1. The bulk modulus of a spherical object is B. If it is subjected to uniform pressure P, the fractional decrease in radius is - (NEET-2017)

(a) $B/3p$ (b) $3P/B$ (c) $P/3B$ (d) P/B.

$B = -P/(\Delta V/V) \Rightarrow -\left(\frac{\Delta V}{V}\right) = P/B \quad V \sim R^3 \Rightarrow \ln V \sim 3\ln R \Rightarrow$ (c)

2. A certain number of spherical drops of liquid of radius r coalesce to form a single drop of radius R & volume V. If T is the surface tension of the liquid, then

(a) energy $= 4VT[1/r - 1/R]$ is released

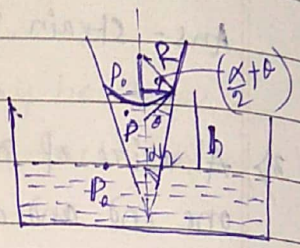
(b) energy $= 3VT[1/r + 1/R]$ is absorbed

(c) energy $= 3VT[1/r - 1/R]$ is released

(d) energy is neither released nor absorbed.

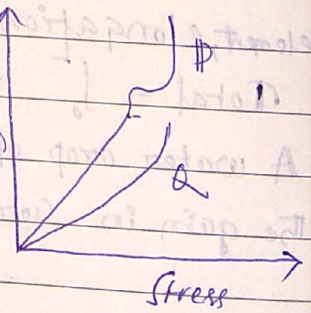
3. A glass capilary tube is of the shape of a truncated cone with an apex angle α so that its two ends have cross-sectional radii. When dipped in water vertically, water rises in it to a height h, where radius of its cross section is b. If the surface tension of water is S, its density ρ, contact angle with glass is θ, the value of h will be (g = gr. accel.n) (JEE (Adv) 2014)

(a) $\frac{2S}{b\rho g}\cos(\theta-\alpha)$ (b) $\frac{2S}{b\rho g}\cos[\theta+\alpha]$ (c) $\frac{2S}{b\rho g}\cos(\theta-\alpha/2)$ (d) $\frac{2S}{b\rho g}\cos[\theta+\alpha/2]$



$P_{concave} - P_{convex} = 2S/R \Rightarrow P_0 - P = 2S/R = \rho gh \Rightarrow h =$ (d)

4) In plotting stress vs. strain curves for 2 materials P and Q, a student by mistake puts strain on the Y-axis and stress on the X-axis as shown. Then the correct statement(s) is (are) (JEE (Adv) 2015)



(a) P has more tensile strength than Q

(b) P is more ductile than Q (c) P is more brittle than Q

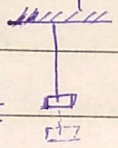
(d) The Young's modulus of P is more than that of Q

5) One end of a horizontal thick copper wire of length 2L and radius 2R is welded to an end of another horizontal thin copper wire of length L and radius R. When the arrangement is stretched by applying forces at 2 ends, the ratio of the elongation in the thin wire to that in the thick wire is (a) 0.25 (b) 0.5 (JEE(Adv.) 2013)

6) A small sphere falls from rest in a viscous liquid. Due to friction, heat is produced. Find the relation betn the rate of production of heat and the radius of the sphere at terminal velocity. $dQ/dt \propto r^5$ (JEE - 2004)

7) A point mass m is suspended at the end of a massless wire of length l & cross sectional area A. If Y is the Young modulus of elasticity of the material of the wire, the freq. of small oscillations of the mass along the vertical line is _____.

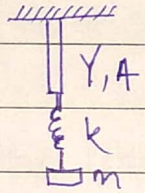
JEE-1978



$F_r = -F = -\frac{YA}{\ell} x \Rightarrow k = \frac{YA}{L}$

$f = \frac{1}{2\pi}\sqrt{YA/lm}$

JEE-1993



$T = 2\pi\sqrt{\frac{m}{k}\left(1+\frac{kL}{YA}\right)}$

8) If 'S' is stress and Y is Young's modulus of material of a wire, the energy stored in the wire per unit volume is -

(a) $S^2/2Y$ (b) $2S^2Y$ (c) $S/2Y$ (d) $2Y/S^2$ (2005)