PHYSICS

BOOKS - MARVEL PHYSICS (HINGLISH)

SURFACE TENSION

Multiple Choice Questions Surface Tension Surface Energy

1. The potential energy the molecules on the free serface of a liquid is

A. minimum

B. maximum

C. zero

D. infinity

Answer: B

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2. A spherical mercury drop is broken into 1000 droplets , all of the same size . In this

process, the physical quantity that does not change is its

A. surface energy

B. radius

C. surface area

D. density

Answer: D

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3. Washing soap is used for cleaning the clothes , because

A. it absorbs dirt

B. it increases the surface tension of the solution

C. it reduces the surface tension of the solution

D. it increases the viscosity of the liquid

Answer: C

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4. If a detergent is dissolved in water, the surface tension of water

A. remains constant

B. increases

C. decreases

D. becomes zero

Answer: C

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5. When a mercury drop of radius R, breaks into n droplets of equal size, the radius (r) of each droplet is

A. $r = \frac{R}{n}$

B. $r = \frac{R}{n^{1/3}}$

C. $r = Rn^{1/3}$

D. $\sqrt[3]{\frac{R}{n}}$

Answer: B

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6. The surface tension of a liuid is 75 dynes/cm in C.G.S system .In SI system this is expressed as

A. 75×10^{-3}N/m

B. 75 N/m

C. 75×10^{3} N/m

D. 75×10^{2} N/m

Answer: A

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7. The radii of two mercury drops are R_1 and R_2 .Under isothermal conditions , a drop is formed from them. The radius (R) of the resultant rop is given by

A. $R = R_1 + R_2$

B. $R = \frac{R_1 + R_2}{2}$

C. $R^3 = R_1^3 + R_2^3$

D. $R^2 = R_1^2 + R_2^2$

Answer: C

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8. The surface tension of a liquid is 5×10^{-2} N/m in SI system ,In system it is expressed as

A. 5×10^{2} dyne/cm

B. 5×10^{5} dyne/cm

C. 5×10^{1} dyne/cm

D. 5×10^{4} dyne/cm

Answer: C

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9. A wire 10 cm long is placed horizontally on the surface of water. It is gently pulled up with a force of 1.4×10^{-2} N to keep It in equilibrium . The surface tension of water is

A. 50 dyne/cm

B. 60 dyne/cm

C. 70 dyne/cm

D. 40 dyne/cm

Answer: C

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10. 125 rain drops are combined to from a single drop . The ratio of the total energy of 125 drops to that of a single drop is

A. 2

B. 5

C. 10

D. $\frac{5}{2}$

Answer: B

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11. What is the potential energy of a soap film formed on a frame of area $5 \times 10^{-3} m^2$? The surface tension of soap solution is 30×10^{-3} N/m

A. 2×10^{-4}J

B. 2.5×10^{-4}J

C. 3×10^{-4}J

D. 5×10^{-4}J

Answer: C

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12. The work done in increasing the size of a soap film from 10 cm × 6 cm to 10 cm × 11 cm is

3×10^{-4} joule . The surface tension of the film is

A. 1.5×10^{-2}N/m

B. 2×10^{-2}N/m

C. 2.5×10^{-2}N/m

D. 3×10^{-2}N/m

Answer: D

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13. 1000 tiny mercury droplets coalesce to form a bigger drop .In this process , the temperature of the drop

A. decreases

B. increases

C. does not change

D. may increases or decrease depending upon the size of the drop

Answer: B

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14. What is the force required to take away a flat circular plate of radius 2 cm from the surface of water ? $T = 70 \times 10^3 N/m.$ Use $\pi = \frac{22}{7}$

A. 4.4×10^{-4}N

B. 6.6×10^{3}N

C. 8.8×10^{3}N

D. 11×10^{-3}N

Answer: C

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15. The energy needed for breaking a drop of radius R into n drops each of radius r is

A. $4\pi T\left(nr^2 - R^2\right)$

B. $\frac{4\pi T}{3}\left(nr^2 - R^2\right)$

C. $4\pi T\left(R^2 - nr^2\right)$

D. $\frac{4}{3}\pi T\left(R^3 - nr^3\right)$

Answer: A

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16. A spherical liquid drop of radius R is split up ino 8 equal droplets .If T is the surface tension of the liquid , then the work done in this process is

A. $4\pi R^2 T$

B. $8\pi R^2 T$

C. $3\pi R^2 T$

D. $2\pi R^2 T$

Answer: A

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17. What is the change in surface energy , when a mercury drop of radius R split up into 1000 droplets of radius of r ? [The surface tension of mercury is T]

A. $8\pi R^2 T$

B. $16\pi R^2 T$

C. $25\pi R^2 T$

D. $36\pi R^2 T$

Answer: D

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18. A 10 cm long wire is placed horizontally on the surface of a liquid and is gently pulled up with a force of 2×10^{-2} N to keep the wire in

equilibrium . The surface tension of the liquid in Nm^{-1} is

A. 0.002

B. 0.001

C. 0.2

D. 0.1

Answer: D

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19. If the surface tension of a liquid is 5 N/m then the surface energy of the liquid film on a ring of area 0.15 m^2 is

A. 1.5J

B. 3.0J

C. 2.25J

D. 0.75J

Answer: A

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20. What is the force required to separate two glass plates of area $3 \times 10^{-2} m^2$ with a film of water of thickness 0.07 mm between them ? (Surface tension of water $= 7 \times 10^{-2}$ N/m)

A. 50 N

B. 60 N

C. 20 N

D. 80 N

Answer: B

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21. If the surface area of anu liquid surface is increased by 50 % then its surface tension will

A. increase by 50%

B. decrease

C. not change

D. be doubled

Answer: C

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22. The surface tension of water $= 72 \times 10^{-3} jm^{-2}$ .The work done in splitting a drop of water of 1 mm radius into 64 droplets is

