

A-level Physics

Summer Independent Learning

Y11-12

Welcome to Y12 A Level Physics! Please complete the following tasks ready for your first day at New College. You can either write on the document electronically, print the document out or write your notes and answers on paper to bring in for your first lesson in September.

You may have to research any knowledge or techniques you cannot immediately recall using common GCSE resources or other tutorials.

Please be aware that you will have an assessment on these topics shortly after beginning your A level Physics course and the knowledge covered is essential to understanding the subsequent content

Summer Independent Learning

Task 1 - Command Words

You will have come across command words at GCSE in most of your subjects. In A level Physics these words become much more significant and, as you learn how to answer questions at A level, you'll be using command words a lot to shape your answers. Some questions will also have pairs of command words such as 'state and explain' or 'Calculate and deduce'.

Part 1

Below is a list of command words and definitions but they are all jumbled up. Match the command word with the definition by making a list of corresponding words and definitions.

Analyse	Add notation or labelling to a graph, diagram or other drawing.
Annotate	Arrive at answer using a numerical or algebraic method.
Apply	Assemble a piece of equipment, usually in the context of ISA or EMPA test.
Calculate	Draw approximately.
Comment	Draw conclusions from information provided.
Compare	Express in clear terms.
Complete	Find an item of data for a given quantity.
Construct	Finish a task by adding to given information
Deduce	Give a plausible outcome.
Derive	Give an account of
Describe	Give reasons
Design	Identify similarities and/or differences.
Determine	Interpret data to arrive at a conclusion.
Discuss	Judge from available evidence.
Distinguish	List a number of features or points without further elaboration.
Draw	List the differences between different items.
Evaluate	Make a judgement based on a value.
Explain	Obtain a relationship or equation from the manipulation of fundamental relationships and/or data.
Identify	Present a possible case/solution.
List	Present key points about different ideas or strengths and weaknesses of an idea.
Measure	Produce a diagram.
Outline	Provide an answer from a number of alternatives.
Predict	Provide structured evidence to reach a conclusion

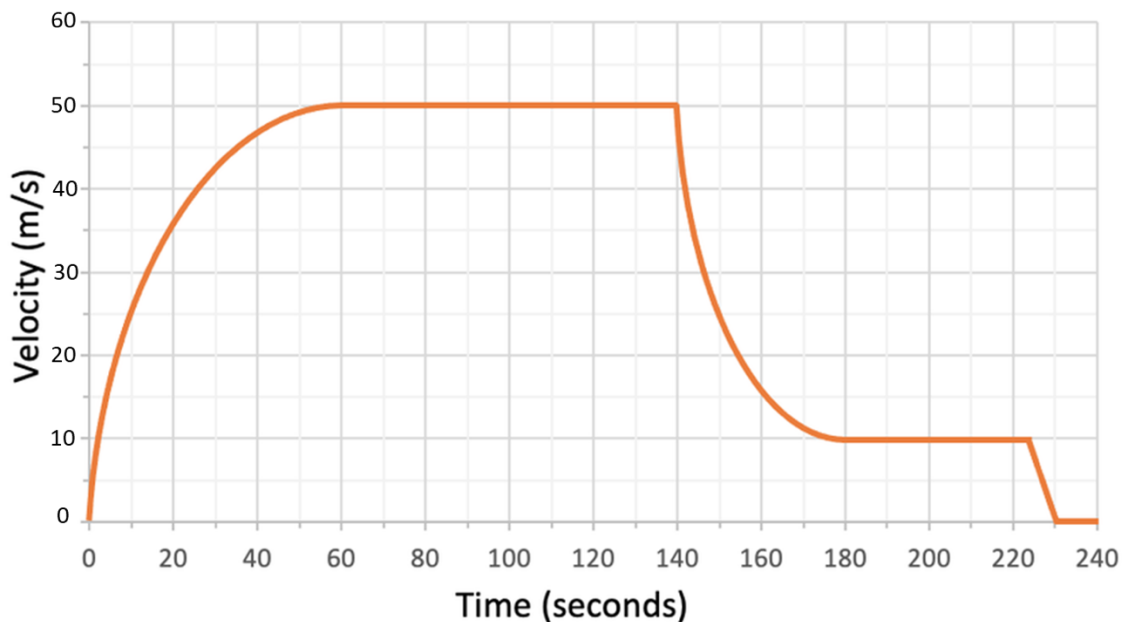
Show	Recall basic knowledge possibly after a simple numerical manipulation.
Sketch	Set out how something will be done.
Solve	Set out main characteristics.
State	Use given data or information to obtain an answer.
Suggest	Use information in a new context.
Write	Work out the value of something.

