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PHYSICS · JEE MAIN

Fluid Mechanics

Previous Year Questions with answers

186 questions · **144** papers · **2002–2026** · newest paper first

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What is in this PDF: every Fluid Mechanics question we hold from past JEE Main and AIEEE papers, with its options and answer. Where an answer comes from a source other than the official final key, it says so next to the answer.

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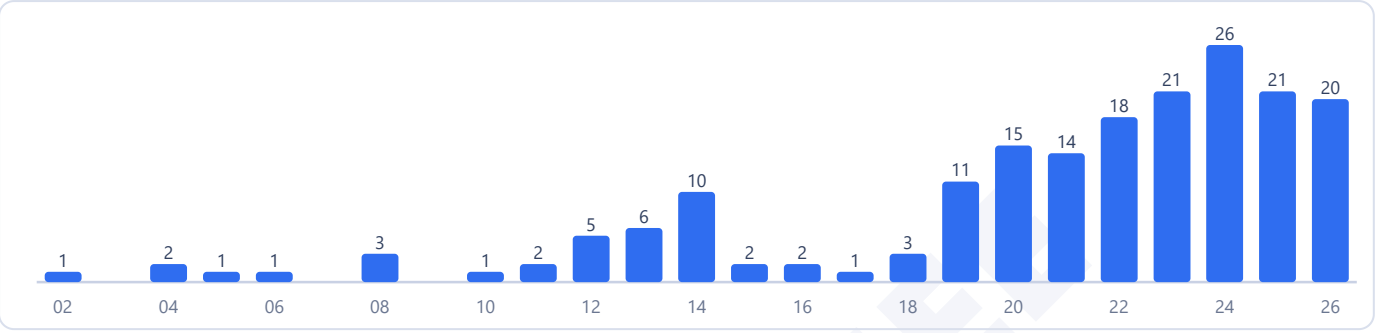
Chapter at a glance

3.2%	186	116 of 162	143 / 43
of Physics questions, 2019–2026	questions, 2002–2026	papers asked it, 2019–2026	MCQ / numerical, 2002–2026

Trend. Rising: 1.2 questions per paper in 2024–2026 against 0.8 in 2019–2023.

Questions per year



Counts are the questions we hold: 186 in 144 papers. No question in this chapter was found repeated across papers.

Most-asked topics in this chapter (2002–2026)



How often it comes up

Fluid Mechanics is a fundamental branch of continuum physics that tests both hydrostatic balances and moving flow dynamics in JEE Main. In the papers we hold from 2019 to 2026, the chapter accounted for **146 questions in 162 papers**, working out to **0.9 questions per paper**, and appeared in 116 of those 162 papers. That puts it at **15th of 29 Physics chapters** over that eight-year period, representing 3.2% of all Physics questions.

The chapter has grown in weighting in recent exam years. Between 2002 and 2018, it claimed 3.0% of Physics; across the last three exam years (2024 to 2026), its share rose to 4.3%, yielding 67 questions in 58 papers. The most active single year in our collection was 2024, with 26 questions across 20 papers. Every exam year since 2019 included questions on fluids, with questions appearing in 116 of the 162 papers in our set.

The topics form part of Unit 7: Properties of Solids and Liquids in NTA's Class 11 Physics syllabus. The concepts bridge mechanical equilibrium with energy conservation along streamlines and molecular surface forces.

Most-asked topics

From 2019 to 2026, the questions distributed across four distinct topics:

- **Surface Tension**: 51 questions. Capillary rise, excess pressure across spherical interfaces, bubble coalescence work, and contact angles.
- **Viscosity**: 36 questions. Terminal velocity in viscous media, Stokes' law, Poiseuille flow, and velocity gradients.
- **Fluid Dynamics**: 30 questions. Bernoulli's equation, continuity equation, Torricelli's orifice efflux, and venturi meters.
- **Fluid Statics**: 29 questions. Archimedes' principle, hydrostatic pressure variation with depth, buoyant equilibrium, and accelerated fluid tanks.

All four topic divisions were tested in the 2026 exam cycle, so preparing across the entire chapter is necessary.

What the questions look like

Surface tension questions frequently feature capillary tubes and spherical bubbles. A common question gives two capillary tubes of different bore radii dipped into the same liquid and asks for the ratio of liquid column heights, or evaluates the percentage change in capillary rise when radius, liquid density, and surface tension shift by small percentages. Other questions calculate the mechanical work done in blowing a soap bubble or merging many tiny mist droplets into a larger drop.

Viscosity problems center on steady terminal motion. A typical problem presents a small metallic sphere falling through glycerine or oil under gravity. Students balance downward gravitational force against the combined upward forces of buoyancy and Stokes viscous drag, showing that terminal velocity is proportional to the square of the sphere radius and the density difference. Questions often ask for the new terminal speed when the sphere radius is halved.

Fluid dynamics questions apply Bernoulli's theorem along streamlines. You will encounter venturi meter problems where a manometer level difference between wide and constricted pipe sections allows you to calculate volume discharge rate. In fluid statics, problems typically ask for the submerged depth or tilt angle of a solid block floating at an interface between two immiscible liquids.

Direct numeric computation is common in this chapter: 43 of the 146 questions since 2019 were numerical-response questions without options.

How to practise it

Begin with fluid statics and buoyancy. Practice writing equilibrium equations for floating bodies by equating weight to buoyant force, taking care to use the density of the displaced liquid rather than the solid body. For accelerated fluid containers, remember that the free surface tilts such that the effective gravity vector is perpendicular to the liquid surface.

Next, master the combination of the continuity equation and Bernoulli's equation. Whenever you analyze horizontal pipe flow, remember that higher fluid speed in a narrow constriction corresponds to lower static pressure, not higher. Always verify whether a point on a streamline is exposed to the atmosphere so atmospheric pressure terms cancel cleanly.

For surface tension, distinguish carefully between drops and bubbles: a liquid drop has one interface with excess pressure 2T/R, whereas a soap bubble surrounded by air has two interfaces with excess pressure 4T/R. In viscosity problems, never omit the buoyant force when deriving terminal velocity unless the surrounding fluid density is explicitly stated to be negligible.

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Q1 JEE Main 2026 · 8 Apr · Shift 2 MCQ

A liquid of density 600 kg/m^3 flowing steadily in a tube of varying cross-section. The cross-section at a point A is 1.0 cm^2 and that at B is 20 mm^2. Both the points A and B are in same horizontal plane, the speed of the liquid at A is 10 cm/s. The difference in pressures at A and B points is _____ Pa.

(A) 18
(B) 144
(C) 36
(D) 72

Answer: (D) 72 · Official NTA final key

Q2 JEE Main 2026 · 8 Apr · Shift 2 MCQ

A spherical liquid drop of radius R acquires the terminal velocity v_1 when falls through a gas of viscosity η. Now the drop is broken into 64 identical droplets and each droplet acquires terminal velocity v_2 falling through the same gas. The ratio of terminal velocities v_1/v_2 is _____.

(A) 4
(B) 0.25
(C) 32
(D) 16

Answer: (D) 16 · Official NTA final key

Q3 JEE Main 2026 · 6 Apr · Shift 2 MCQ

A cylindrical vessel of 40 cm radius is completely filled with water and its capacity is 528 dm^3 (dm : decimeter) The vessel is placed on a solid block of exactly same height as vessel. If a small hole is made at 70 cm below the top of water level, then horizontal range of water falling on the ground in the beginning is _____ cm.

(A) $120\sqrt{2}$
(B) $140\sqrt{2}$
(C) $140\sqrt{3}$
(D) $120\sqrt{3}$

Answer: (B) $140\sqrt{2}$ · Official NTA final key

Q4 JEE Main 2026 · 5 Apr · Shift 2 MCQ

Eight mercury drops, each of radius r, coalesce to form a bigger drop. The surface energy released in this process is _____. (S is the surface tension of mercury).

(A) $8\pi r^2 S$
(B) $16\pi r^2 S$
(C) $64\pi r^2 S$
(D) $4\pi r^2 S$

Answer: (B) $16\pi r^2 S$ · Official NTA final key

Q5 JEE Main 2026 · 4 Apr · Shift 1 Numerical

The surface tension of a soap solution is 3.5×10^{-2} N/m. The work required to increase the radius of a soap bubble from 1 cm to 2 cm is $\alpha \times 10^{-6}$ J. The value of α is _____.
($\pi = 22/7$)

Numerical value type: the answer is a number.

Answer: 264. · Official NTA final key

Q6 JEE Main 2026 · 4 Apr · Shift 2 MCQ

A water spray gun is attached to a hose of cross sectional area 30 cm^2. The gun comprises of 10 perforations each of cross sectional area of 15 mm^2. If the water flows in the hose with the speed of 50 cm/s, calculate the speed at which the water flows out from each perforation. (Neglect any edge effects)

(A) 100 m/s
(B) 10 m/s
(C) 1000 m/s
(D) 15×10^2 m/s

Answer: (B) 10 m/s · Official NTA final key

Q7 JEE Main 2026 · 2 Apr · Shift 1 MCQ

A liquid drop of diameter 2 mm breaks into 512 droplets. The change in surface energy is $\alpha \times 10^{-6}$ J. The value of α is _____. (Take surface tension of liquid $= 0.08$ N/m)

(A) 10
(B) 7
(C) 8
(D) 11

Answer: (B) 7 · Official NTA final key

Q8 JEE Main 2026 · 2 Apr · Shift 1 Numerical

A tub is filled with water and a wooden cube 10 cm $\times$ 10 cm $\times$ 10 cm is placed in the water. The wooden cube is found to float on the water with a part of it submerged in water. When a metal coin is placed on the wooden cube, the submerged part is increased by 3.87 cm. The mass of the metal

coin is _____ gram.
(Take water density as 1 g/cm^3 and density of wood as 0.4 g/cm^3)

Numerical value type: the answer is a number.

Answer: 387. · Official NTA final key

Q9 JEE Main 2026 · 2 Apr · Shift 2 MCQ

The surface tension of a soap bubble is 0.03 N/m. The work done in increasing the diameter of bubble from 2 cm to 6 cm is $\alpha\pi \times 10^{-4}$ J. The value of α is _____. (Take $\pi = 3.14$)

(A) 0.86
(B) 0.64
(C) 1.92
(D) 7.68

Answer: (C) 1.92 · Official NTA final key

Q10 JEE Main 2026 · 2 Apr · Shift 2 MCQ

If an air bubble of diameter 2 mm rises steadily through a liquid of density 2000 kg/m^3 at a rate of 0.5 cm/s, then the coefficient of viscosity of liquid is _____ Poise. (Take g = 10 m/s^2)

(A) 0.88
(B) 8.8
(C) 88.8
(D) 0.088

Answer: (B) 8.8 · Official NTA final key

Q11 JEE Main 2026 · 24 Jan · Shift 1 Numerical

Sixty four rain drops of radius 1 mm each falling down with a terminal velocity of 10 cm/s coalesce to form a bigger drop. The terminal velocity of bigger drop is _____ cm/s.

Numerical value type: the answer is a number.

Answer: 160. · Official NTA final key

Q12 JEE Main 2026 · 24 Jan · Shift 2 MCQ

A cubical block of density $\rho_b = 600$ kg/m^3 floats in a liquid of density $\rho_e = 900$ kg/m^3. If the height of block is $H = 8.0$ cm then height of the submerged part is _____ cm.

(A) 5.3
(B) 6.3
(C) 7.3
(D) 4.3

Answer: (A) 5.3 · Official NTA final key

Q13 JEE Main 2026 · 24 Jan · Shift 2 · Numerical

A soap bubble of surface tension 0.04 N/m is blown to a diameter of 7 cm. If $(15000 - x)\ \mu$J of work is done in blowing it further to make its diameter 14 cm, then the value of x is _____.

($\pi = 22/7$)

Numerical value type: the answer is a number.

Answer: 11304. · Official NTA final key

Q14 JEE Main 2026 · 23 Jan · Shift 2 · MCQ

A small metallic sphere of diameter 2 mm and density 10.5 g/cm^3 is dropped in glycerine having viscosity 10 Poise and density 1.5 g/cm^3 respectively. The terminal velocity attained by the sphere is _____ cm/s.

($\pi = \dfrac{22}{7}$ and $g = 10$ m/s^2)

(A) 1.5
(B) 2.0
(C) 3.0
(D) 1.0

Answer: (B) 2.0 · Official NTA final key

Q15 JEE Main 2026 · 22 Jan · Shift 1 · MCQ

Given below are two statements:

Statement I: Pressure of a fluid is exerted only on a solid surface in contact as the fluid-pressure does not exist everywhere in a still fluid.

Statement II: Excess potential energy of the molecules on the surface of a liquid, when compared to interior, results in surface tension.

In the light of the above statements, choose the **correct** answer from the options given below

(A) Both Statement I and Statement II are false
(B) Statement I is true but Statement II is false
(C) Both Statement I and Statement II are true
(D) Statement I is false but Statement II is true

Answer: (D) Statement I is false but Statement II is true · Official NTA final key

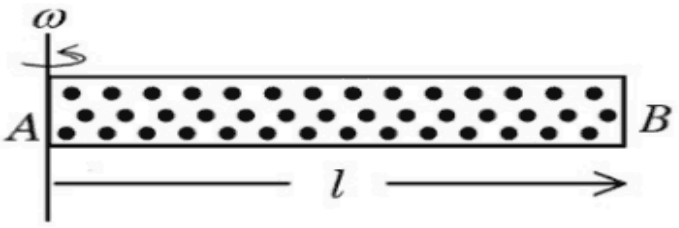
Q16 JEE Main 2026 · 22 Jan · Shift 1 MCQ

A cylindrical tube AB of length l, closed at both ends contains an ideal gas of 1 mol having molecular weight M. The tube is rotated in a horizontal plane with constant angular velocity ω about an axis perpendicular to AB and passing through the edge at end A, as shown in the figure. If P_A and P_B are the pressures at A and B respectively, then

(Consider the temperature is same at all points in the tube)

(see the figure above)

Q.43
A cylindrical tube AB of length l, closed at both ends contains an ideal gas of 1 mol having molecular weight M. The tube is rotated in a horizontal plane with constant angular velocity ω about an axis perpendicular to AB and passing through the edge at end A, as shown in the figure. If P_A and P_B are the pressures at A and B respectively, then
(Consider the temperature is same at all points in the tube)



Options
1. $P_B = P_A \exp(M\omega^2 l^2/RT)$
2. $P_B = P_A$
3. $P_B = P_A \exp(M\omega^2 l^2/3RT)$
4. $P_B = P_A \exp(M\omega^2 l^2/2RT)$

(A) $P_B = P_A \exp\left(M\omega^2 l^2/RT\right)$
(B) $P_B = P_A$
(C) $P_B = P_A \exp\left(M\omega^2 l^2/3RT\right)$
(D) $P_B = P_A \exp\left(M\omega^2 l^2/2RT\right)$

Answer: (D) $P_B = P_A \exp\left(M\omega^2 l^2/2RT\right)$ · Official NTA final key

Q17 JEE Main 2026 · 22 Jan · Shift 2 MCQ

When a part of a straight capillary tube is placed vertically in a liquid, the liquid raises upto certain height h. If the inner radius of the capillary tube, density of the liquid and surface tension of the liquid decrease by 1% each, then the height of the liquid in the tube will change by _____ %.

