QUESTIONS FROM COMPETITIVE EXAMS

2.1 Introduction

(MHT-CET 2020)

1. A force of 50 N is applied to the smaller piston of a hydraulic press. If the diameters of the pistons are in the ratio 5 : 1, the force on the larger piston is
   a) 250 N b) 1000 N c) 1250 N d) 100 N

(MHT-CET 2022)

2. In a streamline flow, velocity of a fluid at given point
   a) is always constant
   b) does not remain constant
   c) changes from low value to high value
   d) changes from high value of low value

2.2 Fluid (Pressure)

(MHT-CET 2022)

3. In a turbulent flow, velocity of a fluid at any point
   a) in which, layers move parallel to each other.
   b) does not remain constant.
   c) always remains constant.
   d) changes from high value to low value only.
4. When a liquid flows through a tube, the Reynold's number is 2400, the flow of liquid
   a) is sometimes turbulent and sometimes streamline.
   b) is turbulent.
   c) is streamline.
   d) changes from turbulent flow to a streamline flow.

2.3 Pascal's Law and Its Applications

(MHT-CET 2020)

5. Pascal's law is not applied in
   a) an atomizer
   b) a hydraulic jack
   c) a hydraulic press
   d) hydraulic brakes

2.4 Surface Tension and Surface Energy

(MHT-CET 2002)

6. The dimensions of surface tension are
   a) $[L M T^{-1}]$ b) $[L^2 M T^{-2}]$ c) $[L^0 M T^{-2}]$ d) $[L^{-1} M T^{-2}]$

(MHT-CET 2005)

7. Work done in blowing a liquid drop to radius R is W_1 and that to radius 3R is W_2. The ratio of work done is
   a) 1 : 3 b) 1 : 4 c) 1 : 2 d) 1 : 9

(MHT-CET 2007)

8. The surface tension of soap solution is 0.035 N/m. The energy needed to increase the radius of the bubble from 4 cm to 6 cm is
   a) 1.5×10^{-3} J b) 1.5×10^{-2} J c) 3×10^{-2} J d) 1.5×10^{-4} J

9. A square frame of length L is immersed in soap solution and taken out. The force experienced by the square plate is

a) TL b) 2 TL c) 4 TL d) 8 TL

(MHT-CET 2008)

10. Potential energy of a molecule on the surface of liquid as compared to molecules inside the liquid is

a) maximum b) same c) minimum d) halved

(MHT-CET 2010)

11. On the surface of the liquid in equilibrium, molecules of the liquid possess

a) maximum potential energy b) minimum potential energy
c) maximum kinetic energy d) minimum kinetic energy

(MHT-CET 2011)

12. The SI unit of surface tension is

a) m / N b) dyne / cm c) J / m^2 d) J / m

(A.I.E.E.E. 2011)

13. Work done in increasing the size of a soap bubble from a radius of 3 cm to 5 cm is nearly (surface tension of soap solution = $0.03\ Nm^{-1}$)

a) 0.2π mJ b) 2π mJ c) 0.4π mJ d) 4π mJ

(MHT-CET 2012)

14. A spherical liquid drop of radius 'R' is divided into eight droplets of same size. If surface tension of liquid is T, then the work done in this process will be

a) $8\pi R^2 T$ b) $3\pi R^2 T$ c) $4\pi R^2 T$ d) $2\pi R T^2$

(MH-CET 2016)

15. A liquid drop having surface energy 'E' is spread into 512 droplets of same size. The final surface energy of the droplets is

a) 2 E b) 4 E c) 8 E d) 12 E

(MH-CET 2016)

16. A big water drop is formed by the combination of 'n' small water drops of equal radii. The ratio of the surface energy of 'n' drops to the surface energy of big drop is

a) $n^2 : 1$ b) $n : 1$ c) $\sqrt{n} : 1$ d) $\sqrt[3]{n} : 1$

(MHT-CET 2019)

17. Eight identical drops of water falling through air with uniform velocity of 10 cm/s combine to form a single drop of big size, then terminal velocity of the big drop will be

a) 30 cm/s b) 80 cm/s c) 10 cm/s d) 40 cm/s

(MHT-CET 2020)

18. A square frame of each side 'L' is dipped in a soap solution and taken out, the force acting on the film formed is

a) 2 TL b) 4 TL c) 8 TL d) 6 TL

19. A large number of liquid drops each of radius 'r' coalesce to form a big drop of radius 'R'. The energy released in the process in converted into kinetic energy of the big drop. The speed of the big drop is

a) $\left[\frac{3T}{\rho}\left(\frac{1}{r}-\frac{1}{R}\right)\right]^{\frac{1}{2}}$ b) $\left[\frac{6T}{\rho}\left(\frac{1}{r}+\frac{1}{R}\right)\right]^{\frac{1}{2}}$ c) $\left[\frac{6T}{\rho}\left(\frac{1}{r}-\frac{1}{R}\right)\right]^{\frac{1}{2}}$ d) $\left[\frac{3T}{\rho}\left(\frac{1}{r}+\frac{1}{R}\right)\right]^{\frac{1}{2}}$