Part 2

Let's now put some of those command words into practice. In this task you'll be asked to consider information from Physics you already know well from GCSE. In each question, carefully consider the command word.

Question 1

Consider the following graph which shows the velocity of a skydiver from the moment they leave the plane to the moment they land.

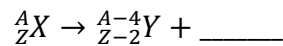
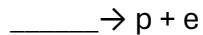


- Sketch the graph and annotate each section in terms of what is happening, taking care to describe the acting forces on the person
- Describe the shape of the graph between 0 and 140 seconds
- State and explain the reason for the shape of the graph between 60 and 140 seconds.

- d) Identify the time at which the skydiver deploys their parachute
- e) Determine the total distance travelled by the skydiver

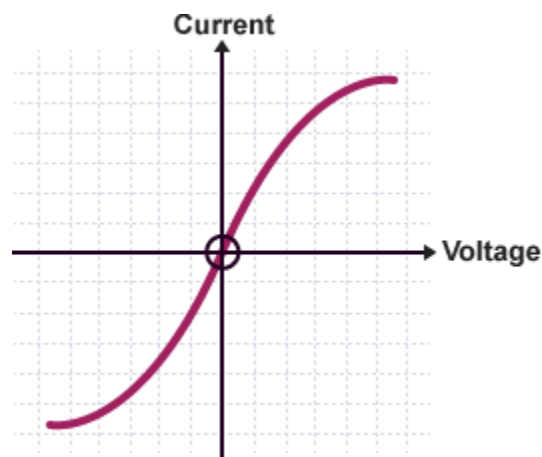
Question 2

Consider beta and alpha decay and complete the following equations:



Question 3

The following graph shows the IV characteristic of a filament bulb.



Describe and explain the shape of the curve

Task 2 - Rearranging equations

You will have had to rearrange equations for GCSE Physics and some other subjects and A level is no different, the equations just get a little more complicated. You are given a data sheet in the exams which means A level is less about remembering equations and more about knowing what to do with them and how to rearrange them to find unknown quantities.

Rearrange the all of the equations below for each of the terms in the equation. **Annotate** each of the steps as you go. An example has been completed for you.

$E_k = \frac{1}{2}mv^2$ <p>Rearrange for m (\times both sides by 2)</p> $2E_k = mv^2$ <p>(\div both sides by v^2)</p> $\frac{2E_k}{v^2} = m \quad \checkmark$	<p>Rearrange for v (\times both sides by 2)</p> $2E_k = mv^2$ <p>(\div both sides by m)</p> $\frac{2E_k}{m} = v^2$ <p>(Square root both sides)</p> $\sqrt{\frac{2E_k}{m}} = v \quad \checkmark$
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Waves

wave speed $c = f\lambda$ period $f = \frac{1}{T}$

first harmonic $f = \frac{1}{2l} \sqrt{\frac{T}{\mu}}$

fringe spacing $w = \frac{\lambda D}{s}$ diffraction grating $d \sin \theta = n\lambda$

refractive index of a substance s , $n = \frac{c}{c_s}$

for two different substances of refractive indices n_1 and n_2 ,

law of refraction $n_1 \sin \theta_1 = n_2 \sin \theta_2$

critical angle $\sin \theta_c = \frac{n_2}{n_1}$ for $n_1 > n_2$

Mechanics

moments moment = Fd

velocity and acceleration $v = \frac{\Delta s}{\Delta t}$ $a = \frac{\Delta v}{\Delta t}$

equations of motion $v = u + at$ $s = \left(\frac{u+v}{2}\right)t$

$v^2 = u^2 + 2as$ $s = ut + \frac{at^2}{2}$

force $F = ma$

Task 3 – Geometry

Complete the questions on the following worksheets on paper:

Worksheet 1

<https://corbettmaths.com/wp-content/uploads/2013/02/trigonometry-pdf1.pdf>

Worksheet 2

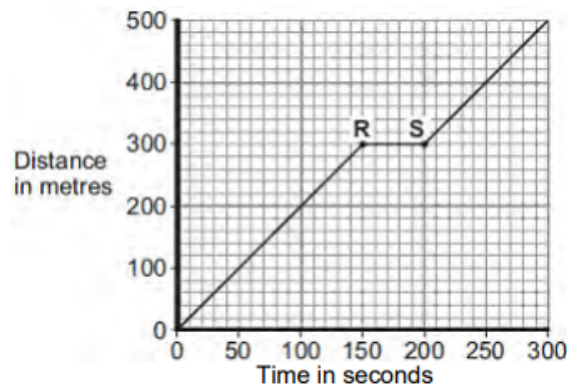
<https://corbettmaths.com/wp-content/uploads/2013/02/pythagoras-pdf2.pdf>

