New Specification

Rewarding Learning

Centre Number

71	

Candidate Number

General Certificate of Secondary Education
2012–2013

Double Award Science: Physics

Unit P1

Higher Tier

[GSD32]

GSD32

WEDNESDAY 14 NOVEMBER 2012, AFTERNOON

TIME

1 hour.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
Write your answers in the spaces provided in this question paper.
Answer **all nine** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 70.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in question **2(a)**.

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	
Total Marks	

Examiner Only	
Marks	Remark

1 Radioactive substances emit up to three types of radiations, alpha, beta, and gamma. These radiations can travel different distances in air. A source of radiation is placed at one end of a laboratory bench.

A detector is placed at points A, B and C in turn.

(a) (i) At which point A, B or C, will the detector record only gamma radiation?

Answer = _____ [1]

(ii) At which point A, B or C, will the detector record alpha, beta, and gamma radiation?

Answer = _____ [1]

(iii) At which point A, B or C, will the detector record only beta and gamma radiation?

Answer = _____ [1]

(b) (i) When alpha or beta particles pass through air they collide with the air molecules, causing them to become charged. What is the name of this process?

Name of this process is _____ [1]

(ii) How do the air molecules become charged?

_____ [1]

(c) Workers who use radioactive sources must take steps to protect themselves. Give two ways in which they can do this.

1. _____

2. _____ [2]

(d) The half-life of a radioactive source is a measure of how quickly it decays. What do we mean by “half-life”?

_____

_____ [2]

Examiner Only	
Marks	Remark

2 **(a)** Describe, in detail, how you would measure your personal power.

Examiner Only	
Marks	Remark

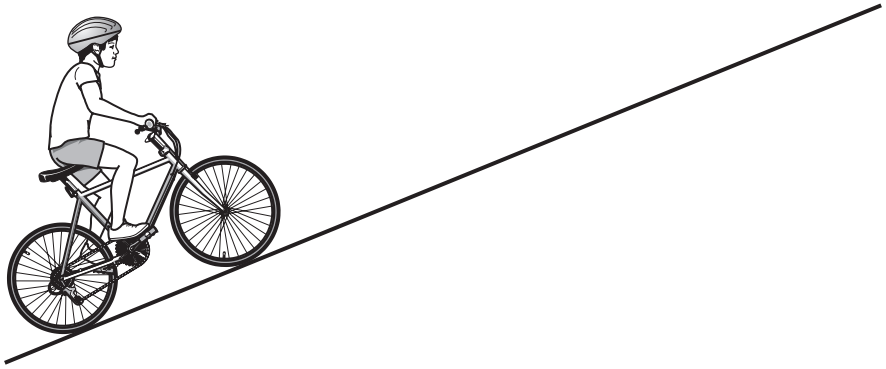
In your account you should include:

- the measurements you make and the measuring instruments;
- how you use your measurements to measure your personal power.

In this question you will be assessed on your written communication skills including the use of specialist scientific terms.

[6]

(b) Jim does 3800 J of work when riding his bicycle up a hill as shown.



It takes 5 seconds to travel from the bottom of the hill to the top.

Calculate the power developed by Jim.

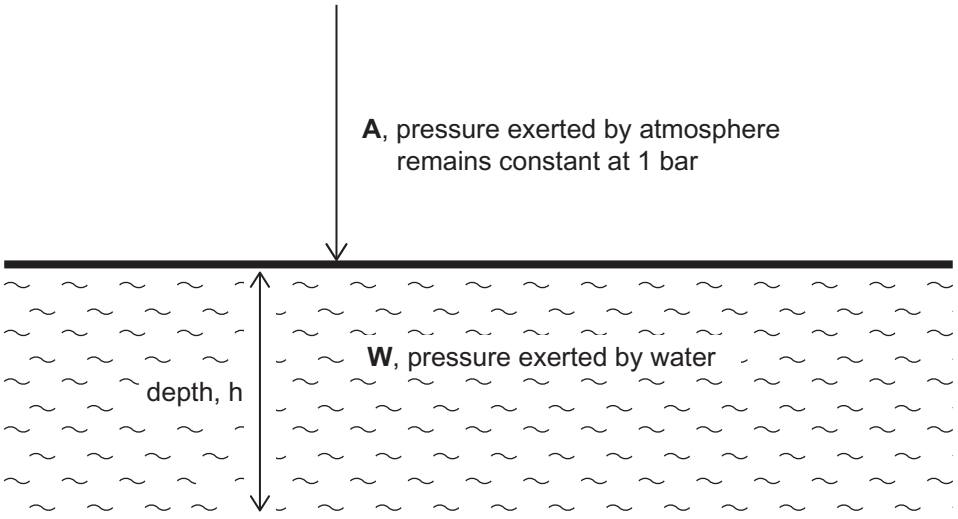
Give your answer in kW.

