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fayyad-in-physics

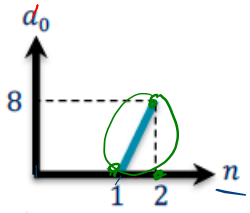
Part 3 from: Thin prism to viscosity

1-A light beam falls on one of the faces of a thin glass prism with a apex angle of 8° and a refractive index of 1.5 immersed in a liquid with a refractive index of 1.2. The angle of deviation of the beam is..... (A) 1° (B) 2° (C) 2.5° (D) 5°

$\alpha_0 = A\left(\frac{n_p}{n_L} - 1\right) = 8\left(\frac{1.5}{1.2} - 1\right)$

2-The opposite graph shows the relationship between the angles of deviation of several thin prisms with the same apex angle and the refractive indices of the materials of these prisms. The apex angle of any prism is equal to .....

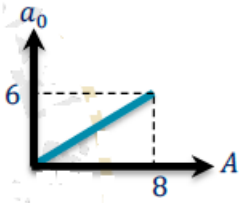
(A) 4° (B) 6° (C) 8° (D) 10°



$A = 8$

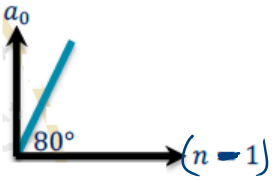
3-The opposite figure shows the graphical relationship between the apex angles of several thin prisms made of the same material and the angle of deflection of a light beam in each of them. The value of the refractive index of the prism material is .....

(A) 1.3 (B) 1.4 (C) 1.5 (D) 1.75



$\alpha = A(n-1)$ Slope $= 0.75$ Slope $= n-1$ $n - 1 = 0.75$

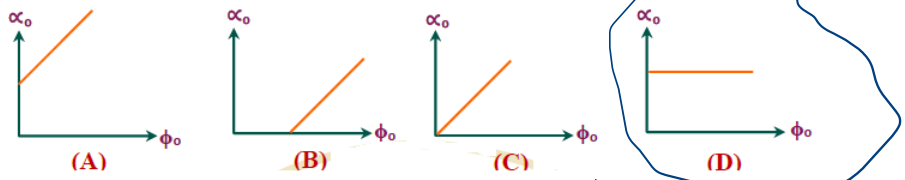
4- Find the value of the apex angle of the thin prism.



$\alpha_0 = A(n-1)$ Slope $= A = \tan 80 = 5.67$

5-Which of the following graphs correctly expresses the relationship between the angle of incidence (φo) and the angle of deviation (∝o) in a thin prism?

$\alpha_0 = A(n-1)$



$5 = \theta_1 + \theta_2 = A$

6-A light ray fell on one face of a triangular prism with a apex angle of 5° made of glass with a refractive index of 1.5, and emerged normally from the other face. Calculate the angle of incidence and the deviation angle.

$\phi_2 = \theta_2 = 0$

$\alpha_0 = A(n-1)$

$n = \frac{\phi_1}{\theta_1}$

$1.5 = \frac{\phi_1}{5}$ $\phi_1 = 1.5 \times 5 = 7.5$

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$\alpha_0 = A(n-1)$ $\alpha_0 = An - A$ Slope $= A$ Slope $= \frac{\Delta y}{\Delta x}$ $8 = \frac{8-0}{2-1}$

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7-If the angular dispersion between the blue and red rays is equal for two thin prisms, the first with a apex angle of 6° and the refractive index of its material for blue and red light 1.68, 1.62 respectively and the second with a apex angle of 9° and the refractive index of its material for blue light 1.65, then the refractive index of its material for red light is . . . . . .

(A) 1.64 (B) 4.63 (C) 1.62 (D) 1.61

8- A thin prism with a apex angle of 9° and the refractive index of its material for blue light is 1.72 and for red light is 1.68, then its average refractive index is . . .

9-A light beam falls on one of the faces of a thin glass prism with a apex angle of 8° and the refractive index of its material for blue is 1.664 and for red is 1.644. The value of the dispersive power of this prism is . . . (A) 0.05 (B) 0.04 (C) 0.03 (D) 0.02

10-If you know that the dispersive power of a thin prism with a apex angle of 8° is 0.037 and the refractive index of its material for yellow is 1.54, the angular dispersion of the prism is . . . . .

(A) 0.11 (B) 0.12 (C) 0.14 (D) 0.16

11-Two thin prisms, the refractive index of the prism material for red and blue in the first prism are 1.48, 1.56 respectively, and in the second prism 1.63, 1.69 respectively, so the ratio between the dispersive power of the first prism and the dispersive power of the second prism is .....

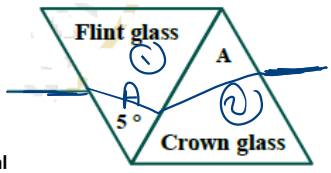
(A) 11/13 (B) 11/15 (C) 22/13 (D) 13/22

12-The ratio of the dispersive power of a thin prism with a apex angle of 5° to the dispersive power of another thin prism with a apex angle of 10° of the same material is .....

(A) 1/1 (B) 1/2 (C) 2/1 (D) 3/2

13-A light beam falls on two thin prisms as shown in the figure. The table shows the refractive index of flint glass and crown glass for both red and violet light. flint glass crown glass

	flint glass	crown glass
n_b	1.773	1.523
n_r	1.743	1.513



Find:(a) The apex angle of the flint prism is such that the total outgoing ray is zero?

(b) Calculate the dispersive power for both of them

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14- A water pipe supplies a house with a radius of 1.5 cm and the speed of water flowing through it is 0.2 m/s. If the radius of the pipe at its end becomes 0.5 cm, calculate: (a) The speed of the water at the narrow end. (b) The volume of water flowing per minute at any section of it.

