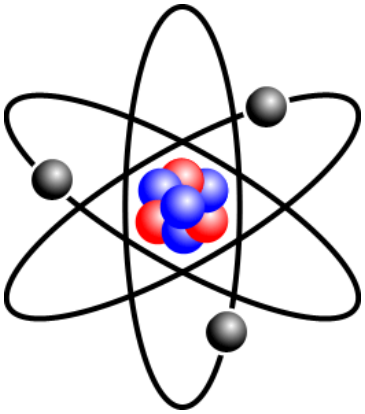
Name .....

Samuel Whitbread Academy

A-Level Physics



HOLIDAY INDUCTION WORK

Please complete this work and hand it in on the first lesson back in September.

57 marks available

Mathematical Tasks

There are many mathematical skills which are essential to Physics and these questions are about showing you understand these. The skills you will need include:

1. Re-arranging equations.
2. Solving equations.
3. Plotting graphs, drawing lines of best fit and finding the gradient.
4. Trigonometry.
5. Using standard form and understanding significant figures.
6. Analysing data.

Questions

1. Re-arrange and simplify (where possible) the following equations:

   (a) $s = vt$ for v [1]

   (b) $P = mgh$ for g [1]

   (c) $c = a + f$ for a [1]

   (d) $v = u + at$ for u [1]

   (e) $E = pv^2$ for v [1]

   (f) $Z = ½pc$ for p [1]

   (g) $v^2 = u^2 + 2as$ for v [1]

   (h) $v^2 = u^2 + 2as$ for a [1]

   (i) $v^2 = u^2 + 2as$ for u [1]

   (j) $s = ut + ½at^2$ for a [1]

[Total: 10 marks]

2. Solve the following equations:

(a) The gravitational potential energy gained by an object is given by the equation GPE = mgh where m is mass in kg, g is gravitational field strength in N/kg and h is the height gained in m. Calculate the GPE gained by a 325kg mass being raised 30m in the earth's gravity of strength 10N/kg

[2]

(b) The kinetic energy (KE) of a moving object is given by the equation $KE = \frac{1}{2}mv^2$ where m is mass in kg and v is speed in m/s . Find the KE of a 1200kg car moving at 20m/s.

[2]

(c) For the example set in (a) above, if the object now falls back to the ground, so converting GPE to KE, calculate the speed it strikes the ground. What assumption have you made?

[4]

(d) Electrical power is calculated using the following equation $P = I^2R$ where P is power in Watts, I is current in amps and R is resistance in ohms. Find the resistance when the power is 7.75W and the current is 0.2A.

[3]

(e) Electrical energy use is calculated in kilowatthours. This is the energy transferred (the word transferred is used here because energy is not really used, but converted or transferred from one form to another) by 1kW (1000 Watts) in an hour (60 minutes). The number of kilowatthours used is given by the equation:

Kilowatthours = kilowatts x hours.

Find the number of kilowatthours used by a 1800W heater which is used for 30 minutes. Remember to convert watts to kilowatts and minutes to hours.

[3]

(f) The final speed, v, of an accelerating object is given by the equation $v = u + at$ where u is the initial speed in m/s, a is the acceleration in m/s^2 and t is the time for which it is accelerating. Find the time taken (t) for a car accelerating at $4m/s^2$ to go from 3m/s to 15m/s.

[3]

[Total: 17 marks]

3. **Trigonometry.** Remember sine is opposite/hypotenuse, cosine is adjacent/hypotenuse and tangent is opposite/adjacent. Carefully draw a right-angled triangle with the following information (the right angle is between the base & height):

Height = 6cm; Base = 12cm

Use the trig ratios given above (ie sine = opposite/hypotenuse etc) to find the angles in this triangle. Check them using a protractor. Show your working and final answers clearly.

[Total: 4 marks]

4. **Standard form.** Express the following in standard form:

(a) 346 [1]

(b) 256.4 [1]

(c) 2 000 146 [1]

(d) 45 000.3 [1]

(e) 0.0039 [1]

[Total: 5 marks]

Ohm's Law

A resistor of unknown resistance was connected to a variable power supply. The current through, I, and potential difference across, V, were measured. You will use this information to calculate the resistance, R, of the resistor.

Experimental Data

Potential Difference, V (V)			Current, I (A)		
9.12	9.05	9.07	1.18	1.26	1.24
6.98	7.03	7.06	0.98	0.92	1.01
5.03	4.93	5.02	0.71	0.69	0.65
-4.11	-4.02	-4.04	-0.53	-0.59	-0.53
-5.89	-6.02	-5.98	-0.84	-0.86	-0.78
-8.07	-8.10	-7.92	-1.11	-1.08	-1.14

Mean Potential Difference, V (V)	Mean Current, I (A)

Analysis Questions: (You may complete these on this sheet or on separate paper)

1. Complete the table by calculating the mean values of V and I.

[6]

2. Plot a graph of I (on the y axis) against V (on the x axis). Draw a line of best fit. (Graph paper is on the next page).

[5]

3. Does your line of best fit pass through the origin? Should it? Explain your answer.

[2]

4. Calculate the gradient of your line of best fit.

[2]

5. What does the gradient of your graph represent?

[1]

6. Use the gradient to calculate the resistance, R, of the resistor.

[2]

7. The given value of the resistor is 7.3Ω. What is the difference between your value and the given value?

[1]

8. What is this as a percentage of the given value?

[2]

[Total: 21 marks]

Graph paper for Ohm's Law results: