Solutions to AS Physics Bridging Workbook

1. Any 3 – V=IR, GPE = mgh, v = fλ, P=VI, Q = It, E=P/t, etc.
2. R = Resistance, A = Amperes, F = Farads, m = milli , I = Current, ρ = Density or Resistivity, Q =Charge, V = Voltge
3. **86** (24+26 characters = 50, all of which have an upper and lower case so 50 x 2 = 100)
   However, there are some duplications. Removing the 14 identical symbols eg capital A and capital alpha, the answer is 100-14 = **86. Allow 85** if lower case kappa considered a duplicate of lower case k.
4. C = wave speed, f = frequency, λ = wavelength
5. Any 2 from data sheet
6. Any two symbols from data sheet equations where same letters used to describe different quantities. (1 mark for letter/symbol, 1 mark for what it stands for, 1 for equation they are in)
7.
   a. $15cm = 1.5 \times 10^{-1}m$
   b. $500g = 5 \times 10^{-1}kg$
   c. $3 \times 10^{3}m$
   d. $35mV = 3.5 \times 10^{-2}V$
   e. $220nF = 2.2 \times 10^{-7}F$
8.
   a. $1m^2 = 1000000mm^2$ or 10^6mm^2,
   b. $0.45mm^2 = 4.5 \times 10^{-7}m^2$,
   c. $1cm^3 = 10^{-6}m^3$,
   d. $22.4mm^3 = 1.4x10^{-5}m^3$
9. 2 marks for any sensible comment
10.
   a. $86 = 8.6 \times 10^{1}$,
   b. $381 = 3.81 \times 10^{2}$,
   c. $45300 = 4.53 \times 10^{4}$,
   d. $1,500,000,000 = 1.5 \times 10^{9}$,
   e. $0.03 = 3 \times 10^{-2}$,
   f. $0.00045 = 4.5 \times 10^{-4}$,
   g. $0.0000000782 = 7.82 \times 10^{-8}$
11.
   a. 8.68×10^{18},
   b. 21.1,
   c. 3.05,
   d. 0.83,
   e. 65.0°,
   f. 65.0°,
   g. Not defined (calculator may return MA error) because 1.0052 is not in the range of Sin(x) which must be between -1 and +1
   h. 4.27×10^{-6},
   i. 2.30,
   j. 7.81

12. Any two from data sheet

13. R = V/I, v = ρ/m, m = ρV, C = Q/V

14.

a. $v = \frac{nRT}{P}$,

b. $\Delta h = \frac{E_p}{mg}$,

c. $G = -\frac{VR}{M}$,

d. $D = \frac{ws}{\lambda}$

15. $t = \frac{v-u}{a}, r = \frac{E-V}{I}$

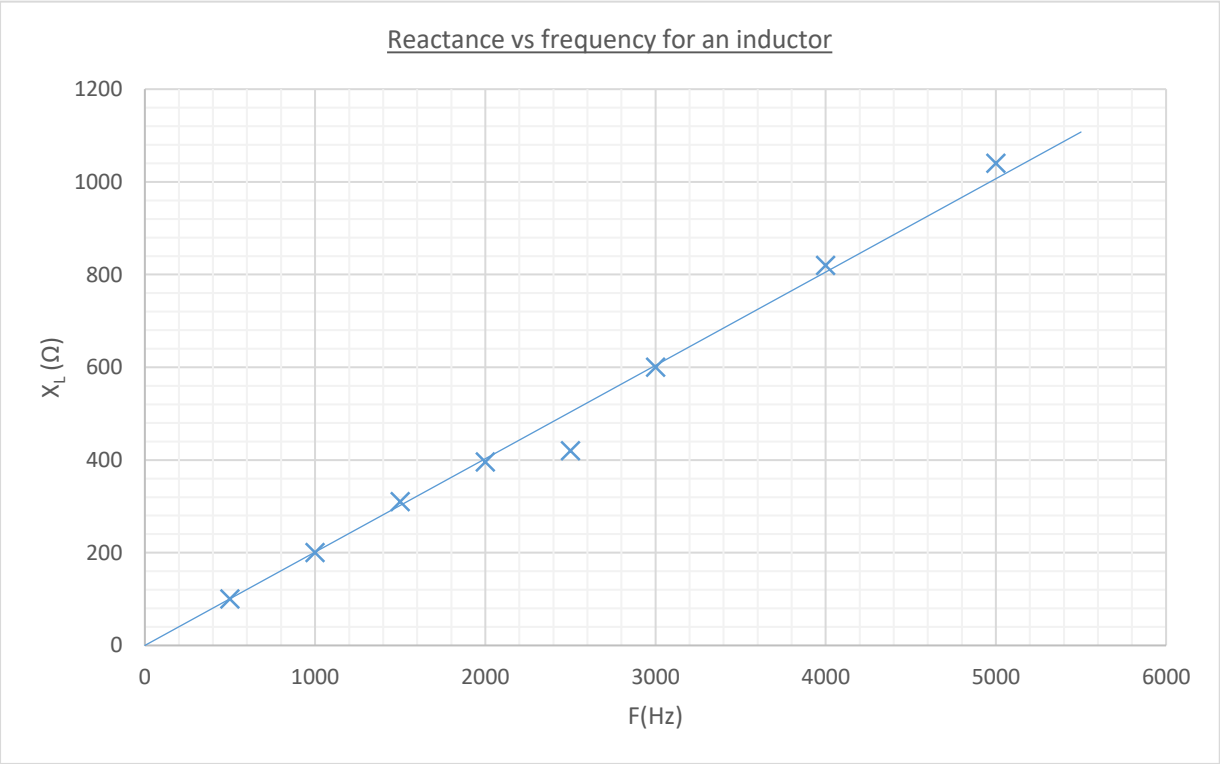
16. $v = \sqrt{\frac{2E_K}{m}}$ or $v = \left(\frac{2E_K}{m}\right)^{\frac{1}{2}}$

