Rewarding Learning

General Certificate of Secondary Education
2015–2016

# Double Award Science: Physics

## Unit P1

## Higher Tier

**[GSD32]**

**FRIDAY 26 FEBRUARY 2016, MORNING**

# MARK SCHEME

## General Marking Instructions

### Introduction

Mark schemes are published to assist teachers and students in their preparation for examinations. Through the mark schemes teachers and students will be able to see what examiners are looking for in response to questions and exactly where the marks have been awarded. The publishing of the mark schemes may help to show that examiners are not concerned about finding out what a student does not know but rather with rewarding students for what they do know.

### The Purpose of Mark Schemes

Examination papers are set and revised by teams of examiners and revisers appointed by the Council. The teams of examiners and revisers include experienced teachers who are familiar with the level and standards expected of students in schools and colleges.

The job of the examiners is to set the questions and the mark schemes; and the job of the revisers is to review the questions and mark schemes commenting on a large range of issues about which they must be satisfied before the question papers and mark schemes are finalised.

The questions and the mark schemes are developed in association with each other so that the issues of differentiation and positive achievement can be addressed right from the start. Mark schemes, therefore, are regarded as part of an integral process which begins with the setting of questions and ends with the marking of the examination.

The main purpose of the mark scheme is to provide a uniform basis for the marking process so that all the markers are following exactly the same instructions and making the same judgements in so far as this is possible. Before marking begins a standardising meeting is held where all the markers are briefed using the mark scheme and samples of the students' work in the form of scripts. Consideration is also given at this stage to any comments on the operational papers received from teachers and their organisations. During this meeting, and up to and including the end of the marking, there is provision for amendments to be made to the mark scheme. What is published represents this final form of the mark scheme.

It is important to recognise that in some cases there may well be other correct responses which are equally acceptable to those published: the mark scheme can only cover those responses which emerged in the examination. There may also be instances where certain judgements may have to be left to the experience of the examiner, for example, where there is no absolute correct response – all teachers will be familiar with making such judgements.

| AVAILABLE MARKS |
|---|

**1** **(a)** Gamma or $\gamma$
Alpha or $\alpha$
Gamma or $\gamma$
Beta or β
[1] each [4]

**(b)** **(i)** Time/how long [1] [threshold mark] for radiation/(radio)activity/count rate [1]
to halve [1] [3]

**(ii)**

| Activity/counts per minute | Number of half-lives |
|---|---|
| 6000 (arrives) | 0 |
| **3000** | 1 |
| 1500 | **2** |
| **375** | 4 |

[3]

10

**2** neutron(s)
absorbed or taken in
**(**by) U/Pu
(fission) fragments produced or U/Pu **split**
neutron(s) produced
energy released
[1] each } Free-standing marks [6]

| **Response** | **Mark** |
|---|---|
| Candidates explain **5 or 6** of the above points. They use good spelling, punctuation and grammar. The form and style are of a high standard and specialist terms are used appropriately. | [5]–[6] |
| Candidates explain **3 or 4** of the above points. They use satisfactory spelling, punctuation and grammar. The form and style are of a satisfactory standard and they have made use of some specialist terms. | [3]–[4] |
| Candidates explain **1 or 2** of the above points. They use limited spelling, punctuation and grammar. The form and style are of a limited standard and they have made no use of specialist terms. | [1]–[2] |
| Response not worthy of credit. | [0] |

