PHYSICS

BOOKS - TARGET PHYSICS (HINGLISH)

SURFACE TENSION

Classical Thinking

1. The force of attraction between molecules of different substances is

A. cohesive force .

B. adhesive force.

C. gravitational force

D. nuclear force

Answer: B

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2. Cohesive force is experienced between

A. magnetic subtances .

B. molecules of different substances.

C. molecules of same substances

D. molecules of liquid .

Answer: C

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3. The molesular force are

A. short range forces

B. zero range forces .

C. long range forces

D. multi-range forces .

Answer: A

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4. Molecular forces are

A. only adhesive

B. only cohesive

C. only repulsive

D. cohesive and adhesive .

Answer: D

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5. The maximum distance upto which the intermolecular forces are effective is called

A. range of molecular attraction .

B. radius of the molecule .

C. sphere of influnce of that molecule .

D. molecular force .

Answer: A

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6. Molecular range of molecule is

A. the maximum distance travelled.

B. the maximum distance upto which the adhesive forced is effective .

C. the maximum distance upto which the cohesive force is effective .

D. the distance of separation between two molecules .

Answer: C

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7. The molecules on the liquid surface

A. experience a net inward force from liquid molecules inside the liquid .

B. possess maxium K.E .

C. possess zero potential energy .

D. do not experence a force due to surface tension

Answer: A

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8. An imaginary sphere drawn with a radius equal to the range of molecular attraction is called

A. effective range of molecular attraction

B. diameter of that molecule

C. sphere of influence of that molecule .

D. radius of molecular attraction .

Answer: C

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9. Free surface of a liquid behaves like a stretched membrane and tends to assume smallest possible area due to

A. cohesive force .

B. adhesive force.

C. centripetal force .

D. centrifugal force .

Answer: A

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10. A liquid film at the surface behaves as a

A. stretched membrane

B. unstretched membrane

C. expanding surface

D. unoccupied space.

Answer: A

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11. In case of a liquid which does not wet a solid surface , the force of adhesion

A. is equal to the force of cohesion .

B. is greater than the force of cohesion .

C. is less than the force of cohesion

D. cannot be predicted .

Answer: C

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12. Surface tension is due to

A. frictional force between molecules .

B. cohesive force between molecules .

C. adhesive force between molecules

D. gravitational forces

Answer: B

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13. A liquid molecule is brought from within to the surface layer . It gains potential energy because

A. its velocity increases

B. its distance from the centre of gravity increases.

C. work is done to overcome the inward attraction of the molecules.

D. work is done aginst molecular repulsion .

Answer: C

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14. Surface tension of a liquid is numerically equal to

A. surface energy

B. surface energy per unit length

C. surface energy per unit area

D. surface energy per unit volume .

Answer: C

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15. A big drop of a liquid is spread into 5 identical droplets . In this process.

A. energy will be released .

B. energy is absorbed

C. mass will not be conserved

D. energy will neither be released nor be absorbed .

Answer: B

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16. A molecule of a liquid which reaches the surface from interior gains energy because

A. it reaches the surface with higher speed

B. it overcomes the force of attraction between the molecules at the surface .

C. it overcomes the force of repulsion on molecules at the surface

D. gravitational potential energy in more .

Answer: B

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17. A needle or a pin floats on the surface of water because of

A. surface tension

B. adhesive force.

C. lighter weight

D. viscosity

Answer: A

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18. Insects are able to run on the surface of water bacause :

A. insects have less weight

B. insects swim on water

C. of the Archimedes 's upthrust.

D. surface tension makes the surface behave as elastic membrane .

Answer: D

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19. The surface tension of cold water is that of hot water

A. less than

B. more than

C. same as

D. negligibly small than

Answer: B

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20. The surface tension of two liquids are 30 and 60 dyne cm^{-1} respectively. The liquid drop form at the ends of two tube of the same radius. The ratio of the weight of the two drops is

A. $1:2$

B. $1:3$

C. $2:3$

D. $3:4$

Answer: A

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21. Due to which property of water, tiny particles of camphor dance on the surface of water

A. Viscosity

B. Surface tension

C. Weight

D. Force of buoyancy

Answer: B

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22. Dettol antiseptic lotion is used for nursing cuts and wounds on the body because its surface tension is

A. less so it spreads well into the wound .

B. high so It spreads well into the wound

C. less so that it does not spread on the surface of other parts of the body .

D. high so that it does not spread on the surface of other parts of the body .

Answer: A

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23. Coating used on raincoat are waterproof because

A. water is absorbed by the coating

B. cohesive force becomes greater.

C. water is not scattered away by the coating

D. angle of contact decreases.

Answer: B

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24. Hot tomto soup is tastier than cold tomato soup because .

A. Hot soup has more surface tension hence it spreads over large area .

B. cold soup has more surface tension hence it speads over large area .

C. Hot soup has less surface tension hence it spreads over large area.

D. Cold soup has less surface tension hence it spreads over large area.

Answer: C

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25. S.I. Unit of surface tension is:

A. Nm

B. Nm^{-2}

C. Nm^{-1}

D. Ns^{-1}

Answer: C

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26. What make it difficult to separate two glass sheets having a drop of water between them .

A. Viscosity

B. Gravity

C. Surface tension

D. Atmospheric pressure

Answer: C

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27. Hair of shaving brush cling together when it is removed from water due to

A. force of attraction

B. Surface tension

C. Viscosity of water

D. characteristic property of hairs.

Answer: B

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28. When kerosene is poured on the surface of water , the larvae and mosquitoes do not remain alive because

A. surface tension decreases

B. surface tension increases

C. they do not get oxygen.

D. viscosity increases.

Answer: A

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29. Which of the following liquids has of the liquid surface is equivalent to

A. water

B. Soap-solution

C. Alcohol

D. Mercury

Answer: D

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30. The work done to increase unit area of the liquid surface is equivalent to

A. suface tension

B. power

C. pressure

D. viscosity

Answer: A

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31. When a liquid is in contact with a solid , the angle between the surface of the solid and the tangent drawn to the surface of the liquid at that point of contact , measured on the side of the liquid , is called .

A. acute angle

B. obtuse angle

C. angle of contact

D. solid angle .

Answer: C

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32. Which of the following factors does not affect the angle of contact ?

A. Nature of vessel

B. Temperature

C. Nature of liquid

D. Surface area

Answer: D

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33. The angle of contact between a solid and a liquid is a characteristic property of

A. solid only

B. liquid only

C. both the solid liquid

D. shape of the solid

Answer: C

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34. Angle of contact depends on

A. the nature of the liquid

B. the nature of the solid

C. the material which exists above the free surface of liquid

D. all of these .

Answer: D

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35. The angle of contact for a liquid which wets the surface of a solid is

A. zero

B. acute

C. obtuse.

D. 90°

Answer: B

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36. 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. increase

B. remain unchanged .

C. increase or decrease

D. decrease.

Answer: B

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37. If a liquid does not rise or fall in a capillary tube , then its angle of contact is

A. 0°

B. 165°

C. 90°

D. 45°

Answer: C

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38. A water proofing agent chages the angle of contact from

A. from obtuse to acute

B. from acute to obtuse

C. from obtuse to $\frac{\pi}{2}$

D. from acute to $\frac{\pi}{2}$

Answer: B

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39. Angle of contact with a solid surface does not depend on

A. angle between solid and liquid surface

B. the nature of liquid

C. the nature of solid

D. medium of the liquid surface .

Answer: A

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40. Which of the following statement is incorrect ?