You are advised to show your working out.

Power = _____ kW [3]

Examiner Only	
Marks	Remark

3 When divers go underwater the pressure exerted on them changes with depth.



The total pressure exerted at a depth h is equal to the pressure exerted by the water, W, plus the pressure exerted by the atmosphere, A. This means:

Total pressure at a depth h = A + W

The pressure exerted by the atmosphere, A, **remains constant at 1 bar**. The bar is a unit of pressure.

Each 10 m depth of water adds 1 bar of pressure as shown in the second row of the table.

(i) Complete the table below to show the total pressure. One value has been entered for you.

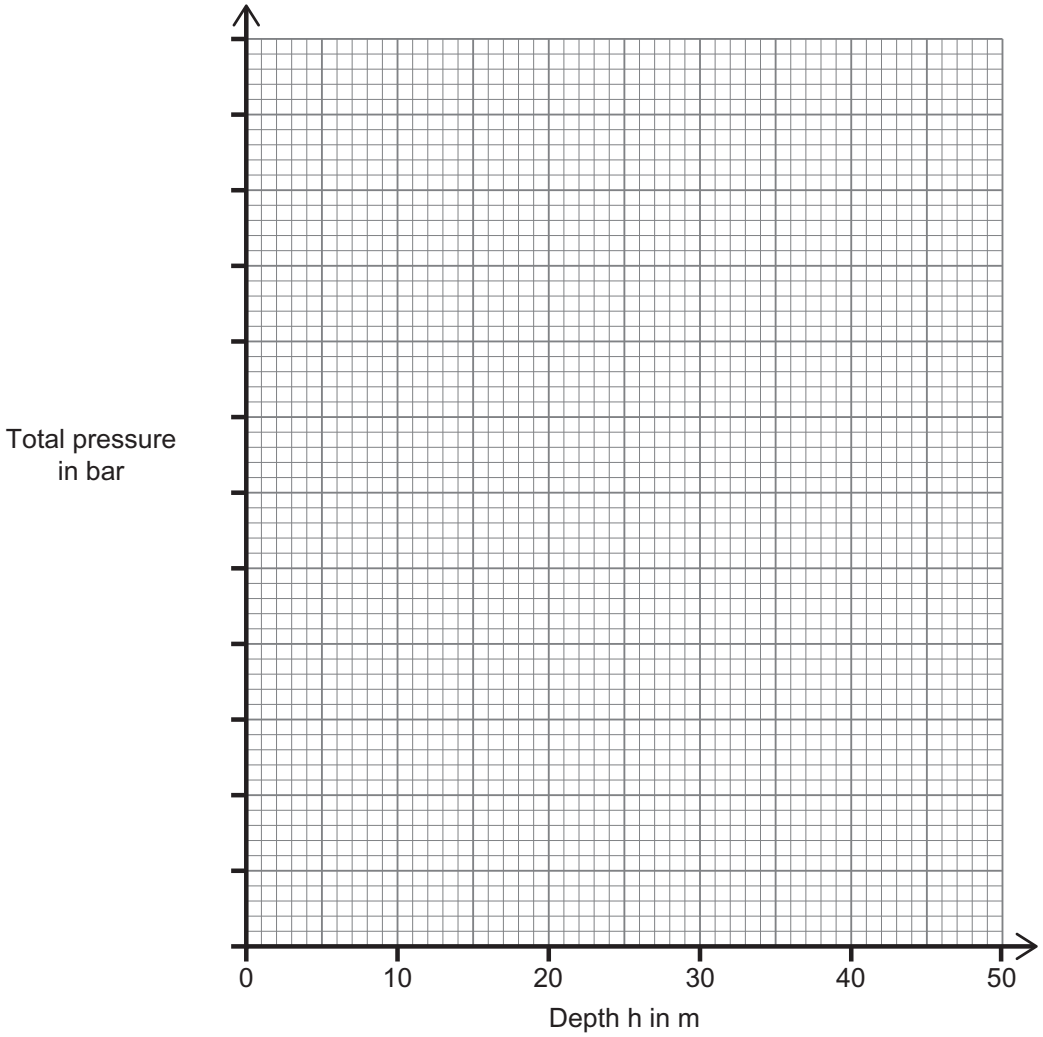
Depth h in m	**0**	**10**	**20**	**30**	**40**	**50**
W in bar	**0**	**1**	**2**	**3**	**4**	**5**
Total pressure in bar				**4**		

[2]

(ii) Choose a suitable scale on the graph opposite for the vertical axis. Plot a graph of total pressure against the depth h. [4]

Examiner Only

Marks	Remark



(iii) Draw a straight line of best fit. [1]

(iv) What feature **of the graph** indicates that the pressure exerted by the atmosphere alone is 1 bar?