6

| | | | | AVAILABLE MARKS |
|---|---|---|---|---|
| **3** | **(i)** | Scale over halfway, [1]<br>axis labelled with unit [1] | [2] | |
| | **(ii)** | At least 5 correct points [2] or 4 points for [1] ± 1 square = tolerance<br>curve [1] | [3] | |
| | **(iii)** | Evidence from graph [1]<br>Drag force = **10.1** (N) [± 0.2] [1] i.e. 9.9 to 10.3 | [2] | |
| | **(iv)** | Not a straight line<br>**or** not constant gradient | [1] | 8 |
| **4** | **(a)** | **(i)** (Very) high temperature/large number density/containment<br>**or** ⩾ 1 million (°C) | [1] | |
| | | **(ii)** Sun/star(s) | [1] | |
| | **(b)** | 228 [1] 4 [1]<br>88 [1] 2 [1] | [4] | 6 |
| **5** | **(i)** | Displacement or distance = area (of triangle) [1] or area under graph<br>= ½ 15 × 20 [1]<br>= 150 [1] (m)<br>**or**<br>Displacement = **av**. vel. × time [1]<br>= 10 × 15 [1]<br>= 150 [1] (m) | [3] | |
| | **(ii)** | 0 **or** zero | [1] | |
| | **(iii)** | a = grad [1] or $a = \frac{\Delta v}{t}$ or $a = \frac{v - u}{t}$ or $a = \frac{\text{Rise}}{\text{Run}}$<br>$= \frac{-20}{15}$ [1]<br>= –1.3 (m/s$^2$) [1] or 1.33 or $1.\dot{3}$ | [3] | 7 |
| **6** | **(a)** | Tension = 0.3 × 10 [1] or weight = 0.3 × 10 for Partial Credit<br>= 3 [1] (N) | [2] | |
| | **(b)** | **(i)** G.P.E. = m × g × h [1] **or** W = f × d [1]<br>= (0.3 × 10) × 1.5 [2] W = 3 × 1.5 [2] (**e.c.f from 6(a)**)<br>= 4.5 [1] (J) = 4.5 [1] (J) | [4] | |
| | | **(ii)** 4.5 (J) or e.c.f. from **(ii)** | [1] | |
| | **(c)** | Time = W.D./Power [1] or equivalent<br>= 36/0.9 [1]<br>= 40 (s) [1] | [3] | 10 |

| AVAILABLE MARKS |
|---|

**7** **(a)** (Top-pan) balance or scales or scale
Measuring cylinder
Find mass
Immerse stone or drop stone
Subtract the readings
To find the volume
**or**
Top-pan balance or scales or scale
Eureka vessel or displacement can or Eureka can
Find mass
Immerse stone
Find the volume
Measure in **graduated cylinder** or measuring cylinder [6]

| Response | Mark |
|---|---|
| Candidates explain **5 or 6** of the above points. They use good spelling, punctuation and grammar. The form and style are of a high standard and specialist terms are used appropriately. | [5]–[6] |
| Candidates explain **3 or 4** of the above points. They use satisfactory spelling, punctuation and grammar. The form and style are of a satisfactory standard and they have made use of some specialist terms. | [3]–[4] |
| Candidates explain **1 or 2** of the above points. They use limited spelling, punctuation and grammar. The form and style are of a limited standard and they have made no use of specialist terms. | [1]–[2] |
| Response not worthy of credit. | [0] |

**(b)** Mass = density $\times$ volume [1]
= $7.95 \times 10^3 \times 1.6$ [1]
= 12 720 [1] (kg) [3] 9

**8** **(a)** Distance = (Av) speed $\times$ time [1]
= $19 \times 4$ [1]
= 76 (m) [1] [3]

**(b)** **(i)** Downward force (600 N) **greater** than drag force [1]

**(ii)** (R)F = ma [1] or $F = F_R$
[1] $600 - D = 60 \times 8$ [1]
D = 120 (N) [1]
**or**
$R_f$ = ma [1]
= $60 \times 8$ [1]
= 480 [1] therefore D = 120 (N) [1] [4] 8

| | | | AVAILABLE MARKS |
|---|---|---|---|
| **9** | **(a)** | Moment = force × distance (to pivot)<br>= 300 × 2.5 [1] award [1] for formula **or** substituted f'la<br>= 750 [1]<br>Nm [1] [3] | |
| | **(b)** | $F_1 \times d_1 = F_2 \times d_2$ (or equivalent) [1] AC**M** = C**M** or (M = M)<br>W × 1.2 = 750 [1] (allow e.c.f. from **(a)**)<br>W = 625 [1] (N) [3] | 6 |
| | | **Total** | **70** |