A. For $\theta < 90^\circ$, shape lo liquid meniscus is concave.

B. For $\theta = 90^\circ$, shape of liquid meniscus is plane

C. For $\theta > 90^\circ$, shape of liquid meniscus is convex

D. For $\theta = 90^\circ$, the liquid wets the solid surface

Answer: D

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

A. 0°

B. 90°

C. 45°

D. 33°

Answer: A

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42. An imaginary line is drawn on a liquid surface . At what angle of the line does the surface tension act ?

A. 0

B. $\frac{\pi}{4}$

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

D. π

Answer: C

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43. The angle of contact of mercury glass surface is

A. 0°

B. 80°

C. 120°

D. 135°

Answer: D

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44. Angle of contact varies between

A. 0 to π

B. $\pi/2$ to $(3\pi)/2$

C. 0 to 2π

D. π to 2π

Answer: A

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45. When a droplet of water is pound on a plane surface of a wax then it will

A. remian in the form of a drop

B. spread in any arbitrary manner

C. spread in the form of a circle .

D. spread in the form of a square.

Answer: A

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46. The surface of a liquid will be concave if the cohesive force between liquid molecules and container is

A. infinite

B. less than the force of adhesion between liquid molecules

C. equal to the force of adhesion between liquid molecules .

D. more then the force of adhesion between liquid molecules

Answer: D

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47. A mercury drop continues to be spherical inside the water which proves that as compared to the adhesive force between water and mercury molecules , the cohesive forces between mercury molecules are

A. stronger

B. weaker

C. equal

D. all of these .

Answer: A

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48. If the cohesive force is greater than the adhesive force , the liquid surface will be

A. plane

B. convex

C. concave

D. horizontal

Answer: B

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49. The surface of water in contact with glass wall is

A. plane

B. concave

C. convex

D. both (B) and (c)

Answer: B

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50. If a liquid does not wet the walls of the container , then the adhesive force is

A. $1/\sqrt{2}$ times smaller then the cohesive force

B. $1/\sqrt{2}$ times more then the cohesive force

C. $\sqrt{2}$ times smaller then the cohesive force

D. $\sqrt{2}$ times more then the cohesive force .

Answer: A

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51. The meniscus of mercury in the capillary tube is

A. concave

B. convex

C. plane

D. plano convex

Answer: B

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52. The liquid suface near a vertical solid wall curves upward , because

A. cohesive force is more then adhesive force

B. adhesive force is more then cohesive force

C. both cohesive and adhesive forces are equal

D. of force of gravity

Answer: A

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53. If two soap bubbles of unequal radii are in communication with each other , then

A. air flows from the larger bubble into smaller bubble unitl they have the same size .

B. the size of the bubbles remains the same .

C. air flows from smaller bubble into larger bubble and the larger bubble grows in size and the size of the smaller bubble decreases.

D. air may flow from the smaller to larger bubble or from larger to smaller bubble depending upon the concentration of the soap solution.

Answer: C

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54. Select the correct statement . If a liquid surface is curved , then

A. the pressure on the concave side is less then that on the convex side

B. the pressure on the concave side is equal to pressure on the convex side

C. the presuure on concave side is more then that on convex side

D. the pressure on the convex side is atmospheric pressure .

Answer: C

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55. Two soap bubbles have radii in the ratio of $2:1$ The ratio of the excess pressures inside them is

A. $1:2$

B. $1:4$

C. $2:1$

D. $4:1$

Answer: A

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56. The excess of pressure in a soap bubble of diameter 10 mm , when the surface tension is 0.04N//m is

A. 16Pa

B. 32Pa

C. 4 Pa

D. 64 Pa

Answer: B

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57. The excess pressure inside an air bubble of radius 1 mm formed inside water is (S.T=0.072N//)

A. $14.4N/m^2$

B. $28.8N/m^2$

C. $144N/m^2$

D. $288N/m^2$

Answer: C

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58. A soap bubble of diameter 6mm is formed in air . The surface tension of liquid is 30

dyne/cm . The excess pressure inside the soap bubble is

A. 150 dyne $/ cm^2$

B. 300 dyne $/ cm^2$

C. 400 dyne $/ cm^2$

D. 3×10^{-3} dyne $/ cm^2$

Answer: C

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59. The tip of the nib of a fountain pen is cut , so that

A. The ink comes in contact with air .

B. capillary rise of the ink takes place

C. the surface tension acts on the surface of the nib .

D. none of these

Answer: B

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60. Agricultural farm is ploughed because

A. water can go in depth in land

B. it is easier to sow the seeds .

C. the land is made soft

D. the clay capillaries are deformed to prevent water deep down from rising to the surface and being evaporated .

Answer: D

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61. Kerosene rises in the wicks of a stove due to the property of

A. high viscosity

B. low density

C. capillary action

D. evaporation of oil at low temperature .

Answer: C

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62. The height to which a liquid will rise in a capillary tube is

A. directly proportional to the radius of the capillary .

B. directly proportional to the density of the liquid .

C. directly proportional to acceleration due to gravity

D. directly proportional to the surface tension of liquid .

Answer: D

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63. If the lower end of ta capillary tube touches a liquid whose angle of contact is 90° , then the liquid

A. rises into the tube

B. falls in the tube

C. may rise or fall inside the tube

D. neither rises nor falls inside the tube .

Answer: D

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64. When two capillary tubes of different diameters are dipped vertically in a liquid , the rise of the liquid in the capillary tube

A. is same in both tubes

B. is more in tube of larger diameter

C. is more in tube of smaller diameter

D. there is no rise of liquid in capillary tube of larger diameter.

Answer: B

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65. If a liquid does not wet the material of a capillary tube, then the liquid in it

A. rises

B. falls

C. neither rises nor falls

D. starts freezing .

Answer: B

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66. Due to capillary action, a liquid will rise in the capillary tube if the angle of contact is

A. obtuse

B. acute

C. 90°

D. less than zero

Answer: B

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67. As a result of addition of detergent to a liquid the angle of contact .

A. decreases

B. increases.

C. remains same

D. may decrease or increases .

Answer: D

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68. Soap helps in cleaning clothes, because

A. chemicals of soap change

B. it increases the surface tension of the solution

C. it absorbs the dirt.

D. it lowers the surface tension of the solution.

Answer: D

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69. Detergents in hot water enable grease to be removed from the dishes by

A. raising the surface tension of water

B. changing the angle of contact between greases and dish to an obtuse angle

C. changing the angle of contact between greases and dish to an acute angle.

D. increasing the temperature of water

Answer: A

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70. What is the surface tension of boiling water ?

A. Zero

B. infinity

C. 100 times than that at $0^\circ C$

D. 72N/m

Answer: A

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71. The value of surface tension of a liquid at critical temperature

A. is zero

B. is infinite

C. is between 0 and ∞

D. cannot be determined .

Answer: A

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72. It is easy to wash clothes in hot water because its :-

A. surface tention is more

B. surface tension is less

C. consumes less soap

D. none of these

Answer: B

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73. A false statement is

A. Angle of contact $\theta < 90^\circ$, if cohesive force $<$ adhesive force .

B. Angle of contact $\theta > 90^\circ$ if cohesive force $>$ adhesive force .

C. Angle of contact $\theta = 90^\circ$,if cohesive force =adhesive force

D. If the radius of capillary is reduced to half ,the rise of liquid column becomes

four times ,

Answer: D

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74. If the surface tension of liquid is T , the work required to increases its surface are by A,is

A. $A \times T$

B. $A \times 2$

C. $2A \times T$

D. $A^2 \times T$

Answer: A

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75. Surface tension of 1 Nm^{-1} is equivalent to (in C.G.S. system)

A. 10dyne cm^{-1}

B. 10^3 dyne cm^{-1}

C. 10^5 dyne cm^{-1}

D. 10^7 dyne cm^{-1}

Answer: B

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76. The graph between surface tension and temperature T is

A. 

