Rewarding Learning

General Certificate of Secondary Education

# Double Award Science: Physics

Unit P2

Higher Tier

**[GDW62]**

## Assessment

# MARK SCHEME

**General marking principles.**

1 For spelling use professional judgment – but be generous. Do not distinguish between lower and upper case symbols.

2 Word equations may be used instead of symbols.

3 When marking calculations adopt the following procedure: Correct answer gets full marks unless preceded by an incorrect equation. An incorrect equation leads to [0] overall. A correct answer with no work shown gets full marks.

4 If an answer is incorrect then partial credit may be given. Begin at the first line and award marks up to the error.

5 If the Mark Scheme gives a mark for the unit then this mark is free-standing and is credited independently.

6 e.c.f. in the Mark Scheme means error carried forward. For example, if an answer is calculated incorrectly but is used in a later calculation then do not penalise the incorrect value – it is an e.c.f.

**Subject-specific Instructions**

In numerical problems, the marks for the intermediate steps shown in the mark scheme are for the benefit of candidates who do not obtain the final correct 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 correct units for intermediate numerical quantities.

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

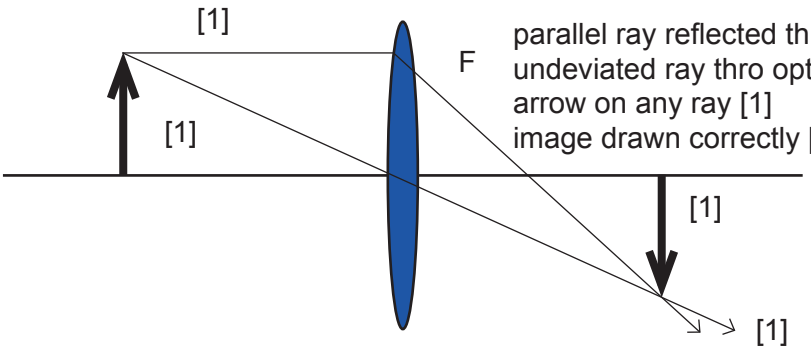
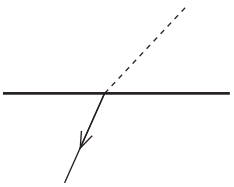
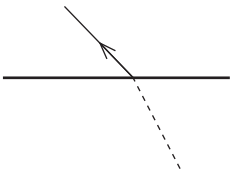
**Do not reward wrong physics**. No credit is given for consistent substitution of numerical data, or subsequent arithmetic, **in a physically incorrect equation**. However, answers to subsequent stages of questions that are consistent with an earlier incorrect numerical answer, and are based on physically correct equation, must gain full credit. Designate this by writing **ECF** (Error Carried Forward) by your text marks.

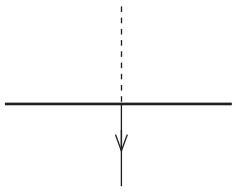
The normal penalty for an arithmetical and/or unit error is to lose the mark(s) for the answer/unit line. Substitution errors lose both the substitution and answer marks, but $10^n$ errors (e.g. writing 550 nm as $550 \times 10^{-6}$ m) count only as arithmetical slips and lose the answer mark.

| | | | | AVAILABLE MARKS |
|---|---|---|---|---|
| **1** | **(a)** | **(i)** | P = IV [1]<br>220 = 2 × V [1]<br>V = 110 [1] (V) [3] | |
| | | **(ii)** | Changes direction [1] regularly [1] CRO [1] Changes direction is needed before regularly can be credited [3] | |
| | | **(iii)** | Mains (supply) or power pack [1] battery/cell [1] [2] | |
| | **(b)** | **(i)** | Cost = Power × time × unit price [1]<br>= 0.220 [1] × 0.5 [1] × 20 [1]<br>= 2.2 [1] (p)<br><br>**OR**<br><br>Energy = power × time [1]<br>= 0.220 [1] × 0.5 [1]<br>= 0.110 [1]<br>Cost = 2.2 [1] (p) [5] | |
| | | **(ii)** | Kilowatt-hour or kWh [1] | |
| | | **(iii)** | Energy [1] | |
| | **(c)** | | High [1] melts/blows [1] gap/break [1] [3]<br>big = high | 18 |
| **2** | **(a)** | | Mark up to **six** indicative points:<br>Dispersion<br>Prism<br>Orange Yellow Green Blue Indigo Violet<br>Correct order<br>Travel at different speeds/have different wavelengths<br>Violet (is refracted the most)<br>Slowed the most/smallest λ<br><br>For consistency please adopt the following procedure – for one, three or five indicative points award [2], [4] or [6] marks, and for two, four or six indicative points award [2], [4] or [6] marks. | |

