Sir Graham Balfour

Physics A level

Transition Pack

Welcome to A-level Physics. This pack contains a programme of activities to prepare you to start an A-level in Physics in September. It is aimed to be used after you complete your GCSE, throughout the remainder of the Summer term and over the Summer Holidays to ensure you are ready to start your course in September.

Get interested in the subject you will be studying for two years. The more you are interested the more you will enjoy it!

These activities are compulsory and need to be handed in when you start the course in September. You will have a test on these topics to assess your understanding.

Activity 1.

Prefixes

You need to **learn the following prefixes, the symbols and the powers of ten.**

Prefix	**Symbol**	**Power of ten**
pico	p	$\times 10^{-12}$
nano	n	$\times 10^{-9}$
micro	μ	$\times 10^{-6}$
milli	m	$\times 10^{-3}$
centi	c	$\times 10^{-2}$
kilo	k	$\times 10^{3}$
mega	M	$\times 10^{6}$
giga	G	$\times 10^{9}$
tera	T	$\times 10^{12}$

Activity 2

SI Units and Base Units

Every measurement must have a size and a unit. To avoid confusion standard units are used eg Kg, Joule, Newton. These standard units can be converted into Base Units. There are seven base units (**you need to know six**).

Physical quantity	Usual quantity symbol	Unit	Abbreviation
mass	m	kilogram	kg
length	l or x	metre	m
time	t	second	s
electric current	I	ampere	A
temperature	T	kelvin	K
amount of substance	N	mole	mol
luminous intensity	(not used at A-level)	candela	cd

Activity 3

Standard Form

At A level quantities will be written in standard form, and it is expected that your answers will be too.

This means answers should be written as ….x 10^{y}. E.g. for an answer of 1200kg we would write 1.2 x 10^{3}kg.

1. Write 2530 in standard form.

2. Write 280 in standard form.

3. Write 0.77 in standard form.

4. Write 0.0091 in standard form.

5. Write 1 872 000 in standard form.

6. Write 12.2 in standard form

7. Write 2.4 x 10^{2} as a normal number.

8. Write 3.505 x 10^{1} as a normal number.

9. Write 8.31 x 10^{6} as a normal number.

10. Write 6.002 x 10^{2} as a normal number.

Activity 4
Significant Figures

Give the following to 3 significant figures:

1. 3.4527

2. 40.691

3. 0.838991

4. 1.0247

5. 59.972

Calculate the following to a suitable number of significant figures:

6. 63.2/78.1

7. 39+78+120

8. (3.4+3.7+3.2)/3

Activity 5

Rearranging Equations

You need to be able to rearrange equations correctly and quickly.

Complete the table

Equation	First Rearrangement	Second Rearrangement
(refractive index) $n = \frac{c}{v}$	$c =$	$v =$
(current) $I = \frac{\Delta Q}{\Delta t}$		
(electric potential) $V = \frac{\Delta E}{\Delta Q}$		
(power) $P = \frac{\Delta E}{\Delta t}$		
(power) $P = VI$		
(conductance) $G = \frac{I}{V}$		
(resistance) $R = \frac{V}{I}$		
(resistance) $R = \frac{1}{G}$		
(power) $P = I^2 R$		
(power) $P = \frac{V^2}{R}$		
(stress) $\sigma = \frac{F}{A}$	$F =$	$A =$
(strain) $\varepsilon = \frac{x}{l}$	$x =$	$l =$
(Young's modulus) $E = \frac{\sigma}{\varepsilon}$	$\sigma =$	$\varepsilon =$
(conductance) $G = \frac{\sigma A}{L}$		
(resistance) $R = \frac{\rho L}{A}$		

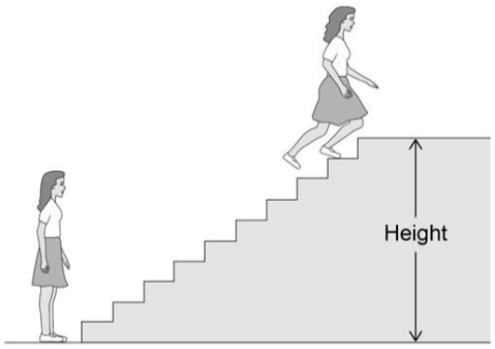
Activity 6

Linking concept and equations

This is a fundamental skill for A level. Use your GCSE knowledge to complete the following questions.

0 9 **Figure 10** shows a girl doing an experiment to determine her power output by running to the top of some stairs.

Figure 10



0 9 . 1 The mass of the girl was 60.0 kg.

