

PHYSICS · JEE MAIN

Surface Tension

Chapter-wise previous year questions, with answer key

38

PYQS

2020–2025

PAPERS

4

TOPICS

Excess Pressure in Drops and Bubbles

Capillarity

Angle of Contact

Surface Energy and Surface Tension

- 1 Attempt each question on paper first — they're grouped by topic, newest papers first.
- 2 Check yourself against the answer key at the end.
- 3 Got one wrong? Tap “Step-by-step solution” under it for the full working.

Stuck on a question?

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Excess Pressure in Drops and Bubbles · 12 PYQs

Q1 JEE Main 2025 · 3 Apr · Shift 2

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 answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/oFV2xyzZQO](https://www.prepwiser.in/questions/oFV2xyzZQO)

Q2 JEE Main 2025 · 24 Jan · Shift 1

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

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

[Step-by-step solution ► prepwiser.in/questions/_oxpxPA5yv](https://www.prepwiser.in/questions/_oxpxPA5yv)

Q3 JEE Main 2025 · 23 Jan · Shift 2

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

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/wp3TBihUOV](https://www.prepwiser.in/questions/wp3TBihUOV)

Q4 JEE Main 2025 · 22 Jan · Shift 1

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 answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/GZRxPaMHWp](https://www.prepwiser.in/questions/GZRxPaMHWp)

Q5 JEE Main 2024 · 9 Apr · Shift 2

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 : 27
(C) 1 : 81 (D) 1 : 3

[Step-by-step solution ► prepwiser.in/questions/xQPhrMxVeQ](https://www.prepwiser.in/questions/xQPhrMxVeQ)

Q6 JEE Main 2024 · 8 Apr · Shift 1

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

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/8BQX85BVWH](https://www.prepwiser.in/questions/8BQX85BVWH)

Q7 JEE Main 2024 · 6 Apr · Shift 2

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) $\frac{S}{R}$

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

(C) $\frac{4R}{S}$

(D) $\frac{2S}{R}$

Step-by-step solution ► [prepwiser.in/questions/jqCkQri98p](https://www.prepwiser.in/questions/jqCkQri98p)

Q8 JEE Main 2023 · 15 Apr · Shift 1

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

Numerical answer — enter the value.

Step-by-step solution ► [prepwiser.in/questions/N9rFKkscBn](https://www.prepwiser.in/questions/N9rFKkscBn)

Q9 JEE Main 2022 · 27 Jul · Shift 2

A spherical soap bubble of radius 3 cm is formed inside another spherical soap bubble of radius 6 cm . If the 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 $r\text{ cm}$. The value of r is _____.

Numerical answer — enter the value.

Step-by-step solution ► [prepwiser.in/questions/Lu0esAqq3x](https://www.prepwiser.in/questions/Lu0esAqq3x)

Q10 JEE Main 2022 · 30 Jun · Shift 1

The excess pressure inside a liquid drop is 500 Nm^{-2} . If the radius of the drop is 2 mm , the surface tension of liquid is $x \times 10^{-3}\text{ Nm}^{-1}$. The value of x is _____.

Numerical answer — enter the value.

Step-by-step solution ► [prepwiser.in/questions/t0DFE8ntzu](https://www.prepwiser.in/questions/t0DFE8ntzu)

Q11 JEE Main 2021 · 26 Aug · Shift 1

A soap bubble of radius 3 cm is formed inside the another soap bubble of radius 6 cm . The radius of an equivalent soap bubble which has the same excess pressure as inside the smaller bubble with respect to the atmospheric pressure is cm.

Numerical answer — enter the value.

Step-by-step solution ► [prepwiser.in/questions/_KR1irdIDi](https://www.prepwiser.in/questions/_KR1irdIDi)

Q12 JEE Main 2020 · 3 Sep · Shift 1

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

(A) $4 : 1$

(B) $8 : 1$

(C) $2 : 1$

(D) $0.8 : 1$

Step-by-step solution ► [prepwiser.in/questions/jWR_K8mE81](https://www.prepwiser.in/questions/jWR_K8mE81)

Q13 JEE Main 2024 · 5 Apr · Shift 1

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

[Step-by-step solution ► prepwisser.in/questions/gegBP3v5Z9](https://www.prepwisser.in/questions/gegBP3v5Z9)

Q14 JEE Main 2024 · 29 Jan · Shift 1

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

[Step-by-step solution ► prepwisser.in/questions/J41N-UrCCS](https://www.prepwisser.in/questions/J41N-UrCCS)