A. 2×10^{-6}J

B. 2.7×10^{-6}J

C. 4×10^{-6}J

D. 6.4×10^{-6}J

Answer: B

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23. A film of water is formed between two straight parallel wires , each of length 10 cm and separated by 4 mm . How much work should be done to increase their separation by 1 mm , while still maintaining their parallelism ? $\left[T = 7.5 \times 10^{-2} N/m\right]$

A. 0.5×10^{-5}J

B. 1.2×10^{-5}J

C. 1.5×10^{-5}J

D. 15×10^{-7}J

Answer: C

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24. The force required to separate two glass plates of area $10^{-2}m^2$ with a film of water 0.05 mm thick between them , is

A. 50 N

B. 28 N

C. 38 N

D. 14 N

Answer: B

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25. Small droplets of a liquid are usually more spherical in shape than larger drops of the same liquid because

A. the force of gravity and the force of S.T act in the same direction and are equal

B. the force of gravity predominates the forcce of S.T

C. the force of S.T predominates the force of gravity

D. the force of S.T is equal and opposite to the force of gravity

Answer: C

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26. What is ratio of surface energy of 1 small drop and 1 large drop, if 1000 small drops combined to form 1 large drop

A. $1:100$

B. $10:1$

C. $100:1$

D. $1000:1$

Answer: A

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27. What is the potential energy of a soap film formed on a frame of area $3 \times 10^{-3} m^2$? [The surface tension of soap solution is 30×10^{-3} N/m]

A. 1.2×10^{-4} J

B. 1.5×10^{-4}J

C. 1.8×10^{-4}J

D. 2.4×10^{-4}J

Answer: C

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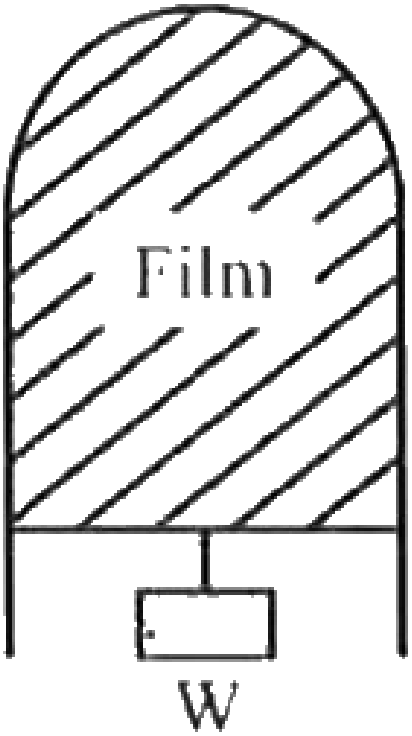
28. A thin liquid film formed between a U - shaped wire and a light slider s 30 cm and its weight is negligible . The surface tension of

the liquid film is



A. $0.1 N/m$

B. $0.05 N/m$

C. $0.025 N/m$

D. $0.0125 \mathrm{N/m}$

Answer: C

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29. Molecules on the surface of a liquid in equilibrium possess

A. Minimum K.E

B. Maximum P.E

C. Minimum P.E

D. Maximum K.E

Answer: B

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30. What is the unit of surface tension ?

A. $J - m$

B. J/m

C. J/m^2

D. Jm^2

Answer: C

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31. The surface tension of a liquid is 10^8 dyne/cm .It is equivalent to

A. $10^7 Nm^{-1}$

B. $10^5 Nm^{-1}$

C. $10^4 Nm^{-1}$

D. $10^6 Nm^{-1}$

Answer: B

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32. The P.E of a molecule of a liquid on the surface of the liquid when compared to its ., when inside the liquid is

A. greater

B. less

C. equal

D. depending on the liquid , sometimes less, sometimes more

Answer: A

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Multiple Choice Questions Higher Level

1. A mercury drop of radius R splits up into 1000 droplets of equal radii . The change in the surface area is

A. $8\pi R^2$

B. $36\pi R^2$

C. $12\pi R^2$

D. $40\pi R^2$

Answer: B

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2. A film of water is formed between two straight parallel wires of length 10 cm each separated by $0.5cm$ If their separation is

increased by $1mm$ while still maintaining their parallelism, how much work will have to be done (Surface tension of water $= 7.2 \times 10^{-2} \frac{N}{m}$)

A. 7.22×10^{-6}J

B. 1.44×10^{-5}J

C. 2.88×10^{-5}J

D. 5.76×10^{-5}J

Answer: B

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

A. $1:2$

B. $2:1$

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

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

Answer: D

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4. A water drop of radius R is split into n smaller drops , each of radius r. If T is the surface tension of water ,then the work done in the process is

A. $\frac{4}{3}\pi R^3 T\left(\frac{1}{r}-\frac{1}{R}\right)$

B. $\frac{3}{4}\pi R^3 T\left(\frac{1}{R}-\frac{1}{r}\right)$

C. $4\pi R^3 T\left(\frac{1}{r}-\frac{1}{R}\right)$

D. $6\pi R^2\left(\frac{1}{R}-\frac{1}{r}\right)$

Answer: C

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5. A metallic wire of diameter d is lying horizontally o the surface of water. The maximum length of wire so that is may not sink will be

A. $r = \sqrt{\frac{2T}{\pi dg}}$

B. $r = \sqrt{\frac{\pi dg}{2T}}$

C. $r = \sqrt{\frac{2T}{\pi dg}}$

D. $r = \sqrt{\frac{2dg}{\pi T}}$

Answer: C

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6. Which is the fundamental unit that has the same power in the dimensional formulae of surface tension and coefficient of vicosity ?