Task 4 – Graphs

Graphs are a really useful tool in science and you will use them a lot in A-level Physics. Answer the following questions:

Q1.(a) **Figure 1** shows the distance–time graph for a person walking to a bus stop.

Figure 1



- (i) Which **one** of the following statements describes the motion of the person between points **R** and **S** on the graph?

Tick (✓) **one** box.

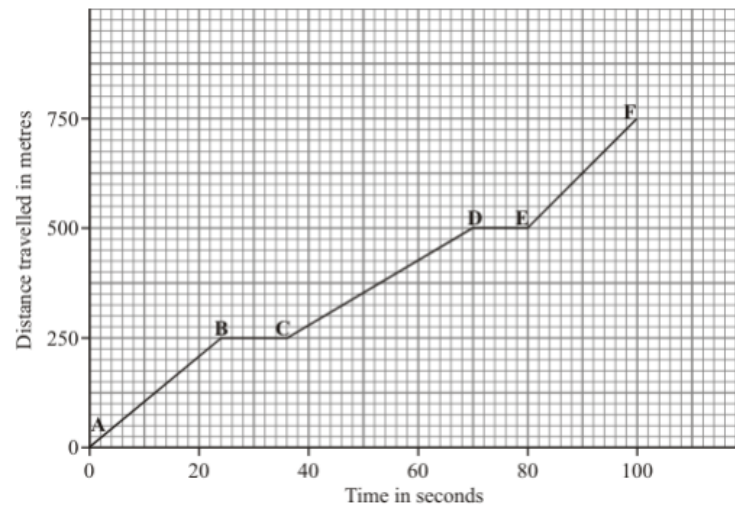
Not moving

Moving at constant speed

Moving with increasing speed

Q2. This question is about a car travelling through a town.

(a) The graph shows how far the car travelled and how long it took.

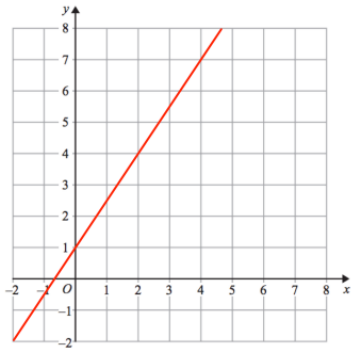


(i) Between which points was the car travelling fastest? Tick (✓) your answer.

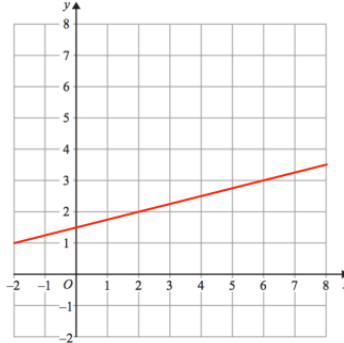
Points	Tick (✓)
A – B	
B – C	
C – D	
D – E	
E – F	

Question 3: Find the gradient of each of these lines

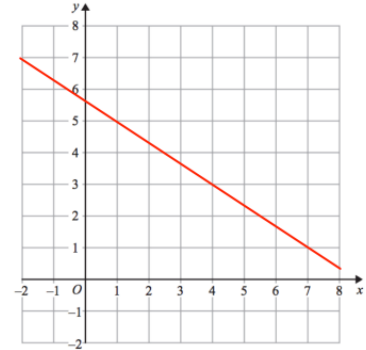
(a)



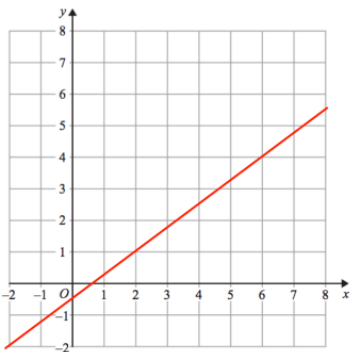
(b)