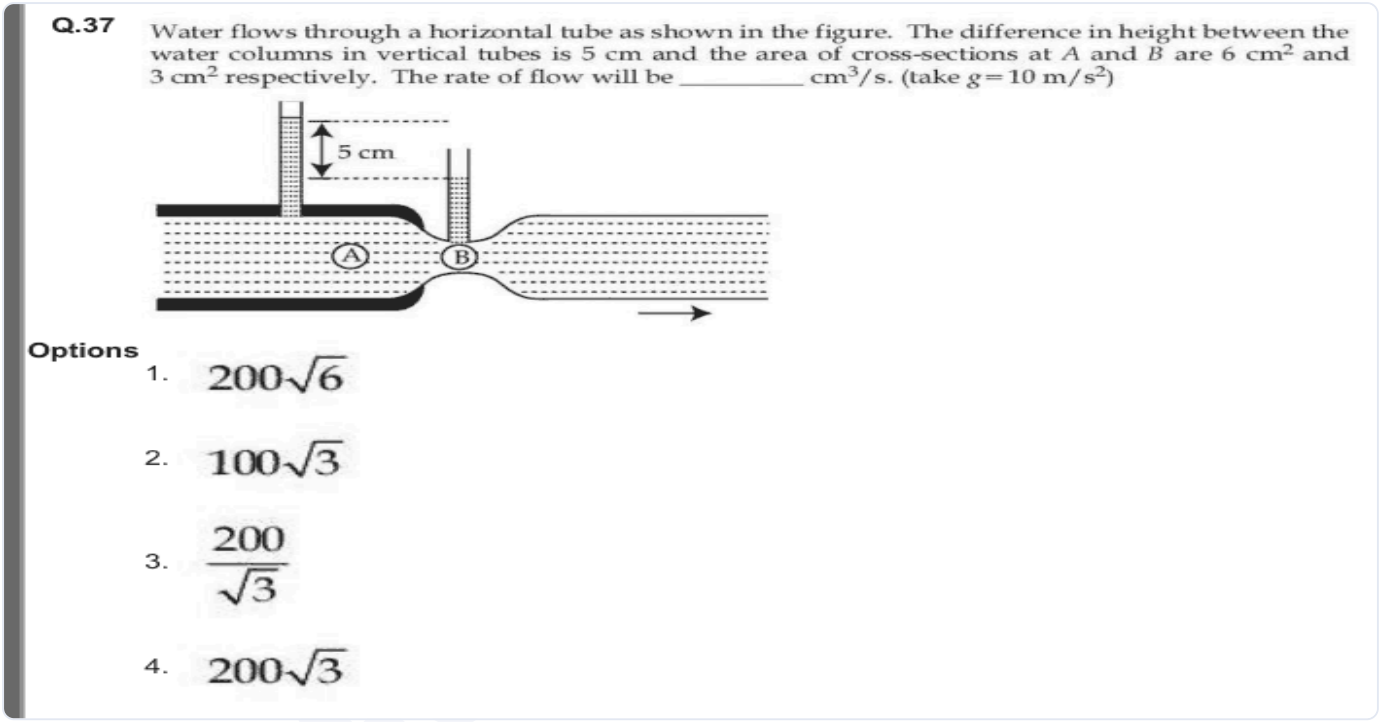
(A) -1
(B) -3
(C) $+1$
(D) $+3$

Answer: (C) $+1$ · Official NTA final key

Q18 JEE Main 2026 · 21 Jan · Shift 1 MCQ

Water flows through a horizontal tube as shown in the figure. The difference in height between the water columns in vertical tubes is 5 cm and the area of cross-sections at A and B are 6 cm^2 and 3 cm^2 respectively. The rate of flow will be _____ cm^3/s. (take $g = 10$ m/s^2)

(see the figure above)



(A) $200\sqrt{6}$
(B) $100\sqrt{3}$
(C) $\frac{200}{\sqrt{3}}$
(D) $200\sqrt{3}$

Answer: (D) $200\sqrt{3}$ · Official NTA final key

Q19 JEE Main 2026 · 21 Jan · Shift 2 MCQ

Surface tension of two liquids (having same densities), T_1 and T_2, are measured using capillary rise method utilizing two tubes with inner radii of r_1 and r_2 where $r_1 > r_2$. The measured liquid heights in these tubes are h_1 and h_2 respectively. [Ignore the weight of the liquid about the lowest point of meniscus]. The heights h_1 and h_2 and surfaces tensions T_1 and T_2 satisfy the relation :

(A) $h_1 > h_2$ and $T_1 < T_2$
(B) $h_1 = h_2$ and $T_1 = T_2$
(C) $h_1 < h_2$ and $T_1 = T_2$
(D) $h_1 > h_2$ and $T_1 = T_2$

Answer: (C) $h_1 < h_2$ and $T_1 = T_2$ · Official NTA final key

Q20 JEE Main 2026 · 21 Jan · Shift 2 Numerical

The terminal velocity of a metallic ball of radius 6 mm in a viscous fluid is 20 cm/s. The terminal velocity of another ball of same material and having radius 3 mm in the same fluid will be _____ cm/s.

Numerical value type: the answer is a number.

Answer: 5. · Official NTA final key

Q21 JEE Main 2025 · 8 Apr · Shift 2 Numerical

A cube having a side of 10 cm with unknown mass and 200 gm mass were hung at two ends of an uniform rigid rod of 27 cm long. The rod along with masses was placed on a wedge keeping the distance between wedge point and 200 gm weight as 25 cm. Initially the masses were not at balance. A beaker is placed beneath the unknown mass and water is added slowly to it. At given point the masses were in balance and half volume of the unknown mass was inside the water. (Take the density of unknown mass is more than that of the water, the mass did not absorb water and water density is 1gm/cm^3). The unknown mass is _____ kg.

Numerical value type: the answer is a number.

Answer: 3. · Key from source paper

Q22 JEE Main 2025 · 7 Apr · Shift 2 MCQ

A capillary tube of radius 0.1 mm is partly dipped in water (surface tension 70dyn/cm and glass water contact angle $\approx 0^\circ$) with 30° inclined with the vertical. The length of water risen in the capillary is _____ cm . (Take $g = 9.8m/s^2$)

(A) $\frac{82}{5}$
(B) $\frac{57}{2}$
(C) $\frac{68}{5}$
(D) $\frac{71}{5}$

Answer: (A) $\frac{82}{5}$ · Key from source paper

Q23 JEE Main 2025 · 4 Apr · Shift 1 MCQ

Two liquids A and B have θ_A and θ_B as contact angles in a capillary tube. If $K = \cos\theta_A / \cos\theta_B$, then identify the correct statement:

(A) K is negative, then liquid A and liquid B have concave meniscus.
(B) K is zero, then liquid A has convex meniscus and liquid B has concave meniscus.
(C) K is negative, then liquid A and liquid B have convex meniscus.
(D) K is negative, then liquid A has concave meniscus and liquid B has convex meniscus.

Answer: (D) K is negative, then liquid A has concave meniscus and liquid B has convex meniscus. · Key from source paper

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Q24 JEE Main 2025 · 3 Apr · Shift 1 MCQ

Consider a completely full cylindrical water tank of height 1.6 m and of cross-sectional area $0.5m^2$. It has a small hole in its side at a height 90 cm from the bottom. Assume, the cross-sectional area of the hole to be negligibly small as compared to that of the water tank. If a load 50 kg is applied at the top surface of the water in the tank then the velocity of the water coming out at the instant when the hole is opened is: $(g = 10m/s^2)$

(A) $5m/s$
(B) $3m/s$
(C) $2m/s$
(D) $4m/s$

Answer: (D) $4m/s$ · Key from source paper

Q25 JEE Main 2025 · 3 Apr · Shift 2 MCQ

A solid steel ball of diameter 3.6 mm acquired terminal velocity $2.45 \times 10^{-2}m/s$ while falling under gravity through an oil of density $925kgm^{-3}$. Take density of steel as $7825kgm^{-3}$ and g as 9.8 m/s^2. The viscosity of the oil in SI unit is

(A) 1.68
(B) 2.38
(C) 1.99
(D) 2.18

Answer: (C) 1.99 · Key from source paper

Q26 JEE Main 2025 · 3 Apr · Shift 2 MCQ

Two cylindrical vessels of equal cross sectional area of $2m^2$ contain water upto heights 10 m and 6 m, respectively. If the vessels are connected at their bottom then the work done by the force of gravity is (Density of water is $10^3kg/m^3$ and $g = 10m/s^2$)

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(A) $8 \times 10^4 J$
(B) $4 \times 10^4 J$
(C) $1 \times 10^5 J$
(D) $6 \times 10^4 J$

Answer: (A) $8 \times 10^4 J$ · Key from source paper

Q27 JEE Main 2025 · 3 Apr · Shift 2 Numerical

The excess pressure inside a soap bubble A in air is half the excess pressure inside another soap bubble B in air. If the volume of the bubble A is n times the volume of the bubble B, then, the value of n is _____ .

Numerical value type: the answer is a number.

Answer: 8. · Key from source paper

Q28 JEE Main 2025 · 2 Apr · Shift 1 Numerical

A vessel with square cross-section and height of 6 m is vertically partitioned. A small window of $100 cm^2$ with hinged door is fitted at a depth of 3 m in the partition wall. One part of the vessel is filled completely with water and the other side is filled with the liquid having density $1.5 \times 10^3 kg/m^3$. What force one needs to apply on the hinged door so that it does not get opened ?

(Acceleration due to gravity $= 10 m/s^2$)

Numerical value type: the answer is a number.

Answer: 150. · Key from source paper

Q29 JEE Main 2025 · 2 Apr · Shift 2 MCQ

Two water drops each of radius ' r ' coalesce to form a bigger drop. If ' T ' is the surface tension, the surface energy released in this process is :

(A) $4\pi r^2 T[\sqrt{2}-1]$
(B) $4\pi r^2 T\left[2-2^{2/3}\right]$
(C) $4\pi r^2 T\left[2-2^{1/3}\right]$
(D) $4\pi r^2 T[1+\sqrt{2}]$

Answer: (B) $4\pi r^2 T\left[2-2^{2/3}\right]$ · Key from source paper

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Q30 JEE Main 2025 · 29 Jan · Shift 1 Numerical

In a hydraulic lift, the surface area of the input piston is 6 cm^2 and that of the output piston is 1500 cm^2. If 100 N force is applied to the input piston to raise the output piston by 20 cm, then the work done is _____ kJ.

Numerical value type: the answer is a number.

Answer: 5. · Key from source paper

Q31 JEE Main 2025 · 28 Jan · Shift 1 MCQ

In the experiment for measurement of viscosity ' η ' of given liquid with a ball having radius R, consider following statements. A. Graph between terminal velocity V and R will be a parabola. B. The terminal velocities of different diameter balls are constant for a given liquid. C. Measurement of terminal velocity is dependent on the temperature. D. This experiment can be utilized to assess the density of a given liquid. E. If balls are dropped with some initial speed, the value of η will change. Choose the correct answer from the options given below:

(A) A, B and E Only
(B) B, D and E Only
(C) A, C and D Only
(D) C, D and E Only

Answer: (C) A, C and D Only · Key from source paper

Q32 JEE Main 2025 · 28 Jan · Shift 1 MCQ

Consider following statements: A. Surface tension arises due to extra energy of the molecules at the interior as compared to the molecules at the surface, of a liquid. B. As the temperature of liquid rises, the coefficient of viscosity increases. C. As the temperature of gas increases, the coefficient of viscosity increases D. The onset of turbulence is determined by Reynold's number. E. In a steady flow two stream lines never intersect. Choose the correct answer from the options given below:

(A) C, D, E Only
(B) A, D, E Only
(C) B, C, D Only
(D) A, B, C Only

Answer: (A) C, D, E Only · Key from source paper

Q33 JEE Main 2025 · 28 Jan · Shift 2 MCQ

A 400 g solid cube having an edge of length 10 cm floats in water. How much volume of the cube is outside the water ? (Given : density of water = $1000\ \mathrm{kg\,m^{-3}}$)

(A) 1400 cm^3
(B) 600 cm^3
(C) 4000 cm^3
(D) 400 cm^3

Answer: (B) 600 cm^3 · Key from source paper

Q34 JEE Main 2025 · 24 Jan · Shift 1 MCQ

The amount of work done to break a big water drop of radius ' R ' into 27 small drops of equal radius is 10 J . The work done required to break the same big drop into 64 small drops of equal radius will be

(A) 15 J
(B) 5 J
(C) 20 J
(D) 10 J

Answer: (A) 15 J · Key from source paper

Q35 JEE Main 2025 · 24 Jan · Shift 1 MCQ

An air bubble of radius 0.1 cm lies at a depth of 20 cm below the free surface of a liquid of density 1000 $\mathrm{kg/m^3}$. If the pressure inside the bubble is 2100 $\mathrm{N/m^2}$ greater than the atmospheric pressure, then the surface tension of the liquid in SI unit is (use g = 10 $\mathrm{m/s^2}$)

(A) 0.1
(B) 0.05
(C) 0.02
(D) 0.25

Answer: (B) 0.05 · Key from source paper

Q36 JEE Main 2025 · 23 Jan · Shift 1 MCQ

Given below are two statements: Statement I: The hot water flows faster than cold water Statement II: Soap water has higher surface tension as compared to fresh water. In the light above statements, choose the correct answer from the options given below

(A) Statement I is true but Statement II is false
(B) Statement I is false but Statement II is true
(C) Both Statement I and Statement II are false
(D) Both Statement I and Statement II are true

Answer: (A) Statement I is true but Statement II is false · Key from source paper

Q37 JEE Main 2025 · 23 Jan · Shift 2 MCQ

Water flows in a horizontal pipe whose one end is closed with a valve. The reading of the pressure gauge attached to the pipe is P_1. The reading of the pressure gauge falls to P_2 when the valve is opened. The speed of water flowing in the pipe is proportional to

(A) $P_1 - P_2$
(B) $(P_1 - P_2)^4$
(C) $(\mathrm{P_1 - P_2})^2$
(D) $\sqrt{\mathrm{P_1 - P_2}}$

Answer: (D) $\sqrt{\mathrm{P_1 - P_2}}$ · Key from source paper

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Q38 JEE Main 2025 · 23 Jan · Shift 2 Numerical

An air bubble of radius 1.0 mm is observed at a depth of 20 cm below the free surface of a liquid having surface tension $0.095\ \mathrm{J/m^2}$ and density $10^3\ \mathrm{kg/m^3}$. The difference between pressure inside the bubble and atmospheric pressure is _____ $\mathrm{N/m^2}$. (Take g = 10 $\mathrm{m/s^2}$)

Numerical value type: the answer is a number.

Answer: 2190. · Key from source paper

Q39 JEE Main 2025 · 22 Jan · Shift 1 Numerical

Two soap bubbles of radius 2 cm and 4 cm , respectively, are in contact with each other. The radius of curvature of the common surface, in cm , is _____ .

Numerical value type: the answer is a number.

Answer: 4. · Key from source paper

Q40 JEE Main 2025 · 22 Jan · Shift 2 MCQ

A small rigid spherical ball of mass M is dropped in a long vertical tube containing glycerine. The velocity of the ball becomes constant after some time. If the density of glycerine is half of the density of the ball, then the viscous force acting on the ball will be (consider g as acceleration due to gravity)

(A) 2 Mg
(B) Mg
(C) $\frac{3}{2}$Mg
(D) $\frac{Mg}{2}$

Answer: (D) $\frac{Mg}{2}$ · Key from source paper

Q41 JEE Main 2025 · 22 Jan · Shift 2 MCQ

see figure

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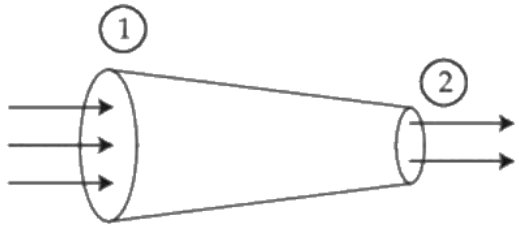
Q41.



A tube of length L is shown in the figure. The radius of cross section at the point (1) is 2 cm and at the point (2) is 1 cm , respectively. If the velocity of water entering at point (1) is 2 m/s, then velocity of water leaving the point (2) will be

(1) 4 m/s
(2) 2 m/s
(3) 6 m/s
(4) 8 m/s

(A) 4 m/s
(B) 2 m/s
(C) 6 m/s
(D) 8 m/s

Answer: (D) 8 m/s · Key from source paper

Q42 JEE Main 2024 · 9 Apr · Shift 1 MCQ

A sphere of relative density σ and diameter D has concentric cavity of diameter d. The ratio of $\frac{D}{d}$, if it just floats on water in a tank is :

(A) $\left(\frac{\sigma-2}{\sigma+2}\right)^{1/3}$
(B) $\left(\frac{\sigma}{\sigma-1}\right)^{1/3}$
(C) $\left(\frac{\sigma-1}{\sigma}\right)^{1/3}$
(D) $\left(\frac{\sigma+1}{\sigma-1}\right)^{1/3}$

Answer: (B) $\left(\frac{\sigma}{\sigma-1}\right)^{1/3}$ · Key from source paper

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Q43 JEE Main 2024 · 9 Apr · Shift 2 MCQ

The excess pressure inside a soap bubble is thrice the excess pressure inside a second soap bubble. The ratio between the volume of the first and the second bubble is:

(A) 1 : 9
(B) 1 : 3
(C) 1 : 27
(D) 1 : 81

Answer: (C) 1 : 27 · Key from source paper

Q44 JEE Main 2024 · 9 Apr · Shift 2 MCQ

A spherical ball of radius 1×10^{-4} m and density 10^5 kg/m^3 falls freely under gravity through a distance h before entering a tank of water, If after entering in water the velocity of the ball does not

change, then the value of h is approximately: (The coefficient of viscosity of water is 9.8×10^{-6} N s/m ^{2})

(A) 2296 m
(B) 2518 m
(C) 2249 m
(D) 2396 m

Answer: (B) 2518 m · Key from source paper

Q45 JEE Main 2024 · 8 Apr · Shift 1 MCQ

Correct Bernoulli's equation is (symbols have their usual meaning) :

(A) $P + mgh + \frac{1}{2}mv^2$ = constant
(B) $P + \rho gh + \frac{1}{2}\rho v^2$ = constant
(C) $P + \rho gh + \rho v^2$ = constant
(D) $P + \frac{1}{2}\rho gh + \frac{1}{2}\rho v^2$ = constant

Answer: (B) $P + \rho gh + \frac{1}{2}\rho v^2$ = constant · Key from source paper

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Q46 JEE Main 2024 · 8 Apr · Shift 1 Numerical

A liquid column of height 0.04 cm balances excess pressure of a soap bubble of certain radius. If density of liquid is $8 \times 10^3\ \mathrm{kg\,m^{-3}}$ and surface tension of soap solution is $0.28\mathrm{Nm^{-1}}$, then diameter of the soap bubble is _____ cm. (if $g = 10\ \mathrm{m\,s^{-2}}$)

Numerical value type: the answer is a number.