A. Temperature

B. Time

C. Length

D. Mass

Answer: D

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7. A wooden stick 2m long is floating on the surface of water. The surface tension of water 0.07 N/m. By putting soap solution on one side of the sticks the surface tension is

reduced to 0.06 N/m. The net force on the stick will be

A. 0.06N

B. 0.01N

C. 0.02N

D. 0.07N

Answer: C

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8. A thin metal disc of radius r floats on water surface and bends the surface downwards along the perimeter making an angle θ with vertical edge of the disc of the disc. If the disc dispplaces a weight of water W and surface tension of water is T, then the weight of metal disc is

A. $W - 2\pi T \cos\theta$

B. $2\pi T + W$

C. $2\pi T \cos\theta - W$

D. $2pT\cos\theta + W$

Answer: D

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9. A large number of liquid drops each of radius 'a' coalesce to form a single spherical drop of radish b. The energy released in the process is converted into kinetic energy of the big drops formed. The speed of big drop will be

A. $\left[\frac{6T}{\rho}\left(\frac{1}{a}-\frac{1}{b}\right)\right]^{1/2}$

B. $\left[\frac{6T}{\rho}\left(\frac{1}{b}-\frac{1}{a}\right)\right]^{1/2}$

C. $\left[\frac{\rho}{6T}\left(\frac{1}{a}-\frac{1}{b}\right)\right]^{1/2}$

D. $\left[\frac{\rho}{6T}\left(\frac{1}{b}-\frac{1}{a}\right)\right]^{1/2}$

Answer: A

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10. A certain number of spherical drops of a liquid of radius r coalesce to form a single

drop of radius R and volume V. If T is the surface tension of the liquid, then

A. energy = 3VT $\left(\frac{1}{r}-\frac{1}{R}\right)$ is released

B. energy is neither released nor absorbed

C. energy = 4VT $\left(\frac{1}{r}=\frac{1}{R}\right)$ is released

D. energy = 3VT $\left(\frac{1}{r}-\frac{1}{R}\right)$ is absorbed

Answer: A

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11. One end of a glass capillary tube with a radius $r = 0.05cm$ is immersed into water to a depth of $h = 2cm$.Excess pressure required to blow an air bubble out of the lower end of the tube will be $(S.T$ of water $= 70\text{dyne}/cm)$.Take $g = 980cm/s^2$.

A. 8 cm

B. 10 cm

C. 6 cm

D. 12 cm

Answer: D

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12. A capillary tube having 1 mm and 2.5 mm as internal an external radii hangs vertically from the arm of a balance . The lower end of the tube just touches a liquid of surface tension 40 dyne/cm .If the touches a liquid of surface tension 40 dyne/cm . If the angle of contact is zero, then the change in weight due to surface tension is

A. 4.4×10^{-4} N

B. 8.8×10^{-4}N

C. 2.2×10^{-4}N

D. 3.3×10^{-4}N

Answer: B

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13. If a capillary tube of radius 1 mm is immersed in water , the mass of water rising in the capillary tube is M . If the radius tube is

doubled , then the mass of water , that rises in the capillary tube will be

A. $\frac{M}{2}$

B. 2 M

C. 3 M

D. M

Answer: B

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14. Pure water rises through a height h in a capillary tube of internal radius (r). If T is the S.T of water , then the pressure diference between water level in the container and the lowest point of the concave meniscus is

A. $\frac{T}{r}$

B. $\frac{r}{T}$

C. $\frac{2T}{r}$

D. $\frac{r}{2T}$

Answer: C

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15. For which of the two pairs, the angle of contact is same

A. Water and glass , glass and alcohol

B. Silver and water, water and chromium

C. Water and glass , glass and mercury

D. Silver and water, mercury and glass

Answer: A

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16. A capillary tube of radius r is dipped in a liquid of density ρ and surface tension S. if the angle of contanct is θ, the pressure difference between the two surface in the beaker and the capillary ?

A. $\frac{2T}{r}\cos\theta$

B. $\frac{T}{r\cos\theta}$

C. $\frac{2T}{r\cos\theta}$

D. $\frac{T}{r}(\cos\theta)$

Answer: A

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17. Water rises upto a height h in a capillary tube of radius r. What is the network done in this process if the density of water is ρ ?

A. $\frac{\pi r^2 h^2 \rho g}{2}$

B. $\pi r^2 h \rho g$

C. $2\pi r^2 h \rho g$

D. $\frac{\pi r^2 g \rho g}{2}$

Answer: A

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18. Water rises in a capillary tube to a certain height such that the upward force due to surface tension is balanced by 75×10^{-4} newton force due to the weight of the liquid. If the surface tension of water is 6×10^-2` newton/metre the inner circumference of the capillary must be:

A. 6.5×10^{-2}m

B. 12.5×10^{-2}m

C. 1.25×10^{-2}m

D. 0.50×10^{-2}m

Answer: B

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19. Water rises to a height of $10cm$ in a capillary tube and mercury falls to a depth of $3.42cm$ in the same capillary tube. If the

density of mercury is $13.6g/c.c.$ and the angles of contact for mercury and for water are 135° and 0°, respectively, the ratio of surface tension for water and mercury is

A. $1:2$

B. $1:13.6$

C. $1:3.42$

D. $1:6.58$

Answer: D

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20. The height upto which water will rise in a capillary tube will be:

A. minimum when the temperature of watr is $4^\circ C$

B. maximum when the temperature of water is $4^\circ C$

C. minimum when the temperture of water is $0^\circ C$

D. the same at all temperatures

Answer: A

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21. The lower end of a capillary tube is dipped in water. Water rises to a height of 8 cm. The tube is then broken at a height of 6 cm. The height of water colume and angle of contact will be

A. $4cm \sin^{-1}\left(\frac{1}{2}\right)$

B. $4cm, \cos^{-1}\left(\frac{1}{2}\right)$

C. $6cm, \sin^{-1}\left(\frac{3}{4}\right)$

D. $6cm, \cos^{-1}\left(\frac{3}{4}\right)$

Answer: D

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22. A capillary tube of radius r is immersed in water and water rises in to a height h. The mass of water in the capillary tube is 5g. Another capillary tube of radius 2 r is

immersed in water. The mass of water that will rise in this tube is

A. 5.0 g

B. 10 g

C. 20 g

D. 2.5 g

Answer: B

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23. The lower end of a capillary tube of radius r cm is placed vertically in water. What is the heat evolved if water rise upto a height h in the capillary tube ?