B. 

C. 

D. 

Answer: A

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Critical Thinking

1. The net force acting on a molecule inside the liquid is

A. directly upwards at the liquid surface

B. directly inwards at the liquid surface

C. zero

D. infinite

Answer: C

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

A. force of surface tension is equal and opposite to force of gravity

B. force of gravity predominates force of surface tension

C. force of surface tension predominates force of gravity

D. cohesive force predominates adhesive force .

Answer: C

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3. F_c and F_A denote cohesive and adhesive forces on a liquid molecule near the surface of a solid. The surface of liquid is convex , if

A. $F_A > \frac{F_c}{\sqrt{2}}$

B. $F_A = \frac{F_c}{\sqrt{2}}$

C. $F_A < \frac{F_c}{\sqrt{2}}$

D. $F_A > F_c$

Answer: A

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4. Statement I: Surface tension has the same units as force gradient.

Statement II: Surface tension is the force gradient along the surface of liquid.

A. Assertion is True , Reason is True , Reason is a correct explanation for Assertion

B. Assertion is Ture , Reason is True , Reason in not a correct explanation for

Assertion

C. Assertion is True , Reason is False

D. Assertion is False but , Reason is False .

Answer: A

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5. Assertion: Oil spreads on cold water .

Reason : The surface tension of oil is graater than that of cold water .

A. Asseration is True ,Reason is True , Reason is a correct explanation for Asseration

B. Assertion is True , reason is true, reason is not a is not a correct explanation for assrtion

C. Assertion is True , Reason is False

D. Assertion is False but , Reason is True .

Answer: C

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6. The surface tension of water in C.G.S units is 70 dyne / cm . Its S.I unit is

A. 70N//m

B. 7×10^{-2} N//m

C. 0.7N//m

D. $7 \times 10^{3} N/m$

Answer: B

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7. A square wire frame of size L is dipped in a liquid . On taking out , a membrane is formed . If the surface tension of liquid is T, then force acting per unit length of the frame is

A. 2T

B. 4T

C. 8T

D. T

Answer: A

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8. The maximum force in addition to the weight required to pull a wire frame 5.0 cm long from a water surface at a temperature of 20° C is 720dyne . The surface tension of water is

A. 72.0dyne/cm

B. 145dyne/cm

C. 720dyne /cm

D. 14.5 dyne /cm

Answer: A

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9. A disc of paper of radius R is floating on the surface of water of surface tension T . If r=20 cm and T=0.070N//m , then the force of surface tension on the disc is

A. $2.2 \times 10^{-2} N$

B. $4.4 \times 10^{-2} N$

C. $8.8 \times 10^{-2} N$

D. 44×10^{-2}N

Answer: C

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10. Water rises in a capillary tube upto a certain height such that the upward force of surface tension balances the force of $75 \times 10^{-5} N$ due to weight of the liquid. If surface tension of water is $6 \times 10^{-2} Nm^{-1}$,

what must be the internal circumference of the capillary tube?

A. 1.25×10^{-2}m

B. 0.50×10^{-2} m

C. 6.5×10^{-2} m

D. $12.5 \times 10^{-2} m$

Answer: D

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11. A wire ring of diameter $14cm$ is gently lowered on to a liquid surface and then pulled up. When the film just breaks, the force required is $0.0616N$. The surface tension of the liquid is

A. 70N m^{-1}

B. $7Nm^{-1}$

C. 70 dyne cm^{-1}

D. 7 dyne cm^{-1}

Answer: C

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12. A ring of radius 0.75 cm is floating on the surface of water . If surface tension of water is 0.07N//m , then the force required to lift the ring from the surface of water will be

A. 66×10^{-1} N

B. 66×10^{-2} N

C. 66×10^{-3} N

D. 66×10^{-4} N

Answer: D

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13. A glass tube of internal diameter 3.5cm and thickness 0.5 cm is held vertically with its lower end immersed in water . The downward pull on the tube to surface tension (S.T.of water =0.074N//m) is

A. 1.86×10^{-2}N

B. 1.86×10^{-3} N

C. 1.86×10^{-1} N

D. 1.86 N

Answer: A

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14. Two glass plates are separated by water. If surface tension of water is $75 dyn / cm$ and the area of each plate wetted by water is $8 cm^2$ and the distance between the plates is

$0.12mm$, then the force applied to separate the two plates is

A. 10^2 dyne

B. 10^4 dyne

C. 10^5 dyne

D. 10^6 dyne

Answer: C

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15. A clean glass plate of length 9.8 cm , breadth 4 cm an thicness 0.2 cm is suspended vertically with its long side horizontal and with half the side immersed. Pull due to suface tension will be (S.T.=0.07N//m)

A. 16×10^{-3} N

B. 9×10^{-3} N

C. 12×10^{-3} N

D. 14×10^{-3} N

Answer: D

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16. Two drops of soap equal radius r coalesce to form a single drop under isothermal conditions . The radius of such a drop would be

A. r

B. 1.4 r

C. 1.5r

D. 2 r

Answer: B

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17. Assertion : if work done in increasing th size of a soap film from 10 cm $\times$ 4 cm to $10cm \times 8cm$is 2×10^{-4}J, then the surface tension is $5 \times 10^{-4} Nm^{-1}$

Reason : work done = surface tension $\times$ increase in area .

A. Assertion is true ,Reason is true , ,Reason is a correct explanation for Assertion

B. Assertion is True , reason Is True reason is not a correct explanation for asserion

C. Assertion is True , Reason is False

D. Assertion is false but reason is true

Answer: D

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18. The surface tension of soap is T . The work done in blowing a soap bubble of radius 3 R to that of a radius 5R is

A. $64\pi R^2 T$

B. $100\pi R^2 T$

C. $128\pi R^2 T$

D. $256\pi R^2 T$

Answer: C

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19. The work done in blowing a soap bubble of radius r of the solution of surface tension T will be

A. $4\pi R^2 T$

B. $\frac{4}{3}\pi R^3 T$

C. $8\pi R^2 T$

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

Answer: C

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20. 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. $\frac{W}{2}$

B. 2W

C. 4W

D. $2\frac{1}{3}W$

Answer: C

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21. Energy needed in breaking a drop of radius R into n drops of radii r is given by

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

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

C. $8\pi T\left(R^2 - nr^2\right)$

D. $4\pi T\left(nr^2 + R^2\right)$

Answer: A

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22. 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. $1.5 \times 10^{-2} N/m$

B. $3 \times 10^{-2} N/m$

C. $6 \times 10^{-2} N/m$

D. $11 \times 10^{-2} N/m$

Answer: B

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23. The surface tension of a liquid is $5Nm^{-1}$. If a thin film formed on a loop of area $0.02m^{-2}$ then its surface energy will be

A. 5×10^{-2}J

B. 2.5×10^{-2} J

C. 2×10^{-1} J

D. 3×10^{-1} J

Answer: C

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24. 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: A

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25. The work done in blowing a soap bubble from a radius of 6 cm to 9 cm if surface tension of soap solution is $25 \times 10^{-3} N/m$, is

A. $90\pi \times 10^{-5}$J

B. $60\pi \times 10^{-5}$

C. $60\pi \times 10^{-5}$

D. $90\pi \times 10^{-6}$ J

Answer: A

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26. The surface tension of a soap solution is 2.1×10^{-2} N//m . The work done in blowing a soap bubble of diameter 6.0 cm is