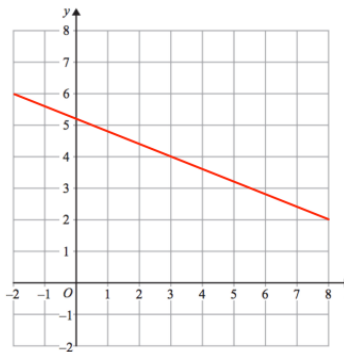
(c)



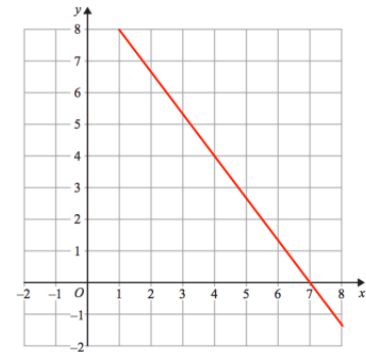
(d)



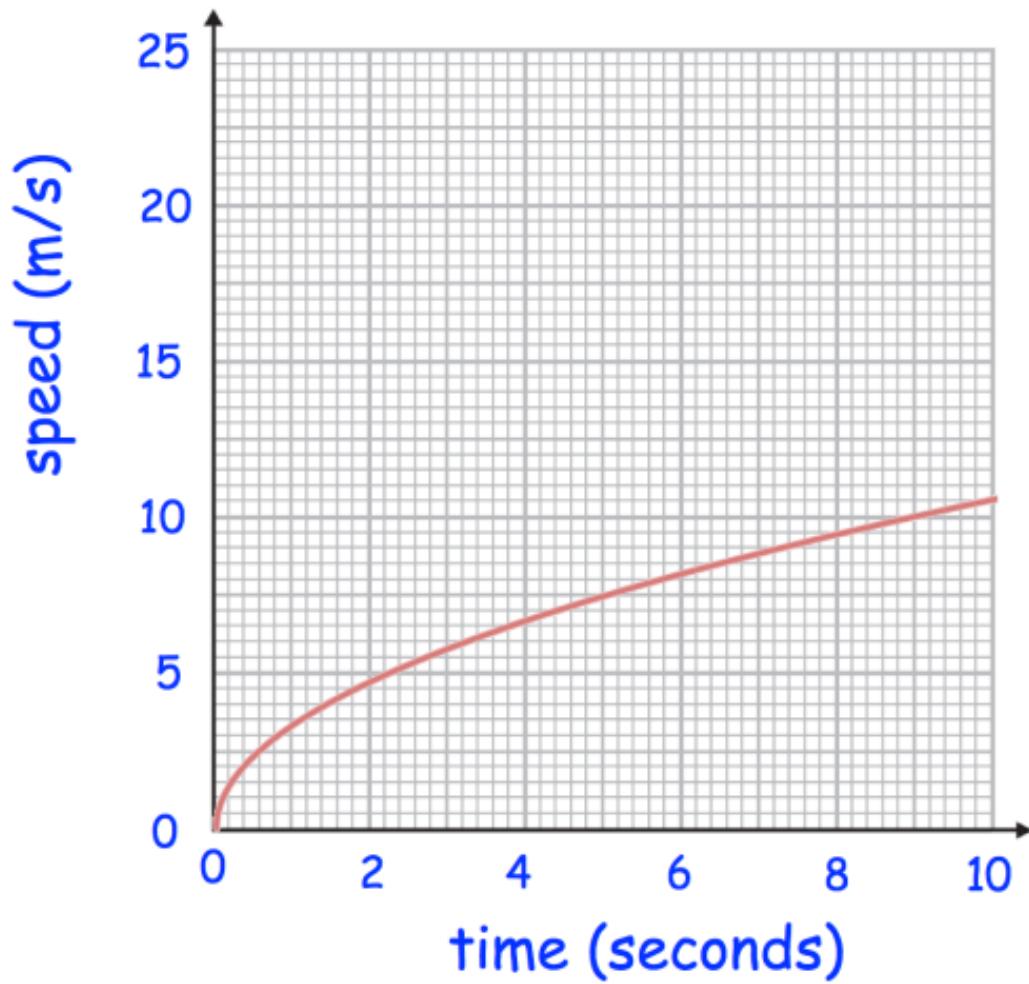
(e)



(f)