A. $\frac{\pi^2 r^2 h^2 g}{J}$

B. $-\frac{\pi^2 r^2 h^2 g}{J}$

C. $-\frac{\pi^2 r^2 h^2 g}{2J}$

D. $\frac{\pi r^2 h^2 g}{2J}$

Answer: D

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24. Two narrow bores of diameters 3.0mm and 6.0 mm are joined together to form a U-shaped tube open at both ends. If th U-tube contains water, what is the difference in its levels in the two limbs of the tube? Surface tension of water at the temperature of the experiment is $7.3 \times 10^{-2} Nm^{-1}$. Take the angle of contact to be zero. and density of water to be $1.0 \times 10^{3} kg/m^{3}$.

$(g = 9.8 ms^{-2})$

A. 4 mm

B. 5 mm

C. 8 mm

D. 3 mm

Answer: B

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25. If h is the rise of water in a capillary tube of radius r, then the work done by the force of

surface tension is

(ρ is density g = $(\text{acc})^n$ due to gravity)

A. $\frac{2gT^2}{\rho\pi}$

B. $\frac{2\pi T^2}{\rho g}$

C. $\frac{4gT^2}{\rho\pi}$

D. $\frac{4\pi T^2}{\rho g}$

Answer: B

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26. Liquid rises to a height of 2 cm in a capillary tube and the angle of contact between the solid and the liquid is zero. If the tube is depressed more now so that top of capillary is only 1 cm above the liquid, then the apparent angle of contact between the solid and the liquid is

A. 30°

B. 60°

C. 0°

D. 90°

Answer: B

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27. Water rises upto a height x in capillary tube immersed vertically in water . When this whole arrangement is taken to a depth d in a mine , the water level rises upto a height y . If R is the radius of the earth , then the ration $\frac{x}{y}$ is given by

A. $1+\frac{d}{R}$

B. $1-\frac{d}{R}$

C. $\frac{R+d}{R-d}$

D. $\frac{R-d}{R+d}$

Answer: B

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28. If two soap bubbles of equal radii r coalesce then the radius of curvature of interface between two bubbles will be

A. 0

B. 2r

C. $\frac{r}{2}$

D. infinity

Answer: D

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29. The pressure inside two soap bubbles is 1.01 and 1.02 atmosphere. The ration of their respective volumes is

A. $101:102$

B. $102:101$

C. $8:1$

D. $2:1$

Answer: C

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30. A soap bubble assumes a spherical surface . Which one of the following statement is wrong ?

A. The soap bubble encloses air inside it

B. The soap film consists of two surface layers of molecules back to back

C. The pressure of air inside the bubble is less than the atmospheric pressure.hence the atmospheric pressure compresses it equally from all sides to give it a spherical shape.

D. Because of the elastic property of the film , it tends to shrink to as small a

surface area as possible for the volume it has enclosed .

Answer: C

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31. W_1 is the work done in blowing a soap bubble of radius r from a soap solution at room temperature . The soap solution is then heated and second soap bubble of radius 2r is blown from the heated solution . If W_2 is the

work done in forming the second bubble , then

A. $W_2 = 2W_1$

B. $W < 2W_1$

C. $W_2 = 4W_1$

D. $W_2 < 4W_1$

Answer: D

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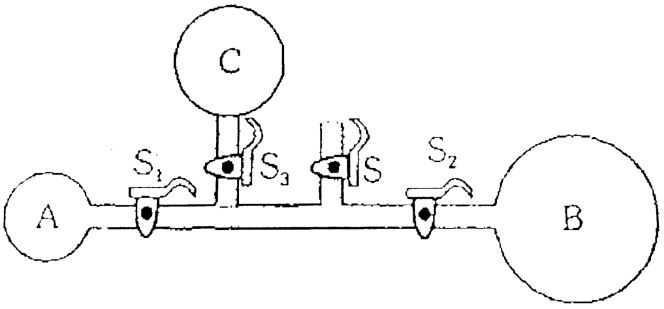

32.

The adjoining diagram shows three soap bubbles, A , B and C prepared by blowing the capillary tube fitted with stop cocks S, S_1, S_2 and S_3 with stop cock S closed and stop cocks S_1, S_2 and S_3 opened-

A. Both C and A will start collapsing with the size of B increasing

B. Sizes of A,B and C will becomes equal at equalibrium

C. B will start collapsing with sizes of A and C increasing

D. C will start collapsing with sizes of A and B increasing

Answer: A

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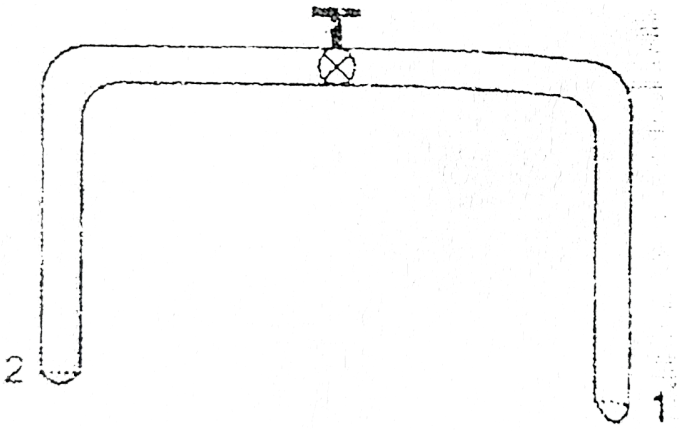
33. A glass tube of uniform internal radius (r) has a valve separating the two identical ends. Initially, the valve is in a tightly closed position. End 1 has a hemispherical soap bubble of radius r. End 2 has sub-hemispherical soap bubble as shown in figure. Just after opening the valve.