| **Response** | **Marks** |
|---|---|
| Candidates explain **5** of the above points. They use good spelling, punctuation and grammar. The form and style is 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 is 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 is of a limited standard and they have made no use of specialist terms. | **[1]–[2]** |
| Response not worthy of credit. | **[0]** |

[6] 6

| | | | | AVAILABLE MARKS |
|---|---|---|---|---|
| **3** | **(a)** | Mars [1]<br>Neptune [1]<br>Correct 4 inner planets circled [1] | [3] | |
| | **(b)** | Hydrogen [1] Helium [1]<br>Fusion [1] | [3] | |
| | **(c)** | Gas/hydrogen and dust [1] i.e. Gas and hydrogen **or** Gas and dust<br>Come or pulled together [1]<br>By gravity [1] | [3] | 9 |
| **4** | **(a)** | Converging/convex | [1] | |
| | **(b)** **(i)** |  <br>parallel ray reflected thro F [1]<br>undeviated ray thro optical centre [1]<br>arrow on any ray [1]<br>image drawn correctly [1] | [4] | |
| | **(ii)** | Real, inverted, the same size [1] each | [3] | 8 |
| **5** | **(a)** **(i)** | 60 degree | [1] | |
| | **(ii)** | Reflected ray (i = r by eye) [1]<br>Normal drawn at right angles (by eye) [1]<br>70 degree [1] | [3] | |
| | **(b)** **(i)** |  <br>Refraction [1]<br>correct [1] | [2] | |
| | **(ii)** |  <br>Refraction [1]<br>correct [1] | [2] | |

| | | | | | AVAILABLE MARKS |
|---|---|---|---|---|---|
| | **(iii)** |  | [1] | | |
| | **(iv)** | 0 ( °) | [1] | | 10 |
| **6** | **(a)** | **(i)** Battery | [1] | | |
| | | **(ii)** Variable resistor | [1] | | |
| | | **(iii)** Switch | [1] | | |
| | **(b)** | **(i)** R = V/I [1]<br>= 1.5 / 0.03 [1] and [1]<br>= 50 [1] (Ω) | [4] | | |
| | | **(ii)** Graph C | [1] | | |
| | **(c)** | Graph showing R increasing with I [1] [dep marking]<br>Positive intercept [1] i.e. can only award positive intercept mark if the first mark has been awarded | [2] | | 10 |
| **7** | **(a)** | **(i)** $1/R = 1/R_1 + 1/R_2$ [1]<br>$= 1/6 + 1/3$ [1]<br>$R = 2$ [1] (Ω)<br><br>**OR**<br><br>$R = \frac{\text{Product}}{\text{Sum}}$ [1]<br>$R = \frac{6}{3}$ [1]<br>$R = 2$ [1] (Ω) | [3] | | |
| | | **(ii)** 6 (Ω) [1]<br>2 (Ω) [1]<br>6 (Ω) [1] | [3] | | |
| | | **(iii)** 0.2 [1] (A)<br>0.4 [1] (A) | [2] | | |
| | **(b)** | Q = I t [1]<br>= 30 000 × 0.0005 [1]<br>= 15 [1] C [1] | [4] | | 12 |

| | | | | | AVAILABLE MARKS |
|---|---|---|---|---|---|
| **8** | **(a)** | **(i)** | 14 billion Allow 13.7 billion | [1] | |
| | | **(ii)** | 2 [1] for first correct i.e. 2 in the top box<br>1 [1] for last correct i.e. 3 in the bottom box<br>4 [1] for middle two in correct order i.e. 1 in the second box and 4 in the third box<br>3 | [3] | |
| | **(b)** | | Light [1] galaxies [1] expanding [1] | [3] | 7 |
| | | | | **Total** | **80** |