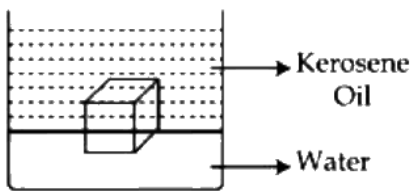
Answer: 7. · Key from source paper

Q47 JEE Main 2024 · 8 Apr · Shift 2 MCQ

A cube of ice floats partly in water and partly in kerosene oil. The ratio of volume of ice immersed in water to that in kerosene oil (specific gravity of Kerosene oil = 0.8, specific gravity of ice = 0.9)

(see the figure above)

Q7. A cube of ice floats partly in water and partly in kerosene oil. The ratio of volume of ice immersed in water to that in kerosene oil (specific gravity of Kerosene oil $= 0.8$, specific gravity of ice $= 0.9$)



(1) 1 : 1
(2) 5 : 4
(3) 8 : 9
(4) 9 : 10

(A) 1 : 1
(B) 5 : 4
(C) 8 : 9
(D) 9 : 10

Answer: (A) 1 : 1 · Key from source paper

Q48 JEE Main 2024 · 8 Apr · Shift 2 Numerical

Small water droplets of radius 0.01 mm are formed in the upper atmosphere and falling with a terminal velocity of 10 cm/s. Due to condensation, if 8 such droplets are coalesced and formed a larger drop, the new terminal velocity will be _____ cm/s.

Numerical value type: the answer is a number.

Answer: 40. · Key from source paper

Q49 JEE Main 2024 · 6 Apr · Shift 1 MCQ

A small ball of mass m and density ρ is dropped in a viscous liquid of density ρ_0. After sometime, the ball falls with constant velocity. The viscous force on the ball is :

(A) $mg\left(1-\rho\rho_0\right)$
(B) $mg\left(1+\frac{\rho}{\rho_0}\right)$
(C) $mg\left(\frac{\rho_0}{\rho}-1\right)$
(D) $mg\left(1-\frac{\rho_0}{\rho}\right)$

Answer: (D) $mg\left(1-\frac{\rho_0}{\rho}\right)$ · Key from source paper

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Q50 JEE Main 2024 · 6 Apr · Shift 1 Numerical

A big drop is formed by coalescing 1000 small droplets of water. The ratio of surface energy of 1000 droplets to that of energy of big drop is $\frac{10}{x}$. The value of x is _____

Numerical value type: the answer is a number.

Answer: 1. · Key from source paper

Q51 JEE Main 2024 · 6 Apr · Shift 2 MCQ

Pressure inside a soap bubble is greater than the pressure outside by an amount : (given : R = Radius of bubble S = Surface tension of bubble)

(A) $\frac{2S}{R}$
(B) $\frac{4R}{S}$
(C) $\frac{S}{R}$
(D) $\frac{4S}{R}$

Answer: (D) $\frac{4S}{R}$ · Key from source paper

Q52 JEE Main 2024 · 5 Apr · Shift 1 MCQ

Given below are two statements : Statement I : When a capillary tube is dipped into a liquid, the liquid neither rises nor falls in the capillary. The contact angle may be 0°. Statement II : The contact angle between a solid and a liquid is a property of the material of the solid and liquid as well. In the light of the above statement, choose the correct answer from the options given below.

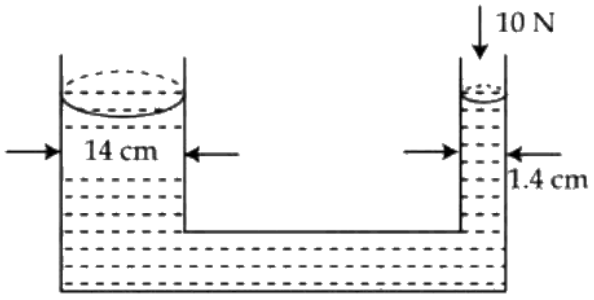
(A) Both Statement I and Statement II are false
(B) Both Statement I and Statement II are true
(C) Statement I is false but Statement II is true
(D) Statement I is true and Statement II is false

Answer: (C) Statement I is false but Statement II is true · Key from source paper

Q53 JEE Main 2024 · 5 Apr · Shift 2 Numerical

see figure

Q23.



A hydraulic press containing water has two arms with diameters as mentioned in the figure. A force of 10 N is applied on the surface of water in the thinner arm. The force required to be applied on the surface of water in the thicker arm to maintain equilibrium of water is _____N.

Numerical value type: the answer is a number.

Answer: 1000. · Key from source paper

Q54 JEE Main 2024 · 4 Apr · Shift 1 MCQ

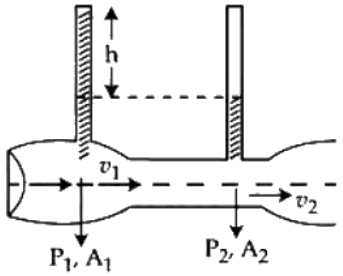
Given below are two statements: Statement I : When speed of liquid is zero everywhere, pressure difference at any two points depends on equation $P_1 - P_2 = \rho g\,(h_2 - h_1)$. Statement II : In ventury tube shown

(see the figure above)

$2gh = v_1^2 - v_2^2$

In the light of the above statements, choose the most appropriate answer from the options given below.

Q8. Given below are two statements: Statement I : When speed of liquid is zero everywhere, pressure difference at any two points depends on equation $P_1 - P_2 = \rho g(h_2 - h_1)$. Statement II : In ventury tube shown



$2gh = v_1^2 - v_2^2$

In the light of the above statements, choose the most appropriate answer from the options given below.

(1) Both Statement I and Statement II are correct.

(2) Statement I is correct but Statement II is incorrect.

(3) Statement I is incorrect but Statement II is correct.

(4) Both Statement I and Statement II are incorrect.

(A) Both Statement I and Statement II are correct.

(B) Statement I is correct but Statement II is incorrect.

(C) Statement I is incorrect but Statement II is correct.

(D) Both Statement I and Statement II are incorrect.

Answer: (B) Statement I is correct but Statement II is incorrect. · Key from source paper

Q55 JEE Main 2024 · 4 Apr · Shift 1 Numerical

A soap bubble is blown to a diameter of 7 cm.36960erg of work is done in blowing it further. If surface tension of soap solution is 40dyne/cm then the new radius is _____ cm Take ($\pi = \frac{22}{7}$)

Numerical value type: the answer is a number.

Answer: 7. · Key from source paper

Q56 JEE Main 2024 · 4 Apr · Shift 2 MCQ

Given below are two statements : Statement I : The contact angle between a solid and a liquid is a property of the material of the solid and liquid as well. Statement II : The rise of a liquid in a capillary tube does not depend on the inner radius of the tube. In the light of the above statements, choose the correct answer from the options given below:

(A) Statement I is true but Statement II is false.
(B) Statement I is false but Statement II is true.
(C) Both Statement I and Statement II are false.
(D) Both Statement I and Statement II are true.

Answer: (A) Statement I is true but Statement II is false. · Key from source paper

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Q57 JEE Main 2024 · 4 Apr · Shift 2 Numerical

Mercury is filled in a tube of radius 2 cm up to a height of 30 cm. The force exerted by mercury on the bottom of the tube is _____ N. (Given, atmospheric pressure = $10^5\ \mathrm{Nm}^{-2}$, density of mercury = 1.36×10^4 kg m^{-3}, g = 10 m s^{-2}, $\pi = \frac{22}{7}$)

Numerical value type: the answer is a number.

Answer: 177. · Key from source paper

Q58 JEE Main 2024 · 1 Feb · Shift 1 Numerical

A plane is in level flight at constant speed and each of its two wings has an area of 40 m^2. If the speed of the air is 180 $\mathrm{km\ h}^{-1}$ over the lower wing surface and 252 $\mathrm{km\ h}^{-1}$ over the upper wing surface, the mass of the plane is _____ kg. (Take air density to be 1 $\mathrm{kg\ m}^{-3}$ and $g = 10\ \mathrm{m\ s}^{-2}$)

Numerical value type: the answer is a number.

Answer: 9600. · Key from source paper

Q59 JEE Main 2024 · 1 Feb · Shift 2 MCQ

A big drop is formed by coalescing 1000 small droplets of water. The surface energy will become :

(A) 100 times
(B) 10 times
(C) $\frac{1}{100}$th
(D) $\frac{1}{10}$th

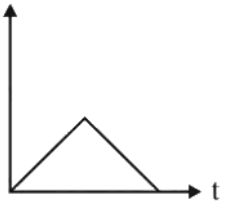
Answer: (D) $\frac{1}{10}$th · Key from source paper

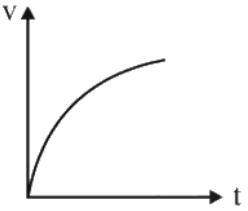
Q60 JEE Main 2024 · 31 Jan · Shift 1 MCQ

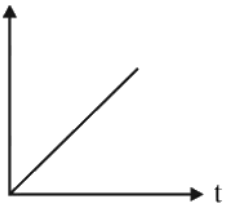
A small steel ball is dropped into a long cylinder containing glycerine. Which one of the following is the correct representation of the velocity time graph for the transit of the ball?

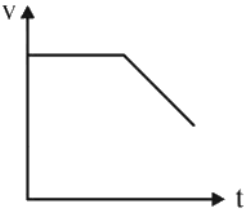
(see the figure above)

Q4. A small steel ball is dropped into a long cylinder containing glycerine. Which one of the following is the correct representation of the velocity time graph for the transit of the ball?

(1) 

(2) 

(3) 

(4) 

(A) *see figure*
(B) *see figure*
(C) *see figure*
(D) *see figure*

Answer: (B) · Key from source paper

Q61 JEE Main 2024 · 31 Jan · Shift 2 MCQ

A small spherical ball of radius r, falling through a viscous medium of negligible density has terminal velocity v. Another ball of the same mass but of radius $2r$, falling through the same viscous medium will have terminal velocity:

(A) $\frac{v}{2}$
(B) $\frac{v}{4}$
(C) $4v$
(D) $2v$

Answer: (A) $\frac{v}{2}$ · Key from source paper

Q62 JEE Main 2024 · 30 Jan · Shift 2 Numerical

A big drop is formed by coalescing 1000 small identical drops of water. If E_1 be the total surface energy of 1000 small drops of water and E_2 be the surface energy of single big drop of water, the $E_1 : E_2$ is $x : 1$, where x = _____.

Numerical value type: the answer is a number.

Answer: 10. · Key from source paper

Q63 JEE Main 2024 · 29 Jan · Shift 1 MCQ

Given below are two statements:

Statement I : If a capillary tube is immersed first in cold water and then in hot water, the height of capillary rise will be smaller in hot water.

Statement II : If a capillary tube is immersed first in cold water and then in hot water, the height of capillary rise will be smaller in cold water.

In the light of the above statements, choose the most appropriate from the options given below

(A) Both Statement I and Statement II are true
(B) Both Statement I and Statement II are false
(C) Statement I is true but Statement II is false
(D) Statement I is false but Statement II is true

Answer: (C) Statement I is true but Statement II is false · Key from source paper

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Q64 JEE Main 2024 · 29 Jan · Shift 1 Numerical

In a test experiment on a model aeroplane in wind tunnel, the flow speeds on the upper and lower surfaces of the wings are 70 m s^{-1} and 65 m s^{-1} respectively. If the wing area is 2 m^2, the lift of the wing is _____ N. (Given density of air = 1.2 kg m^{-3})

Numerical value type: the answer is a number.

Answer: 810. · Key from source paper

Q65 JEE Main 2024 · 29 Jan · Shift 2 MCQ

A small liquid drop of radius R is divided into 27 identical liquid drops. If the surface tension is T, then the work done in the process will be :

(A) $8\pi R^2 T$
(B) $3\pi R^2 T$
(C) $\frac{1}{8}\pi R^2 T$
(D) $4\pi R^2 T$

Answer: (A) $8\pi R^2 T$ · Key from source paper

Q66 JEE Main 2024 · 27 Jan · Shift 1 MCQ

Given below are two statements :

Statement (I) : Viscosity of gases is greater than that of liquids.

Statement (II) : Surface tension of a liquid decreases due to the presence of insoluble impurities.

In the light of the above statements, choose the most appropriate answer from the options given below :

(A) Statement I is correct but statement II is incorrect
(B) Statement I is incorrect but Statement II is correct
(C) Both Statement I and Statement II are incorrect
(D) Both Statement I and Statement II are correct

Answer: (B) Statement I is incorrect but Statement II is correct · Key from source paper

Q67 JEE Main 2024 · 27 Jan · Shift 2 Numerical

The reading of pressure metre attached with a closed pipe is 4.5×10^4 N m^{-2}. On opening the valve, water starts flowing and the reading of pressure metre falls to 2.0×10^4 N m^{-2}. The velocity of water is found to be $\sqrt{V}$ m s^{-1}. The value of V is _____.

Numerical value type: the answer is a number.

Answer: 50. · Key from source paper

Q68 JEE Main 2023 · 15 Apr · Shift 1 Numerical

There is an air bubble of radius 1.0 mm in a liquid of surface tension 0.075 N m^{-1} and density 1000 kg m^{-3} at a depth of 10 cm below the free surface. The amount by which the pressure inside the bubble is greater than the atmospheric pressure is _____ $Pa (g$ = 10 m s$^{-2})$.

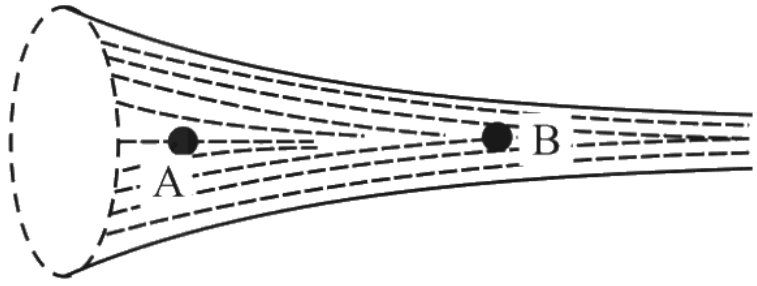
Numerical value type: the answer is a number.

Answer: 1150. · Key from source paper

Q69 JEE Main 2023 · 13 Apr · Shift 1 MCQ

see figure

Q11.



The figure shows a liquid of given density flowing steadily in horizontal tube of varying cross-section. Cross-sectional areas at A is 1.5 cm^2, and B is 25 mm^2, if the speed of liquid at B is 60 cm s^{-1} then $(P_A – P_B)$ is
(Given P_A and P_B are liquid pressures at A and B points.
Density $\rho = 1000$ kg m^{-3}
A and B are on the axis of tube)

(1) 135 Pa
(2) 27 Pa
(3) 175 Pa
(4) 36 Pa

(A) 135 Pa
(B) 27 Pa
(C) 175 Pa
(D) 36 Pa

Answer: (C) 175 Pa · Key from source paper

Q70 JEE Main 2023 · 13 Apr · Shift 2 MCQ

Given below are two statements: one is labelled as Assertion A and the other is labelled as Reason R
Assertion A : A spherical body of radius (5 ± 0.1) mm having a particular density is falling through a liquid of constant density. The percentage error in the calculation of its terminal velocity is 4%.
Reason R : The terminal velocity of the spherical body falling through the liquid is inversely proportional to its radius. In the light of the above statements, choose the correct answer from the options given below

(A) Both A and R are true and R is the correct explanation of A
(B) Both A and R are true but R is NOT the correct explanation of A
(C) A is true but R is false
(D) A is false but R is true

Answer: (C) A is true but R is false · Key from source paper

Q71 JEE Main 2023 · 12 Apr · Shift 1 Numerical

Glycerin of density $1.25 \times 10^3\ \mathrm{kg\ m^{-3}}$ is flowing through the conical section of pipe. The area of cross-section of the pipe at its ends are $10\ \mathrm{cm^2}$ and $5\ \mathrm{cm^2}$ and pressure drop across its length is $3\ \mathrm{N\ m^{-2}}$. The rate of flow of glycerin through the pipe is $x \times 10^{-5}\ \mathrm{m^3\ s^{-1}}$. The value of x is _____.

Numerical value type: the answer is a number.

Answer: 4. · Key from source paper

Q72 JEE Main 2023 · 11 Apr · Shift 2 MCQ

Eight equal drops of water are falling through air with a steady speed of $10\ \mathrm{cm\ s^{-1}}$. If the drops coalesce, the new velocity is:-

(A) $16\ \mathrm{cm\ s^{-1}}$
(B) $40\ \mathrm{cm\ s^{-1}}$
(C) $5\ \mathrm{cm\ s^{-1}}$
(D) $10\ \mathrm{cm\ s^{-1}}$

Answer: (B) $40\ \mathrm{cm\ s^{-1}}$ · Key from source paper

Q73 JEE Main 2023 · 11 Apr · Shift 2 Numerical

The surface tension of soap solution is $3.5 \times 10^{-2}\ \mathrm{N\ m^{-1}}$. The amount of work done required to increase the radius of soap bubble from 10 cm to 20 cm is _____ $\times 10^{-4}$ J. (take $\pi = \frac{22}{7}$)

Numerical value type: the answer is a number.

