Ribston Hall – A level Physics Summer Work

- Please read through each slide, learn the parts that you are asked to and attempt the tasks. We will use these in the first couple of lessons in September (i.e. go through, check up and review answers)

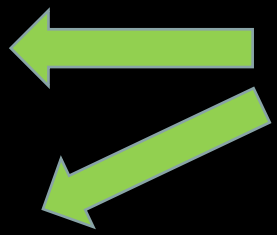
Orders of Magnitude

$10 \times 10 = 100 = 10^2$

$10 \times 10 \times 10 = 1000 = 10^3$

$256000 = 2.56 \times 10^5$

$0.000346 = 3.46 \times 10^{-4}$



These powers of 10 are known as the "***order of magnitude***" i.e. hundreds/thousands/ millions/hundredths/ thousandths etc

SI Prefixes

Multiple	Prefix	Symbol
10^{15}	peta	P
10^{12}	tera	T
10^{9}	giga	G
10^{6}	mega	M
10^{3}	kilo	k
10^{2}	hecto	h
10	deka	da
10^{-1}	deci	d
10^{-2}	centi	c
10^{-3}	milli	m
10^{-6}	micro	μ
10^{-9}	nano	n
10^{-12}	pico	p
10^{-15}	femto	f

You need to learn and memorise as many of these as possible!

Video link – please watch this – really interesting examples of objects on different scales

The Scale of the Universe - YouTube

Using Prefixes – more than one answer to calculations!

e.g.

$256000m = 2.56 \times 10^{5}$

$= 25.6 \times 10^{4} m$

$= 256 \times 10^{3} m = 256km$

$0.000346s = 3.46 \times 10^{-4} s$

$= 34.6 \times 10^{-5} s$

$= 346 \times 10^{-6} s = 346\mu s$

Try these:

Give 3 alternative answers to each value (your choices) - including at least one that can also use a prefix:

1. 204s
2. 562m
3. 0.0035V
4. 0.239s
5. 628.3V
6. 4560000C

Units in Physics

- As you know from GCSE, lots of Physics involves calculations of quantities, but in order to be clear we should always use UNITS.

- Without units, things are very confusing (e.g. if I said I walked to school at 5.3, what does that mean!? 5.3 m/s? 5.3 mph?

Types of Units

- Base units – all physical quantities are measured using the BASE units (see next slide)

- Many quantities are a combination of base units. For simplicity, these combinations are then renamed (e.g. pressure is measured in N/m^2 but we call this a Pascal (Pa). So 35 N/m^2 is the same as 35 Pa)

Base S.I. Units

You need to learn these (apart from the last one) – may will be familiar from GCSE anyway!

Base Quantity		Base Unit	
Name	Symbol	Name	Symbol
Length	l, h, r	meter	m
Mass	m	kilogram	kg
Time	t	second	s
Electric current	I, i	ampere	A
Temperature	T	kelvin	K
Amount of substance	n	mole	mol
Luminous intensity	I_V	candela	cd

Derived S.I. Units

Quantity	Name	Symbol	Expression
Frequency	Hertz	Hz	$1/s$
Force	Newton	N	$kg \cdot m/s^2$
Pressure, stress	Pascal	Pa	$N/m^2 = kg/m \cdot s^2$
Energy, work	Joule	J	$N \cdot m = kg \cdot m^2/s^2$
Power, radiant flux	Watt	W	$J/s = kg \cdot m^2/s^3$
Electric charge	Coulomb	C	$A \cdot s$
Voltage, electric potential	Volt	V	$W/A = kg \cdot m^2/A \cdot s^3$
Capacitance	Farad	F	$C/V = s^4A^2/m^2kg$
Electric resistance	Ohm	Ω	$V/A = m^2kg/s^3A^2$
Conductance	Siemens or mho	S or Ω	$1/\Omega = s^3A^2/m^2kg$
Magnetic field	Tesla	T	$N/A \cdot m = kg/s^2A$
Magnetic flux	Weber	Wb	$T \cdot m^2 = m^2kg/s^2A$
Inductance	Henry	H	$V \cdot s/A = m^2kg/s^2A^2$

You need to learn these (apart from Siemens and Henry) – may will be familiar from GCSE anyway!

Working out derived units

- Derived units usually come about from the way they are calculated (i.e. from equations)

- e.g.

  Force = mass x acceleration

  Newtons = kg x m/s^2

i.e. 1N is the same as 1 kg m/s^2

Task

- Using the list of derived units (which shows what combination of base units they are made up of) can you identify HOW these units are derived (i.e. which equation(s) are used to link them)?

- Do this for as many (hopefully all) the derived units on the list (apart from Siemens and Henry)