A. air form end 1 flows towards end 2, No change in the volume of the soap bubbles

B. air from end 1 flows towards end 2. Volume of the soap bubble at end 1 decreases

C. no change occurs

D. air from end 2 flows towars end 1 .Volume of the soap bubble at end 1 increases

Answer: B

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34. The surface tension and vapour pressure of water at $20^\circ C$ is $7.28 \times 10^{-2} Nm^{-1}$ and $2.33 \times 10^3 Pa$, respectively. What is the radius of the smallest spherical water droplet which can form without evaporating at $20^\circ C$?

A. 6.25×10^{-3}mm

B. 6.25×10^2 mm

C. 5×10^4 m

D. 4.5×10^{-5}m

Answer: B

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35. In air , a charged soap bubble of radius 'r' is in equilibrium having outside and inside pressures being equal . The charge on the drop is (ε_0 = permittivity of free space , T = surface tension of soap solution)

A. $4\pi r^2\sqrt{\frac{2T\varepsilon_0}{r}}$

B. $4\pi r^2\sqrt{\frac{4T\varepsilon_0}{r}}$

C. $4\pi r^2\sqrt{\frac{6T\varepsilon_0}{r}}$

D. $4\pi r^2\sqrt{\frac{8T\varepsilon_0}{r}}$

Answer: D

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Multiple Choice Questions Standard Level

1. ANGLE OF CONTACT

A. $0 \text{ to } 90^\circ$

B. $90^\circ \text{to} 180^\circ$

C. $0 \text{ to } 180^\circ$

D. $0 \text{ to } 360^\circ$

Answer: C

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2. The value of contact angle for kerosene with solid surface.

A. 0°

B. 90°

C. 145°

D. 33°

Answer: D

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3. Water can rise upto a height of 10 cm in a fine capillary tube . The tube is lowered in such a way that only 5 cm of the tube is above the water level . In this case the water at the top of the capillary tube will

A. form a convex surface

B. form a concave surface

C. overflow

D. form a flat surface

Answer: D

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4. If a capillary tube made up of silver is dipped in water . It is found that there in no rise or fall of water in the tube . This shows that the angle of contact is

A. less than 90°

B. more than 90°

C. 90°

D. zero

Answer: C

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5. A liquid rises to a height of 10 cm in a capillary tube of height 16 cm and radius 1 mm , above the liquid level . If the tube is cut at a height of 8 cm , then

A. the liquid will come out as a fountain from the capillary tube

B. liquid will flow down from the sides of the tube

C. the liquid will rise only upto a height 5 cm in the capillary

D. the liquid will not flow out but the liquid surface will flatten out at the open end of the capillary

Answer: D

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6. The surface tension of water is $7 \times 10^{-2} N/m^2$ and its angle of contact with glass is zero . The rise of water in a capillary tube of diameter 0.5 mm is . . . . . .

A. 10 cm

B. 8 cm

C. 5.7 cm

D. 4 cm

Answer: C

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7. A capillary tube when immersed vertically in a liquid records a rise of 3cm.if the tube is immersed in the liquid at an angle of 60° with the vertical, then find the length of the liqiud column along the tube.

A. 3 cm

B. 4 cm

C. 5 cm

D. 6 cm

Answer: D

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8. Water rises in a vertical capillary tube upto 10 cm . If the tube is made inclined to the liquid surface at 45° then the water will rise in the tube upto a length equal to

A. $\frac{10}{\sqrt{2}}$ cm

B. $10\sqrt{2}$cm

C. 10 cm

D. 20 cm

Answer: B

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9. Two vertical parallel glass plates , separated by 0.5 mm, are kept in water . The surface tension of water is 7×10^{-2} N/m . How high will the water rise between the plates ? (use g = $10 \mathrm{m/s}^2$)

A. 1.4 cm

B. 2 cm

C. 2.8 cm

D. 3.5 cm

Answer: C

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10. In a surface tension experiment , with a capillary tube, water rises upto a height of 5 cm . In th capillary tube . If the same experiment is repeated in an artificial satellite ,

revolving round the earth , then the water will rise in the capillary tube upto a height equal to

A. 3 cm

B. 6 cm

C. 9.8cm

D. full length of the capillary tube

Answer: D

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11. The two arms of a Verical U tube have internal radii of 0.4 cm and 0.8 cm respectively . The tube contains water . What is the difference in the surface levels of water in the two arms ? S.T of water $= 70 \times 10^{-3}$ N/m

A. 0.7mm

B. 1.785 mm

C. 3.785 mm

D. 5 mm

Answer: B

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12. Choose the wrong statement from the following

A. Small droplets of a liquid are spherical due to surface tension

B. Oil ries through the wick due to capillary

C. In drinking the cold drinks through a straw, we use the phenomenon of capillary

D. Gum is used to stick two surfaces. In this process we use the property of adhesion

Answer: C

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13. A liquid is kept in a glass vessel . I fthe liquid solid adhesive force between the liquid and the vessel is very weak as compared to the cohesive force in the liquid , then the shape compared to the cohesive force in the liquid ,

then the shape of the liquid surface near the solid should be

A. Concave

B. Convex

C. horizontal

D. Almost vertical

Answer: B

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14. Water rises to a height of 6 cm in a capillary tube of radius r. If the radius of the capillary tube is 3r, the height to which water will rise is ....cm.