Answer: 264. · Key from source paper

Q74 JEE Main 2023 · 10 Apr · Shift 1 MCQ

Given below are two statements:
Statement I: Pressure in a reservoir of water is same at all points at the same level of water.
Statement II: The pressure applied to enclosed water is transmitted in all directions equally.
In the light of the above statements, choose the correct answer from the options given below:

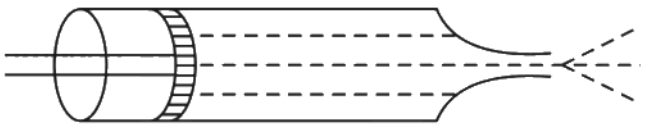
(A) Both Statement I and Statement II are false
(B) Statement I is true but Statement II is false
(C) Statement I is false but Statement II is true
(D) Both Statement I and Statement II are true

Answer: (D) Both Statement I and Statement II are true · Key from source paper

Q75 JEE Main 2023 · 10 Apr · Shift 2 Numerical

Figure below shows a liquid being pushed out of the tube by a piston having area of cross section $2.0\ \mathrm{cm^2}$. The area of cross section at the outlet is $10\ \mathrm{mm^2}$. If the piston is pushed at a speed of $4\ \mathrm{cm\,s^{-1}}$, the speed of outgoing fluid is _____ $\mathrm{cm\,s^{-1}}$
(see the figure above)

Q23. Figure below shows a liquid being pushed out of the tube by a piston having area of cross section 2.0 $\mathrm{cm^2}$. The area of cross section at the outlet is 10 $\mathrm{mm^2}$. If the piston is pushed at a speed of 4 $\mathrm{cm\ s^{-1}}$, the speed of outgoing fluid is _____ $\mathrm{cm\ s^{-1}}$



Numerical value type: the answer is a number.

Answer: 80. · Key from source paper

Q76 JEE Main 2023 · 8 Apr · Shift 1 Numerical

An air bubble of diameter 6 mm rises steadily through a solution of density $1750\ \mathrm{kg\,m^{-3}}$ at the rate of $0.35\ \mathrm{cm\,s^{-1}}$. The co-efficient of viscosity of the solution (neglect density of air) is _____ Pas (given, $\mathrm{g} = 10\ \mathrm{m\,s^{-2}}$).

Numerical value type: the answer is a number.

Answer: 10. · Key from source paper

Q77 JEE Main 2023 · 8 Apr · Shift 2 MCQ

A hydraulic automobile lift is designed to lift vehicles of mass $5000\ \mathrm{kg}$. The area of cross section of the cylinder carrying load is $250\ \mathrm{cm}^2$. The maximum pressure the smaller piston would have to bear is [Assume $g = 10\ \mathrm{m\,s^{-2}}$]

(A) $20 \times 10^6\ \mathrm{Pa}$
(B) $2 \times 10^5\ \mathrm{Pa}$
(C) $200 \times 10^6\ \mathrm{Pa}$
(D) $2 \times 10^6\ \mathrm{Pa}$

Answer: (D) $2 \times 10^6\ \mathrm{Pa}$ · Key from source paper

Q78 JEE Main 2023 · 6 Apr · Shift 1 MCQ

A small ball of mass M and density ρ is dropped in a viscous liquid of density ρ_0. After some time, the ball falls with a constant velocity. What is the viscous force on the ball?

(A) $F = Mg\left(1 + \frac{\rho_0}{\rho}\right)$
(B) $F = Mg\left(1 + \frac{\rho}{\rho_0}\right)$
(C) $F = Mg\left(1 - \frac{\rho_0}{\rho}\right)$
(D) $F = Mg\left(1 \pm \rho\rho_0\right)$

Answer: (C) $F = Mg\left(1 - \frac{\rho_0}{\rho}\right)$ · Key from source paper

Q79 JEE Main 2023 · 6 Apr · Shift 2 MCQ

Given below are two statements: one is labelled as **Assertion A** and the other is labelled as **Reason R**

Assertion A: When you squeeze one end of a tube to get toothpaste out from the other end, Pascal's principle is observed.

Reason R: A change in the pressure applied to an enclosed incompressible fluid is transmitted undiminished to every portion of the fluid and to the walls of its container.

In the light of the above statements, choose the most appropriate answer from the options given below.

(A) Both A and R are correct but R is NOT the correct explanation of A
(B) A is not correct but R is correct
(C) A is correct but R is not correct
(D) Both A and R is correct and R is the correct explanation of A

Answer: (D) Both A and R is correct and R is the correct explanation of A · Key from source paper

Q80 JEE Main 2023 · 1 Feb · Shift 1 MCQ

A mercury drop of radius 10^{-3} m is broken into 125 equal size droplets. Surface tension of mercury is 0.45 $\mathrm{N\ m^{-1}}$. The gain in surface energy is:

(A) 2.26×10^{-5} J
(B) 28×10^{-5} J
(C) 17.5×10^{-5} J
(D) 5×10^{-5} J

Answer: (A) 2.26×10^{-5} J · Key from source paper

Q81 JEE Main 2023 · 1 Feb · Shift 2 Numerical

The surface of water in a water tank of cross section area 750 $\mathrm{cm^2}$ on the top of a house is h m. above the tap level. The speed of water coming out through the tap of cross section area 500 $\mathrm{mm^2}$ is 30 $\mathrm{cm\ s^{-1}}$. At that instant, $\frac{dh}{dt}$ is $x \times 10^{-3}$ $\mathrm{m\ s^{-1}}$. The value of x will be _____.

Numerical value type: the answer is a number.

Answer: 2. · Key from source paper

Q82 JEE Main 2023 · 31 Jan · Shift 1 MCQ

If 1000 droplets of water of surface tension 0.07 $\mathrm{N\ m^{-1}}$. having same radius 1 mm each, combine to from a single drop. In the process the released surface energy is-
Take $\pi = \frac{22}{7}$

(A) 7.92×10^{-6} J
(B) 7.92×10^{-4} J
(C) 9.68×10^{-4} J
(D) 8.8×10^{-5}J

Answer: (B) 7.92×10^{-4} J · Key from source paper

Q83 JEE Main 2023 · 30 Jan · Shift 1 MCQ

The height of liquid column raised in a capillary tube of certain radius when dipped in liquid A vertically is, 5 cm. If the tube is dipped in a similar manner in another liquid B of surface tension and density double the values of liquid A, the height of liquid column raised in liquid B would be _____ m.

(A) 0.20
(B) 0.5
(C) 0.05
(D) 0.10

Answer: (C) 0.05 · Key from source paper

Q84 JEE Main 2023 · 29 Jan · Shift 1 MCQ

Surface tension of a soap bubble is $2.0 \times 10^{-2}\ \mathrm{N\,m^{-1}}$. Work done to increase the radius of soap bubble from $3.5\ \mathrm{cm}$ to $7\ \mathrm{cm}$ will be : [Take $\pi = \frac{22}{7}$]

(A) $0.72 \times 10^{-4}\ \mathrm{J}$
(B) $5.76 \times 10^{-4}\ \mathrm{J}$
(C) $18.48 \times 10^{-4}\ \mathrm{J}$
(D) $9.24 \times 10^{-4}\ \mathrm{J}$

Answer: (C) $18.48 \times 10^{-4}\ \mathrm{J}$ · Key from source paper

Q85 JEE Main 2023 · 29 Jan · Shift 2 MCQ

A fully loaded boeing aircraft has a mass of 5.4×10^5 kg. Its total wing area is $500\ \mathrm{m^2}$. It is in level flight with a speed of $1080\ \mathrm{km\,h^{-1}}$. If the density of air ρ is $1.2\ \mathrm{kg\,m^{-3}}$, the fractional increase in the speed of the air on the upper surface of the wing relative to the lower surface in percentage will be ($g = 10\ \mathrm{m\,s^{-2}}$)

(A) 16
(B) 6
(C) 8
(D) 10

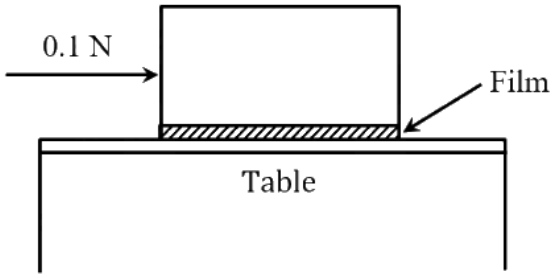
Answer: (D) 10 · Key from source paper

Q86 JEE Main 2023 · 29 Jan · Shift 2 Numerical

A metal block of base area $0.20\ \mathrm{m^2}$ is placed on a table, as shown in figure. A liquid film of thickness $0.25\ \mathrm{mm}$ is inserted between the block and the table. The block is pushed by a horizontal force of $0.1\ \mathrm{N}$ and moves with a constant speed. If the viscosity of the liquid is 5.0×10^{-3} Pl, the speed of block is _____ $\times 10^{-3}\ \mathrm{m\,s^{-1}}$.

(see the figure above)

Q11. A metal block of base area $0.20\ \mathrm{m^2}$ is placed on a table, as shown in figure. A liquid film of thickness $0.25\ \mathrm{mm}$ is inserted between the block and the table. The block is pushed by a horizontal force of $0.1\ \mathrm{N}$ and moves with a constant speed. If the viscosity of the liquid is 5.0×10^{-3} Pl, the speed of block is _____ $\times 10^{-3}\ \mathrm{m\,s^{-1}}$.



Numerical value type: the answer is a number.

Answer: 25. · Key from source paper

Q87 JEE Main 2023 · 25 Jan · Shift 2 Numerical

A spherical drop of liquid splits into 1000 identical spherical drops. If u_i is the surface energy of the original drop and u_f is the total surface energy of the resulting drops, the (ignoring evaporation), $\frac{u_f}{u_i} = \left(\frac{10}{x}\right)$. Then value of x is _____:

Numerical value type: the answer is a number.

Answer: 1. · Key from source paper

Q88 JEE Main 2023 · 24 Jan · Shift 2 Numerical

A spherical ball of radius 1 mm and density $10.5\ \mathrm{g\,cc^{-1}}$ is dropped in glycerine of coefficient of viscosity 9.8 poise and density $1.5\ \mathrm{g\,cc^{-1}}$. Viscous force on the ball when it attains constant velocity is 3696×10^{-x} N. The value of x is

(Given, $g = 9.8\ \mathrm{m\,s^{-2}}$ and $\pi = \frac{22}{7}$)

Numerical value type: the answer is a number.

Answer: 7. · Key from source paper

Q89 JEE Main 2022 · 29 Jul · Shift 1 MCQ

Given below are two statements: One is labelled as Assertion (A) and the other is labelled as Reason (R).
Assertion (A): Clothes containing oil or grease stains cannot be cleaned by water wash.
Reason (R) : Because the angle of contact between the oil/ grease and water is obtuse. In the light of the above statements, choose the correct answer from the option given below.

(A) Both (A) and (R) are true and (R) is the correct explanation of (A)
(B) Both (A) and (R) are true but (R) is not the correct explanation of (A)
(C) (A) is true but (R) is false
(D) (A) is true but (R) is true

Answer: (A) Both (A) and (R) are true and (R) is the correct explanation of (A) · Key from source paper

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Q90 JEE Main 2022 · 29 Jul · Shift 2 Numerical

The velocity of a small ball of mass 0.3 g and density 8 $\mathrm{g\,cc^{-1}}$ when dropped in a container filled with glycerine becomes constant after some time. If the density of glycerine is 1.3 $\mathrm{g\,cc^{-1}}$, then the value of viscous force acting on the ball will be $x \times 10^{-4}$ N, the value of x is _____. [use $g = 10\ \mathrm{m\,s^{-2}}$]

Numerical value type: the answer is a number.

Answer: 25. · Key from source paper

Q91 JEE Main 2022 · 28 Jul · Shift 1 Numerical

The diameter of an air bubble which was initially $2\ \text{mm}$, rises steadily through a solution of density $1750\ \text{kg/m}^3$ at the rate of $0.35\ \text{cm/s}$. Coefficient of viscosity of the solution is _____ (Assume mass of the bubble to be negligible) (Answer in Poise to the nearest integer)

Numerical value type: the answer is a number.

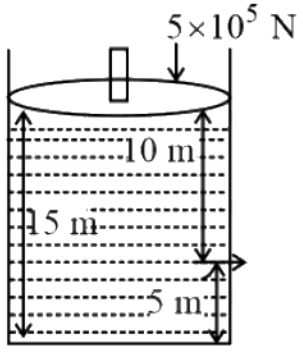
Answer: 11. · Key from source paper

Q92 JEE Main 2022 · 28 Jul · Shift 2 MCQ

Consider a cylindrical tank of radius $1\ \text{m}$ is filled with water. The top surface of water is at $15\ \text{m}$ from the bottom of the cylinder. There is a hole on the wall of cylinder at a height of $5\ \text{m}$ from the bottom. A force of $5 \times 10^5\ \text{N}$ is applied on the top surface of water using a piston. The speed of efflux from the hole will be :
(given atmospheric pressure $P_A = 1.01 \times 10^5\ Pa$, density of water $\rho_w = 1000\ \text{kg m}^{-3}$ and gravitational acceleration $g = 10\ \text{m s}^{-2}$)

(see the figure above)

Q7. Consider a cylindrical tank of radius 1 m is filled with water. The top surface of water is at 15 m from the bottom of the cylinder. There is a hole on the wall of cylinder at a height of 5 m from the bottom. A force of 5×10^5 N is applied an the top surface of water using a piston. The speed of efflux from the hole will be :
(given atmospheric pressure $P_A = 1.01 \times 10^5\ Pa$, density of water $\rho_w = 1000$ kg m^{-3} and gravitational acceleration $g = 10\ \text{m s}^{-2}$)



(1) $11.6\ \text{m s}^{-1}$
(2) $10.8\ \text{m s}^{-1}$
(3) $17.8\ \text{m s}^{-1}$
(4) $14.4\ \text{m s}^{-1}$

(A) $11.6\ \text{m s}^{-1}$
(B) $10.8\ \text{m s}^{-1}$
(C) $17.8\ \text{m s}^{-1}$
(D) $14.4\ \text{m s}^{-1}$

Answer: (C) $17.8\ \text{m s}^{-1}$ · Key from source paper

Q93 JEE Main 2022 · 27 Jul · Shift 1 MCQ

Two cylindrical vessels of equal cross-sectional area 16 cm^2 contain water upto heights 100 cm and 150 cm respectively. The vessels are interconnected so that the water levels in them become equal.

The work done by the force of gravity during the process, is [Take density of water = $10^3\ \mathrm{kg\ m^{-3}}$ and g = 10 $\mathrm{ms^{-2}}$]

(A) 0.25 J
(B) 1 J
(C) 8 J
(D) 12 J

Answer: (B) 1 J · Key from source paper

Q94 JEE Main 2022 · 27 Jul · Shift 2 Numerical

A spherical soap bubble of radius 3 cm is formed inside another spherical soap bubble of radius 6 cm. If internal pressure of the smaller bubble of radius 3 cm in the above system is equal to the internal pressure of the another single soap bubble of radius r cm. The value of r is _____

Numerical value type: the answer is a number.

Answer: 2. · Key from source paper

Q95 JEE Main 2022 · 26 Jul · Shift 1 MCQ

A water drop of radius 1 cm is broken into 729 equal droplets. If surface tension of water is 75 dyne $\mathrm{cm^{-1}}$, then the gain in surface energy upto first decimal place will be
[Given π = 3.14]

(A) 8.5×10^{-4} J
(B) 8.2×10^{-4} J
(C) 7.5×10^{-4} J
(D) 5.3×10^{-4} J

Answer: (C) 7.5×10^{-4} **J** · Key from source paper

Q96 JEE Main 2022 · 25 Jul · Shift 2 MCQ

A drop of liquid of density ρ is floating half immersed in a liquid of density σ and surface tension $7.5 \times 10^{-4}\ \mathrm{N\,cm^{-1}}$. The radius of drop in cm will be : (Take : $g = 10\ \mathrm{ms^{-2}}$)

(A) $\frac{15}{\sqrt{2\rho-\sigma}}$
(B) $\frac{15}{\sqrt{\rho-\sigma}}$
(C) $\frac{3}{2\sqrt{\rho-\sigma}}$
(D) $\frac{3}{20\sqrt{2\rho-\sigma}}$

Answer: (A) $\frac{15}{\sqrt{2\rho-\sigma}}$ · Key from source paper

Q97 JEE Main 2022 · 29 Jun · Shift 2 Numerical

A small spherical ball of radius $0.1\ \text{mm}$ and density $10^4\ \text{kg m}^{-3}$ falls freely under gravity through a distance h before entering a tank of water. If, after entering the water the velocity of ball does not change and it continue to fall with same constant velocity inside water, then the value of h will be _____ m. (Given $g = 10\ \text{m s}^{-2}$, viscosity of water $= 1.0 \times 10^{-5}\ \text{N-s m}^{-2}$).

Numerical value type: the answer is a number.