A. 47.4×10^{-5} J

B. 11.9×10^{-5} J

C. 25.4×10^{-5} J

D. 35.8×10^{-5} J

Answer: A

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27. Two soap bubbles, each of radius r, coaleses in vacuum under isotermal

conditions to from a bigger bubble of radius R. Then R is equal to

A. $2^{-1/2}$ r

B. $2^{1/3}$r

C. $2^{1/2}$ r

D. 2r

Answer: C

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28. If W is amount of work done in forming a soap bubble of volume V , then the amount of work done In forming a bubble of volume 2V from the same solution will be

A. $W/2$

B. 2W

C. $\sqrt{2}W$

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

Answer: D

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29. Surface area of a soap bubble is $1.3 \times 10^{-4} m^2$. The work done to doble the surface area will be (Surface tension for soap solution = 3×10^{-3}N//m)

A. 5.85×10^{-7} joule

B. 7.8×10^{-7} joule

C. 1.95×10^{-7} joule

D. 3.9×10^{-7} joule

Answer: D

Watch Video Solution

30. Two mercury drops each of radius r merge to form a bigger drop. Calculate the surface energy released.

A. $8\pi r^2 T - 4 \times 2^{2/3} \pi r^2 T$

B. zero

C. negative

D. $8\pi r^2 T - 8 \times 2^{1/3} r^2 T$

Answer: A

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31. A water film is formed between two stratght parallel wires of length 20 cm each with a separation of 0.1 cm . If the distance between the wires is increased by 0.1 cm , how much work is done ? (T=0.072 N/m)

A. 0.144×10^{-5}J

B. 14.4×10^{-5} J

C. 1.44×10^{-5} J

D. 144×10^{-5} J

Answer: C

Watch Video Solution

32. A film of water is formed between two straight parallel wires of length 10 cm with separation of 0.5 cm . The work done to increase the separation by 0.1 cm is (S.T=0.070 N/m)

A. 14×10^{-6} J

B. 16×10^{-6}J

C. 18×10^{-6} J

D. 12×10^{-6} J

Answer: A

View Text Solution

33. A film of soap solution is formed in a rectnagular wire frame of length 10 cm and breadth 5 cm . The surface energy of the film ,

if the surface tension of soap solution is 0.035 N/m is

A. 5.5×10^{-4} J

B. 3.5×10^{-4} J

C. 1.75×10^{-4} J

D. 2.75×10^{-4} J

Answer: B

View Text Solution

34. If n drops of a liquid , each with surface energy E , join to form a single drop , then

A. Some energy will be absorbed in the process.

B. the energy released in the process will be nE (n-$n^{1/3}$).

C. the energy absorbed or released will be nE($2^{2/3} - 1$) .

D. the energy released will be ($n - n^{2/3}$).

Answer: D

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35. The surface energy of a liquid drop is u . If it is split into 1000 equal droplets , then its surface energy becomes .

A. u

B. 10 u

C. 100 u

D. 1000 u

Answer: B

View Text Solution

36. The work done in splitting a drop of water of 1 mm radius into 64 identical droplets is (S.T. of water is $72 \times 10^{-3} j/m^2$)

A. 2.0×10^{-6}J

B. 2.7×10^{-6} J

C. 4×10^{-6} J

D. 5.4×10^{-6} J

Answer: B

View Text Solution

37. A spherical liquid drop of radius R is divided into eight equal droplets . If surface tension is T, then the work done in this process will be

A. $2\pi R^2 T$

B. $3\pi R^2 T$

C. $4\pi R^2 T$

D. $22\pi RT^2$

Answer: C

View Text Solution

38. A drop of liquid of diameter 2.8 mm breaks up into 125 identical droplests . The change in energy is nearly (S.T . Of liquid =75 dyne/cm)

A. Zero

B. 19 erg

C. 46 erg

D. 74 erg

Answer: D

View Text Solution

39. The excess pressure in a soap bubble of diameter 8 cm and surface tension 0.02 N/m, is

A. $2N/m^2$

B. $4N/m^2$

C. $0.04Nm^2$

D. $0.02N/m^2$

Answer: B

View Text Solution

40. If the value of excess pressure in a soap bubble is four times that of other , then the ratio of their volumes will be

A. $64:1$

B. $1:64$

C. $1:4$

D. $1:2$

Answer: B

View Text Solution

41. Two soap bubble have volumes in the ratio $8:1$. The ratio of excess pressures inside them will be

A. $1:2$

B. $1:4$

C. $2:1$

D. $4:1$

Answer: A

Watch Video Solution

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

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

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

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

Answer: B

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43. The most approprite graph between height (h) of the liquid column in a capillary tube and the radius (r) of the tube for a given liquid will be

A. 

B. 

C. 

D. 

Answer: C

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44. The radius of the bore of a capillary tube is r and the angle of contact of the liquid is θ . When the tube is dipped in the liquid , the radius of curvature of the meniscus of liquid rising in the tube is

A. $r\cos\theta$

B. $r\sin\theta$

C. $\frac{r}{\sin\theta}$

D. $\frac{r}{\cos\theta}$

Answer: D

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45. The meniscus of mercury in a capillary tube is 1.356 cm below plane surface outside it . If the density is 13.59 gm/cc and surface tension is 547 dyne /cm , then the radius of curvature of its meniscus is

A. 0.05 cm

B. 0.10 cm

C. 0.06 cm

D. 0.26 cm

Answer: C

Watch Video Solution

46. A capillary tube is held vertically in water . The internal radius of the tube is $(1/42)$ cm . If the surface tension is 70 dyne /cm and angle of contact is zero , then rise in the capillary tube is

A. 6 cm

B. 4 cm

C. 12 cm

D. 24 cm

Answer: A

Watch Video Solution

47. 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. $1:0.5$

B. $1:3$

C. $1:6.5$

D. $1.5:1$

Answer: C

Watch Video Solution

48. The height of liquid column in the capillary on the surface of Moon ,if it is h on surface of the Earth is

A. h

B. $\frac{h}{6}$

C. 6h

D. zero

Answer: C

Watch Video Solution

49. In a surface tension experiment with a capillary tube water rises upto $0.1m$. If the same experiment is repeated in an artificial satellite, which is revolving around the earth , water will rise in the capillary tube upto a height of :

A. 0.1m

B. 0.2 m

C. 0.98 m

D. full length of the tube

Answer: D

Watch Video Solution

50. A capillary tube is kept vertical with the lower end dipped in water . The height of water raised in the capillary is 4 cm . If the length of the capillary tube is made 2 cm , then the angle made by the water surface in the capillary with the wall is

A. 0°

B. 30°

C. 60°

D. 90°

Answer: C

Watch Video Solution

51. A liquid of density 850 kg/m^3 has an unknown surface tension . However , it is observed that if rises three times high in a capillary tube as compared to pure water . If

the contact angles for both are same , then the surface tension of liquid is (Surface tension of water =$7.0 \times 10^{-2} N/m$)

A. 0.10 N/m

B. 0.18N/m

C. 0.24 N/m

D. 0.32 N/m

Answer: B

Watch Video Solution

52. The U -tube with limbs of diameters 6 mm and 3 mm contain water of surface tension $7 \times 10^{-2} Nm^{-1}$. The angle of contact is zero and density $10^{3} kgm^{-3}$. If g is 10 ms^{-2} , then the difference in levels in the two limbes is

A. 4.6 cm

B. 4.66 mm

C. 4.6 m

D. 0.46 mm

Answer: B

Watch Video Solution

53. The surface tension of water is 0.072 N/m. The height to which water will rise in a capillary tube of bore diameter 0.048 cm will be (Angle of contact of water is zero , acceleration due to gravity is 10 m/s^2 and density of water =1000 kg/m^3).