$k = \frac{4\pi^2 m}{T^2}$

$C = \frac{1}{4\pi^2 L f^2}$

Bonus: $t = -RC\ln(\frac{V}{V_o})$

17. 850Ω (2 marks if +/- 10Ω, 1 mark if +/- 20Ω), 3500Hz precisely (1 mark if within +/- 100Hz). Graph should look like this:



18. Gradient by triangle construction method = 0.2 (4 marks if large triangle (half page) drawn on graph)

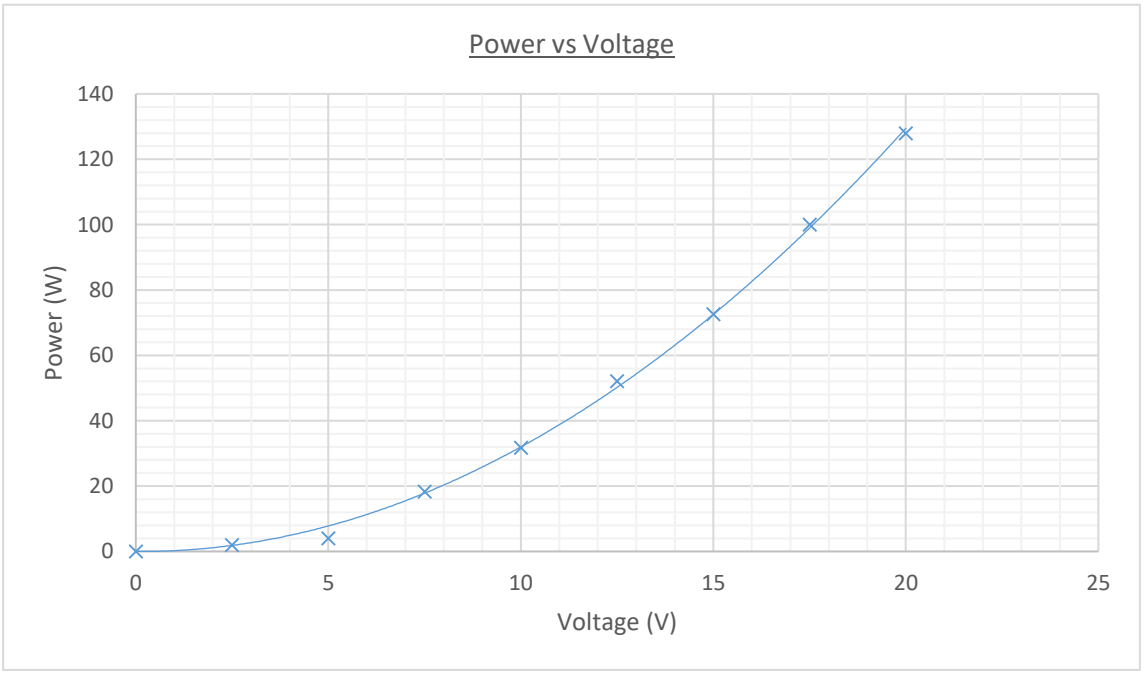
Units are ΩHz^{-1} (2 marks)

If graph drawn with frequency on Y axis, gradient is 4.8 $Hz\Omega^{-1}$

19. The gradient $0.2 = 2\pi L$ so rearrange to $L = \frac{0.2}{2\pi}$ to obtain $L = 0.03H$. Allow ECF from gradient calculated in 18.

    Note: if graph drawn in 18 had frequency on Y axis, the equation would be $f = \left(\frac{1}{2\pi L}\right) X_L$ with $\frac{1}{2\pi L} = 4.8$, gives $L = \frac{1}{2\pi \times 4.8}$, giving the same result of $L = 0.03H$

20. Zero (it should be because the equation $X_L = 2\pi L f$ has no added part (ie the $+c$ in the $y = mx + c$ form is zero).
21. Correctly scaled graph (2 marks), with axis labels with units (2 marks) points correctly plotted (2 marks), Correctly placed line of best fit (2 marks). If dot-to-dot line is drawn, award zero for whole graph. Correct graph for reference:



22. This looks like $y = x^2$ (quadratic) (1 mark), so $P \propto V^2$ (1 mark)

    Bonus:

    $P = I^2R$ seen (1 mark)

    $V = IR$ (Ohm's law) seen (1 mark)

    Re-arrange Ohm to get $I = \frac{V}{R}$ (1 mark)

    Sub I into $P = I^2R$ to get $P = \left(\frac{V}{R}\right)^2 R$ (1 mark)

    So $P = \frac{V^2}{R}$ which shows that P depends on V^2 as required (1 mark)

23. (a) Mean = 35g , Range = 6g, Absolute uncertainty $\epsilon = \pm 3g$, Percentage uncertainty $\alpha = \pm 9\%$
    (b) Mean = 17.6N , Range =1.1N , Absolute uncertainty $\epsilon = \pm 0.55N$, Percentage uncertainty $\alpha = \pm 3\%$