_____ [1]

(v) A diver is at a depth of 35 m. Use the graph to find the total pressure acting on the diver.

_____ [1]

(vi) What feature of the graph tells us that total pressure is **not** directly proportional to depth?

_____ [1]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

4 $^{13}_{6}C$ and $^{14}_{6}C$ are both isotopes of carbon.

(a) (i) Write down one similarity in the nuclei of these isotopes.

_____ [1]

(ii) Write down one difference between the nuclei of these isotopes.

_____ [1]

(b) $^{14}_{6}C$ is radioactive. It decays to nitrogen by emitting a beta particle.

Complete the equation below which describes the decay.

$$^{14}_{6}C \rightarrow \square\!\!\square N + \square\!\!\square \beta$$

[4]

(c) The activity of a sample of wood from a freshly cut tree is measured to be 80 disintegrations per second.

Calculate the **decrease** in activity of the sample after 3 half-lives.

You are advised to show your working out.

Decrease in activity = _____ disintegrations per second [3]

5 In recent years, scientists have been researching nuclear fusion.

(i) Explain fully what is meant by nuclear fusion.

_____

_____

_____ [2]

(ii) Give **one** advantage that nuclear fusion may have over nuclear fission, for the generation of electricity.

_____

_____ [1]

(iii) Where does nuclear fusion occur naturally?

_____ [1]

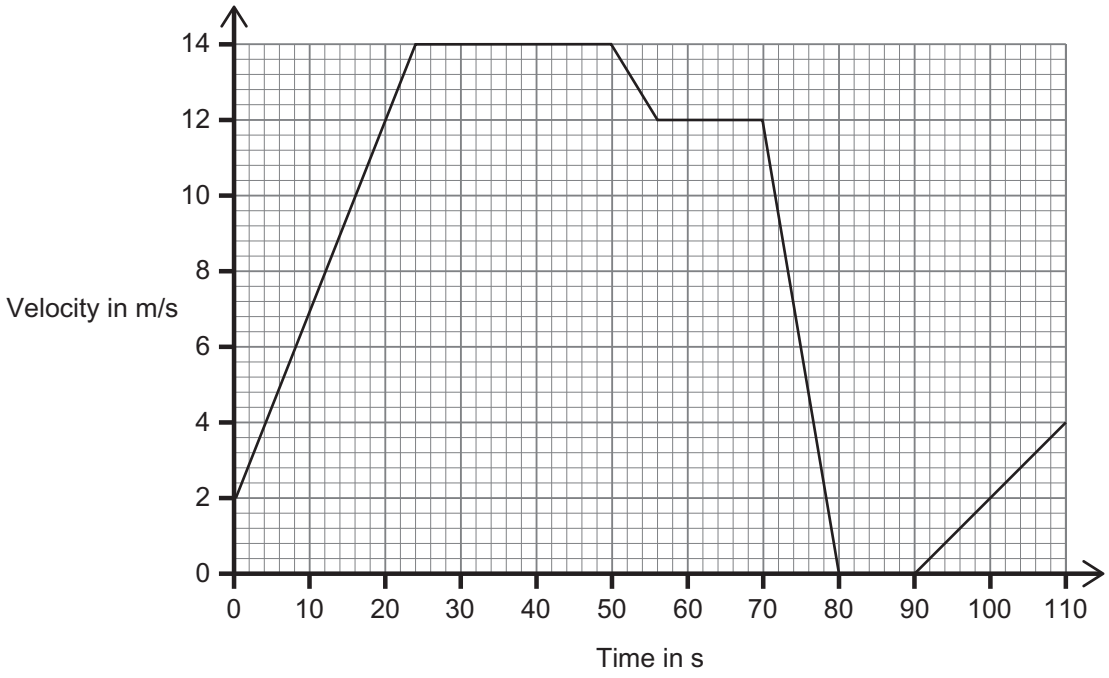
Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

6 The graph below shows how the velocity of a car changes as it drives through the village of Ballyclare.

At time t = 0 s, it enters Ballyclare.