Answer: 20. · Key from source paper

Q98 JEE Main 2022 · 28 Jun · Shift 1 MCQ

A water drop of diameter $2\ \text{cm}$ is broken into 64 equal droplets. The surface tension of water is $0.075\ \text{N m}^{-1}$. In this process the gain in surface energy will be

(A) $2.8 \times 10^{-4}\ \text{J}$
(B) $1.5 \times 10^{-3}\ \text{J}$
(C) $1.9 \times 10^{-4}\ \text{J}$
(D) $9.4 \times 10^{-5}\ \text{J}$

Answer: (A) $2.8 \times 10^{-4}\ \text{J}$ · Key from source paper

Q99 JEE Main 2022 · 28 Jun · Shift 2 MCQ

A water drop of radius $1\mu\text{m}$ falls in a situation where the effect of buoyant force is negligible. Co-efficient of viscosity of air is $1.8 \times 10^{-5}\ \text{N s m}^{-2}$ and its density is negligible as compared to that of water $10^6\ \text{g m}^{-3}$. Terminal velocity of the water drop is
(Take acceleration due to gravity $= 10\ \text{m s}^{-2}$)

(A) $145.4 \times 10^{-6}\ \text{m s}^{-1}$
(B) $123.4 \times 10^{-6}\ \text{m s}^{-1}$
(C) $118.0 \times 10^{-6}\ \text{m s}^{-1}$
(D) $132.6 \times 10^{-6}\ \text{m s}^{-1}$

Answer: (B) $123.4 \times 10^{-6}\ \text{m s}^{-1}$ · Key from source paper

Q100 JEE Main 2022 · 28 Jun · Shift 2 Numerical

A liquid of density $750\ \text{kg m}^{-3}$ flows smoothly through a horizontal pipe that tapers in cross-sectional area from $A_1 = 1.2 \times 10^{-2}\ \text{m}^2$ to $A_2 = \frac{A_1}{2}$. The pressure difference between the wide and narrow sections of the pipe is $4500\ \text{Pa}$. The rate of flow of liquid is _____ $\times 10^{-3}\ \text{m}^3\ \text{s}^{-1}$.

Numerical value type: the answer is a number.

Answer: 24. · Key from source paper

Q101 JEE Main 2022 · 27 Jun · Shift 1 MCQ

The velocity of a small ball of mass m and density d_1, when dropped in a container filled with glycerine, becomes constant after some time. If the density of glycerine is d_2, then the viscous force acting on the ball, will be

(A) $mg\left(1-\frac{d_1}{d_2}\right)$

(B) $mg\left(1-\frac{d_2}{d_1}\right)$

(C) $mg\left(\frac{d_1}{d_2}-1\right)$

(D) $mg\left(\frac{d_2}{d_1}-1\right)$

Answer: (B) $mg\left(1-\frac{d_2}{d_1}\right)$ · Key from source paper

Q102 JEE Main 2022 · 27 Jun · Shift 1 Numerical

The area of cross-section of a large tank is $0.5\ \mathrm{m}^2$. It has a narrow opening near the bottom having area of cross-section $1\ \mathrm{cm}^2$. A load of $25\ \mathrm{kg}$ is applied on the water at the top in the tank. Neglecting the speed of water in the tank, the velocity of the water, coming out of the opening at the time when the height of water level in the tank is $40\ \mathrm{cm}$ above the bottom, will be _____ $\mathrm{cm\ s^{-1}}$.
[Take $g = 10\ \mathrm{m\ s^{-2}}$]

Numerical value type: the answer is a number.

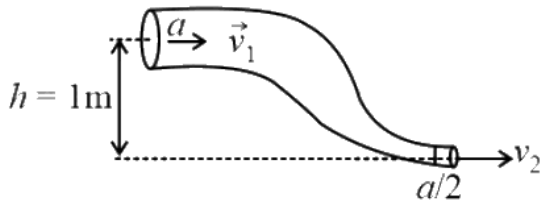
Answer: 300. · Key from source paper

Q103 JEE Main 2022 · 26 Jun · Shift 1 Numerical

An ideal fluid of density $800\ \mathrm{kg\ m^{-3}}$, flows smoothly through a bent pipe (as shown in figure) that tapers in cross-sectional area from a to $\frac{a}{2}$. The pressure difference between the wide and narrow sections of pipe is $4100\ \mathrm{Pa}$. At wider section, the velocity of fluid is $\frac{\sqrt{x}}{6}\ \mathrm{m\ s^{-1}}$ for $x =$ _____ . (Given $g = 10\ \mathrm{m\ s^{-2}}$)

(see the figure above)

Q25. An ideal fluid of density $800\ \mathrm{kg\ m^{-3}}$, flows smoothly through a bent pipe (as shown in figure) that tapers in cross-sectional area from a to $\frac{a}{2}$. The pressure difference between the wide and narrow sections of pipe is $4100\ \mathrm{Pa}$. At wider section, the velocity of fluid is $\frac{\sqrt{x}}{6}\ \mathrm{m\ s^{-1}}$ for $x =$_____ . (Given $g = 10\ \mathrm{m\ s^{-2}}$)



Numerical value type: the answer is a number.

Answer: 363. · Key from source paper

Q104 JEE Main 2022 · 26 Jun · Shift 2 MCQ

If p is the density and η is coefficient of viscosity of fluid which flows with a speed v in the pipe of diameter d, the correct formula for Reynolds number R_e is

(A) $R_e = \frac{\pi d}{\rho v}$
(B) $R_e = \frac{\rho v}{\eta d}$
(C) $R_e = \frac{\rho v d}{\eta}$
(D) $R_e = \frac{\eta}{\rho v d}$

Answer: (C) $R_e = \frac{\rho v d}{\eta}$ · Key from source paper

Q105 JEE Main 2022 · 25 Jun · Shift 1 MCQ

The terminal velocity v_t of the spherical rain drop depends on the radius r of the spherical rain drop as

(A) r
(B) r^2
(C) $\frac{1}{r}$
(D) $\frac{1}{r^2}$

Answer: (B) r^2 · Key from source paper

Q106 JEE Main 2022 · 25 Jun · Shift 1 Numerical

The velocity of upper layer of water in a river is $36\ \mathrm{km\ h^{-1}}$. Shearing stress between horizontal layers of water is $10^{-3}\ \mathrm{N\ m^{-2}}$. Depth of the river is _____ m. (Co-efficient of viscosity of water is $10^{-2}\ \mathrm{Pa\ s}$)

Numerical value type: the answer is a number.

Answer: 100. · Key from source paper

Q107 JEE Main 2021 · 27 Aug · Shift 1 MCQ

In Millikan's oil drop experiment, what is viscous force acting on an uncharged drop of radius 2.0×10^{-5} m and density 1.2×10^3 kg m^{-3}? Take viscosity of liquid $= 1.8 \times 10^{-5}$ N s m^{-2}. (Neglect buoyancy due to air).

(A) 5.8×10^{-10} N
(B) 3.9×10^{-10} N
(C) 1.8×10^{-10} N
(D) 3.8×10^{-11} N

Answer: (B) 3.9×10^{-10} N · Key from source paper

Q108 JEE Main 2021 · 26 Aug · Shift 1 MCQ

Two narrow bores of diameter $5.0\ \text{mm}$ and $8.0\ \text{mm}$ are joined together to form a $U-$shaped tube open at both ends. If this $U-$tube contains water, what is the difference in the level of two limbs of the tube.
[Take surface tension of water $T = 7.3 \times 10^{-2}\ \text{N m}^{-1}$, angle of contact $= 0$, $g = 10\ \text{m s}^{-2}$ and density of water$= 1.0 \times 10^{3}\ \text{kg m}^{-3}$]

(A) $5.34\ \text{mm}$
(B) $3.62\ \text{mm}$
(C) $2.19\ \text{mm}$
(D) $4.97\ \text{mm}$

Answer: (C) $2.19\ \text{mm}$ · Key from source paper

Q109 JEE Main 2021 · 26 Aug · Shift 1 Numerical

A soap bubble of the radius $3\ \text{cm}$ is formed inside another soap bubble of radius, $6\ \text{cm}$. The radius of an equivalent soap bubble that has the same excess pressure as inside the smaller bubble with respect to the atmospheric pressure is ___cm.

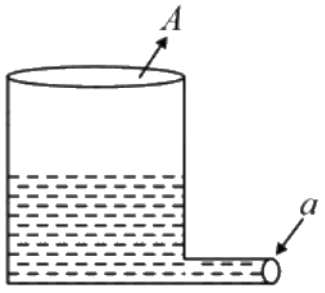
Numerical value type: the answer is a number.

Answer: 2. · Key from source paper

Q110 JEE Main 2021 · 27 Jul · Shift 1 MCQ

A light cylindrical vessel is kept on a horizontal surface. Area of the base is A. A hole of cross-sectional area a is made just at its bottom side. The minimum coefficient of friction necessary to prevent sliding the vessel due to the impact force of the emerging liquid is
(see the figure above)

Q6. A light cylindrical vessel is kept on a horizontal surface. Area of the base is A. A hole of cross-sectional area a is made just at its bottom side. The minimum coefficient of friction necessary to prevent sliding the vessel due to the impact force of the emerging liquid is



(1) $\frac{A}{2a}$
(2) None of these
(3) $\frac{2a}{A}$
(4) $\frac{a}{A}$

(A) $\frac{A}{2a}$
(B) None of these
(C) $\frac{2a}{A}$
(D) $\frac{a}{A}$

Answer: (C) $\frac{2a}{A}$ · Key from source paper

Q111 JEE Main 2021 · 27 Jul · Shift 2 MCQ

A raindrop with radius $\mathrm{R} = 0.2\ \mathrm{mm}$ falls from a cloud at a height $\mathrm{h} = 2000\ \mathrm{m}$ above the ground. Assume that the drop is spherical throughout its fall and the force of buoyance may be neglected, then the terminal speed attained by the raindrop is : [Density of water $\rho_{\mathrm{w}} = 1000\ \mathrm{kg\ m^{-3}}$ and Density of air $\rho_{\mathrm{a}} = 1.2\ \mathrm{kg\ m^{-3}}$, $\mathrm{g} = 10\ \mathrm{m/s^2}$ Coefficient of viscosity of air $= 1.8 \times 10^{-5}\ \mathrm{N\ s\ m^{-2}}$]

(A) $250.6\ \mathrm{m\ s^{-1}}$
(B) $43.56\ \mathrm{m\ s^{-1}}$
(C) $4.94\ \mathrm{m\ s^{-1}}$
(D) $14.4\ \mathrm{m\ s^{-1}}$

Answer: (C) $4.94\ \mathrm{m\ s^{-1}}$ · Key from source paper

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Q112 JEE Main 2021 · 27 Jul · Shift 2 Numerical

The water is filled up to a height of $12\ \mathrm{m}$ in a tank having vertical sidewalls. A hole is made in one of the walls at a depth h below the water level. The value of h for which the emerging stream of water strikes the ground at the maximum range is _____ m.

Numerical value type: the answer is a number.

Answer: 6. · Key from source paper

Q113 JEE Main 2021 · 25 Jul · Shift 2 MCQ

Two spherical soap bubbles of radii r_1 and r_2 in vacuum combine under isothermal conditions. The resulting bubble has a radius equal to:

(A) $\frac{r_1 r_2}{r_1 + r_2}$
(B) $\sqrt{r_1 r_2}$
(C) $\sqrt{r_1^2 + r_2^2}$
(D) $\frac{r_1 + r_2}{2}$

Answer: (C) $\sqrt{r_1^2 + r_2^2}$ · Key from source paper

Q114 JEE Main 2021 · 20 Jul · Shift 2 MCQ

Two small drops of mercury each of radius R coalesce to form a single large drop. The ratio of total surface energy before and after the change is

(A) $2^{\frac{1}{3}} : 1$

(B) $1 : 2^{\frac{1}{3}}$

(C) $2 : 1$

(D) $1 : 2$

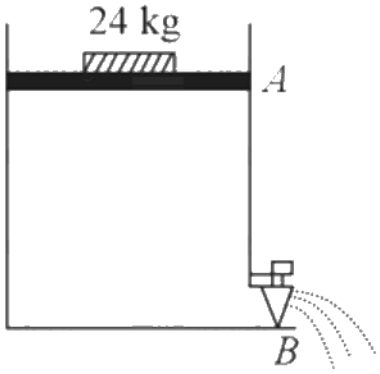
Answer: (A) $2^{\frac{1}{3}} : 1$ · Key from source paper

Q115 JEE Main 2021 · 18 Mar · Shift 2 Numerical

Consider a water tank as shown in the figure. It's cross-sectional area is $0.4\ \mathrm{m}^2$. The tank has an opening B near the bottom whose cross-section area is $1\ \mathrm{cm}^2$. A load of $24\ \mathrm{kg}$ is applied on the water at the top when the height of the water level is $40\ \mathrm{cm}$ above the bottom, the velocity of water coming out the opening B is $v\ \mathrm{m\ s^{-1}}$. The value of v, to the nearest integer, is _____ .[Take the value of g to be $10\ \mathrm{m\ s^{-2}}$]

(see the figure above)

Q24. Consider a water tank as shown in the figure. It's cross-sectional area is $0.4\ \mathrm{m}^2$. The tank has an opening B near the bottom whose cross-section area is $1\ \mathrm{cm}^2$. A load of $24\ \mathrm{kg}$ is applied on the water at the top when the height of the water level is $40\ \mathrm{cm}$ above the bottom, the velocity of water coming out the opening B is $\mathrm{v\ m\ s^{-1}}$. The value of v, to the nearest integer, is ___ .[Take the value of g to be $10\ \mathrm{m\ s^{-2}}$]



Numerical value type: the answer is a number.

Answer: 3. · Key from source paper

Q116 JEE Main 2021 · 17 Mar · Shift 1 MCQ

When two soap bubbles of radii a and $b(b > a)$ coalesce, the radius of curvature of common surface is:

(A) $\frac{ab}{b-a}$

(B) $\frac{a+b}{ab}$

(C) $\frac{b-a}{ab}$

(D) $\frac{ab}{a+b}$

Answer: (A) $\frac{ab}{b-a}$ · Key from source paper

Q117 JEE Main 2021 · 16 Mar · Shift 1 MCQ

The pressure acting on a submarine is 3×10^5 Pa at a certain depth. If the depth is doubled, the percentage increase in the pressure acting on the submarine would be: (Assume that atmospheric pressure is 1×10^5 Pa density of water is 10^3 kg m^{-3}, $g = 10$ ms^{-2})

(A) $\frac{200}{3}\%$
(B) $\frac{200}{5}\%$
(C) $\frac{5}{200}\%$
(D) $\frac{3}{200}\%$

Answer: (A) $\frac{200}{3}\%$ · Key from source paper

Q118 JEE Main 2021 · 16 Mar · Shift 2 MCQ

What will be the nature of flow of water from a circular tap, when its flow rate increased from 0.18 L $(\text{min})^{-1}$ to 0.48 L $(\text{min})^{-1}$? The radius of the tap and viscosity of water are 0.5 cm and 10^{-3} Pa s, respectively. (Density of water : 10^3 kg m^{-3})

(A) Unsteady to steady flow
(B) Remains steady flow
(C) Remains turbulent flow
(D) Steady flow to unsteady flow

Answer: (D) Steady flow to unsteady flow · Key from source paper

Q119 JEE Main 2021 · 26 Feb · Shift 1 MCQ

A large number of water drops, each of radius r, combine to have a drop of radius R. If the surface tension is T and mechanical equivalent of heat is J, the rise in heat energy per unit volume will be:

(A) $\frac{2T}{rJ}$
(B) $\frac{3T}{rJ}$
(C) $\frac{2T}{J}\left(\frac{1}{r}-\frac{1}{R}\right)$
(D) $\frac{3T}{J}\left(\frac{1}{r}-\frac{1}{R}\right)$

Answer: (D) $\frac{3T}{J}\left(\frac{1}{r}-\frac{1}{R}\right)$ · Key from source paper

Q120 JEE Main 2021 · 24 Feb · Shift 1 Numerical

A hydraulic press can lift 100 kg when a mass m is placed on the smaller piston. It can lift kg when the diameter of the larger piston is increased by 4 times and that of the smaller piston is decreased by 4 times keeping the same mass m on the smaller piston.

Numerical value type: the answer is a number.

