**General Certificate of Secondary Education
2014**

Double Award Science: Physics

Unit P2

Foundation Tier

[GSD61]

THURSDAY 12 JUNE 2014, MORNING

MARK
SCHEME

Subject-specific instructions

1 In numerical problems, the marks for intermediate steps shown in the mark scheme are for the benefit of candidates who do not obtain the correct final answer. A correct answer and unit, if obtained from a valid starting-point, gets full credit, even if all the intermediate steps are not shown. It is not necessary to quote units for intermediate numerical quantities.

Note that this "correct answer" rule does not apply to formal proofs and derivations, which must be valid in all the stages shown in the mark scheme to obtain full credit.

2 Do not reward wrong physics. No credit is given for substitution of numerical data, or subsequent arithmetic, in a physically incorrect equation.

However, answers to later parts of questions that are consistent with an earlier incorrect numerical answer, and are based on a physically correct equation, must gain full credit.
Annotate this by writing **ECF** (Error Carried Forward) by your text marks.

3 The normal penalty for an arithmetical and/or unit error is to lose the mark(s) for the answer/unit line. Substitution errors lose both the substitution and answer mark, but 10^n errors (e.g. writing 550 nm as 550×10^{-6} m) count only as arithmetical slips and lose the answer/unit mark.

1 **(a)** **(i)** Wavelength = $\frac{6}{4}$ = 1.5 (cm) [1]

(ii) Frequency $\left(=\frac{10}{5}\right)$ = 2 [1] Hz [1] [2]

(iii) v = f × λ [1]
v = 1.5 × 2 [1]   **ECF** from **(a)(i)** and **(a)(ii)**
v = 3.0 (cm/s) [1] [3]

(b) **(i)** • smaller λ [1]
• 2 parallel [1]   parallel to each other and **touching** ray
• right angles [1] [3]

(ii) (speed) decreases [1]
(frequency) (remains the) same [1] [2]   11

2 **(a)** Longitudinal [1]

(b) Suitable application, e.g. foetal scan [1]
to see the unborn child [1] [2]

(c) Distance = Speed × Time [1] **or** Distance = Speed × Time [1]
Distance = 1500 × 0.8   [1]   = 1500 × 0.4   [2]
         = 1200 (m)   [1]   = 600 (m)   [1]
     d = 600 (m)   [1] [4]   7

3 **(a)** Each part of image L correctly positioned [1] **each** [2]

(b) **(i)** Normal in correct place and at right angles to mirror [1]

(ii) 55° [1]

(iii)

incident ray [1]
reflected ray [1]
(roughly parallel
to incident ray) [2]

(iv) 90° − 55° [1]
= 35 degrees [1]   **allow ECF from (b)(ii)** [2]

(c) **(i)** Dispersion [1]
Reject: dispersing, refraction

(ii) Orange, Yellow, Green, Blue, Indigo and Violet [1]

(iii) X-rays **or** UV **or** gamma [1]   IR **or** micro **or** radio [1] [2]   12
Reject: TV, Radar

4 (a) Conductors have **free electrons** (insulators do not) [1]

(b) I = Q/t [1] = $\frac{15}{50}$ [1] = 0.3 [1] [3]

(c) (i) Ammeter in series [1]
Voltmeter in parallel [1]
2 correct symbols [1] [3]

(ii) Indicative content
- Measure current and voltage [2]
- Use $R = \frac{V}{I}$ [1]
- Repeat or measure length [1]
- Draw a graph of R versus length or find ratio R/l [1]
- Conclusion: R proportional to l [1]

(Any **five** points)

Response	Marks
Candidates use appropriate specialist terms throughout to discuss fully and in logical sequence 5 points shown in the indicative content above. They use good spelling, punctuation and grammar throughout and the form and style are of a high standard.	[5]–[6]
Candidates use some appropriate specialist terms to discuss in logical sequence three or four points shown in the indicative content above. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3]–[4]
Candidates use limited specialist terms to discuss one or two points shown in the indicative content above. Their spelling, punctuation, grammar, form and style are of a limited standard.	[1]–[2]
Response not worthy of credit.	[0]

[6]   13

5 (a) (i) 4 (V) [1]

(ii) 4 (V) [1]

(iii) 0.4 (A) [1]

(iv) 0.8 (A) [1]

(v) R = 10/2 [1]   **or**   R = prod/sum   **or** $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$
R = 5 (Ω) [1] [2]

(b) (i) Correct labels [1] each [3]

(ii) Brown [1]

(iii) Earth [1]

(iv) 0 [1]   12

6 **(i)** (Flows in) one **direction** [1]

(ii) battery/cell/battery charger/phone charger [1]

(iii) **Direction** reverses [1] periodically/regularly [1] – Dependent marking [2]

(iv) mains/transformer/generator/power station/alternator/dynamo [1]

(v) 1.   D
2.   ABC for [2] and 2 correct for [1] [3]

(vi) CRO/oscilloscope [1]   9

7 **(a)** 1 – crust [1]
2 – outer core [1]
3 – inner core [1] [3]

(b) Nickel [1] and iron [1]   **or**   Ni and Fe [2]

(c) **(i)**   Crust [1] **solid** portion of **upper** mantle [1] – Independent marks [2]

(ii)   Float on a liquid/on a liquid layer/convection current [1]
Reject: Magma

(iii)   Volcanoes [1] earthquakes [1]   tsunami = earthquakes [2]   10

8 **(a)** Suitable scale [1] labelled correctly [1]
6 or more points correctly plotted [2]
5 points [1] [4]

(b) Best fit (by eye) lines – 2 aspects for [1] each [2]
Reject: dot-to-dot

(c) **(i)**   0 to 5 (seconds) [1]

(ii)   Straight line [1] through origin [1] – Independent marks [2]

(iii) grad = rise/run or equivalent [1]

or   grad = $\dfrac{y_2 - y_1}{x_2 - x_1}$ **or**   grad = accel   **or**   grad = $\dfrac{v}{t}$

= 0.20 [1]
cm/s^2 [1] [3]   12

Mark **(i)** and **(ii)** independently

9 (a) Travel through vacuum
Travel in straight lines
Can pass through the atmosphere
Any **two** [2]

(b) Espionage = spying = observation = military use
Weather
(Sat.) Navigation – Google maps/mapping/Google Earth
Astronomy
Agriculture
Any **two** [1] each [2]   4

                             Total   **90**