Surface tension Assignment

1. The spherical shape of rain-drop is due to

(a) Density of the liquid (b) Surface tension (c) Atmospheric pressure (d) Gravity

2. At which of the following temperatures, the value of surface tension of water is minimum

(a) $4^o C$ (b) $25^o C$ (c) $50^o C$ (d) $75^o C$

3. Force necessary to pull a circular plate of 5*cm* radius from water surface for which surface tension is 75 *dynes*/*cm*, is

(a) 30 *dynes* (b) 60 *dynes* (c) 750 *dynes* (d) 750π *dynes*

4. A square frame of side *L* is dipped in a liquid. On taking it out, a membrane is formed. If the surface tension of the liquid is *T*, the force acting on the frame will be

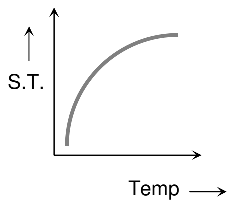
(a) 2*TL* (b) 4*TL* (c) 8*TL* (d) 10*TL*

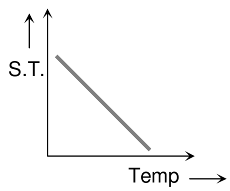
5. Ball pen and fountain pen depend respectively upon the principle of

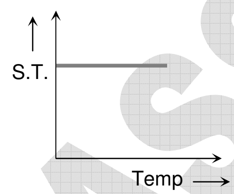
(a) Surface tension and viscosity (b) Surface tension and gravity

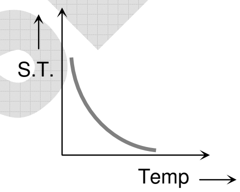
(c) Gravitation and surface tension (d) Surface tension and surface tension

6. Which graph represents the variation of surface tension with temperature over small temperature ranges for water

(a)


(b)


(c)


(d)


7. The material of a wire has a density of 1.4 *g* per cm^3. If it is not wetted by a liquid of surface tension 44 *dyne* per *cm*, then the maximum radius of the wire which can float on the surface of the liquid is

(a) $\frac{1}{7}$ *cm* (b) 0.7 *cm* (c) $\frac{10}{14}$ *cm* (d) $\frac{10}{28}$ *cm*

8. A water drop of 0.05cm^3 is squeezed between two glass plates and spreads into area of 40cm^2. If the surface tension of water is 70 *dyne*/*cm* then the normal force required to separate the glass plates from each other will be

(a) 90 *N* (b) 45 *N* (c) 22.5 *N* (d) 450 *N*

9. The main difference between a stretched membrane and the liquid surface is

(a) The liquid surface has a tendency to contract but the stretched membrane does not

(b) The surface tension does not depend on area but on the tension of the stretched membrane does

(c) The surface tension increases with increases in area

(d) Surface tension increases irregularly with temperature

10. On bisecting a soap bubble along a diameter, the force due to surface tension on any of its half part will be

(a) $4\pi RT$ (b) $\frac{4\pi R}{T}$ (c) $\frac{T}{4\pi R}$ (d) $\frac{2T}{R}$

11. The addition of soap changes the surface tension of water to σ_1 and that of sugar changes it to σ_2. Then

(a) $\sigma_1 = \sigma_2$ (b) $\sigma_1 > \sigma_2$

(c) $\sigma_1 < \sigma_2$ (d) It is not possible to predict the above

12. A hollow disc of aluminum whose external and internal radii are *R* and *r* respectively, is floating on the surface of a liquid whose surface tension is *T*. The maximum weight of disc can be

(a) $2\pi(R + r)\, T$ (b) $2\pi(R - r)\, T$ (c) $4\pi(R + r)\, T$ (d) $4\pi(R - r)\, T$

13. 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

14. 8 mercury drops coalesce to form one mercury drop, the energy changes by a factor of

(a) 1 (b) 2 (c) 4 (d) 6

15. Which of the following statements are true in case when two water drops coalesce and make a bigger drop

(a) Energy is released

(b) Energy is absorbed

(c) The surface area of the bigger drop is greater than the sum of the surface areas of both the drops

(d) The surface area of the bigger drop is smaller than the sum of the surface areas of both the drops

16. An oil drop of radius 1*cm* is sprayed into 1000 small equal drops of same radius. If the surface tension of oil drop is 50 *dyne*/*cm* then the work done is

(a) 18π *ergs* (b) 180π *ergs* (c) 1800π *ergs* (d) 18000π *ergs*

17. If work *W* is done in blowing a bubble of radius *R* from a soap solution, then the work done in blowing a bubble of radius 2*R* from the same solution is