Answer: 25600. · Key from source paper

EdLoop JEE

Q121 JEE Main 2020 · 6 Sep · Shift 2 MCQ

A fluid is flowing through a horizontal pipe of varying cross-section, with v ms^{-1} at a point where the pressure is P Pascal. At another point where pressure $\frac{P}{2}$ Pascal its speed is V ms^{-1}. If the density of the fluid is $\rho\,\mathrm{kg}-\mathrm{m}^{-3}$ and the flow is streamline, then V is equal to

(A) $\sqrt{\frac{P}{\rho}+v}$

(B) $\sqrt{\frac{2P}{\rho}+v^2}$

(C) $\sqrt{\frac{P}{2\rho}+v^2}$

(D) $\sqrt{\frac{P}{\rho}+v^2}$

Answer: (D) $\sqrt{\frac{P}{\rho}+v^2}$ · Key from source paper

Q122 JEE Main 2020 · 5 Sep · Shift 1 MCQ

A hollow spherical shell at outer radius R floats just submerged under the water surface. The inner radius of the shell is r . If the specific gravity of the shell material is $\frac{27}{8}$ with respect to water, the value of r is:

(A) $\frac{8}{9}R$

(B) $\frac{4}{9}R$

(C) $\frac{2}{3}R$

(D) $\frac{1}{3}R$

Answer: (A) $\frac{8}{9}R$ · Key from source paper

Q123 JEE Main 2020 · 5 Sep · Shift 2 MCQ

In an experiment to verify Stokes law, a small spherical ball of radius r and density ρ falls under gravity through a distance h in air before entering a tank of water. If the terminal velocity of the ball inside water is same as its velocity just before entering the water surface, then the value of h is proportional to: (ignore viscosity of air)

(A) r^4

(B) r

(C) r^3

(D) r^2

Answer: (A) r^4 · Key from source paper

Q124 JEE Main 2020 · 4 Sep · Shift 1 MCQ

A air bubble of radius 1 cm in water has an upward acceleration of $9.8\ \mathrm{cms}^{-2}$. The density of water is $1\ \mathrm{gm\ cm}^{-3}$ and water offers negligible drag force on the bubble. The mass of the bubble is $\left(g\ =\ 980\ \mathrm{cm/s}^2\right)$.

(A) $4.51\ \text{gm}$
(B) $3.15\ \text{gm}$
(C) $4.15\ \text{gm}$
(D) $1.52\ \text{gm}$

Answer: (C) $4.15\ \text{gm}$ · Key from source paper

Q125 JEE Main 2020 · 4 Sep · Shift 2 MCQ

Two identical cylindrical vessels are kept on the ground and each contain the same liquid of density d. The area of the base of both vessels is S but the height of liquid in one vessel is x_1 and in the other x_2. When both cylinders are connected through a pipe of negligible volume very close to the bottom, the liquid flows from one vessel to the other until it comes to equilibrium at a new height. The change in energy of the system in the process is :

(A) $gdS\left(x_2^2+x_1^2\right)$
(B) $gdS\left(x_2+x_1\right)^2$
(C) $\frac{3}{4}gdS\left(x_2-x_1\right)^2$
(D) $\frac{1}{4}gdS\left(x_2-x_1\right)^2$

Answer: (D) $\frac{1}{4}gdS\left(x_2-x_1\right)^2$ · Key from source paper

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Q126 JEE Main 2020 · 3 Sep · Shift 1 MCQ

Pressure inside two soap bubbles are 1.01 and 1.02 atmosphere, respectively. The ratio of their volumes is :

(A) $4:1$
(B) $0.8:1$
(C) $8:1$
(D) $2:1$

Answer: (C) $8:1$ · Key from source paper

Q127 JEE Main 2020 · 3 Sep · Shift 1 Numerical

When a long glass capillary tube of radius $0.015\ \text{cm}$ is dipped in a liquid, the liquid rises to a height of $15\ \text{cm}$ within it. If the contact angle between the liquid and glass to close to 0°, the surface tension of the liquid, in milliNewton m^{-1}, is $[\rho_{(\text{liqued})}=900\ \text{kg m}^{-3}, g=10\ \text{m s}^{-2}]$ (Given answer in closed integer)

Numerical value type: the answer is a number.

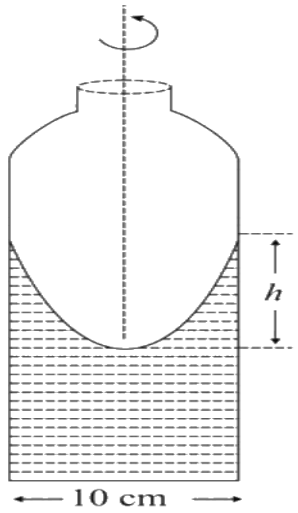
Answer: 101. · Key from source paper

Q128 JEE Main 2020 · 2 Sep · Shift 1 MCQ

A cylindrical vessel containing a liquid is rotated about its axis so that the liquid rises at its sides as shown in the figure. The radius of vessel is $5\ \text{cm}$ and the angular speed of rotation is $\omega\ \text{rad s}^{-1}$. The difference in the height, h (in cm) of liquid at the Centre of vessel and at the sides of the vessel will be :

(see the figure above)

Q8. A cylindrical vessel containing a liquid is rotated about its axis so that the liquid rises at its sides as shown in the figure. The radius of vessel is 5 cm and the angular speed of rotation is ω rad s^{-1}. The difference in the height, h (in cm) of liquid at the Centre of vessel and at the sides of the vessel will be :



(1) $\frac{2\omega^2}{25g}$
(2) $\frac{5\omega^2}{2g}$
(3) $\frac{25\omega^2}{2g}$
(4) $\frac{2\omega^2}{5g}$

(A) $\frac{2\omega^2}{25g}$
(B) $\frac{5\omega^2}{2g}$
(C) $\frac{25\omega^2}{2g}$
(D) $\frac{2\omega^2}{5g}$

Answer: (C) $\frac{25\omega^2}{2g}$ · Key from source paper

Q129 JEE Main 2020 · 2 Sep · Shift 2 MCQ

A capillary tube made of glass of radius $0.15\ \text{mm}$ is dipped vertically in a beaker filled with methylene iodide (surface tension $= 0.05\ \text{N m}^{-1}$, density $= 667\ \text{kg m}^{-3}$) which rises to height h in the tube. It is observed that the two tangents drawn from observed that the two tangents drawn from liquid-glass interfaces (from opp. sides of the capillary) make an angle of 60° with one another. Then h is close to ($g = 10\ \text{m s}^{-2}$)

(A) 0.049 m
(B) 0.087 m
(C) 0.137 m
(D) 0.172 m

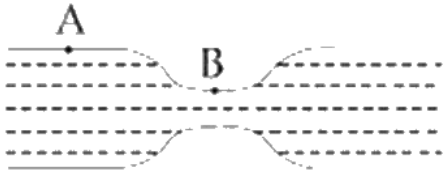
Answer: (B) 0.087 m · Key from source paper

Q130 JEE Main 2020 · 9 Jan · Shift 1 MCQ

Water flows in a horizontal tube (see figure). The pressure of water changes by 700 Nm^{-2} between A and B where the area of cross section are 40 cm^2 and 20 cm^2, respectively. Find the rate of flow of water through the tube. (density of water $= 1000\ kgm^{-3}$)

(see the figure above)

Q6. Water flows m a horizontal tube (see figure). The pressure of water changes by 700 Nm^{-2} between A and B where the area of cross section are 40 cm^2 and 20 cm^2, respectively. Find the rate of flow of water through the tube. (density of water $= 1000\ kgm^{-3}$)



(1) $3020\text{cm}^3/\text{s}$
(2) $2720\text{cm}^3/\text{s}$
(3) $2420\text{cm}^3/\text{s}$
(4) $1810\text{cm}^3/\text{s}$

(A) $3020\text{cm}^3/\text{s}$
(B) $2720\text{cm}^3/\text{s}$
(C) $2420\text{cm}^3/\text{s}$
(D) $1810\text{cm}^3/\text{s}$

Answer: (B) $2720\text{cm}^3/\text{s}$ · Key from source paper

Q131 JEE Main 2020 · 9 Jan · Shift 2 MCQ

A small spherical droplet of density d is floating exactly half immersed in a liquid of density ρ and surface tension T. The radius of the droplet is (take note that the surface tension applies an upward force on the droplet):

(A) $r = \sqrt{\frac{2T}{3(d+\rho)g}}$
(B) $r = \sqrt{\frac{T}{(d-\rho)g}}$
(C) $r = \sqrt{\frac{T}{(d+\rho)g}}$
(D) $r = \sqrt{\frac{3T}{(2d-\rho)g}}$

Answer: (D) $r = \sqrt{\frac{3T}{(2d-\rho)g}}$ · Key from source paper

Q132 JEE Main 2020 · 8 Jan · Shift 1 MCQ

A leak proof cylinder of length $1\ \mathrm{m}$, made of a metal which has very low coefficient of expansion is floating vertically in water at $0^{\circ}\mathrm{C}$ such that its height above the water surface is $20\ \mathrm{cm}$. When the temperature of water is increased to $4^{\circ}\mathrm{C}$, the height of the cylinder above the water surface becomes $21\ \mathrm{cm}$. The density of water at $T = 4^{\circ}\mathrm{C}$, relative to the density at $T = 0^{\circ}\mathrm{C}$ is close to:

(A) 1.26
(B) 1.04
(C) 1.01
(D) 1.03

Answer: (C) 1.01 · Key from source paper

Q133 JEE Main 2020 · 8 Jan · Shift 1 MCQ

Consider a solid sphere of radius R and mass density $\rho(r) = \rho_0\left(1 - \frac{r^2}{R^2}\right), 0 < r \leq R$. The minimum density of a liquid in which it will float is:

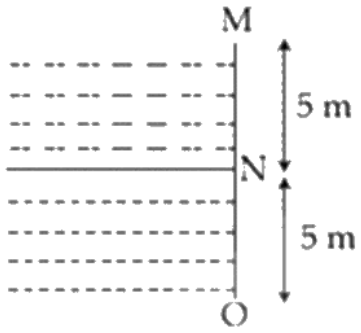
(A) $\frac{\rho_0}{3}$
(B) $\frac{\rho_0}{5}$
(C) $\frac{2\rho_0}{5}$
(D) $\frac{2\rho_0}{3}$

Answer: (C) $\frac{2\rho_0}{5}$ · Key from source paper

Q134 JEE Main 2020 · 8 Jan · Shift 2 MCQ

see figure

Q7.



Two liquids of densities ρ_1 and $\rho_2(\rho_2 = 2\rho_1)$ are filled up behind a square wall of side 10m as shown in figure. Each liquid has a height of 5m. The ratio of the forces due to these liquids exerted on upper part MN to that at the lower part NO is (Assume that the liquids are not mixing):

(1) $\frac{1}{3}$
(2) $\frac{2}{3}$
(3) $\frac{1}{2}$
(4) $\frac{1}{4}$

(A) $\frac{1}{3}$
(B) $\frac{2}{3}$
(C) $\frac{1}{2}$
(D) $\frac{1}{4}$

Answer: (D) $\frac{1}{4}$ · Key from source paper

Q135 JEE Main 2020 · 7 Jan · Shift 2 MCQ

An ideal fluid flows (laminar flow) through a pipe of non-uniform diameter. The maximum and minimum diameters of the pipes are 6.4cm and 4.8cm, respectively. The ratio of the minimum and the maximum velocities of fluid in this pipe is:

(A) $\frac{9}{16}$
(B) $\frac{\sqrt{3}}{2}$
(C) $\frac{3}{4}$
(D) $\frac{81}{256}$

Answer: (A) $\frac{9}{16}$ · Key from source paper

Q136 JEE Main 2019 · 12 Apr · Shift 2 MCQ

A solid sphere, of radius R acquires a terminal velocity v_1 when falling (due to gravity) through a viscous fluid having a coefficient of viscosity η. The sphere is broken into 27 identical solid spheres. If each of these spheres acquires a terminal velocity, v_2, when falling through the same fluid, the ratio $\left(\frac{v_1}{v_2}\right)$ equals:

(A) $\frac{1}{9}$
(B) 27
(C) $\frac{1}{27}$
(D) 9

Answer: (D) 9 · Key from source paper

Q137 JEE Main 2019 · 10 Apr · Shift 1 MCQ

The ratio of surface tensions of mercury and water is given to be 7.5, while the ratio of their densities is 13.6 . Their contact angles, with glass, are close to 135° and 0°, respectively. If it is observed that mercury gets depressed by an amount h in a capillary tube of radius r_1, while water rises by the same amount h in a capillary tube of radius r_2, then the ratio $\frac{r_1}{r_2}$ is close to

(A) $\frac{3}{5}$
(B) $\frac{2}{3}$
(C) $\frac{4}{5}$
(D) $\frac{2}{5}$

Answer: (D) $\frac{2}{5}$ · Key from source paper

Q138 JEE Main 2019 · 10 Apr · Shift 2 MCQ

A cubical block of side $0.5\ \mathrm{m}$ floats on water with 30% of its volume under water. What is the maximum weight that can be put on the block without fully submerging it under water?
[Take, density of water $= 10^3\ \mathrm{kg}/\mathrm{m}^3$]

(A) $87.5\ \mathrm{kg}$
(B) $65.4\ \mathrm{kg}$
(C) $30.1\ \mathrm{kg}$
(D) $46.3\ \mathrm{kg}$

Answer: (A) $87.5\ \mathrm{kg}$ · Key from source paper

Q139 JEE Main 2019 · 10 Apr · Shift 2 MCQ

Water from a tap emerges vertically downwards with an initial speed of $1.0\ \mathrm{ms}^{-1}$. The cross - sectional area of the tap is $10^{-4}\ \mathrm{m}^2$. Assume that the pressure is constant throughout the stream of water and that the flow is streamlined. The cross - sectional area of the stream, $0.15\ \mathrm{m}$ below the tap would be:
(Take $g = 10\ \mathrm{ms}^{-2}$)

(A) $1 \times 10^{-5}\ \mathrm{m}^2$
(B) $5 \times 10^{-4}\ \mathrm{m}^2$
(C) $2 \times 10^{-5}\ \mathrm{m}^2$
(D) $5 \times 10^{-5}\ \mathrm{m}^2$

Answer: (D) $5 \times 10^{-5}\ \mathrm{m}^2$ · Key from source paper

Q140 JEE Main 2019 · 10 Apr · Shift 2 MCQ

A submarine experiences a pressure of $5.05 \times 10^6\ \mathrm{Pa}$ at a depth of d_1 in a sea. When it goes further to a depth of d_2, it experiences a pressure of $8.08 \times 10^6\ \mathrm{Pa}$. Then $d_2 - d_1$ is approximately (density of water $= 10^3\ \mathrm{kg}/\mathrm{m}^3$ and acceleration due to gravity $= 10\ \mathrm{ms}^{-2}$):

(A) $600\ \mathrm{m}$
(B) $500\ \mathrm{m}$
(C) $300\ \mathrm{m}$
(D) $400\ \mathrm{m}$

Answer: (C) $300\ \mathrm{m}$ · Key from source paper

Q141 JEE Main 2019 · 9 Apr · Shift 1 MCQ

If 'M' is the mass of water that rises in a capillary tube of radius 'r' , then mass of water which will rise in a capillary tube of radius '2r' is:

(A) 4 M
(B) 2 M
(C) $\frac{M}{2}$
(D) M

Answer: (B) 2 M · Key from source paper

Q142 JEE Main 2019 · 9 Apr · Shift 2 MCQ

A wooden block floating in a bucket of water has $\frac{4}{5}$ of its volume submerged. When certain amount of an oil is poured into the bucket, it is found that the block is just under the oil surface with half of its volume under water and half in oil. The density of oil relative to that of water is:

(A) 0.8
(B) 0.7
(C) 0.5
(D) 0.6

Answer: (D) 0.6 · Key from source paper

Q143 JEE Main 2019 · 8 Apr · Shift 1 MCQ

Water from a pipe is coming at a rate of 100 liters per minute. If the radius of the pipe is 5 cm, the Reynolds number for the flow is of the order of: (density of water = 100 $\mathrm{kg/m^3}$, coefficient of viscosity of water = 1 mPa s)

(A) 10^2
(B) 10^4
(C) 10^3
(D) 10^6

Options (2) or (3) were accepted. More than one answer was accepted. · Key from source paper

Q144 JEE Main 2019 · 12 Jan · Shift 2 MCQ

A long cylindrical vessel is half filled with a liquid. When the vessel is rotated about its own vertical axis, the liquid rises up near the wall. If the radius of vessel is 5 cm and its rotational speed is 2 rotations per second, then the difference in the heights between the center and the sides, in cm, will be:

EdLoop JEE

(A) 0.4
(B) 2.0
(C) 1.2
(D) 0.1

Answer: (B) 2.0 · Key from source paper

Q145 JEE Main 2019 · 10 Jan · Shift 1 MCQ

Water flows into a large tank with flat bottom at the rate of $10^{-4}\ m^3 s^{-1}$. Water is also leaking out of a hole of area $1\ cm^2$ at its bottom. If the height of the water in the tank remains steady then this height is:

(A) $5.1\ cm$
(B) $1.7\ cm$
(C) $2.9\ cm$
(D) $4\ cm$

Answer: (A) $5.1\ cm$ · Key from source paper

Q146 JEE Main 2019 · 9 Jan · Shift 2 MCQ

The top of a water tank is open to air and its water level is maintained. It is giving out $0.74\ \mathrm{m}^3$ water per minute through a circular opening of $2\ \mathrm{cm}$ radius in its wall. The depth of the centre of the opening from the level of water in the tank is close to:

(A) $2.9\ \mathrm{m}$
(B) $4.8\ \mathrm{m}$
(C) $6.0\ \mathrm{m}$
(D) $9.6\ \mathrm{m}$

