1(a) V & I are 90° out of phase so
$P = \frac{V_0 I_0}{2} \cos\phi = 0$

2(c) $P_{DC} = I^2 R = 4R$
$P_{AC} = I_{rms}^2 R = \left(\frac{2}{\sqrt{2}}\right)^2 \cdot R = 2R$

3(c) $W_0 = \frac{1}{\sqrt{LC}}$ → No dependency on R.

4.(b) Av. value of $5 \sin(100\pi t)$ is zero

5.(b) $\mathcal{E}_s = -L \frac{di_p}{dt} = -0.2 \times 5 = -1.0$

6.(d) $\frac{1}{\lambda} = R\left(\frac{1}{3^2} - \frac{1}{n^2}\right)$ n=5 for II nd line.

7.(d) $L = n\left(\frac{h}{2\pi}\right)$ No dependency on Z.

8(a) $BE = KE = |TE| = \frac{|PE|}{2}$

9(b) $V \propto \frac{Z}{n}$

10.(c) $\frac{1}{\lambda} = R\left(\frac{1}{2^2} - \frac{1}{4^2}\right) = R\left(\frac{1}{4} - \frac{1}{16}\right) = R\left(\frac{4-1}{16}\right) = 3R/16$

11. c

12(d) For maximum power $r = R$
$I = \mathcal{E}/2r \quad P = I^2 R = \frac{\mathcal{E}^2}{4r^2} \cdot r = \frac{\mathcal{E}^2}{4r}$

13(a) Potential remain same in ||el
so $I = 10/5 = 2A$

14.(b) $R \propto l^2$ so $R' = 1.21R$

15.(b) $R_{net} = 6\Omega \quad I_{net} = 2A$

$R_1 : R_2 = 3:1$
$I_1 : I_2 = 1:3$
$I_1 = \frac{1}{4} \times 2 = \frac{1}{2} A$
$I_2 = \frac{3}{4} \times 2 = \frac{3}{2} A$

16(c) $p = E/c$

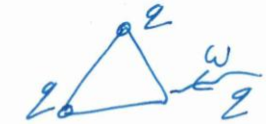
17(c) $P = n \cdot h\nu$ n = no. of photons/sec.
$n = \frac{P\lambda}{hc} = \frac{100 \times 540 \times 10^{-9}}{6 \times 10^{-34} \times 3 \times 10^8} = 3 \times 10^{20}$

18(a) For same energy $\lambda_{ph} > \lambda_{electron}$
for same wavelength $E_{ph} > E_{electron}$

19(c) $eV_s = \frac{hc}{\lambda} - \phi$

20(c) $eV_{s_1} = \frac{hc}{3500} - \phi$ — (I)
$eV_{s_2} = \frac{hc}{5400} - \phi$ — (II) Divide
$\frac{2}{1} = \frac{12400/3500 - \phi}{12400/5400 - \phi}$ & solve

21(a)



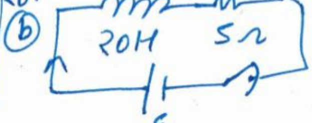
22(b) $U = \frac{kqq}{a}$
$W = q\left(\frac{kq}{a} + \frac{kq}{a}\right) = 2\frac{kq^2}{a} = 2U$

23(c) $\frac{1}{2}\epsilon_0 E^2 (Ad)$ — energy density × vol = Total energy

24(a) $V_f = \frac{Q_{net}}{C_{net}} = \frac{0.2 \times 600}{1.2} = 100$ volt.

25(a) $\Delta q = \frac{\Delta\phi}{R} = \frac{B\Delta A}{R} = \frac{0.05 \times 1 \times 10^{-4}}{2} = 2.5 \times 10^{-6} C$

26.(b)



$\mathcal{E} = L\frac{di}{dt} + iR$
at $t=0$ $i=0$ but $\frac{di}{dt} = 4$
$\mathcal{E} = 20 \times 4 = 80V$

27.(d) $\omega = 2\pi \cdot 100 = 200\pi$ rad/s
$\mathcal{E}_0 = NBA\omega$

28.(c) Balanced wheat stone Bridge.