The height of the stairs was 175 cm.

The girl ran to the top of the stairs in 1.40 s.

gravitational field strength = 9.8 N/kg

Calculate the power output of the girl.

Use the Physics Equations Sheet.

[5 marks]

Power = _____ W

0 6 . 6 A different car accelerated from 0.12 m/s to 0.52 m/s.

The acceleration of the car was 0.040 m/s^2.

The work done to accelerate the car was 0.48 J.

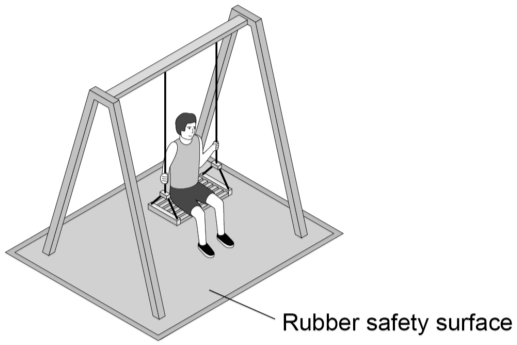
Calculate the resultant force needed to accelerate the car.

[6 marks]

Resultant force = _____ N

0 6 . 3 **Figure 11** shows a child on a playground swing. The playground has a rubber safety surface.

Figure 11



A child of mass 32 kg jumped from the swing.

When the child reached the ground she took 180 milliseconds to slow down and stop.

During this time an average force of 800 N was exerted on her by the ground.

Calculate the velocity of the child when she first touched the ground.

Use the Physics Equations Sheet.

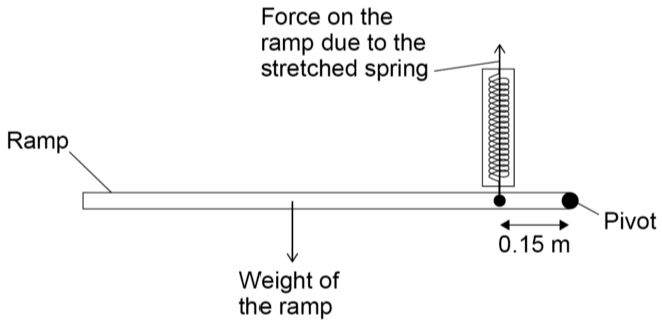
[4 marks]

Velocity = _____ m/s

When the ramp is lowered, work is done to stretch a spring on the side of the ramp. Elastic potential energy is stored in the stretched spring.

Figure 20 shows the ramp part way down in a balanced horizontal position.

Figure 20



1 0 . 2 With the ramp horizontal:

the moment caused by the weight of the ramp = 924 Nm

the spring is stretched by 0.250 m

Calculate the elastic potential energy stored in the stretched spring.

Use data from **Figure 20**.

[6 marks]

Elastic potential energy = _____ J

Activity 7

Research task

Pick one of the following to research and write a brief report.

https://webb.nasa.gov/

Visit the NASA website to write a report on the importance and the discoveries of the James Webb telescope

http://home.cern/about

CERN encompasses the Large Hadron Collider (LHC) and is the largest collaborative science experiment ever undertaken. Find out about it here and make a page of suitable notes on the accelerator.

http://joshworth.com/dev/pixelspace/pixelspace_solarsystem.html

The solar system is massive and its scale is hard to comprehend. Have a look at this award winning website and make a page of suitable notes.

https://phet.colorado.edu/en/simulations/category/html

PhET create online Physics simulations when you can complete some simple experiments online. Open up the resistance of a wire html5 simulation. Conduct a simple experiment and make a one page summary of the experiment and your findings.

http://climate.nasa.gov/

NASA's Jet Propulsion Laboratory has lots of information on Climate Change and Engineering Solutions to combat it. Have a look and make notes on an article of your choice.

http://www.livescience.com/46558-laws-of-motion.html

Newton's Laws of Motion are fundamental laws for the motion of all the object we can see around us. Use this website and the suggested further reading links on the webpage to make your own 1 page of notes on the topics.

Useful websites

Get to know the websites which will help you through the course

GCSE Review

Seneca

Oak National Academy

https://www.flippedaroundphysics.com/a-level.html

https://www.khanacademy.org/

https://www.physicsandmathstutor.com/

https://isaacphysics.org/

http://www.antonine-education.co.uk/

www.cyberphysics.co.uk/

http://www.physbot.co.uk/

https://www.s-cool.co.uk/a-level/physics

https://www.alevelphysicsonline.com/