Q15 JEE Main 2023 · 30 Jan · Shift 1

The height of liquid column raised in a capillary tube of certain radius when dipped in liquid A vertically is, 5cm. 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) 0.05
- (B) 0.20
- (C) 0.5
- (D) 0.10

[Step-by-step solution ► prepwisser.in/questions/-hIulUD5ys](https://www.prepwisser.in/questions/-hIulUD5ys)

Q16 JEE Main 2021 · 26 Aug · Shift 1

Two narrow bores of diameter 5.0 mm and 8.0 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 $T = 7.3 \times 10^{-2} \text{ Nm}^{-1}$, angle of contact = 0 , $g = 10 \text{ ms}^{-2}$ and density of water = $1.0 \times 10^3 \text{ kg m}^{-3}$]

- (A) 3.62 mm
- (B) 2.19 mm
- (C) 5.34 mm
- (D) 4.97 mm

[Step-by-step solution ► prepwisser.in/questions/tKJR80n8FK](https://www.prepwisser.in/questions/tKJR80n8FK)

Q17 JEE Main 2020 · 3 Sep · Shift 1

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

Numerical answer — enter the value.

[Step-by-step solution ► prepwisar.in/questions/Mwz4TGF1rl](https://www.prepwisar.in/questions/Mwz4TGF1rl)

Angle of Contact · 3 PYQs

Q18 JEE Main 2025 · 4 Apr · Shift 1

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

[Step-by-step solution ► prepwisar.in/questions/3w_MABxLdq](https://www.prepwisar.in/questions/3w_MABxLdq)

Q19 JEE Main 2024 · 4 Apr · Shift 2

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) 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 but Statement II is false.

[Step-by-step solution ► prepwisar.in/questions/3Iv1IGzI14](https://www.prepwisar.in/questions/3Iv1IGzI14)

Q20 JEE Main 2022 · 29 Jul · Shift 1

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 false but (R) is true

[Step-by-step solution ► prepwisar.in/questions/38zSxOYox9](https://www.prepwisar.in/questions/38zSxOYox9)

Surface Energy and Surface Tension · 18 PYQs

Q21 JEE Main 2025 · 2 Apr · Shift 2

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

[Step-by-step solution ► prepwisser.in/questions/8v-TTiB-kN](https://www.prepwisser.in/questions/8v-TTiB-kN)

Q22 JEE Main 2025 · 24 Jan · Shift 1

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

[Step-by-step solution ► prepwisser.in/questions/xx6e5KQmdP](https://www.prepwisser.in/questions/xx6e5KQmdP)

Q23 JEE Main 2025 · 23 Jan · Shift 1

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) 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 but Statement II is false

[Step-by-step solution ► prepwisser.in/questions/7Ysf8xBk4_](https://www.prepwisser.in/questions/7Ysf8xBk4_)

Q24 JEE Main 2024 · 6 Apr · Shift 1

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 answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/BZJqMvz8kp](https://www.prepwisser.in/questions/BZJqMvz8kp)

Q25 JEE Main 2024 · 4 Apr · Shift 1

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

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/u2su6ebMEU](https://www.prepwisser.in/questions/u2su6ebMEU)

Q26 JEE Main 2024 · 1 Feb · Shift 2

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

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

[Step-by-step solution ► prepwisser.in/questions/AeZAqJmKNC](https://www.prepwisser.in/questions/AeZAqJmKNC)

Q27 JEE Main 2024 · 30 Jan · Shift 2

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, then $E_1 : E_2$ is $x : 1$ where $x =$ _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/f-ZDNbULxZ](https://www.prepwisser.in/questions/f-ZDNbULxZ)

Q28 JEE Main 2024 · 29 Jan · Shift 2

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

[Step-by-step solution ► prepwisser.in/questions/0_8sRzkbQu](https://www.prepwisser.in/questions/0_8sRzkbQu)

Q29 JEE Main 2023 · 11 Apr · Shift 2

The surface tension of soap solution is $3.5 \times 10^{-2} \text{Nm}^{-1}$. The amount of work done required to increase the radius of soap bubble from 10cm to 20cm is _____ $\times 10^{-4} \text{J}$.

(take $\pi = 22/7$)

Numerical answer — enter the value.