2.4.2 Excess Pressure Due to Surface Tension

(MHT-CET 2002)

30. Amount of energy required to blow a bubble of radius 5 cm, is (surface tension of soap is 30×10^{-2} N/m)

a) 1.88 J b) 1.88×10^{-1} J c) 1.88×10^{-2} J d) 1.88×10 J

(MHT-CET 2003)

31. Two soap bubbles have radii in the ratio of 4 : 3. What is the ratio of work done to blow these bubbles ?

a) 4 : 3 b) 16 : 9 c) 9 : 16 d) 3 : 4

(MHT-CET 2019)

32. The excess of pressure, due to surface tension, on a spherical liquid drop of radius 'R' is proportional to

a) R^2 b) R^{-2} c) R d) R^{-1}

(MHT-CET 2020)

33. Under isothermal conditions, two soap bubbles of radii 'r_1' and 'r_2' combine to form a single soap bubble of radius 'R'. The surface tension of soap solution is (P = outside pressure)

a) $P(R^3 - r_1^3 - r_2^3) / 4(r_1^2 + r_2^2 - R^2)$ b) $P(r_1^3 - R^3 + r_2^3) / 4(R^2 - r_1^2 - r_2^2)$

c) $P(R^3 + r_1^3 + r_2^3) / 4(r_1^2 + r_2^2 - R^2)$ d) $P(r_1^3 - r_2^3 + R^3) / 4(r_1^2 + r_2^2 + R^2)$

(MHT-CET 2021)

34. The excess of pressure inside a soap bubble of volume 'V_1' is twice the excess of pressure inside a second soap bubble of volume 'V_2'. The value of the ratio $\frac{V_1}{V_2}$ is

a) $\frac{1}{8}$ b) $\frac{1}{4}$ c) $\frac{1}{2}$ d) 1

(MHT-CET 2022)

35. Two narrow tubes of diameters 'd_1' and 'd_2' are joined together to form a U tube open at both ends. If U tube contains water, the difference in water levels in the limbs is

a) $\frac{2T}{\rho g}\left[\frac{d_1 + d_2}{d_1 d_2}\right]$ b) $\frac{4T}{\rho g}\left[\frac{d_2 - d_1}{d_1 d_2}\right]$ c) $\frac{2T}{\rho g}\left[\frac{d_2 - d_1}{d_1 d_2}\right]$ d) $\frac{4T}{\rho g}\left[\frac{d_1 d_2}{d_1 + d_2}\right]$

2.4.3 Capillarity and Expression for Surface Tension

(MHT-CET 2001)

36. When a liquid rises inside a capillary tube, the weight of the liquid in the tube is supported

a) by atmospheric pressure

b) partly by atmospheric pressure and partly by surface tension

c) entirely by the force due to surface tension

d) partly by the force due to surface tension

37. The height of water in a capillary tube of radius 2 cm is 4 cm. What should be the radius of capillary, if the water rises to 8 cm in tube ?

a) 1 cm b) 0.1 cm c) 2 cm d) 4 cm

(MHT-CET 2022)

45. In a capillary tube having area of cross-section 'A', water rises to a height 'h'. If cross sectional area is reduced to $\frac{A}{9}$, the rise of water in the capillary tube is

a) 3 h b) 2 h c) h d) 4 h

46. Water rises to a height of 20 mm in a capillary tube of cross-sectional area 'A'. If the area of cross-section of the tube is made $\left(\frac{A}{4}\right)$, then water will rise to a height of

a) 6 cm b) 2 cm c) 3 cm d) 4 cm

47. Surface tension of soap solution is 'T'. A charged soap bubble of radius 'r' is in equilibrium, with outside and inside pressures being equal. The charge on the drop is

a) $4\pi r\sqrt{\frac{8T}{\epsilon_0}}$ b) $4\pi r^2\sqrt{\frac{r}{8T\epsilon_0}}$ c) $4\pi r^2\sqrt{\frac{8T\epsilon_0}{r}}$ d) $4\pi r\sqrt{8T\epsilon_0}$

2.4.4 Radius of New Bubble Formed When Two Bubbles Combine

(MHT-CET 2001)

48. Two spherical soap bubbles of radii r_1 and r_2 in vacuum coalesce under isothermal conditions. The resulting bubble has the radius R such that

a) $R = r_1 + r_2$ b) $R = \frac{r_1 r_2}{r_1 + r_2}$ c) $R^2 = r_1^2 + r_2^2$ d) $R = \frac{r_1 + r_2}{r_2}$