(a) *W*/2 (b) 2*W* (c) 4*W* (d) $2\frac{1}{3}W$

18. A liquid drop of radius *R* is broken up into *N* small droplets. The work done is proportional to

(a) *N* (b) $N^{2/3}$ (c) $N^{1/3}$ (d) N^0

19. The work done in increasing the volume of a soap bubble of radius *R* and surface tension *T* by 700% will be

(a) $8\pi R^2 T$ (b) $24\pi R^2 T$ (c) $48\pi R^2 T$ (d) $8\pi R^2 T^2 / 3$

20. 1000 drops of water all of same size join together to form a single drop and the energy released raises the temperature of the drop. Given that *T* is the surface tension of water, *r* the radius of each small drop, ρ the density of liquid, *J* the mechanical equivalent of heat. What is the rise in the temperature

(a) *T*/*Jr* (b) 10*T*/*Jr* (c) 100*T*/*Jr* (d) None of these

21. Two bubbles *A* and *B* (*A* > *B*) are joined through a narrow tube. Then

(a) The size of *A* will increase (b) The size of *B* will increase

(c) The size of *B* will increase until the pressure equals (d) None of these

22. Excess pressure of one soap bubble is four times more than the other. Then the ratio of volume of first bubble to another one is

(a) 1 : 64 (b) 1 : 4 (c) 64 : 1 (d) 1 : 2

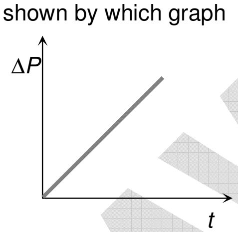
23. The pressure of air in a soap bubble of 0.7*cm* diameter is 8*mm* of water above the pressure outside. The surface tension of the soap solution is

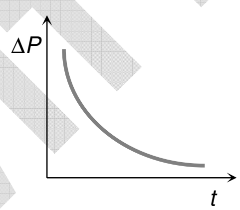
(a) 100 *dyne*/*cm* (b) 68.66 *dyne*/*cm* (c) 137 *dyne*/*cm* (d) 150 *dyne*/*cm*

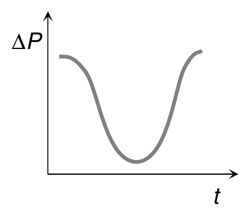
24. An air bubble of radius *r* in water is at a depth *h* below the water surface at some instant. If *P* is atmospheric pressure, *d* and *T* are density and surface tension of water respectively, the pressure inside the bubble will be

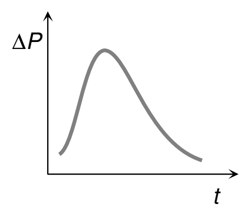
(a) $P + h\,dg - \frac{4T}{r}$ (b) $P + h\,dg + \frac{2T}{r}$ (c) $P + h\,dg - \frac{2T}{r}$ (d) $P + h\,dg + \frac{4T}{r}$

25. A soap bubble is very slowly blown at the end of a glass tube by a mechanical pump which supplies a fixed volume of air every minute whatever the pressure against which it is pumping. The excess pressure ΔP inside the bubble varies with time as shown by which graph

(a)


(b)


(c)


(d)


26. A liquid does not wet the sides of a solid, if the angle of contact is

(a) Zero (b) Obtuse (More than 90^o) (c) Acute (Less than 90^o) (d) 90^{oo}

27. The meniscus of mercury in the capillary tube is

(a) Convex (b) Concave (c) Plane (d) Uncertain

28. The angle of contact between glass and mercury is

(a) 0^o (b) 30^o (c) 90^o (d) 135^o

29. When the temperature is increased the angle of contact of a liquid

(a) Increases (b) Decreases

(c) Remains the same (d) First increases and then decreases

30. For those liquids which do not wet the solid surface, the ratio of cohesive force and adhesive force will be

(a) Greater than $\frac{1}{\sqrt{2}}$ (b) Greater than $\sqrt{2}$ (c) Lesser than $\frac{1}{\sqrt{2}}$ (d) Lesser than $\sqrt{2}$

31. The water proofing agent makes an angle of contact

(a) From acute angle to obtuse angle (b) From obtuse angle to acute angle

(c) From obtuse angle to right angle (d) From acute angle to right angle

32. 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

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

(a) $\frac{\rho g}{2hr}$ (b) $\frac{2}{hr\rho g}$ (c) $\frac{r\rho g}{2h}$ (d) $\frac{hr\rho g}{2}$

34. If capillary experiment is performed in vacuum then for a liquid there

(a) It will rise (b) Will remain same (c) It will fall (d) Rise to the top

35. A surface tension experiment with a capillary tube in water is repeated in an artificial satellite. Which is revolving around the earth, water will rise in the capillary tube upto a height of

(a) 0.1 *m* (b) 0.2 *m*

(c) 0.98 *m* (d) Full length of the capillary tube

36. When a capillary is dipped in water, water rises to a height *h*. If the length of the capillary is made less than *h*, then

(a) The water will come out (b) The water will not come out

(c) The water will not rise (d) The water will rise but less than height of capillary