A. 6 cm

B. 8 cm

C. 4 cm

D. 10 cm

Answer: A

Watch Video Solution

54. Two capillaries A and B are dipped in water and held vertical . The diameter of A is twice that of B . The ratio of the heights to which water rises in A and B is

A. $2:1$

B. $1:2$

C. $4:1$

D. $1:4$

Answer: B

 Watch Video Solution

55. Water rises to a height of $2cm$ in a capillary tube. If the tube is tilted 60° from the vertical, water will rise in the tube to a length of

A. 4.0 cm

B. 2.0 cm

C. 1.0 cm

D. water will not rise at all

Answer: A

 Watch Video Solution

56. A capillary tube when immersed vertically in a liquid records a rise of 6 cm . If the tube is

immersed inclined 30° with the vertical , then length of liquid column along the tube will be

A. $2\sqrt{3}cm$

B. $4\sqrt{3}cm$

C. $\frac{4}{\sqrt{3}}cm$

D. 12 cm

Answer: B

Watch Video Solution

57. Two tubes of same material but of different radii are dipped in a liquid . The height to which a liquid rises in one tube is 2.2 cm and in the other is 6.6 cm . The ratio of their radii is

A. $9:1$

B. $1:9$

C. $3:1$

D. $1:3$

Answer: C

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58. A hollow sphere has a small hole in it. On lowering the sphere in a tank of water, it is observed that water enters into the hollow sphere at a depth of $40cm$ below the surface. Surface tension of water is $7 \times 10^{-2} N/m$. The diameter of the hole is

A. $(1/28)mm$

B. $(1/7)mm$

C. $(1/14)mm$

D. $(7/21)mm$

Answer: C

Watch Video Solution

59. The excess pressure inside a soap bubble is twice the excess pressurre inside a second soap bubble. The volume of the first bubble is n times the volume of the second where n is

A. 4

B. 2

C. 8

D. 0.125

Answer: D

Watch Video Solution

60. The surface tension of water is 7×10^{-2} N/m . The work required to break a drop of water of radius 0.5 cm into identical drops , each of radius 1 mm is

A. 8.8×10^{-4}J

B. 8.8×10^{-5} J

C. 4.4×10^{-4} J

D. 4.4×10^{-5} J

Answer: B

Watch Video Solution

61. If a million tiny droplets of water of the same radius coalesce into one larger drop, the ration of the surface energy of the large drop

to the total surface energy of all the droplets will be

A. $1:10$

B. $1:10^2$

C. $1:10^4$

D. $1:10^6$

Answer: B

 Watch Video Solution

62. A small air bubble of radius 0.1mm is situated at a depth of 20 m below the free surface of water . The external pressure on the bubble will be (Atm. Pressure = $10^5 N/m^2, g = 10 m/s^2$)

A. $0.5 \times 10^5 N/m^2$

B. $10^5 N/m^2$

C. $3 \times 10^5 N/m^2$

D. $4 \times 10^5 N/m^2$

Answer: C

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Competitive Thinking

1. The force of cohesion is

A. maximum in solids.

B. maximum in liquid

C. same in different matters.

D. maximum in gases.

Answer: A

 Watch Video Solution

2. Mercury does not stick to wood or glass rod.

It indicates that its cohesive force is

A. greater than adhesive force .

B. less then the adhesive force .

C. equal to the adhesive force .

D. zero

Answer: A

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3. Rain drops are sphrical because of

A. gravitation.

B. viscosity

C. Surface tension

D. Atmospheric pressure

Answer: C

Watch Video Solution

4. The surface tension may be defined as the mechanical work required to create an additional unit area A of the liquid under

A. isobaric conditions.

B. isothermal conditions .

C. adiabatic conditions

D. isometric condition

Answer: B

Watch Video Solution

5. Dimensions of surface tension are

A. $\left[m^1 L^2 T^2\right]$

B. $\left[m^1 L^0 T^{-2}\right]$

C. $\left[m^1 L^2 T^{-2}\right]$

D. $\left[m^0 L^0 T^{-2}\right]$

Answer: B

Watch Video Solution

6. Surface tension acts

A. only at the free surface of the liquid

B. inside the liquid

C. at the bottom of the liquid

D. at all places of contact between the liquid and the container .

Answer: A

Watch Video Solution

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

A. TL

B. 2TL

C. 4TL

D. 8TL

Answer: D

Watch Video Solution

8. The force exerted by surface tension on the free surface

A. is along the surface

B. is perpendicular to the surface directed upwards.

C. is perpendicular to the surface directed downwards.

D. none of the above

Answer: A

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9. Calculate the force required to separate the glass plates of area $10^{-2}m^2$ with a film of water 0.05 mm thickness between them (surface tension of water $= 70 \times 10^{-3}N/m$))

A. 28N

B. 14 N

C. 50 N

D. 38 N

Answer: A

Watch Video Solution

10. A metal wire of density ρ floats on water surface horozontally. If is NOT to sink in water, then maximum radius of wire is proportional to (where, T=surface tension of water, g=gravitational acceleration)

A. $\sqrt{\frac{T}{\pi\rho g}}$

B. $\sqrt{\frac{\pi\rho g}{T}}$

C. $\frac{T}{\pi\rho g}$

D. $\frac{\pi\rho g}{T}$

Answer: A

Watch Video Solution

11. Two drops of a liquid are merged to form a single drop . In this process,

A. enetgy is released

B. energy is absorbed

C. energy remains constant .

D. first (B) then (C)

Answer: A

Watch Video Solution

12. Two spherical soap bubbles of radii r_1 and r_2 in vacuume coalesce under isothermal condition. The resulting bubble has radius R such that

A. $R = r_1 + r_2$

B. $R = \frac{r_1 r_2}{r_1 + r_2}$

C. $R^2 = r_1^2 + r_2^2$

D. $R = \frac{r_1 + r_2}{2}$

Answer: C

Watch Video Solution

13. The potential energy of molecule on the surface of a liquid as compared to in side the liquid is

A. more

B. less

C. same

D. half

Answer: A

Watch Video Solution

14. Energy needed in breaking a drop of radius R into n drops of radii r is given by

A. $4\pi R^2 T n^{2/3}$

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

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

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

Answer: C

Watch Video Solution

15. Molecules on the surface of the liquid have

A. maximum kinetic energy

B. minimum kinetic energy

C. maximum potential energy

D. minimum potential energy

Answer: C

Watch Video Solution

16. 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. $32\pi r^2 T$

B. $24\pi r^2 T$

C. $16\pi r^2 T$

D. $8\pi r^2 T$

Answer: B

Watch Video Solution

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

A. $4:3$

B. $16:9$

C. $9:16$

D. $3:4$

Answer: B

 Watch Video Solution

18. 1000 droplets of water having 2 mm diameter each coalesce to form a single drop .

