a. $1 : 2^{1/3}$

b. $2^{1/3} : 1$

c. 2 : 1

d. 1 : 2

Q20. A liquid drop of radius 'R' breaks into 64 tiny drops each of radius 'r'. If the surface tension of the liquid is 'T', then the gain in energy is

a. $48\pi R^2T$

b. $12\pi r^2 T$

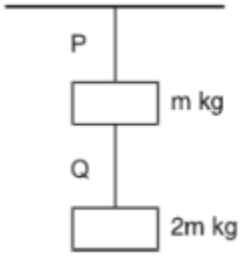
c. $96\pi R^2T$

d. $192\pi r^2T$

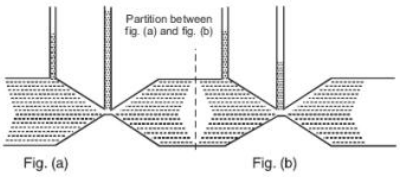
Q21. How does rise in temperature effect (i) viscosity of gases (ii) viscosity of liquids.

Q22. A wire of length I, area of crossection A and young's modulus Y is stretched

Q23. Two wires P and Q of same diameters are loaded as shown in the figure. The length of wire P is L m and its young's modulus is Y N/m^2 While length of wire Q is twice that of P and its material has young's half that of P. Computer the ratio of their elongation.



Q24. The fig (a) & (b) refer to the steady flow of a non viscous liquid. Which one of the two figures is incorrect? Why?



Q25. An aluminium wire 1m in length and radius 1mm is loaded with a mass of 40 kg hanging vertically. Young's modulus of Al is 7.0×10^{-10} N/m^2 Calculate (a) tensile stress (b) change in length (c) tensile strain and (d) the force constant of such a wire.

Q26. The average depth of ocean is 2500 m. Calculate the fractional compression $\left[\frac{\Delta V}{V}\right]$ of water at the bottom of ocean, given that the bulk modulus of water is 2.3×10^9 N/m^2.

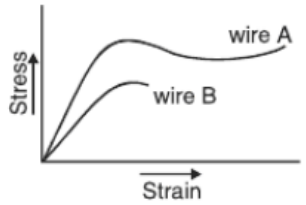
Q27. Terminal velocity of a copper ball of radius 2 mm through a tank of oil at 20°C is 6.0 cm/s. Compare coefficient of viscosity of oil. Given $P_{cu} = 8.9 \times \frac{10^3 kg}{m^3}. P^{oil} = 1.5 \times 10^3 kg/m^3$

Q28. The torque required to produce unit twist in a solid shaft of radius r, length | and made of material of modulus of rigidity η is given by

$$\tau = \frac{\pi \eta r^4}{2\,|}$$

Explain why hollow shafts are preferred to solid shafts for transmitting torque?

Q29. Stress strain curve for two wires of material A and B are as shown in Fig.



(a) Which material is more ductile?
(b) Which material has greater value of young's modulus?
(c) Which of the two is stronger material?
(d) Which material is more brittle?

Q30. The terminal velocity of a tiny droplet is v. N number of such identical droplets combine together forming a bigger drop. Find the terminal velocity of the bigger drop.