(a) (i) How long after entering Ballyclare did the car reach its maximum velocity?

Time = _____ s [1]

(ii) Calculate the distance travelled by the car at this maximum velocity.

You are advised to show your working out.

Distance = _____ m [4]

(b) Describe the motion of the car during the following time intervals:

(i) 0–24 seconds,

_____ [1]

(ii) 56–70 seconds,

_____ [1]

(c) The driver realises he has taken a wrong turn.

He turns round and drives in the opposite direction down the same road at a constant **speed** of 6 m/s in a straight line.

What is his new velocity?

New velocity = _____ m/s [1]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

7 A car is travelling on a level road at a constant velocity of 20 m/s. The driver brakes suddenly and comes to rest in a time of 8.0 s.

(i) Calculate the acceleration of the car.

You are advised to show your working out.

Acceleration = _____ m/s^2 [3]

(ii) If the mass of the car is 950 kg, calculate the braking force on the car.

You are advised to show your working out.

Braking force = _____ N [3]

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(Questions continue overleaf)

8 A snail of mass 12 g climbs up a vertical rose bush. It then sits at rest on a leaf.

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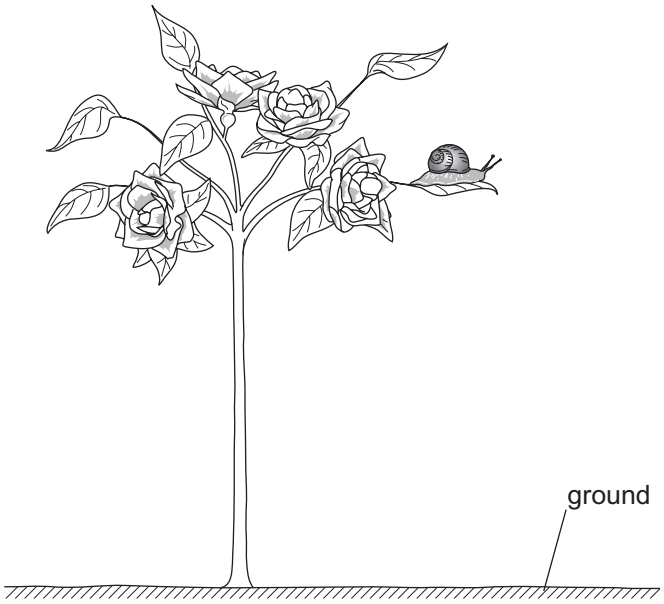
Marks	Remark



(i) Find the weight of the snail.

You are advised to show your working out.

Weight = _____ N [2]

(ii) The potential energy of the snail is 0.30 J. Calculate how high it is above the ground.

You are advised to show your working out.

Height = _____ m [3]

(iii) The snail falls off the leaf towards the ground.

Calculate the velocity of the snail just before it hits the ground.

Assume no energy losses as it falls.

You are advised to show your working out.

Velocity = _____ m/s [4]

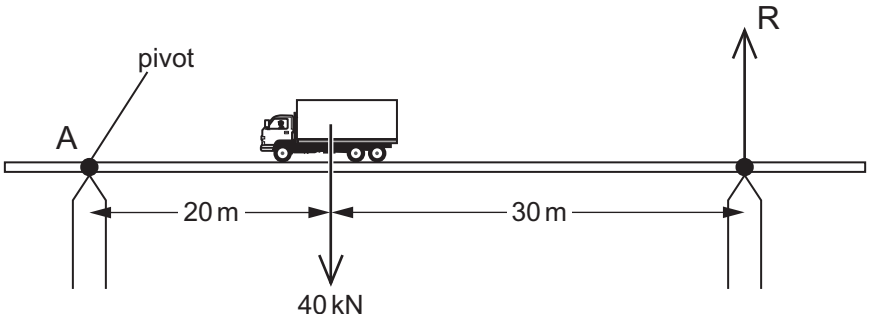
Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

9 **(a)** What is meant by the term, a lever is in equilibrium?

_____ [1]

(b) A lorry travels across a bridge. At a particular instant, the forces acting are shown in the diagram below.



(i) Use the principle of moments to determine the size of the upwards force R. (Hint: Take moments about the point A)

You are advised to show your working out.

Upwards force R = _____ kN [4]

(ii) The lorry approaches point A. What effect, if any, will this have on the size of force R?

_____ [1]

THIS IS THE END OF THE QUESTION PAPER

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