A. 4 mm

B. 1 mm

C. 3 mm

D. 1 cm

Answer: B

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15. The angle of contact between a glass capillary tube of length 10 cm and a liquid is 90° .If the capillary tube is dipped vertically in the liquid , then the liquid

A. will rise in the tube

B. will get depressed in the tube

C. will rise upto 10 cm in the tube and will overflow

D. will neither rise nor fall in the tube

Answer: D

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16. Water rises to a height of 20 mm in a capillary tube having cross sectiona area. If area of cross section of the tube is made $\frac{A}{4}$,then water will rise to a height of

A. 4 cm

B. 2 cm

C. 3 cm

D. 6 cm

Answer: A

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17. To capillaries are dipped side by side in a beaker containing water . It is found the rise water in them is upto heights of 1.3 cm and 3.9 cm respectively . The ratio of their radii is

A. $1:3$

B. $3:1$

C. $1:4$

D. $4:1$

Answer: B

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18. When the temperature of a liquid is increased , following changes take place in the surface tension (T) and angle of contact (θ)

A. Both T and θ are increased

B. Both T and θ are decreased

C. T is increased but θ is decreased

D. T is decreased but θ is increased

Answer: B

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19. Water rises in a capillary tube upto a height 'h' so that the upward force due to S.T is balanced by the force due to the weight of

the water column. If this force is 90 dyne and surface tension of water is 6×10^{-2} N/m then the inner circumference of the capillary must be

A. 0.75×10^{-2} m

B. 1.5×10^{-2} m

C. 15×10^{-2} m

D. 0.5×10^{-2}m

Answer: B

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20. Two capillary tubes of the same diameter are kept vertically in two liquids whose densities are in the ratio $4:3$ What is the ratio of the heights $\left(\frac{h_1}{h_2}\right)$ in the two capillary tubes if their surface tension are int the ratio of $6:5$ [Assume that their angles of contact are equal]

A. $\frac{10}{9}$

B. $\frac{9}{10}$

C. $\frac{5}{10}$

D. $\frac{10}{7}$

Answer: B

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21. Water rises upto a height h in a capillary on the surface of earth in stationary condition. Value of h increases if this tube is taken

A. in a lift going upward with acceleration

B. on the sum

C. in a gift gong downward with acceleration (a) where $a < g$

D. on the poles

Answer: C

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22. A glass plate is partly dipped vertically in the mercury and the angle of contact is measured. If the plate is inclined, then the angle of contact will

A. Decrease

B. Increase

C. Remain unchanged

D. Increase or decrease

Answer: C

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23. A vessel, whose bottom has round holes with diameter of 0.1 mm , is filled with water. The maximum height to which the water can

be filled without leakage is (S.T. of water =75 dyne/cm , g=1000 cm/s)

A. 30 cm

B. 50 cm

C. 75 cm

D. 100 cm

Answer: A

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24. In which one of the following phenomena capillary action is not used ?

A. wick dipped in oil

B. absorption of ink by the blotting paper

C. floating of a wooden cork on water

D. ploughing of the farm

Answer: C

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25. A liquid rises to a height of 3.6 cm in capillary tube of radius r . If the radius of the capillary tube is made 0.75 r, then the height to which the liquid will rise in the capillary tube is

A. 3.6 cm

B. 2.4 cm

C. 4.8 cm

D. 1.8 cm

Answer: C

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26. Two parallel glass plates separated by a small distance x ar dipped partly in a liquid of density ' d keeping them vertical .The surface tension of the liquid is T and angle of contact is θ . What is the rise of the liquid between the plates due to capillarity ?

A. $\frac{2T\cos\theta}{xdg}$

B. $\frac{2T}{xdg\cos\theta}$

C. $\frac{T\cos\theta}{xdg}$

D. $\frac{T\cos\theta}{xd}$

Answer: A

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27. The angle of contact at the interface of water glass is 0° ethylalcohol-glass is 0° mercury glass is 140° and methyliodide-glass is 30° A glass capillary is put in a through containing one of these four liquids. It is

observed that the meniscus is convex. The liquid in the through is

A. Water

B. Ethyl alcohol

C. Mercury

D. Methyl iodide

Answer: C

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28. A liquid rises to a height of 1.8 cm in a glass capillary A another glass capillary B having diameter 90% of capillary A is immersed in the same liquid the rise of liquid in capillary B is

A. 1.4 cm

B. 1.8 cm

C. 2.0 cm

D. 2.2 cm

Answer: C

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Watch Video Solution

29. The surface tension for pure water in a capillary tube experiment is

A. $\frac{2}{hr\rho g}$

B. $\frac{r\rho g}{2h}$

C. $\frac{hr\rho g}{2}$

D. $\frac{\rho g}{2hr}$

Answer: C

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30. A square frame of side L is dipped in a soap solution .When it is taken out of the solution . When it is take out of the solution , a film is formed on it . If the surface tension is T, then force acting on it is :

A. 2TL

B. 16TL

C. 4TL

D. 8TL

Answer: D

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31. The surface tension soap solution is 3×10^{-2} N/m then then the work done in forming a soap film of $20cm \times 5$ cm will be

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32. Work done in increasing the size of a soap bubble from a radius of 3cm to 5cm is nearly

(Surface tension of soap solution $= 0.03 Nm^{-1}$)

A. 6×10^{-3}J

B. 3×10^{-4}J

C. 6×10^{-4}J

D. 3×10^{-3}J

Answer: C

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33. If T is the surface tension of soap solution, the amount of work done in blowing a soap bubble from a diameter D to 2D is

A. 1131 erg

B. 2262 erg

C. 3300 erg

D. 800 erg

Answer: B

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34. If T is the surface tension of soap solution, the amount of work done in blowing a soap bubble from a diameter D to 2D is

A. $2\pi TD^2$

B. $4\pi TD^2$

C. $6\pi TD^2$

D. $8\pi TD^2$

Answer: C

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35. A soap bubble of radius $1/\sqrt{\pi}\text{cm}$ is expanded to radius $2/\sqrt{\pi}\text{cm}$. Calculate the work done. Surface tension of soap solution $= 30\text{dyne} \quad cm^{-1}$.