(A.I.E.E.E. 2004)

49. If two soap bubbles of different radii are connected by a tube then

a) air flows from the bigger bubble to the smaller bubble till the sizes become equal

b) there is no flow of air

c) air flows from the smaller bubble to the bigger bubble

d) air flows from bigger bubble to the smaller bubble till the sizes are interchanged

(MHT-CET 2020)

50. Let 'R_1' and 'R_2' be radii of two mercury drops. A big mercury drop is formed from them under isothermal conditions. The radius of the resultant drop is

a) $R = \sqrt{R_1^2 - R_2^2}$ b) $R = \sqrt{R_1^2 + R_2^2}$ c) $R = \frac{R_1 + R_2}{2}$ d) $R = (R_1^3 + R_2^3)^{1/3}$

2.5 Fluid in Motion

(MHT-CET 2005)

51. Two soap bubbles in vacuum, having radii 3 cm and 4 cm respectively, coalesce under isothermal conditions to form a single bubble. What is the radius of the new bubble ?

a) 12 cm b) 16 cm c) 25 cm d) 5 cm

(MHT-CET 2008)

52. If a small air bubble of radius 0.1 mm is formed just below the surface of water, then the pressure inside the air bubble will be ($P = 10^5\ N/m^2$, $T = 0.07\ N/m$)

a) $14 \times 10^4\ N/m^2$ b) $1.014 \times 10^5\ N/m^2$

c) $1.014 \times 10^6\ N/m^2$ d) $1.14 \times 10^{-5}\ N/m^2$

2.7 Stoke's law and Terminal Velocity

(MHT-CET 2019)

61. A metal sphere of radius 'R' and density 'ρ_1' dropped in a liquid of density 'σ' moves with terminal velocity 'v'. Another metal sphere of same radius and density 'ρ_2' is dropped in the same liquid, its terminal velocity will be

a) $v(\rho_2 - \sigma)/(\rho_1 - \sigma)$
b) $v(\rho_2 + \sigma)/(\rho_1 + \sigma)$
c) $v(\rho_1 + \sigma)/(\rho_2 + \sigma)$
d) $v(\rho_1 - \sigma)/(\rho_2 - \sigma)$

(MHT-CET 2021)

62. If the terminal speed of a sphere A [density ρ_A = [illegible] kg m^{-3}] is 0.4 ms^{-1} in a viscous liquid [density $\rho_L = 1.5$ kg m^{-3}], the terminal speed of sphere B [density $\rho_B = 3$ kg m^{-3}] of the same size in the same liquid is

a) 0.3 ms^{-1}
b) 0.1 ms^{-1}
c) 0.2 ms^{-1}
d) 0.4 ms^{-1}

2.8 Equation of Continuity

(MH-CET 2018)

63. A vessel completely filled with water has holes 'A' and 'B' at depths 'h' and '3h' from the top respectively. Hole 'A' is a square of side 'L' and 'B' is circle of radius 'r'. The water flowing out per second from both the holes is same. Then 'L' is equal to

a) $r^{\frac{1}{2}}(\pi)^{\frac{1}{2}}(3)^{\frac{1}{2}}$
b) $r.(\pi)^{\frac{1}{4}}(3)^{\frac{1}{4}}$
c) $r.(\pi)^{\frac{1}{2}}(3)^{\frac{1}{4}}$
d) $r^{\frac{1}{2}}(\pi)^{\frac{1}{3}}(3)^{\frac{1}{2}}$

(MHT-CET 2019)

64. A large vessel completely filled with water has two holes 'A' and 'B' at depths 'h' and '4h' from the top. Hole 'A' is a square of side 'L' and hole 'B' is circle of radius 'R'. If from both the holes same quantity of water is flowing per second then side of square hole is

a) $\sqrt{2\pi R}$
b) R/2
c) $\sqrt{2\pi} \cdot R$
d) $2\pi R$

(MHT-CET 2020)

65. A large open tank containing water has two holes to its wall. A square hole of side 'a' is made at a depth 'y' and a circular hole of radius 'r' is made at a depth '16y' from the surface of water. If equal amount of water comes out through both the holes per second, then the relation between 'r' and 'a' will be

a) $r = \frac{a}{2\sqrt{\pi}}$
b) $r = \frac{a}{2\pi}$
c) $r = \frac{2a}{\pi}$
d) $r = \frac{2a}{\sqrt{\pi}}$

66. Water is flowing through a horizontal pipe of non-uniform cross-section. In the region of narrowest part inside the pipe, the water will have

a) both the pressure and velocity minimum
b) maximum pressure and minimum velocity
c) both the pressure and velocity maximum
d) maximum velocity and minimum pressure