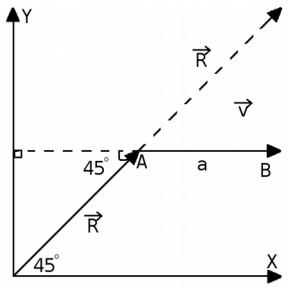
2. Answer :- (2)

Taught directly in class of vectors with angular momentum



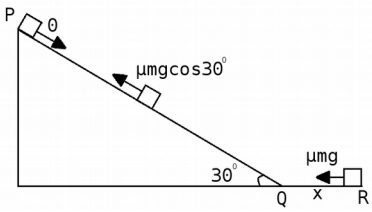

When moving from A to B,

$l = R * mv \Rightarrow l = mv.\ r = mv.\ R\sin 45^\circ (-k) = \frac{-mvR}{\sqrt{2}}\ k$

Similarly for other options.

3. Answer :- (3)

Taught in numerical class on friction on rough incline




From P to Q

By Work-Energy theorem,

$mg.2 - \mu mg\cos 30^\circ . 4 = 1/2mv^2$ ----(1)

From Q to R,

$-\mu mg.x = 0 - 1/2mv^2$ ----(2)

Solving two equations we get, $\mu = 0.29$, $x = 0.35$

4. Answer :- (4)

Simple numerical based on energy transformations

Energy consumed = (10 kg x 9.8 $m/s^2$ x 1 m) x 1000 = 98000 J

weight of fat = $\frac{98000\ J}{3.8 \times 10^7 \times (20/100)\ J/kg} = 12.89 \times 10^{-3}$ kg

6. Answer :- (4)

Taught directly in Theory Class on Gravitation (Satellite Motion)

If satellite orbital speed $V_o = \sqrt{GM/R} = \sqrt{gR}$ is increased $\sqrt{2}$ times, it will escape.

Hence, minimum required velocity to escape = $(\sqrt{2} - 1)\sqrt{gR}$

7. Answer :- (1)

Solution can be directly deduced from formula of time period T of simple pendulum

$T = 2\pi\sqrt{l/g}$

Apply

$$T = 2\pi\sqrt{\frac{L_0}{g}(1+(\alpha(40-T))} \Rightarrow T = 2\pi\sqrt{\frac{L_0}{g}(\alpha(40-T))\times 3600} = 12$$

$$= 2\pi\sqrt{\frac{L_0}{g}(\alpha(T-20))\times 3600\times 24} = 4\ s \qquad \frac{40-T}{T-20} = 3 \qquad 40 - T = 3T - 60$$

$$4T = 100 \qquad T = 25^\circ C$$

8. Answer :- (2)

Taught directly in Theory class of Thermodynamics in Polytropic Process $PV^n$ = constant

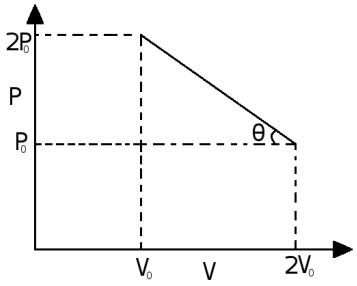
Molar specific Heat Capacity, $C = \frac{R}{r-1} - \frac{R}{n-1} = C_v - \frac{R}{n-1}$

$1 - n = \frac{C_P - C_V}{C - C_V}$ $\therefore n = \frac{C - C_P}{C - C_V}$

9. Answer :- (1)

Taught similar in Thermodynamics in analysis of P-V Indicator Graphs

Equation of straight line




$P - 2P_o = \frac{-(2P_o - P_o)}{(2V_o - V_o)} . (V - V_o)$ => $P = 2P_o - \frac{P_o}{V_o}(V - V_o)$

=> $\frac{nRT}{V} = 3P_o - \frac{P_oV}{V_o}$ => $T = 3P_o . V - \frac{P_o}{nRV_o} . V^2$

For T to be max,

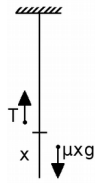
$dT/dV = 0$ => $3P_o/nR - P_o . 2V/nRV_o = 0$ => $V = 3V_o/2$

:. $T_{min} = 9P_oV_o/4nR$

10. Answer :- (4)

Taught directly in Numerical class of S. H. M. by using formula $V = \omega\sqrt{(A^2 - X^2)}$

$v = \omega\sqrt{(A^2 - (2A/3)^2)} = \sqrt{5}\,\omega A/3$




Now trebling the speed, new speed = $\sqrt{5}\omega A = \omega\sqrt{(A_1^2 - (2A/3)^2)}$ => $A_1 = 7A/3$

11. Answer :- (3)

Taught directly in class in numerical no. 26 waves on string H. C. V.