29.(b) X-ray diffraction.

30. (b)

31. (a) $c = \frac{1}{\sqrt{\mu_0 \epsilon_0}}$ $v = \frac{1}{\sqrt{\mu \epsilon}}$ $R.I = \frac{c}{v} = \sqrt{\frac{\mu \epsilon}{\mu_0 \epsilon_0}}$

32. (d) $v = \frac{E}{B}$ $qE = q(vB)\sin 90^\circ$

33. (b) Same direction currents repel & opposite direction currents attract

34. (d) $M = I \cdot \pi r^2 = I \cdot \pi \left(\frac{l}{2\pi}\right)^2 = 1 \cdot \pi \cdot \frac{1}{\pi^2} = \frac{1}{\pi}$

35. (b) 36. (b) $B_H = 0$ at South pole so

$T = 2\pi \sqrt{\frac{I}{MB_H}} \rightarrow \infty$

37. (d) $F = mB$

$6 \times 10^{-4} = m \times 2 \times 10^{-5}$

$m = 30$

$M = m(l)$

$3 = 30(l)$

$l = 0.1 m$

38. (b) 10% decayed in time t & 90% remains in another time t, 10% of remaining again decayed

$100 \xrightarrow{t} 90 \xrightarrow{t} 89$ so decayed $= 19\%$

39. (b) $\Delta E = BE_{Prod} - BE_{reactants}$

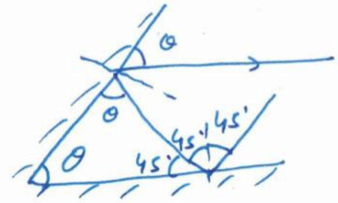
$= c - (a+b) = c - a - b$

40. (a) $\frac{1}{f} = (1.5-1)\left(\frac{1}{20} - \frac{1}{-20}\right)$

$\frac{1}{f} = 0.5 \times \frac{2}{20} = \frac{1}{20}$

$f = 20cm$

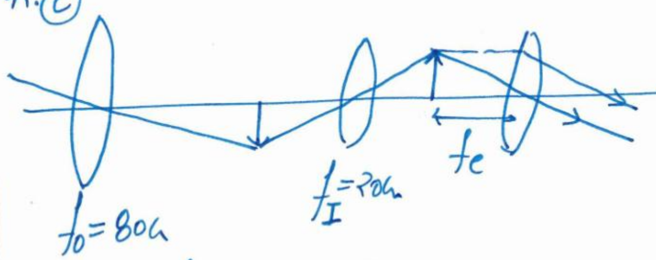
41. (c)



$2\theta + 45^\circ = 180^\circ$

$\theta = \frac{135}{2} = 67.5^\circ$

42. (c)



$M = \frac{f_0}{f_e}$ $20 = \frac{80}{f_e}$ so $f_e = 4cm$

$L = f_0 + 2f_I + 2f_I + f_e = 164cm.$

43. (d) maximum voltage = $200\sqrt{2}$ volt. capacitor after charging to maximum voltage will not discharge since Diode will be in reverse bias.

44. (d) $\beta = 50 = \frac{I_C}{I_B}$ $R_i = 1000\Omega$ $V_i = 0.01$ volt

$I_B = \frac{V_i}{R_i} = \frac{0.01}{1000} = 10\mu A$

$I_C = \beta \cdot I_B = 50 \times 10\mu A = 500\mu A$

45. (a) Intensity at 1.25W from cm = Intensity at 0.75W from cm.

so $y = W/4$ $\Delta x = \frac{dy}{D} = \frac{d}{D} \cdot \frac{1}{4} \cdot \frac{\lambda D}{d} = \lambda/4$

$\Delta\phi = \frac{2\pi}{\lambda} \cdot \frac{\lambda}{4} = \pi/2$

$I = I_{max} \cos^2\left(\frac{\Delta\phi}{2}\right) = \frac{I_{max}}{2}$