A. 30 dyne/cm

B. 20 dyne/cm

C. 15 dyne/cm

D. 40 dyne/cm

Answer: A

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36. The radii of two soap bubbles are r_i and r_2. In isothermal conditions, two meet together in vacuum. Then the radius kof the resultant bubble is given by

A. $r_1 + r_2$

B. $\frac{r_1 + r_2}{2}$

C. $\left(r_1^2 + r_2^2\right)^{1/2}$

D. $\frac{r_1 + r_2}{r_1 r_2}$

Answer: C

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37. Work done in forming a liquid drop of radius R is W_1 and that of radius 3R is W_2. The ratio of work done is

A. $1:3$

B. $3:1$

C. $1:9$

D. $9:1$

Answer: C

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38. A sheet can be made water proof by coating it with a substance that changes the angles of contact

A. to $\frac{\pi}{2}$

B. to zero

C. from acute to obtuse

D. from obtuse to acute

Answer: C

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39. Work W is required to form a bubble of volume V from a given solution. What amount of work is required to be done to form a bubble of volume $2V$?

A. 2W

B. will get depressed in the tube

C. $2^{1/3}W$

D. $4^{1/3}W$

Answer: D

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40. A spherical drop of water has a diameter of 2 mm . If the surface tension of water is 70×10^3 N/m , then the difference of pressures between the inside and outside of the spherical drop is

A. $70N/m^2$

B. $90N/m^2$

C. $110N/m^2$

D. $140N/m^2$

Answer: D

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41. The excess pressure inside a soap bubble of volume V_1 is twice the excess pressure insie a second soap bubble of twice the excess

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

A. 1

B. $\frac{1}{2}$

C. $\frac{1}{4}$

D. $\frac{1}{8}$

Answer: D

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42. Air is pushed in a soap bubble to increase its radius from R to 2R . In this case the pressure inside the bubble

A. becomes zero

B. increases

C. decreases

D. does not change

Answer: C

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43. At critical temperature, the surface tension of a liquid

A. is infinity

B. is zero

C. cannot be determined

D. is the same as that at any other temperature

Answer: B

 Watch Video Solution

44. If the excess pressure inside a soap bubble of radius 5 mm is equal to the pressure of a water column of hight 0.8 cm, then the surface tension of the soap solution will be

A. 980 N/m

B. 98×10^{-2}N/m

C. 98×10^{-3} N/m

D. 98 N/m

Answer: C

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45. When a soap bubble is charged :-

A. it expands

B. it contracts

C. it does not undergo any change in size

D. it may expand or contract , depending upon whether the charge is positive or negative

Answer: A

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46. If the radius of a soap bubble is four times that of another, then the ratio of their pressures will be

A. $4:1$

B. $1:4$

C. $16:1$

D. $1:16$

Answer: B

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47. The surface tension of pure water is measured at different temperatures . If is found that the surface tension is minimum when the temperature of water is

A. $20^\circ C$

B. $40^\circ C$

C. $70^\circ C$

D. $30^\circ C$

Answer: C

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48. When one end of a capillary tube is dipped vertically in water, the pressure below the meniscus of water is

A. more than upper side pressure

B. lesser than upper side pressure

C. equal to atmospheric

D. equal to upper side pressure

Answer: B

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49. A long cylinderical glass vessel has a small hole of radius r at its bottom. The depth to which the vessel can be lowered vertically in a deep water (surface tension S) without any water entering inside is

A. $\frac{T}{\rho r g}$

B. $\frac{2T}{\rho r g}$

C. $\frac{3T}{\rho r g}$

D. $\frac{4T}{\rho r g}$

Answer: B

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50. What is the energy required to blow a soap bubble of radius 5 cm ? [S.T of soap solution $= 30 \times 10^{-2}$ N/m]

A. 1.884×10^{1}J

B. 1.884×10^{-2}J

C. 1.884×10^{1}J

D. 1.884×10^{2}J

Answer: B

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51. The surface tension of soap solution is 0.030 N/m . What is the energy needed to

increase the radius of a soap bubble from 4 cm to 6 cm ?

A. $1.5 \times 10^3 \text{J}$

B. $1.5 \times 10^{-2} \text{J}$

C. $3 \times 10^{-2} \text{J}$

D. $1.5 \times 10^{-4} \text{J}$

Answer: A

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

A. 4πmJ

B. 0.2π mJ

C. 2π mJ

D. 0.4π mJ

Answer: D

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53. When NaCl is added to water, the surface tension of watr will

A. decrease

B. remains same

C. increase

D. nothing can be said

Answer: C

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54. With an increase in temperature , surface tension of liquid (except molten copper and cadmium)

A. decreases

B. remains constant

C. first increases and then decreases

D. increases

Answer: A

 Watch Video Solution

55. Work done in forming a liquid drop of radius R is W_1 and that of radius 3R is W_2. The ratio of work done is

A. $1:2$

B. $1:4$

C. $1:9$

D. $1:3$

Answer: C

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Multiple Choice Questions Graphical Mcqs

1. The correct graph showing the relation between the height of water column in a capillary tube and the capillary tube and the capillary radius is shown by

A. 

B. 