$r_1^2 V_1 = r_2^2 V_2$

$(1.5)^2 \times 0.2 = (0.5)^2 V_2$

b) $V_{o1} = \Phi_v \times t$

$= \pi (1.5 \times 10^{-2})^2 \times 0.2 \times 60$ m^3

15-A main artery with a radius of 0.5 cm and a blood flow velocity of 0.4 m/s branches into several capillaries with a radius of 0.2 cm each and a blood flow velocity of 0.25m/s in each capillary. Find the number of capillaries.

$r_1^2 V_1 = n r_2^2 V_2$

$n = 10$

16-A main artery of an adult has a cross-sectional area of $3cm^2$ and a blood flow velocity of 0.3 m/s. The blood is distributed among a number of capillaries, each with a cross-sectional area of 3×10^{-5} m^2 and a blood flow velocity of 0.05 cm/s in each capillary. Calculate the number of capillaries.

$A_1 V_1 = n A_2 V_2$

$3 \times 10^{-4} \times 0.3 = n \times 3 \times 10^{-5} \times 0.05 \times 10^{-2}$

Density $\frac{kg}{m^3}$

$g/cm^3 \xrightarrow{\times 1000} kg/m^3$

17- (ملياتة تحويلات)Oil flows through a tube at a rate of 6 Liter /min, another tube is connected to it and the oil comes out of its nozzle at a speed of 4 m/s, calculate (a) the cross-sectional area of the second tube ,(b) mass flow rate ,(density of oil 0.8 g/cm3) (C) The mass of the water flowing every minute through any section of the tube

$\Phi_v = A V$

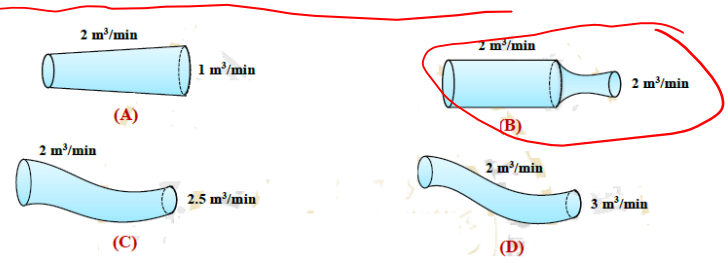
$\Phi_v = 6 \frac{L}{min} = 6 \times \frac{10^{-3}}{60} \frac{m^3}{s}$

$\Phi_m = \rho \Phi_v =$

A.W

18-Water flows through a tube of diameter 2 cm at an average speed of 3 m/s. The end of the tube is closed with a plug with ten holes, each with a radius of 1 mm, calculate the speed of the water flowing from each hole

19- From the opposite figures, which represents a steady flow?



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$\eta = \frac{f \cdot d}{A \cdot V} = \frac{N \cdot m}{m^2 \cdot m/s}$

$\frac{N \cdot s}{m^2}$

$f \cdot d = \eta A V$

$f = \frac{\eta A V}{d}$

$R \propto V$ — 120 Km/h — $R \propto V^2$

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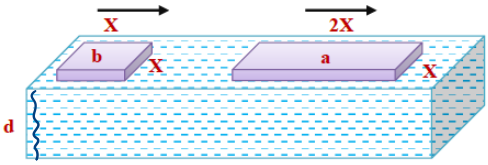
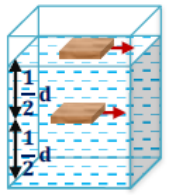
20- Two plates a and b move on the surface of a liquid with the same speed, so the ratio of the forces Fa/Fb is .....

$\frac{2}{1} = \frac{f_a}{f_b} = \frac{A_a}{A_b} = \frac{2X^2}{X^2}$



21- A thin plate moves on the surface of a homogeneous liquid at a speed (v). If it moves at position (X) at the same speed at a depth of 1/2 d, the viscosity coefficient (A) remains constant (B) decreases to half (C) decreases to quarter (D) increases to double



22- Which of the following physical quantities has a unit of measurement?

(A) Absolute refractive index (B) Viscosity coefficient

(C) dispersive power (D) Relative refractive index

$\frac{kg}{m \cdot s}$ $\frac{N \cdot s}{m^2}$

23- At high car speeds, the air resistance resulting from viscosity is proportional to.....

(A) directly proportional to the car speed (B) inversely proportional to the car speed (C) directly proportional to the square of the car speed (D) inversely proportional to the square of the car speed

$f = \frac{\eta A V^2}{d}$

24-A surface layer of a liquid with an area of 2 m^2 moves at a speed of 2 m/s due to a tangential force of 4000 mN, while the stationary layer of the liquid is at a depth of 2 cm from the surface. Calculate:
(a) The viscosity coefficient of the liquid. (b) The force required to make the speed of the moving layer increases to double

$0.02 \frac{kg}{m \cdot s} = \eta = \frac{f \cdot d}{A \cdot V} = \frac{4000 \times 10^{-3} \times 2 \times 10^{-2}}{2 \times 2}$

$\rightarrow f = 8N$

25-The ratio between the coefficient of viscosity of air over the poles to the coefficient of viscosity of air at the equator is .....

(A) greater than one. (B) less than one (C) equal to one. (D) Vanishes

$\frac{\eta_{Poles}}{\eta_{equator}}$

26-A Square slab its side 10 cm slides over another static slab between them a layer of a viscous liquid its viscosity coefficient equals 1.2 $N.s/m^2$. If the upper plate moves with velocity 0.2 m/s as a result of tangential force 0.6 N, what is the thickness of the liquid layer?

$f \cdot d = \eta A V$

$d = \frac{\eta A V}{f} = \frac{1.2 \times (10 \times 10^{-2})^2 \times 0.2}{0.6}$

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