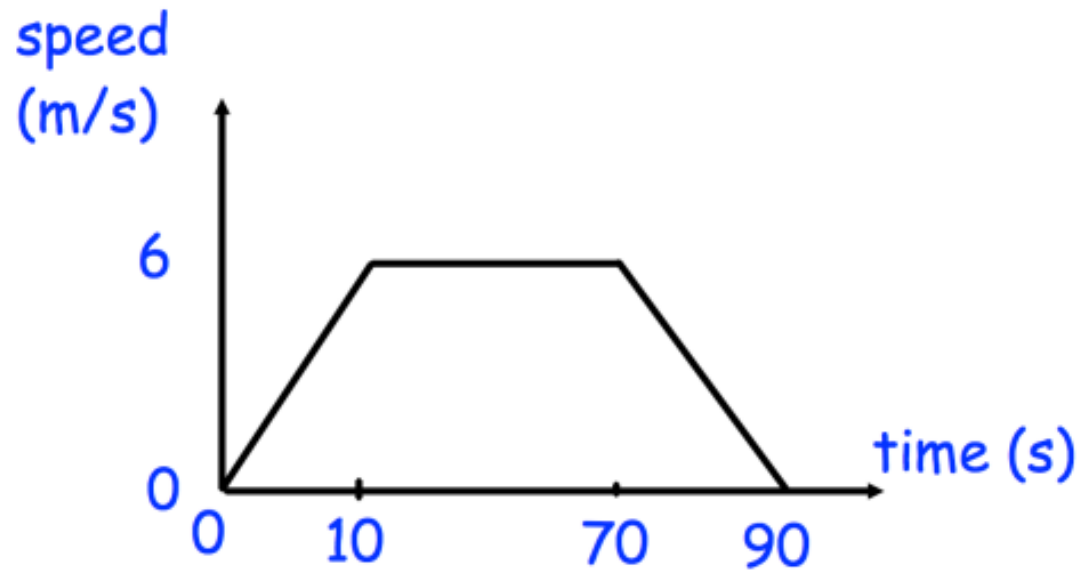


4. Here is a speed-time graph for first 10 seconds of the journey of a car.



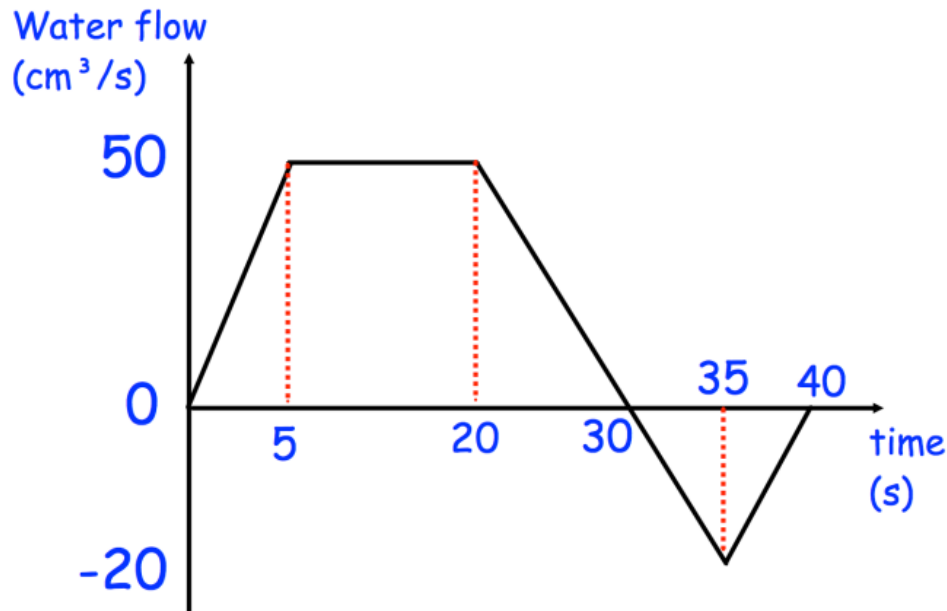
(a) Work out an estimate for the distance the car travelled in the 10 seconds.

5. The graph shows the speed of a bicycle between two houses.



Calculate the distance between the two houses.

The graph below shows information on how an empty container is being filled with water.



How much water is in the container after 40 seconds?

Task 5 – Research tasks

Research the following questions, writing no more than an A4 side on each topic. You may use diagrams to support your answers:

1. How do polaroid sunglasses work to reduce glare from reflective surfaces?
2. How do stationary waves produce a note on a guitar string?
3. How do stationary waves work in a microwave?
4. How do stationary waves produce a sound in a flute or a recorder?
5. What is the structure of a step index optical fibre and how does this allow light to be transmitted over long distances?
6. How does a prism disperse white light into a spectrum?