OCR Physics B - Equations not on formula sheet.

1 Fundamental units

- Hertz (Hz) - s^{-1}
- Newton (N) - $kgms^{-2}$
- Pascal (Pa) - Nm^{-2}, $kgm^{-1}s^{-2}$
- Joule (J) - Nm, kgm^2s^{-2}
- Watt (W) - Js^{-1}, kgm^2s^{-3}
- Coulomb (C) - As, $kgm^{-1}s^{-2}$
- Ampere (A) - Cs^{-1}
- Volt (V) - JC^{-1}, WA^{-1}, $kgm^2s^{-3}A^{-1}$
- Farad (F) - CV^{-1}, $kg^{-1}m^{-2}s^4A^2$
- Ohm (Ω) - VA^{-1}, $kgm^2s^{-3}A^{-2}$
- Siemens (S) - AV^{-1}, $kg^{-1}m^{-2}s^3A^2$
- Weber (Wb) - Vs, $kgm^2s^{-2}A^{-1}$
- Tesla (T) - Wbm^{-2}, $kgs^{-2}A^{-1}$
- Temperature - ^{o}C or K
- Becquerel (Bq) - s^{-1}

2 Chapter 1 - Imaging

1. Curvature (m^{-1}) = $\frac{1}{r}$
2. Lens power (D, m^{-1}) = $\frac{1}{f}$
3. Final curvature = Curvature before + Curvature added by lens
4. Linear magnification (m) = $\frac{\text{Image height}}{\text{Object height}}$
5. Information in image = pixel no. $\times$ bits per pixel
6. Resolution = $\frac{\text{Width of object}}{\text{Number of pixels across object}}$

3 Chapter 2 - Signalling

1. Resolution = $\frac{\text{P.d range of signal}}{\text{Number of quantisation levels}}$
2. Minimum sample rate $> 2 \times$ Highest frequency
3. Bit rate = Samples per second $\times$ bits per sample
4. Duration of signal = $\frac{\text{Number of bits in signal}}{\text{bit rate}}$

4 Chapter 3 - Sensing

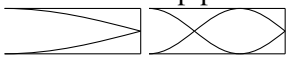
1. V = IR
2. R = $\frac{1}{G}$
3. G = $\frac{I}{V}$
4. P = $\frac{E}{t}$
5. W = ΔE
6. $\Sigma I_{in} = \Sigma I_{out}$
7. $\frac{V_1}{V_2} = \frac{R_1}{R_2}$

5 Chapter 4 - Testing Materials

1. Density = $\frac{m}{V}$

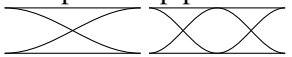
6 Chapter 6 - Wave Behaviour

1. Closed end pipe



$L = \frac{\lambda}{4}$ $L = \frac{3\lambda}{4}$

2. Open end pipe



$L = \frac{\lambda}{2}$ $L = \lambda$

3. $f_{beat} = (f_1 - f_2)$
4. Absolute n = $\frac{c}{c_{medium}}$
5. For small θ, $\lambda = \frac{xd}{L}$ (d = slit separation, L = distance from slit to screen)
6. Spectra limit, n = $\frac{d}{\lambda}$ ($\sin 90 = 1$)

7 Chapter 7 - Quantum Behaviour

1. $E = \frac{hc}{\lambda}$
2. $E = qV$
3. $\Delta E = V\Delta Q$
4. $E_{k(max)} = hf - \phi$ (ϕ = work function energy)
5. de Broglie λ, $\lambda = \frac{h}{mv}$

8 Chapter 8 - Motion

1. $S = vt - \frac{1}{2}at^2$
2. $S = \left(\frac{u+v}{2}\right)t$

9 Chapter 9 - Momentum, force and Energy

1. $m_1v_1 = m_2v_2$ (Momentum before = Momentum after)
2. $F = ma$
3. $K.E = \frac{1}{2}mv^2$
4. $G.P.E = mgh$

10 Chapter 10 - Modelling decay

10.1 Radioactivity

1. $A = A_0e^{-\lambda t}$
2. $A = -\lambda N$
3. $\ln A = -\lambda t + \ln A_0$ (Fits form of $y = mx + c$)
4. Age of a sample, $t = \ln \frac{A}{Ao} \div \lambda$
5. Fraction of nuclei left, $F = 1 \div 2^{\frac{t}{t_{\frac{1}{2}}}}$

10.2 Capacitors

1. $T_{\frac{1}{2}} = \ln 2RC$

11 Chapter 11 - Modelling Oscillations

1. $x = A\sin\theta$

12 Chapter 12 - Circular Motion and Gravity

12.1 Circular Motion

1. $\Delta\theta = \frac{v\Delta t}{r}$
2. $\omega = 2\pi f$
3. $a = \omega^2 r$
4. $v = \omega r$

12.2 Gravity

1. $g = -\frac{GM}{r^2}$
2. $V_{escape} = \sqrt{\frac{2GM}{r}}$ (Equate k.e and g.p.e)

13 Chapter 13 - Our place in the Universe

1. $v = H_0d$
2. Redshift = $\frac{\Delta\lambda}{\lambda} = \frac{v}{c}$
3. Dilated time, $t = \gamma\tau$

14 Chapter 14 - Simple models of matter

1. Boyle's Law - $P \propto \frac{1}{V}$
2. Charles' Law - $V \propto T$
3. Pressure Law - $P \propto T$
4. R.m.s = $\sqrt{\bar{c^2}}$
5. $d = \sqrt{N}x$ (x Step length)
6. $\frac{1}{2}mv^2 = \frac{3}{2}kT = \frac{3}{2}RT$

15 Chapter 15 - Boltzmann factor

1. $f = \frac{N_x}{N_{x-1}}$

16 Chapter 16 - Electromagnetism

1. $\Phi = NI\Lambda$ (Λ is permeance)
2. $\Phi N = BAN$
3. $\varepsilon = vLB$
4. $\frac{V_p}{V_s} = \frac{N_p}{N_s}$

17 Chapter 17 - The Electric field

1. $W = Vq$
2. $V = qEd$
3. $E = \frac{kq}{r^2}$

18 Chapter 18 - Inside the atom

1. $p \approx \frac{E_{total}}{c}$
2. $\lambda = \frac{hc}{E}$
3. $E_k = \frac{h^2}{2m\lambda^2}$
4. $d\sin\theta = 1.22\lambda$ (d is nuclear diameter)

19 Chapter 19 - Using the atom

1. $\alpha = {}^{n}_{z}\mathrm{X} \rightarrow {}^{n-4}_{z-2}\mathrm{Y} + {}^{4}_{2}\mathrm{He}$
2. $\beta^- = {}^{n}_{z}\mathrm{X} \rightarrow {}^{n}_{z+1}\mathrm{Y} + {}^{0}_{-1}\mathrm{e} + {}^{0}_{0}\overline{\nu}_e$
3. $\beta^+ = {}^{n}_{z}\mathrm{X} \rightarrow {}^{n}_{z-1}\mathrm{X} + {}^{0}_{1}\mathrm{e}^+ + {}^{0}_{0}\nu_e$
4. $\gamma = {}^{n}_{z}\mathrm{X} \rightarrow {}^{n}_{z}\mathrm{X} + {}^{0}_{0}\gamma$

Made by Tom Eaton.