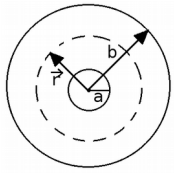
Tension = μxg => $v = \sqrt{(T/\mu)} = \sqrt{(gx)} = dx/dt$ => $\frac{dx}{\sqrt{x}} = \sqrt{g}\ dt$ => $t = 2\sqrt{2}$ sec

12. Answer :- (1)

Taught directly in Irodov Class to calculate feild using Gauss Law $E.dA = q_{en}/\varepsilon_o$

$E.4\pi r^2 = \frac{1}{\varepsilon_o}[Q + \frac{A}{r}.4\pi r^2 dr] = \frac{1}{\varepsilon_o}[Q + \frac{4\pi A}{2}(r^2 - a^2)]$ => $E = \frac{1}{4\pi\varepsilon_o}[\frac{Q}{r^2} + \frac{2\pi A}{r^2}(1 - \frac{a^2}{r^2})]$

$E = \frac{1}{4\pi\varepsilon_o}[2\pi A + (\frac{Q}{r^2} - \frac{2\pi A a^2}{r^2})]$

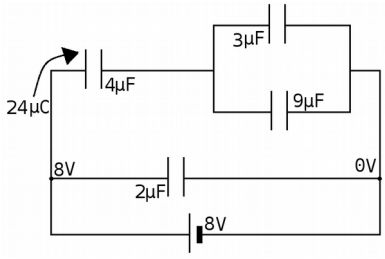



To be constant E, which is independent of locatin r

=> $Q = 2\pi A a^2$ :. $A = Q/2\pi a^2$

13. Answer :- (3)

Taught directly in numerical class of grouping of Capacitors




$C_{eq(1)} = 9 + 3 = 12$ , $C_{eq(2)} = 12x4/(12+4) = 3$ μF

across which 8V is applied =>

:. Charge supplied = 8x3 = 24 μC --> to 4 μF

Then 24 μF will distribute in 3 and 9 μF

On 9 μF --> q' = 9 x 24/(9 +3) =18 μC :. Total charge Q = 24 + 18 = 42 μC

:. $E = \frac{1}{4\pi\varepsilon_o} . \frac{Q}{r^2} = 9 \times 10^9 \times \frac{42 \times 10^{-6}}{30 \times 30}$ = 420 N/C

14. Answer :- (3)

Taught directly in Theory Class on Electric Circuits and Electricity (Semi – Conductors)

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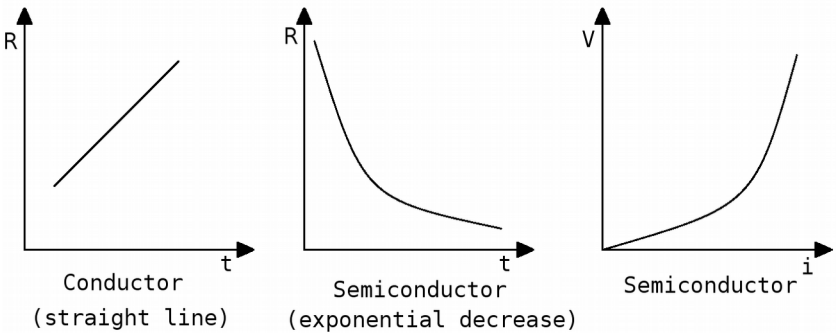


15. Answer :- (4)

Taught directly in Theory Class on Magnetic Field produced by current

$\frac{B_{circle}}{B_{square}} = \frac{\mu_o i/2R}{(4x\ \mu_o i/4\pi 0.5a)(\sin 45^o + \sin 45^o)} = \frac{\pi a\sqrt{2}}{4R}$

where, $l = 2\pi R \Rightarrow R = l/2\pi$ & $l = 4a \Rightarrow a = l/4$ =>Then Ratio, $\frac{B_c}{B_s} = \frac{\pi l\sqrt{2}\ x\ 2\pi}{4\ x\ 4\ x\ l} = \frac{\pi^2}{8\sqrt{2}}$

17. Answer :- (4)

Taught directly in Numerical Class of Alternating Current Q. 13 of H. C. V.

d.c. , $V = iR \Rightarrow R = V/i = 80/10 = 8\Omega \Rightarrow i_{rms} = 10 = 220/[\sqrt{\{8^2 + (2\pi.50.L)^2\}}]$ :. L = 0.065 Henry

18. Answer :- (1)

Taught directly in Theory Class of Electromagnetic Waves and Quantum Theory

$E = h\nu$ ==> E high -> ν high

increasing E -> increasing ν -> decreasing λ <- reverse order

By E. M. Spectrum, Radiowaves, Yellow, Blue, X-Ray

19. Answer :- (4)

Taught directly in Optical Instruments Theory Class on Telescopes

Apparent size depends on single parameter visual angle

:. $M = 20 = \beta/\alpha$ :. $\beta = 20\alpha$ :. Tree will appear 20 times larger and hence 20 times nearer.