Given the surface tension of water is $0.072 Nm^{-1}$ .the energy loss in the process is

A. 8.146×10^{-4} J

B. 4.4×10^{-4} J

C. 2.108×10^{-5} J

D. 4.7×10^{-1} J

Answer: A

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

A. $1.88j$

B. 1.88×10^{-1} J

C. 1.88×10^{-2} J

D. $1.88 \times 10J$

Answer: C

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20. Work done in blowing a soap bubble of diameter 2 cm , is (S.T =3×10^{-2} N/m)

A. 7.54×10^{-5} J

B. 7.54×10^{-6} J

C. 7.54×10^{-3} J

D. $7.54J$

Answer: A

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21. The surface tension of soap solution is 0.035 N/m . The energy needed to increase the radius of the bubble from 4 cm to 6 cm is

A. 1.8×10^{-3} J

B. 1.8×10^{-2} J

C. 3.6×10^{-2} J

D. 1.8×10^{-4} J

Answer: A

Watch Video Solution

22. 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. 0.07N

B. 0.06N

C. 0.01 N

D. 0.02 N

Answer: D

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23. A rectangular film of liquid is extended from $(4cm \times 2cm)$ to $(5cm \times 4 \times cm)$. If the work done is $3 \times 10^{-4} J$, the value of the surface tension of the liquid is

A. $8.0 Nm^{-1}$

B. $0.250 Nm^{-1}$

C. $0.125 Nm^{-1}$

D. $0.2Nm^{-1}$

Answer: C

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24. A frame made of metalic wire enclosing a surface area A is covered with a soap film. If the area of the frame of metallic wire is reduced by 50% the energy of the soap film will be changed by:

A. 1

B. 0.75

C. 0.5

D. 0.25

Answer: C

 Watch Video Solution

25. 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

Watch Video Solution

26. 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. $3\sqrt{n} : 1$

Answer: D

Watch Video Solution

27. 8000 identical water drops are combined to form a big drop then the ratio of the final surface energy to the initial surface energy of all the drops together is

A. $1:10$

B. $1:15$

C. $1:20$

D. $1:25$

Answer: C

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Watch Video Solution

28. A water drop of radius 1 cm is broken into 1000 equal droplets. If the surface tension of water is 0.075 N/m , then the gain in surface enrgy will be

A. 0

B. 8.5×10^{-4} J

C. 7.5×10^{-4} J

D. infinite

Answer: B

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29. Work done in increasing the size of a soap bubble from a radius of $3cm$ to $5cm$ is nearly. (surface tension of soap solution $= 0.3Nm^{-1}$)

A. $4\pi mJ$

B. $0.2\pi mJ$

C. $2\pi mJ$

D. $0.4\pi mJ$

Answer: D

Watch Video Solution

30. 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. 2.3 cm

B. 4.5cm

C. 5 cm

D. 7 cm

Answer: C

Watch Video Solution

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

A. $1:4$

B. $4:1$

C. $16:1$

D. $1:16$

Answer: A

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32. A liquid rises in a capillary tube when the angle of contact is:

A. obtuse

B. acute

C. 180°

D. 90°

Answer: B

Watch Video Solution

33. Nature of meniscus for liquid having angle of contact as 0° is

A. plane

B. parabolic

C. semi-spherical

D. cylindrical

Answer: C

Watch Video Solution

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

A. obtuse

B. acute

C. 0°

D. 90°

Answer: A

Watch Video Solution

35. What is angle between pure water and glass?

A. 90°

B. 0°

C. 45°

D. 30°

Answer: B

Watch Video Solution

36. The liquid meniscus in a capillary tube will be convex, if the angle of contact is

A. greater then 90°

B. less than 90°

C. equal to 90°

D. equal to 0°

Answer: A

Watch Video Solution

37. What is the shape when a non-wetting liquid is placed in a capillary tube

A. concave upward

B. convex upward

C. Concave downward

D. Convex downward

Answer: B

Watch Video Solution

38. When the temperature increased the angle of contact of a liquid

A. increases

B. decreases

C. remains the same

D. first increases and then decreases .

Answer: B

Watch Video Solution

39. If a water drop is kept between two glass plates, then its shape is

A. 

B. 

C. 

D. None of these

Answer: C

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40. A and B are two soap bubbles. Bubble A is larger than B. If these are now joined by a tube then

A. the bubble A becomes more large .

B. the bubble B becomes more large

C. both the bebbles acquire the same size.

D. both the bubbles will get burst.

Answer: A

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41. Excess pressure in a soap bubble of radius r is proportional to:

A. r^2

B. r

C. $1/r$

D. $1/r^2$

Answer: C

Watch Video Solution

42. The difference of pressures between inside and outside of a soap bubble is

A. $2T/r$

B. $4T/r$

C. $2r/T$

D. $4r/T$

Answer: B

Watch Video Solution

43. The excess pressure in a soap bubble is thrice that in other one. Then the ratio of their volumes is

A. $1:3$

B. $1:9$

C. $27:1$

D. $1:27$

Answer: D

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44. When a large bubble rises from the bottom of a lake to the surface its radius doubles. If atmospheric pressure is equal to

that of column of water height H then the depth of lake is

A. H

B. 2H

C. 7H

D. 8H

Answer: C

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45. A soap buble of radius 1.0 cm is formed inside another soap bubble of radius 2.0 cm . The radius of an another soap bubble which has the same pressure difference as that between the inside of the smaller and outside of large soap bubble , in metres is

A. 6.67×10^{-3}

B. 3.34×10^{-3}

C. 2.23×10^{-3}

D. 4.5×10^{-3}

Answer: A

 Watch Video Solution

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

A. by atmospheric pressure.

B. partly by atmospheric pressure and partly by surface tension.

C. entirely by the force due to surface tension .

D. partly by the force due to surface tension.

Answer: C

Watch Video Solution

47. Water rises to height h in capillary tube. If the length of capillary tube above the surface of water is made less than h then

A. Water does not rise at all

B. water rises upto the tip of capillary tube and then starts overflowing like a fountain .

C. water rises upto the top of capillary tube and stays there without overflowing .

D. water rises upto a point a little below the top and stays there

Answer: C

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48. The correct relation is

A. $r = \dfrac{2T\cos\theta}{h\rho g}$

B. $r = \dfrac{h\rho g}{2T\cos\theta}$

C. $r = \dfrac{2T\rho gh}{\cos\theta}$

D. $r = \dfrac{T\cos\theta}{2h\rho g}$

Answer: A

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49. 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. 2 cm

B. 3 cm

C. 6 cm

D. 9 cm

Answer: C

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

A. 4h

B. 3h

C. 2h

D. half

Answer: B

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51. Three liquids of densities ρ_1,ρ_2 and ρ_3 (with $\rho_1 > \rho_2 > \rho_2)$ having the same value of surface tension T, rise to the same height in three identical capillaries. The angles of contact θ_1,θ_2 and θ_3 obey

A. $\pi > \theta_1 > \theta_2 > \theta_3 > \frac{\pi}{2}$

B. $\frac{\pi}{2} > \theta_1 > \theta_2 > \theta_3 \geq 0$

C. $0 \leq \theta_1 < \theta_2 < \theta_3 < \frac{\pi}{2}$

D. $\frac{\pi}{2} < \theta_1 < \theta_2 < \theta_3 < \pi$

Answer: C

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52. 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: B

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

combination is dipped vertically in water such that the lower end of the combination Is at same level . The rise of water in the capillary tube is [T=surface tensiono of water ρ =density of water ,g =gravitational acceleration]

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

Watch Video Solution

54. In a capillary tube experiment, a vertical 30 cm long capillary tube is dipped in water. The water rises up to a height of 10 cm due to capillary action. If this experiment is conducted in a freely falling elevator, the length of te water column becomes

A. 10 cm

B. 20 cm

C. 30 cm

D. zero

Answer: C

Watch Video Solution

55. A 20 cm long capillary tube is dipped vertically in water and the liquid rises upto 10 cm. If the entire system is kept is a freely falling platform, the length of the water column in the tube will be

A. 5 cm

B. 10 cm

C. 15 cm

D. 20 cm

Answer: D

Watch Video Solution

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

A. 1 cm

B. 0.1 cm

C. 2 cm

D. 4 cm

Answer: A

Watch Video Solution

57. A long capillary tube of radius $0.2mm$ is placed vertically inside a beaker of water.

If the surface tension of water is

$7.2 \times 10^{-2} N/m$ the angle of contact between glass and water is zero, then determine the height of the water column in the tube.