Answer: (B) $4.8\ \mathrm{m}$ · Key from source paper

Q147 JEE Main 2018 · 16 Apr · Online MCQ

A small soap bubble of radius 4cm is trapped inside another bubble of radius 6cm without any contact. Let P_2 be the pressure inside the inner bubble and P_0, the pressure outside the outer bubble. Radius of another bubble with pressure difference $P_2 - P_0$ between its inside and outside would be:

(A) 2.4 cm
(B) 12 cm
(C) 4.8 cm
(D) 6 cm

Answer: (A) 2.4 cm · Key from source paper

EdLoop JEE

Q148 JEE Main 2018 · 15 Apr · Shift 1 MCQ

A thin uniform tube is bent into a circle of radius r in the virtical plane. Equal volumes of two immiscible liquids, whose densities are ρ_1 and ρ_2 ($\rho_1 > \rho_2$) fill half the circle. The angle θ between the radius vector passing through the common interface and the vertical is

(A) $\theta = \tan^{-1}\left(\frac{\rho_1-\rho_2}{\rho_1+\rho_2}\right)$

(B) $\theta = \tan^{-1}\frac{\pi}{2}\left(\frac{\rho_1+\rho_2}{\rho_1-\rho_2}\right)$

(C) $\theta = \tan^{-1}\pi\left(\frac{\rho_1}{\rho_2}\right)$

(D) $\theta = \tan^{-1}\frac{\pi}{2}\left(\frac{\rho_2}{\rho_1}\right)$

Answer: (A) $\theta = \tan^{-1}\left(\frac{\rho_1-\rho_2}{\rho_1+\rho_2}\right)$ · Key from source paper

Q149 JEE Main 2018 · 15 Apr · Shift 2 MCQ

When an air bubble of radius r rises from the bottom to the surface of a lake, its radius becomes $\frac{5r}{4}$. Taking the atmospheric pressure to be equal to $10\ \mathrm{m}$ height of water column, the depth of the lake would approximately be (ignore the surface tension and the effect of temperature):

(A) $10.5\ \mathrm{m}$

(B) $8.7\ \mathrm{m}$

(C) $11.2\ \mathrm{m}$

(D) $9.5\ \mathrm{m}$

Answer: (D) $9.5\ \mathrm{m}$ · Key from source paper

Q150 JEE Main 2017 · 9 Apr · Online MCQ

Two tubes of radii r_1 and r_2 and lengths l_1 and l_2, respectively, are connected in series and a liquid flows through each of them in stream line conditions. P_1 and P_2 are pressure differences across the two tubes. If P_2 is $4P_1$ and l_2 is $\frac{l_1}{4}$ then the radius r_2 will be equal to :

(A) $4r_1$

(B) r_1

(C) $2r_1$

(D) $\frac{r_1}{2}$

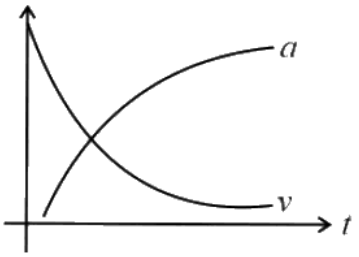
Answer: (D) $\frac{r_1}{2}$ · Key from source paper

Q151 JEE Main 2016 · 9 Apr · Online MCQ

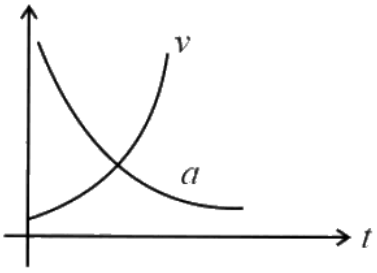
Which of the following option correctly describes the variation of the speed v and acceleration 'a' of a point mass falling vertically in a viscous medium that applies a force $F = -kv$, where 'k' is a constant, on the body? (Graphs are schematic and not drown to scale)

Q3. Which of the following option correctly describes the variation of the speed υ and acceleration 'a' of a point mass falling vertically in a viscous medium that applies a force $F = -k\upsilon$, where 'k' is a constant, on the body? (Graphs are schematic and not drown to scale)

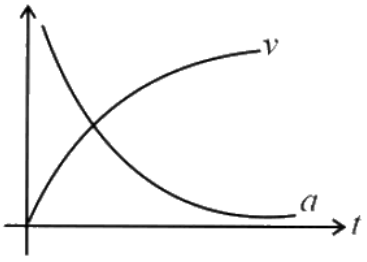
(1)



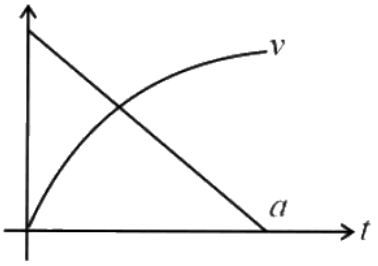
(2)



(3)



(4)



(A) *see figure*

(B) *see figure*

(C) *see figure*

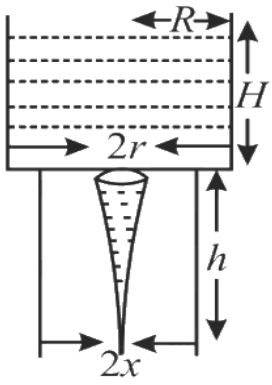
(D) *see figure*

Answer: (C) · Key from source paper

Q152 JEE Main 2016 · 9 Apr · Online MCQ

see figure

Q8.



Consider a water jar of radius R that has water filled up to height H and is kept on a stand of height h (see figure). Through a hole of radius r ($r << R$) at its bottom, the water leaks out and the stream of water coming down towards the ground has a shape like a funnel as shown in the figure. If the radius of the cross-section of water stream when it hits the ground is x. Then:

(1) $x = r\left(\frac{H}{H+h}\right)^{\frac{1}{4}}$

(2) $x = r\left(\frac{H}{H+h}\right)$

(3) $x = r\left(\frac{H}{H+h}\right)^{2}$

(4) $x = r\left(\frac{H}{H+h}\right)^{\frac{1}{2}}$

(A) $x = r\left(\frac{H}{H+h}\right)^{\frac{1}{4}}$
(B) $x = r\left(\frac{H}{H+h}\right)$
(C) $x = r\left(\frac{H}{H+h}\right)^{2}$
(D) $x = r\left(\frac{H}{H+h}\right)^{\frac{1}{2}}$

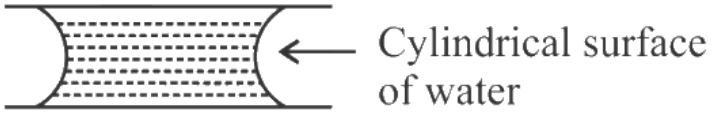
Answer: (A) $x = r\left(\frac{H}{H+h}\right)^{\frac{1}{4}}$ · Key from source paper

Q153 JEE Main 2015 · 10 Apr · Online MCQ

If two glass plates have water between them and are separated by very small distance (see figure), it is very difficult to pull them apart. It is because the water in between forms cylindrical surface on the side that gives rise to lower pressure in the water in comparison to atmosphere. If the radius of the cylindrical surface is R and surface tension of water is T then the pressure in water between the plates is lower by:

(see the figure above)

Q8. If two glass plates have water between them and are separated by very small distance (see figure), it is very difficult to pull them apart. It is because the water in between forms cylindrical surface on the side that gives rise to lower pressure in the water in comparison to atmosphere. If the radius of the cylindrical surface is R and surface tension of water is T then the pressure in water between the plates is lower by:



(1) $\frac{T}{R}$
(2) $\frac{T}{4R}$
(3) $\frac{4T}{R}$
(4) $\frac{2T}{R}$

(A) $\frac{T}{R}$
(B) $\frac{T}{4R}$
(C) $\frac{4T}{R}$
(D) $\frac{2T}{R}$

Answer: (A) $\frac{T}{R}$ · Checked by our team

Q154 JEE Main 2015 · 10 Apr · Online MCQ

If it takes 5 minutes to fill a 15 litre bucket from a water tap of diameter $\frac{2}{\sqrt{\pi}}$ cm then the Reynolds number for the flow is (density of water = $10^3\ kg/m^3$ and viscosity of water = $10^{-3}\ Pa.s$) close to:

(A) 5500
(B) 550
(C) 1100
(D) 11,000

Answer: (A) 5500 · Key from source paper

Q155 JEE Main 2014 · 19 Apr · Online MCQ

The velocity of water in a river is $18\ \mathrm{km\,h^{-1}}$ near the surface. If the river is $5\ \mathrm{m}$ deep, find the shearing stress between the horizontal layers of water. The coefficient of viscosity of water$= 10^{-2}$ poise.

(A) $10^{-4}\ \mathrm{N\,m^{-2}}$
(B) $10^{-3}\ \mathrm{N\,m^{-2}}$
(C) $10^{-2}\ \mathrm{N\,m^{-2}}$
(D) $10^{-1}\ \mathrm{N\,m^{-2}}$

Answer: (B) $10^{-3}\ \mathrm{N\,m^{-2}}$ · Key from source paper

Q156 JEE Main 2014 · 19 Apr · Online MCQ

A large number of liquid drops each of radius r coalesce to form a single drop of the radius R. The energy released in the process is converted into kinetic energy of the big drop so formed. The speed of the big drop is (given surface tension of the liquid T, density ρ)

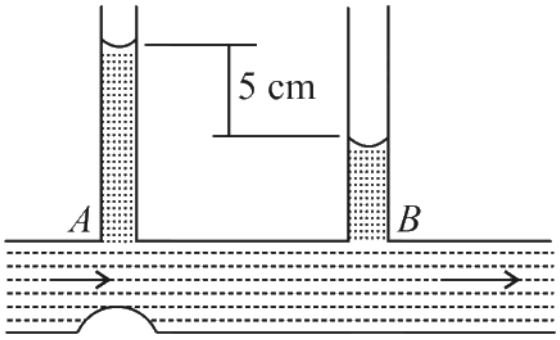
(A) $\sqrt{\frac{2T}{\rho}\left(\frac{1}{r}-\frac{1}{R}\right)}$
(B) $\sqrt{\frac{6T}{\rho}\left(\frac{1}{r}-\frac{1}{R}\right)}$
(C) $\sqrt{\frac{4T}{\rho}\left(\frac{1}{r}-\frac{1}{R}\right)}$
(D) $\sqrt{\frac{T}{\rho}\left(\frac{1}{r}-\frac{1}{R}\right)}$

Answer: (B) $\sqrt{\frac{6T}{\rho}\left(\frac{1}{r}-\frac{1}{R}\right)}$ · Key from source paper

Q157 JEE Main 2014 · 19 Apr · Online MCQ

see figure

Q10.



In the diagram shown, the difference in the two tubes of the manometer is 5 cm, the cross-section of the tube at A and B is 6 $\mathrm{mm^2}$ and 10 $\mathrm{mm^2}$ respectively. The rate at which water flows through the tube is $(g = 10\ \mathrm{m\ s^{-2}})$

(1) 7.5 cc $\mathrm{s^{-1}}$
(2) 12.5 cc $\mathrm{s^{-1}}$
(3) 8.0 cc $\mathrm{s^{-1}}$
(4) 10.0 cc $\mathrm{s^{-1}}$

(A) $7.5\ \mathrm{cc\,s^{-1}}$

(B) $12.5\ \mathrm{cc\,s^{-1}}$

(C) $8.0\ \mathrm{cc\,s^{-1}}$

(D) $10.0\ \mathrm{cc\,s^{-1}}$

Answer: (A) $7.5\ \mathrm{cc\,s^{-1}}$ · Key from source paper

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Q158 JEE Main 2014 · 12 Apr · Online MCQ

A cylindrical vessel of cross-section A contains water to a height h. There is a hole in the bottom of radius ' a '. The time in which it will be emptied is:

(A) $\dfrac{2\,\mathrm{A}}{\pi \mathrm{a}^2}\sqrt{\dfrac{\mathrm{h}}{\mathrm{g}}}$

(B) $\dfrac{\sqrt{2}\,\mathrm{A}}{\pi \mathrm{a}^2}\sqrt{\dfrac{\mathrm{h}}{\mathrm{g}}}$

(C) $\dfrac{2\sqrt{2}\,\mathrm{A}}{\pi \mathrm{a}^2}\sqrt{\dfrac{\mathrm{h}}{\mathrm{g}}}$

(D) $\dfrac{\mathrm{A}}{\sqrt{2}\pi \mathrm{a}^2}\sqrt{\dfrac{\mathrm{h}}{\mathrm{g}}}$

Answer: (B) $\dfrac{\sqrt{2}\,\mathrm{A}}{\pi \mathrm{a}^2}\sqrt{\dfrac{\mathrm{h}}{\mathrm{g}}}$ · Key from source paper

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Q159 JEE Main 2014 · 12 Apr · Online MCQ

Two soap bubbles coalesce to form a single bubble. If V is the subsequent change in volume of contained air and S change in total surface area, T is the surface tension and P atmospheric pressure, then which of the following relation is correct?

(A) $4\mathrm{PV} + 3\mathrm{ST} = 0$

(B) $3\mathrm{PV} + 4\mathrm{ST} = 0$

(C) $2\mathrm{PV} + 3\mathrm{ST} = 0$

(D) $3\mathrm{PV} + 2\mathrm{ST} = 0$

Answer: (B) $3\mathrm{PV} + 4\mathrm{ST} = 0$ · Key from source paper

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Q160 JEE Main 2014 · 11 Apr · Online MCQ

A tank with a small hole at the bottom has been filled with water and kerosene (specific gravity 0.8). The height of water is $3\ \mathrm{m}$ and that of kerosene $2\ \mathrm{m}$. When the hole is opened the velocity of fluid coming out from it is nearly: (take $\mathrm{g} = 10\ \mathrm{ms^{-2}}$ and density of water $= 10^3\ \mathrm{kg\ m^{-3}}$)

(A) $10.7\ \mathrm{ms}^{-1}$
(B) $9.6\ \mathrm{ms}^{-1}$
(C) $8.5\ \mathrm{ms}^{-1}$
(D) $7.6\ \mathrm{ms}^{-1}$

Answer: (B) $9.6\ \mathrm{ms}^{-1}$ · Key from source paper

Q161 JEE Main 2014 · 11 Apr · Online MCQ

An air bubble of radius $0.1\ \mathrm{cm}$ is in a liquid having surface tension $0.06\ \mathrm{N/m}$ and density $10^3\ \mathrm{kg/m}^3$. The pressure inside the bubble is $1100\mathrm{Nm}^{-2}$ greater than the atmospheric pressure. At what depth is the bubble below the surface of the liquid? ($\mathrm{g} = 9.8\ \mathrm{ms}^{-2}$)

(A) $0.1\ \mathrm{m}$
(B) $0.15\ \mathrm{m}$
(C) $0.20\ \mathrm{m}$
(D) $0.25\ \mathrm{m}$

Answer: (A) $0.1\ \mathrm{m}$ · Key from source paper

Q162 JEE Main 2014 · 9 Apr · Online MCQ

A capillary tube is immersed vertically in water and the height of the water column is x. When this arrangement is taken into a mine of depth d, the height of the water column is y. If R is the radius of earth, the ratio $\frac{x}{y}$ is :

(A) $\left(\frac{R-d}{R+d}\right)$
(B) $\left(\frac{R+d}{R-d}\right)$
(C) $\left(1-\frac{2d}{R}\right)$
(D) $\left(1-\frac{d}{R}\right)$

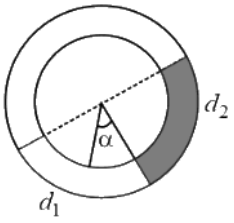
Answer: (D) $\left(1-\frac{d}{R}\right)$ · Key from source paper

Q163 JEE Main 2014 · 6 Apr · Offline MCQ

There is a circular tube in a vertical plane. Two liquids which do not mix and of densities d_1 and d_2 are filled in the tube. Each liquid subtends 90° angle at centre. Radius joining their interface makes an angle α with vertical. Ratio $\frac{\mathrm{d}_1}{\mathrm{d}_2}$ is :

(see the figure above)

Q8. There is a circular tube in a vertical plane. Two liquids which do not mix and of densities d_1 and d_2 are filled in the tube. Each liquid subtends 90° angle at centre. Radius joining their interface makes an angle α with vertical. Ratio $\frac{d_1}{d_2}$ is :



(1) $\frac{1+\sin\alpha}{1-\sin\alpha}$
(2) $\frac{1+\cos\alpha}{1-\cos\alpha}$
(3) $\frac{1+\tan\alpha}{1-\tan\alpha}$
(4) $\frac{1+\sin\alpha}{1-\cos\alpha}$

(A) $\frac{1+\sin\alpha}{1-\sin\alpha}$
(B) $\frac{1+\cos\alpha}{1-\cos\alpha}$
(C) $\frac{1+\tan\alpha}{1-\tan\alpha}$
(D) $\frac{1+\sin\alpha}{1-\cos\alpha}$

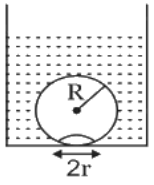
Answer: (C) $\frac{1+\tan\alpha}{1-\tan\alpha}$ · Key from source paper

Q164 JEE Main 2014 · 6 Apr · Offline MCQ

On heating water, bubbles being formed at the bottom of the vessel detatch and rise. Take the bubbles to be spheres of radius R and making a circular contact of radius r with the bottom of the vessel. If $r \ll R$, and the surface tension of water is T, value of r just before bubbles detatch is : (density of water is ρ_w)

(see the figure above)

Q9. On heating water, bubbles being formed at the bottom of the vessel detatch and rise. Take the bubbles to be spheres of radius R and making a circular contact of radius r with the bottom of the vessel. If r << R, and the surface tension of water is T, value of r just before bubbles detatch is :
(density of water is ρ_w)



(1) $R^2\sqrt{\frac{2\rho_w g}{3T}}$
(2) $R^2\sqrt{\frac{\rho_w g}{6T}}$
(3) $R^2\sqrt{\frac{\rho_w g}{T}}$
(4) $R^2\sqrt{\frac{3\rho_w g}{T}}$

(A) $R^2\sqrt{\frac{2\rho_w g}{3T}}$
(B) $R^2\sqrt{\frac{\rho_w g}{6T}}$
(C) $R^2\sqrt{\frac{\rho_w g}{T}}$
(D) $R^2\sqrt{\frac{3\rho_w g}{T}}$

Answer: (A) $R^2\sqrt{\frac{2\rho_w g}{3T}}$ · Key from source paper

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Q165 JEE Main 2013 · 25 Apr · Online MCQ

In an experiment, a small steel ball falls through a liquid at a constant speed of 10 cm/s. If the steel ball is pulled upward with a force equal to twice its effective weight, how fast will it move upward ?