21. Answer :- (1)

Taught directly in Theory Class on Photoelectric Effect

$K_{max} = 1/2\ mv^2 = hc/\lambda - \Phi_o$ Now, $1/2\ mv_2^2 = hc.4/3\lambda - \Phi_o$ -----(1)

$4/3.(1/2\ mv^2) = hc.4/3\lambda - 4\Phi_o/3\lambda$ -----(2)

By (1) & (2), $1/2\ mv_2^2 > 4/3.(1/2\ mv^2) \Rightarrow v_2 = v.\sqrt{(4/3)}$

22. Answer :- (4)

Taught directly in Numerical as Radioactivity

$N_A = N_o/2^{80/20} = N_o/2^4 = N_o/16$ and $N_B = N_o/2^{80/40} = N_o/2^2 = N_o/4$

Hence, number of decayed nuclei, $N_A = \frac{N_o - N_o/16}{N_o - N_o/4} = \frac{15\ x\ 4}{16\ x\ 3} = \frac{5}{4}$

23. Answer :- (2)

Taught directly in Theory Class of Logic Gates

24. Taught directly in Theory Class of Modulation in Communication systems.

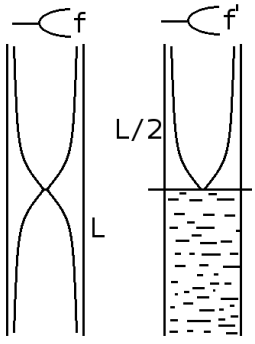
Ans (1) is by basic definition of Amplification Modulation.

25. Answer :- (2)

Taught directly in Theory Class of Measurements with zero error and least count

L. C. =0.5/50 = 0.01mm

Measurement of Thickness = MSD + VSD = 0.5 + (25 + 5)x0.01 = 0.8mm




26. Answer :- (4)

Taught directly in Theory Class of Sound Waves (figure) ---->

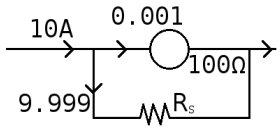
1st Case : $L = \lambda \Rightarrow f = v/\lambda = v/L$

2nd Case : $L/2 = \lambda'/2 \Rightarrow L = \lambda$ :. $f' = v/\lambda' = v/L = f$ :. Ratio = 1

27. Answer :- (1)

Same Numerical directly taught in Class on Ammeter

$9.999R_S = 0.001 \times 100 \Rightarrow R_S = 100/9999 = 100/10000 = 0.01\Omega$




28. Answer :- (1)

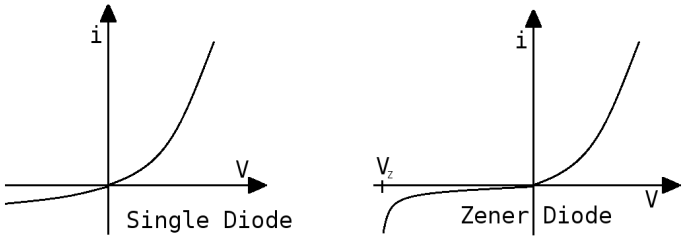
Taught directly in Theory Class of Prisms and also in Q.No 36 Geometrical Optics, H. C. V.

$\delta = i + i' - A \Rightarrow 40 = 35 + 79 - A \Rightarrow A = 74^o$

$\mu = \frac{\sin((A+\delta x)/2)}{\sin A/2} = \frac{\sin((74+40)/2)}{\sin 37^o} = \frac{\sin 57^o}{\sin 37^o} = \frac{4}{5} \times \frac{5}{3} = \frac{4}{3} = 1.33$ :.Closest value is 1.5

29. Answer :- (1)

Taught directly in Theory class on p-n Junctions, Characteristics and Zener Diode (below)




30. Answer :- (2) & (4)

Taught directly in Theory Class on Transistor characteristics α and β

$I_E = I_C + I_B$

Dividing by $I_C$,

$I_E/I_C = 1 + I_B/I_C \Rightarrow 1/\alpha = 1 + 1/\beta$

$\Rightarrow \alpha = \beta/(\beta+1)$

Hence options (2) and (4) both are incorrect