A. $\cos^{-1}\left(\frac{4}{5}\right)$

B. $\cos^{-1}\left(\frac{5}{7}\right)$

C. $\cos^{-1}\left(\frac{2}{7}\right)$

D. $\cos^{-1}\left(\frac{4}{7}\right)$

Answer: B

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58. 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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59. In a capillary tube, water rises by $1.2mm$. The height of water that will rise in another capillary tube having half the radius of the first, is

A. 1.2 mm

B. 2.4 mm

C. 0.6 mm

D. 0.4 mm

Answer: B

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60. If NaCl is dissolved into water , then its surface tension

A. decreases

B. does not change

C. increases

D. first increases then decreases.

Answer: C

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

A. increases

B. decreases

C. remains contant .

D. first increases and then decreases .

Answer: B

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62. The ratio of work done in blowing a liquid drop to radius R and to radius 3R is

A. $\frac{1}{6}$

B. $\frac{1}{18}$

C. $\frac{1}{3}$

D. $\frac{1}{9}$

Answer: D

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63. 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. If the disc displaces a weight of water W and surface tension of water is T, then the weight of metal disc is :

A. $2\pi rT + W$

B. 2pirTcos theta -W`

C. $2\pi rT\cos\theta + W$

D. $W - 2\pi rT\cos\theta$

Answer: C

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64. The surface tension of water is 0.07 N/m . Find the weight of water supported by surface tension in a capillary tube with a radius of 0.1 mm.

A. $11\mu N$

B. $22\mu N$

C. $44\mu N$

D. $88m\mu N$

Answer: C

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65. 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. 2.5 g

B. 5.0 g

C. 10 g

D. 20 g

Answer: C

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66. 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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67. Two soap bubbles A and B are kept in a closed chamber where the air is maintained at pressure $8N/m^2$. The radii of bubbles A and B are $2cm$ and $4cm$, respectively. Surface tension of the soap. Water used to make bubbles is $0.04N/m$. Find the ratio n_B/n_A, where n_A and n_B are the number of moles of

air in bubbles A and B respectively. [Neglect the effect of gravity.]

A. 2

B. 9

C. 8

D. 6

Answer: D

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68. 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. Enetgy =4VT $\left(\frac{1}{r}-\frac{1}{R}\right)$ is released

B. Energy =3VT $\left(\frac{1}{r}+\frac{1}{R}\right)$ is absorbed

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

D. Energy is neither released nor absorbed

Answer: C

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69. Pressure inside two soap bubbles are 1.01 and 1.02 atmospheres. Ratio between their volumes is

A. $102:101$

B. $(102)^3:(101)^3$

C. $8:1$

D. $2:1$

Answer: C

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70. The execc pressure inside the first soap bubble is three times that inside the second bubble. Then the ratio of the volumes of the first and second bubbles is

A. $1:3$

B. $3:1$

C. $1:27$

D. $27:1$

Answer: C

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71. 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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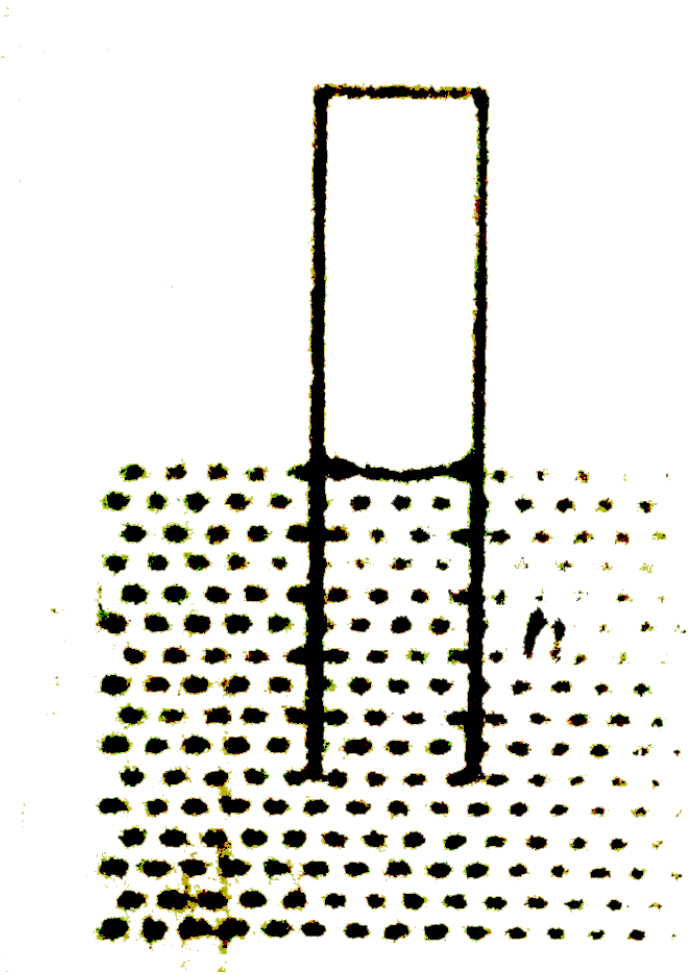
72. A glass capillary of length l and inside radius $r(r << l)$ is submerged vertically into water. The upper end of the capillary is scaled. The atmospheric pressure is p_0. To

what length h has the capillary to be submerged to make the water levels inside and outside the capillary coincide. Assume that temperature of air in the capillary remains constant. (given, surface tension of water = T, angle of contact between glass

water interface $= 0^\circ$)



A. $\dfrac{l}{1 + \frac{P_0 r}{4\gamma}}$

B. $l\left(1 - \dfrac{P_0 r}{4\gamma}\right)$

C. $l\left(1-\frac{P_0 r}{\gamma}\right)$

D. $\frac{l}{1+\frac{P_0 r}{2\gamma}}$

Answer: D

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Evaluation Test

1. A drop of Volume V is pressed between the two glass plates so as to spread to an area of

A. If T is the surface tension, the normal force required to separate the glass plates is

A. $\sqrt{\frac{3T}{g(2\rho-\gamma)}}$

B. $\sqrt{\frac{6T}{g(2\rho-\gamma)}}$

C. $\sqrt{\frac{3T}{g(2p-\sigma)}}$

D. $\sqrt{\frac{3T}{g(4\rho-\sigma)}}$

Answer: C

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2. Assertion : When two soap bubbles having different radii are kept in contact , the common surface at their interface will bulge into a large bubble .

Reason : Pressure inside the smaller bubble is larger .