C. 

D. 

Answer: D

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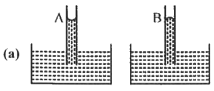
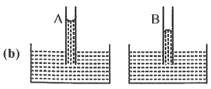
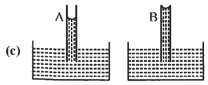
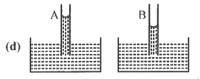
2. A capillary tube (A) is dipped in water. Another identical tube (B) is dipped in a soap-water solution. Which of the following shows the relative nature of the liquid columns in the two tubes?

A. 

B. 

C. 

D. 

Answer: D

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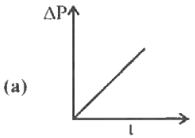
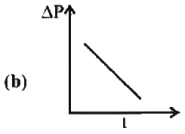
3. A soap bubble is blown with the help of mechanical pump at the mouth of a tube. The pump produces a cartain increase per minute

in the volume of the bubble, irrespective of its internal pressure. The graph between the pressure inside the soap bubble and time t will be

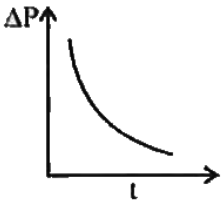
A.



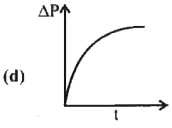
B.



C.



D.



Answer: C

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Multiple Choice Questions Mcq From Previous Exams

1. In which of the following substances , the surface tension increases with an increases in temperature ?

A. Copper

B. Molten copper

C. Iron

D. Molten iron

Answer: B

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2. A big drop of radius R is formed by 1000 small droplets of water, then the radius of small drop is

A. 11 R

B. $\frac{R}{10}$

C. $\frac{R}{100}$

D. $\frac{R}{1000}$

Answer: B

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3. n droplets of equal size and each of radius r coalesce to form a bigger drop of radius R. the energy liberated is equal to

A. $4\pi R^2 T\left(n^{1/3}-1\right)$

B. $4\pi r^2 T\left(n^{1/3}-1\right)$

C. $4\pi R^2 T\left(n^{2/3}-1\right)$

D. $4\pi r^2 T\left(n^{2/3}-1\right)$

Answer: A

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4. In a capillary tube of radius 'R' a straight thin metal wire of radius ' r ' $(R > r)$ is inserted symmetrically and one end of the

combination is at the same level . The rise of water in the capillary tube is

A. $\frac{T}{(R+r)\rho g}$

B. $\frac{R\rho g}{2T}$

C. $\frac{2T}{(R-r)\rho g}$

D. $\frac{(R-r)\rho g}{T}$

Answer: C

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

A. 2E

B. 4E

C. 8E

D. 12E

Answer: C

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6. When one end of the capillary is dipped in water, the height of water column is $'h'$. The upward force of 105 dyne due to surface tension is balanced by the force due to the weight of water column . The inner circumference of the capillary is

(Surface tension of water $= 7 \times 10^{-2} N/m$)

A. 1.5 cm

B. 2 cm

C. 2.5 cm

D. 3 cm

Answer: A

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

A. $n^2 : 1$

B. $n:1$

C. $\sqrt{n}:1$

D. $\sqrt[3]{n}:1$

Answer: D

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Multiple Choice Questions Test Your Grasp

1. One thousand small water drops of equal radii combine to form a big drop. The ratio of

final surface energy to the total initial surface energy is

A. $1:1000$

B. $10:1$

C. $1:10$

D. $1000:1$

Answer: C

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2. A wire of length 10 cm is gently placed horizontally on the surface of water having a surface tension of 75×10^{-3} N/m . What is the force required to pull up the wire from the surface .

A. 10^2

B. 0.5×10^{-2}N

C. 1.5×10^{-2}N

D. 2×10^{-2}N

Answer: C

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3. A disc of radius R has a concentric hole of radius r. It is floating on a liquid of surface tension T . What is the force of surface tension on the disc ?

A. $4\pi(R+r)T$

B. $4\pi(R-r)T$

C. $2\pi(R-r)T$

D. $2\pi(R+r)T$

Answer: D

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4. Two capillary tubes P and Q are dipped in water. The height of water level in capillary P is 2/3 to the height in Q capillary. The ratio of their diameters is

A. $3:2$

B. $2:3$

C. $3:4$

D. $4:3$

Answer: A

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5. The radius of a capillary tube is 1.4 mm . Water of weight 6.28×10^{-4} N rises in the capillary tube, when it is dipped vertically in water . What is the surface tension of water ?

A. 7 N/m

B. 7×10^{-1}N/m

C. 7×10^{-3}N/m

D. 7×10^{-2}N/m

Answer: D

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6. 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. 4 cm

B. 10 cm

C. 16 cm

D. 20 cm

Answer: D

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7. If work W is done in blowing a bubble of radius R from a soap solution. Then the work done is blowing a bubble of radius $2R$ from the same solution is

A. 2 W

B. 4W

C. W/4

D. W/2

Answer: B

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8. The workdone in increasing the size of a soap film from $10cm \times 6cm$ to $10cm \times 11cm$ is $3 \times 10^{-4} J$. The surface tension of the film is

A. 1.5×10^{-2}N/m

B. 5×10^{-2}N/m

C. 3×10^{-2}N/m

D. 6×10^{-2}N/m

Answer: C

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9. A soap bubble in vacuum has a radius of $3cm$ and another soap bubble in vacuum has a radius of $4cm$. If the two bubbles coalesce under isothermal conditions then the radius of the new bubble is :

A. 3 cm

B. 4 cm

C. 5 cm

D. 6 cm

Answer: C

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10. Which one of the following graphs represents the variation of surface tension of water with temperture for a small range of temperature ?

A. 

B. 

C. 

D. 

Answer: C

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