[Step-by-step solution ► prepwisser.in/questions/Y8AjlA8KAQ](https://www.prepwisser.in/questions/Y8AjlA8KAQ)

Q30 JEE Main 2023 · 1 Feb · Shift 1

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

- (A) $28 \times 10^{-5} \text{J}$ (B) $17.5 \times 10^{-5} \text{J}$
(C) $5 \times 10^{-5} \text{J}$ (D) $2.26 \times 10^{-5} \text{J}$

[Step-by-step solution ► prepwisser.in/questions/oTxqQjaIWZ](https://www.prepwisser.in/questions/oTxqQjaIWZ)

Q31 JEE Main 2023 · 31 Jan · Shift 1

If 1000 droplets of water of surface tension 0.07N/m , having same radius 1mm each, combine to form a single drop. In the process the released surface energy is :-

(Take $\pi = \frac{22}{7}$)

- (A) $7.92 \times 10^{-4} \text{J}$ (B) $7.92 \times 10^{-6} \text{J}$
(C) $8.8 \times 10^{-5} \text{J}$ (D) $9.68 \times 10^{-4} \text{J}$

[Step-by-step solution ► prepwisser.in/questions/Ktczk95F1k](https://www.prepwisser.in/questions/Ktczk95F1k)

Q32 JEE Main 2023 · 29 Jan · Shift 1

Surface tension of a soap bubble is $2.0 \times 10^{-2} \text{Nm}^{-1}$. Work done to increase the radius of soap bubble from 3.5cm to 7cm will be:

Take $\left[\pi = \frac{22}{7}\right]$

(A) $18.48 \times 10^{-4} \text{J}$

(B) $5.76 \times 10^{-4} \text{J}$

(C) $0.72 \times 10^{-4} \text{J}$

(D) $9.24 \times 10^{-4} \text{J}$

[Step-by-step solution ► prepwiser.in/questions/kRtkdaL2sg](https://www.prepwiser.in/questions/kRtkdaL2sg)

Q33 JEE Main 2023 · 25 Jan · Shift 2

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 answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/saeb4RLAYh](https://www.prepwiser.in/questions/saeb4RLAYh)

Q34 JEE Main 2022 · 26 Jul · Shift 1

A water drop of radius 1cm is broken into 729 equal droplets. If surface tension of water is 75 dyne/ cm, then the gain in surface energy upto first decimal place will be :

(Given $\pi = 3.14$)

(A) $8.5 \times 10^{-4} \text{J}$

(B) $8.2 \times 10^{-4} \text{J}$

(C) $7.5 \times 10^{-4} \text{J}$

(D) $5.3 \times 10^{-4} \text{J}$

[Step-by-step solution ► prepwiser.in/questions/USNPGE0xhy](https://www.prepwiser.in/questions/USNPGE0xhy)

Q35 JEE Main 2022 · 28 Jun · Shift 1

A water drop of diameter 2 cm is broken into 64 equal droplets. The surface tension of water is 0.075 N/m. 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) $9.4 \times 10^{-5} \text{J}$

[Step-by-step solution ► prepwiser.in/questions/HBE0kgBHlp](https://www.prepwiser.in/questions/HBE0kgBHlp)

Q36 JEE Main 2021 · 20 Jul · Shift 2

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) $1 : 2$

[Step-by-step solution ► prepwiser.in/questions/XhoCqNrRGS](https://www.prepwiser.in/questions/XhoCqNrRGS)

Q37 JEE Main 2021 · 17 Mar · Shift 2

Suppose you have taken a dilute solution of oleic acid in such a way that its concentration becomes 0.01 cm^3 of oleic acid per cm^3 of the solution. Then you make a thin film of this solution (monomolecular thickness) of area 4 cm^2 by considering 100 spherical drops of radius $\left(\frac{3}{40\pi}\right)^{\frac{1}{3}} \times 10^{-3} \text{ cm}$. Then the thickness of oleic acid layer will be $x \times 10^{-14} \text{ m}$. Where x is _____.

Numerical answer — enter the value.

[Step-by-step solution ► prepwiser.in/questions/dCbjaIGaNR](https://www.prepwiser.in/questions/dCbjaIGaNR)

Q38 JEE Main 2021 · 26 Feb · Shift 1

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

[Step-by-step solution ► prepwiser.in/questions/EC3P6Lao8W](https://www.prepwiser.in/questions/EC3P6Lao8W)

Answer key — Surface Tension

Numbers match the question numbers above. For full working, open the solution link under each question.

1	8	2	B	3	2190	4	4	5	B	6	7	7	B	8	1150
9	2	10	500	11	2	12	B	13	B	14	C	15	A	16	B
17	101	18	D	19	D	20	A	21	C	22	D	23	D	24	1
25	7	26	B	27	10	28	B	29	264	30	D	31	A	32	A
33	1	34	C	35	A	36	A	37	25	38	B				

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