A. Assertion is True , Reason is True , Reason is a correct explanation for Assertion

B. Assertion is true , Reason is true , Reason is not a correct explanation for Assertion

C. Assertion is True , Reason is False

D. Assertion is false , Reason is true.

Answer: A

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3. A capillary tube with very thin walls is attached to the beam of a balance which is then equalized. The lower end of the capillry is brought in contact with the surface of water after which an additional load of $P = 0.135gm$ force is needed to regain equilibrium. If the radius of the capillary is $\frac{\lambda}{10}cm$ then find λ The surface tension of water is $70\text{dyne}/\text{cm}$. $\left(g = 9.8m/s^2\right)$

A. 3.3 mm

B. 6.6 mm

C. 9.9 mm

D. 1.1 mm

Answer: A

Watch Video Solution

4. One end of a glass capillary tube with a radius r is immersed into water to a depth of h The surface tension of water is s and atmospheric pressure is p_0 . What pressure is

required to blow an air bubble out of the lower end of the tube? Density of water is ρ

A. $P_0 - \rho gh + \frac{2s}{r}$

B. $P_0 + \rho gh + \frac{2s}{r}$

C. $P_0 + \rho gh - \frac{2s}{r}$

D. $P_0 - \rho gh - \frac{2s}{r}$

Answer: B

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5. A capillary tube of radius r is lowered into water whose surface tension is α and density d. The liquid rises to a height. Assume that the contact angle is zero. Choose the correct statement (s):

A. Magnitude of work done by force of surface tension is $\frac{4\pi\alpha^2}{dg}$

B. Magnitude of work done alone by force of surface tension is $\frac{2\pi apha^2}{dg}$

C. Potential energy required by water is $\frac{2\pi\alpha^2}{dg}$

D. The amount of heat developed is $\frac{2\pi\alpha^2}{dg}$

Answer: B

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6. A soap bubble of radius 'r' is blown up to form a bubble of radius 2r under isothemal conditions. If σ be the surface tension of soap solution , the energy spent in doing so is

A. $3\pi\sigma r^2$

B. $6\pi\sigma r^2$

C. $12\pi\sigma r^2$

D. $24\pi\sigma r^2$

Answer: C

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7. Assertion : Pressure in bubble (r) in the atmosphere of pressure $P_0 is P_0 + \frac{4\sigma}{r}$ where r is the radius and σ is surface tension .

Reason: $\frac{4\sigma}{r}$ is the excess pressure due to two surface exposed to the atmosphere .

A. Assertion is true , Reason is true ,s_2 is correct explanation for Assetion .

B. Assertion is true , reason Is true Reason is not a correct explanation for Assertion .

C. Assertion is true , reason is false

D. Assetion is fales ,reason is true

Answer: B

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8. Assertion:- Rise of water level in capillary tube should be accounted vertically and not on the length of the pipe in which it has rise

Reason:- More the radius, the rise will decrease for different liquids tested.

A. Assertion is true , Reason is true ,s_2 is correct explanation for Assetion .

B. Assertion is true , reason Is true Reason is not a correct explanation for Assertion .

C. Assertion is true , reason is false

D. Assetion is fales ,reason is true

Answer: D

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9. In gravity free space. The liquid in a capillary tube will rise to

A. same height as on earth

B. less height as on earth

C. slightly more height that as the earth

D. infinite height

Answer: D

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10. Assertion : When there is a thin layer of water between two glass plates , there is a strong attraction between them .

Reason : The pressure between the plate becomes less than atmospheric pressure because pressure inside a bubble or drop is greater than outside pressure.

A. Assertion is true , Reason is true, Reason is correct explanation for Assertion .

B. Assertion is true , reason Is true, Reason is not a correct explanation for Assertion

.

C. Assertion is true , reason is false

D. Assertion is false ,reason is true

Answer: A

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11. A glass capillary tube of radius r is placed vertically touching the surface of water. The water rises to height h in capillary tube. If now the tube is dipped into water till only $\frac{h}{2}$

length of it is outside the water surface the , radius of curvature of the meniscus of water in capillary tube will be,

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

B. $\frac{3r}{2}$

C. $2r$

D. $\frac{2r}{3}$

Answer: C

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12. A capillary is dipped in water vessel kept on a freely falling lift, then

A. water will not rise in the tube

B. water will rise to maximum available height of tube

C. water will rise to height observed under normal condition

D. water will rise to height below that observed under normal condition

Answer: B

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13. Two spherical soap bubbles of radii r_1 and r_2 in vacuume coalesce under isothermal condition. The resulting bubble has radius R such that

A. $R = \left(\frac{r_1 + r_2}{2}\right)$

B. $R = \left[\frac{r_1 r_2}{(r_1 + r_2)}\right]$

C. $R = \sqrt{(r_1^2 + r_2^2)}$

D. $R = r_1 + r_2$

Answer: C

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14. Water rises to height of 5 cm in glass capillary tube . If the area of cross section of the tube is reduced to $\left(\frac{1}{16}\right)$ th of the former value , the water rises to a height of

A. 10 cm

B. 20 cm

C. 30 cm

D. 40 cm

Answer: B

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15. Suppose that 64 raindrops combine into a single drop . Calculate the ratio of the totla surface energy of the 64 drops of that of a single drop. (T = 0.072 N/m)

A. 4

B. 5

C. 6

D. 7

Answer: A

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16. Two separate air bubbles (radii $0.002cm$ and 0.004) formed of the same liquid (surface tension $0.07N/m$) come together to form a

double bubble. Find the radius and the sense of curvature of the internal film surface common to both the bubbles.

A. 4

B. 5

C. 6

D. 7

Answer: A

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17. Two soap bubbles A and B are kept in a closed chamber where the air is maintained at pressure $8N/m^2$. The radii of bubbles A and B are $2cm$ and $4cm$, respectively. Surface tension of the soap. Water used to make bubbles is $0.04N/m$. Find the ratio n_B/n_A, where n_A and n_B are the number of moles of air in bubbles A and B respectively. [Neglect the effect of gravity.]

A. 4

B. 5

C. 8

D. 7

Answer: C

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18. Two parallel glass plates are held vertically at a small separation d and dipped in a liquid of surface tension T , the angle of contact $\theta = 0^\circ$ and density ρ . The height of water

that climbs up in the gap between glass plates

is given by

A. $\frac{2T}{d}\rho g$

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

C. $\frac{T}{d\rho g}$

D. None of these

Answer: A

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19. A glass rod of diameter $d_1 = 1.5mm$ is inserted symmetrically into a glass capillary with inside diameter $d_2 = 2mm$. Then the whole arrangement is vertically oriented and broght in contact with the surface of water . Surface tension and density of water are $0.075N/m$ and $10^3 kg/m^3$ respectively . the height throgh which the water will rise in the capillary is $\left(g = 10m/s^2\right)$

A. 12 cm

B. 3 cm

C. 6 cm

D. 36 cm

Answer: C

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20. When a loop of wire is dipped in a wetting liquid and is taken out. A liquid film is formed and loop of light inextensible thread is gently put on the liquid film. A hole is pricked inside the loop of thred. Due to property of suface

tension , free surface of the liquid tries to minimize its surface are and hence are of the hole will be maximized.

In the above desciption. loop wire is square of side 4 units. If lenght of thread is 15 units what is the final suface area for soap film on one side of wire frame?

(Neglect the frication everywhere)

A. 0.289 units^2

B. 0.3625units^2

C. 1.9375 units^2

D. $2units^2$

Answer: A

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21. When a loop of wire is dipped in a wetting liquid and is taken out. A liquid film is formed and loop of light inextensible thread is gently put on the liquid film. A hole is pricked inside the loop of thred. Due to property of suface tension , free surface of the liquid tries to

minimize its surface are and hence are of the hole will be maximized.

In the above description , loop wire is square of side 4 units ,liquid is soap and length of loop of thread is 15 units.

If of the suface tension of soap is 'S' what is the tension inh the thread ?

A. $\frac{S}{4-\pi}$ units

B. $\frac{S}{8-2\pi}$ units

C. $\frac{S}{12-\pi}$ units

D. $\frac{S}{16-4\pi}$ units

Answer: B

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