(A) 5 cm/s
(B) Zero
(C) 10 cm/s
(D) 20 cm/s

Answer: (C) 10 cm/s · Key from source paper

Q166 JEE Main 2013 · 23 Apr · Online MCQ

Wax is coated on the inner wall of a capillary tube and the tube is then dipped in water. Then, compared to the unwaxed capillary, the angle of contact θ and the height h upto which water rises change. These changes are :

(A) θ increases and h also increases
(B) θ decreases and h also decreases
(C) θ increases and h decreases
(D) θ decreases and h increases

Answer: (C) θ increases and h decreases · Key from source paper

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Q167 JEE Main 2013 · 22 Apr · Online MCQ

Air of density $1.2\ \mathrm{kg\ m^{-3}}$ is blowing across the horizontal wings of an aeroplane in such a way that its speeds above and below the wings are $150\ \mathrm{ms^{-1}}$ and $100\ \mathrm{ms^{-1}}$, respectively. The pressure difference between the upper and lower sides of the wings, is :

(A) $60\mathrm{Nm^{-2}}$
(B) $180\mathrm{Nm^{-2}}$
(C) $7500\mathrm{Nm^{-2}}$
(D) $12500\mathrm{Nm^{-2}}$

Answer: (C) $7500\mathrm{Nm^{-2}}$ · Key from source paper

Q168 JEE Main 2013 · 9 Apr · Online MCQ

This question has Statement-1 and Statement- 2 . Of the four choices given after the Statements, choose the one that best describes the two Statetnents. Statement-1: A capillary is dipped in a liquid and liquid rises to a height h in it. As the temperature of the liquid is raised, the height h increases (if the density of the liquid and the angle of contact remain the same). Statement-2: Surface tension of a liquid decreases with the rise in its temperature.

(A) Statement-1 is true, Statement-2 is true; Statement-2 is not the correct explanation for Statement-1.
(B) Statement-1 is false, Statement- 2 is true.
(C) Statement-1 is true, Statement- 2 is false.
(D) Statement-1 is true, Statement-2 is true; Statement-2 is the correct explanation for Statement-1.

Answer: (B) Statement-1 is false, Statement- 2 is true. · Key from source paper

Q169 JEE Main 2013 · 7 Apr · Offline MCQ

A uniform cylinder of length L and mass M having cross-sectional area A is suspended, with its length vertical, from a fixed point by a massless spring, such that it is half submerged in a liquid of density σ at equilibrium position. The extension x_0 of the spring when it is in equilibrium is :

(A) $\frac{Mg}{k}\left(1-\frac{LA\sigma}{2M}\right)$
(B) $\frac{Mg}{k}\left(1+\frac{LA\sigma}{M}\right)$
(C) $\frac{Mg}{k}$
(D) $\frac{Mg}{k}\left(1-\frac{LA\sigma}{M}\right)$

Answer: (A) $\frac{Mg}{k}\left(1-\frac{LA\sigma}{2M}\right)$ · Key from source paper

Q170 JEE Main 2013 · 7 Apr · Offline MCQ

Assume that a drop of a liquid evaporates by a decrease in its surface energy so that its temperature remains unchanged. The minimum radius of the drop for this to be possible is. (The surface tension is T, the density of the liquid is ρ and L is its latent heat of vaporisation.)

(A) $\frac{T}{\rho L}$
(B) $\frac{2T}{\rho L}$
(C) $\frac{\rho L}{T}$
(D) $\sqrt{\frac{T}{\rho L}}$

Answer: (B) $\frac{2T}{\rho L}$ · Key from source paper

Q171 AIEEE 2012 · 26 May · Online MCQ

The terminal velocity of a small sphere of radius a in a viscous liquid is proportional to

(A) a^2
(B) a^3
(C) a
(D) a^{-1}

Answer: (A) a^2 · Key from source paper

Q172 AIEEE 2012 · 19 May · Online MCQ

A large number of droplets, each of radius, r coalesce to form a bigger drop of radius, R. An engineer designs a machine so that the energy released in this process is converted into the kinetic energy of the drop. Velocity of the drop is (T = surface tension, ρ = density)

(A) $\left[\frac{T}{\rho}\left(\frac{1}{r}-\frac{1}{R}\right)\right]^{1/2}$
(B) $\left[\frac{6T}{\rho}\left(\frac{1}{r}-\frac{1}{R}\right)\right]^{1/2}$
(C) $\left[\frac{3T}{\rho}\left(\frac{1}{r}-\frac{1}{R}\right)\right]^{1/2}$
(D) $\left[\frac{2T}{\rho}\left(\frac{1}{r}-\frac{1}{R}\right)\right]^{1/2}$

Answer: (B) $\left[\frac{6T}{\rho}\left(\frac{1}{r}-\frac{1}{R}\right)\right]^{1/2}$ · Key from source paper

Q173 AIEEE 2012 · 12 May · Online MCQ

Water is flowing through a horizontal tube having cross-sectional areas of its two ends being A and A' such that the ratio A/A' is 5 . If the pressure difference of water between the two ends is $3 \times 10^5\ \mathrm{N\,m^{-2}}$, the velocity of water with which it enters the tube will be (neglect gravity effects)

(A) $5\ \mathrm{m\,s^{-1}}$
(B) $10\ \mathrm{m\,s^{-1}}$
(C) $25\ \mathrm{m\,s^{-1}}$
(D) $50\sqrt{10}\ \mathrm{m\,s^{-1}}$

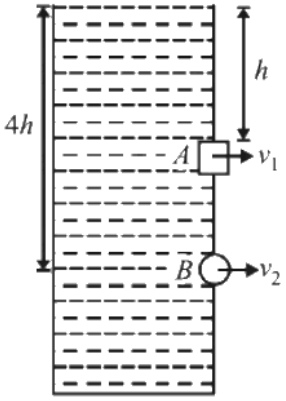
Answer: (A) $5\ \mathrm{m\,s^{-1}}$ · Key from source paper

Q174 AIEEE 2012 · 7 May · Online MCQ

A square hole of side length ℓ is made at a depth of h and a circular hole of radius r is made at a depth of 4 h from the surface of water in a water tank kept on a horizontal surface. If $\ell << h, r << h$ and the rate of water flow from the holes is the same, then r is equal to

(see the figure above)

Q11. A square hole of side length ℓ is made at a depth of h and a circular hole of radius r is made at a depth of 4 h from the surface of water in a water tank kept on a horizontal surface. If $\ell << h, r << h$ and the rate of water flow from the holes is the same, then r is equal to



(1) $\frac{\ell}{\sqrt{2\pi}}$
(2) $\frac{\ell}{\sqrt{3\pi}}$
(3) $\frac{\ell}{3\pi}$
(4) $\frac{\ell}{2\pi}$

A $\frac{\ell}{\sqrt{2\pi}}$
B $\frac{\ell}{\sqrt{3\pi}}$
C $\frac{\ell}{3\pi}$
D $\frac{\ell}{2\pi}$

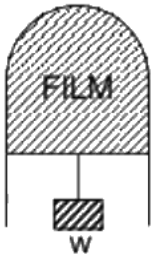
Answer: (A) $\frac{\ell}{\sqrt{2\pi}}$ · Key from source paper

Q175 AIEEE 2012 · Offline MCQ

A thin liquid film formed between a U-shaped wire and a light slider supports a weight of 1.5×10^{-2} N (see figure). The length of the slider is 30 cm and its weight negligible. The surface tension of the liquid film is

(see the figure above)

Q7. A thin liquid film formed between a U-shaped wire and a light slider supports a weight of 1.5×10^{-2} N (see figure). The length of the slider is 30 cm and its weight negligible. The surface tension of the liquid film is



(1) 0.0125 Nm^{-1}
(2) 0.1 Nm^{-1}
(3) 0.05 Nm^{-1}
(4) 0.025 Nm^{-1}

(A) $0.0125\ \mathrm{Nm}^{-1}$
(B) $0.1\ \mathrm{Nm}^{-1}$
(C) $0.05\ \mathrm{Nm}^{-1}$
(D) $0.025\ \mathrm{Nm}^{-1}$

Answer: (D) $0.025\ \mathrm{Nm}^{-1}$ · Key from source paper

Q176 AIEEE 2011 MCQ

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

(A) $0.2\pi\ \mathrm{mJ}$
(B) $2\pi\ \mathrm{mJ}$
(C) $0.4\pi\ \mathrm{mJ}$
(D) $4\pi\ \mathrm{mJ}$

Answer: (C) $0.4\pi\ \mathrm{mJ}$ · Key from source paper

Q177 AIEEE 2011 MCQ

Water is flowing continuously from a tap having an internal diameter $8 \times 10^{-3}\ \mathrm{m}$. The water velocity as it leaves the tap is $0.4\ \mathrm{ms}^{-1}$. The diameter of the water stream at a distance $2 \times 10^{-1}\ \mathrm{m}$ below the lap (sic) is close to :

(A) $7.5 \times 10^{-3}\ \mathrm{m}$
(B) $9.6 \times 10^{-3}\ \mathrm{m}$
(C) $3.6 \times 10^{-3}\ \mathrm{m}$
(D) $5.0 \times 10^{-3}\ \mathrm{m}$

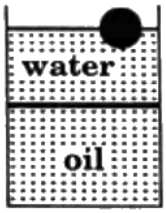
Answer: (C) $3.6 \times 10^{-3}\ \mathrm{m}$ · Key from source paper

Q178 AIEEE 2010 MCQ

A ball is made of a material of density ρ where $\rho_{\mathrm{oil}} < \rho < \rho_{\mathrm{water}}$ with ρ_{oil} and ρ_{water} representing the densities of oil and water, respectively. The oil and water are immiscible. If the above ball is in equilibrium in a mixture of this oil and water, which of the following pictures represents its equilibrium position?

Q10. A ball is made of a material of density ρ where $\rho_{\text{oil}} < \rho < \rho_{\text{water}}$ with ρ_{oil} and ρ_{water} representing the densities of oil and water, respectively. The oil and water are immiscible. If the above ball is in equilibrium in a mixture of this oil and water, which of the following pictures represents its equilibrium position?

(1)



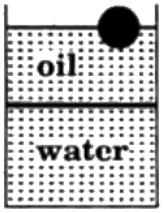
(2)



(3)



(4)



(A) *see figure*
(B) *see figure*
(C) *see figure*
(D) *see figure*

Answer: (B) · Key from source paper

Q179 AIEEE 2008 MCQ

A spherical solid ball of volume V is made of a material of density ρ_1. It is falling through a liquid of density ρ_2 ($\rho_2 < \rho_1$). Assume that the liquid applies a viscous force on the ball that is proportional to the square of its speed v, i.e., $F_{\text{viscous}} = -kv^2$ ($k > 0$). The terminal speed of the ball is

(A) $\sqrt{\frac{\text{Vg}(\rho_1-\rho_2)}{\text{k}}}$
(B) $\frac{\text{Vg}\rho_1}{\text{k}}$
(C) $\sqrt{\frac{Vg\rho_1}{k}}$
(D) $\frac{\text{Vg}(\rho_1-\rho_2)}{\text{k}}$

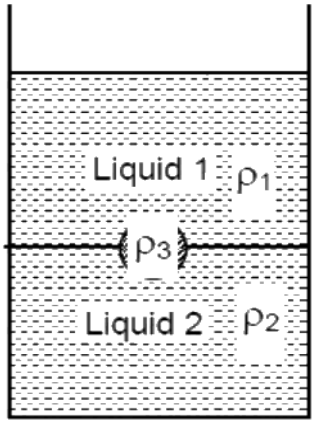
Answer: (A) $\sqrt{\frac{\text{Vg}(\rho_1-\rho_2)}{\text{k}}}$ · Key from source paper

Q180 AIEEE 2008 MCQ

A jar filled with two non mixing liquids 1 and 2 having densities ρ_1 and ρ_2 respectively. A solid ball, made of a material of density ρ_3, is dropped in the jar. It comes to equilibrium in the position shown in the figure. Which of the following is true for ρ_1, ρ_2 and ρ_3 ?

(see the figure above)

Q11. A jar filled with two non mixing liquids 1 and 2 having densities ρ_1 and ρ_2 respectively. A solid ball, made of a material of density ρ_3, is dropped in the jar. It comes to equilibrium in the position shown in the figure. Which



of the following is true for ρ_1, ρ_2 and ρ_3 ?

(1) $\rho_3 < \rho_1 < \rho_2$
(2) $\rho_1 < \rho_3 < \rho_2$
(3) $\rho_1 < \rho_2 < \rho_3$
(4) $\rho_1 < \rho_3 < \rho_2$

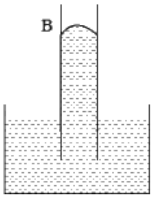
(A) $\rho_3 < \rho_1 < \rho_2$
(B) $\rho_1 > \rho_3 > \rho_2$
(C) $\rho_1 < \rho_2 < \rho_3$
(D) $\rho_1 < \rho_3 < \rho_2$

Answer: (D) $\rho_1 < \rho_3 < \rho_2$ · Key from source paper

Q181 AIEEE 2008 MCQ

A capillary tube (A) is dropped in water. Another identical tube (B) is dipped in a soap water solution. Which of the following shows the relative nature of the liquid columns in the two tubes?
(see the figure above) tube B in a beaker (displaced drawing of option 4)

Q12. A capillary tube (A) is dropped in water. Another identical tube (B) is dipped in a soap water solution. Which

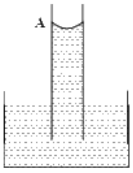


of the following shows the relative nature of the liquid columns in the two tubes?

(1) 

(2) 

(3) 

(4) 

(A) *see figure*
(B) *see figure*
(C) *see figure*
(D) *see figure*

Answer: (C) · Key from source paper

Q182 AIEEE 2006 MCQ

If the terminal speed of a sphere of gold (density = $19.5\ \mathrm{kg/m^3}$) is 0.2 m/s in a viscous liquid (density = $1.5\ \mathrm{kg/m^3}$), find the terminal speed of a sphere of silver (density = $10.5\ \mathrm{kg/m^3}$) of the same size in the same liquid.

(A) 0.2 m/s
(B) 0.4 m/s
(C) 0.133 m/s
(D) 0.1 m/s

Answer: (D) 0.1 m/s · Key from source paper

Q183 AIEEE 2005 MCQ

A 20 cm long capillary tube is dipped in water. The water rises up to 8 cm. If the entire arrangement is put in a freely falling elevator the length of water column in the capillary tube will be

(A) 8 cm
(B) 10 cm
(C) 4 cm
(D) 20 cm

Answer: (D) 20 cm · Key from source paper

Q184 AIEEE 2004 MCQ

Spherical balls of radius R are falling in a viscous fluid of viscosity η with a velocity v. The retarding viscous force acting on the spherical ball is

(A) directly proportional to R but inversely proportional to v.
(B) directly proportional to both radius R and velocity v.
(C) inversely proportional to both radius R and velocity v.
(D) inversely proportional to R but directly proportional to velocity v.

Answer: (B) directly proportional to both radius R and velocity v. · Key from source paper

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Q185 AIEEE 2004 MCQ

If two soap bubbles of different radii are connected by a tube,

(A) air flows from the bigger bubble to the smaller bubble till the sizes are interchanged.
(B) air flows from bigger bubble to the smaller bubble till the sizes are interchanged
(C) air flows from the smaller bubble to the bigger.
(D) there is no flow of air.

Answer: (C) air flows from the smaller bubble to the bigger. · Key from source paper

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Q186 AIEEE 2002 MCQ

A cylinder of height 20 m is completely filled with water. The velocity of efflux of water (in ms^{-1}) through a small hole on the side wall of the cylinder near its bottom is

(A) 10
(B) 20
(C) 25.5
(D) 5

Answer: (B) 20 · Key from source paper

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