37. A long cylindrical glass vessel has a small hole of radius '*r*' at its bottom. The depth to which the vessel can be lowered vertically in the deep water bath (surface tension *T*) without any water entering inside is

(a) $4T/\rho rg$ (b) $3T/\rho rg$ (c) $2T/\rho rg$ (d) $T/\rho rg$

38. Water rises to a height of 10*cm* in capillary tube and mercury falls to a depth of 3.112*cm* in the same capillary tube. If the density of mercury is 13.6 and the angle of contact for mercury is 135^o, the ratio of surface tension of water and mercury is

(a) 1 : 0.15 (b) 1 : 3 (c) 1 : 6 (d) 1.5 : 1

39. Water can rise to a height *h* in a capillary tube lowered vertically into water. If the height of tube above the surface of water be *l* and *l* < *h*, then water will rise in the capillary to a height

(a) *h* (b) *l* (c) *l* – *h* (d) *l* + *h*

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

(a) Maximum when water temperature is $4^o C$ (b) Maximum when water temperature is $0^o C$

(c) Minimum when water temperature is $4^o C$ (d) Same at all temperatures

41. The exact expression for surface tension of liquid which rises up in the capillary tube is

(a) $T = rhdg/2$ (b) $T = rhdg/2\cos\theta$ (c) $T = \frac{r(h+r/3)dg}{2}$ (d) $T = \frac{r(h+r/3)dg}{2\cos\theta}$

42. If a wax coated capillary tube is dipped in water, then water in it will

(a) Rise up (b) Depress

(c) Sometimes rise and sometimes fall (d) Rise up and come out as a fountain

43. Capillaries made from various materials but having the same bore are dipped in the same liquid, then

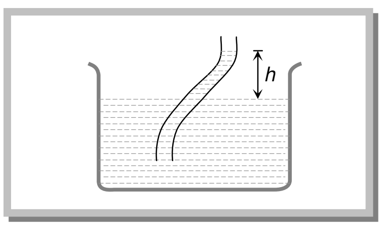
(a) Liquid will not rise in any of them

(b) Liquid will rise in all upto same height

(c) Liquid will not rise in all upto same height

(d) Liquid will rise in all and height of liquid columns will be inversely proportional to the density of material used

44. A straight capillary tube is immersed in water and the water rises to 5*cm*. If the capillary is bent as shown in figure then the height of water column will be



(a) 5*cm*

(b) Less than 5*cm*

(c) Greater than 5*cm*

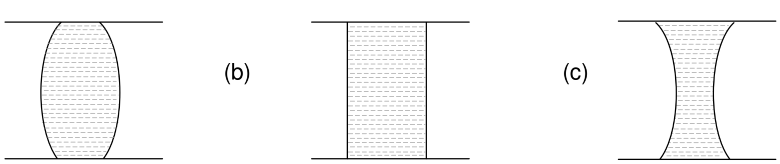
(d) 4 cos α

45. Water rises in a capillary tube through a height *h*. If the tube is inclined to the liquid surface at 30^o, the liquid will rise in the tube upto its length equal to

(a) $\frac{h}{2}$ (b) *h* (c) 2*h* (d) 4*h*

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

(a) (b) (c) (d) None of these



47. When two soap bubbles of radius r_1 and r_2 $(r_2 > r_1)$ coalesce, the radius of curvature of common surface is

(a) $r_2 - r_1$ (b) $\frac{r_2 - r_1}{r_1 r_2}$ (c) $\frac{r_1 r_2}{r_2 - r_1}$ (d) $r_2 + r_1$

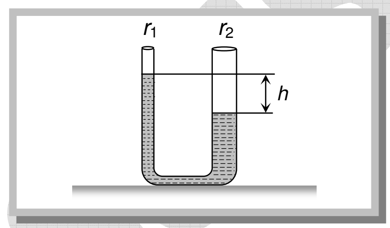
48. Two soap bubbles of radius 1*cm* and 2*cm* coalesce to form a single drop under isothermal conditions. The total energy possessed by them if surface tension is 30 *dyne* cm^{-1}, will be

(a) 400 π *ergs* (b) 600 π *ergs* (c) 1000 π *ergs* (d) 1200 π *ergs*

49. In the above question, the radius of the bigger drop will be

(a) $\sqrt{3}$ *cm* (b) $\sqrt{5}$ *cm* (c) $\sqrt{7}$ *cm* (d) $\sqrt{8}$ *cm*

50. In a *U*-tube the radii of two columns are respectively r_1 and r_2 and if a liquid of density *d* filled in it has level difference of *h* then the surface tension of the liquid is



(a) $T = \frac{hdg}{r_2 - r_1}$

(b) $T = \frac{(r_2 - r_1)hdg}{2}$

(c) $T = \frac{(r_1 + r_2)hdg}{2}$

(d) $T = \frac{hdg}{2} \frac{(r_1 r_2)}{r_2 - r_1}$