# Double Award Science: Physics

## Unit P2

## Foundation Tier

### [GSD61]

**THURSDAY 13 JUNE, 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 $550 \times 10^{-6}$ m) count only as arithmetical slips and lose the answer/unit mark.

**1** **(a)** **(i)** Stopwatch/stopclock [1]

**(ii)** 3 [1] Hz [1]    Independent unit mark [2]

**(iii)** energy [1]

**(iv)** X = 5 (cm) Y = 6 (cm) [2]

**(v)** $v = f \times \lambda$ [1]
        $= 3 \times 5$ [1]
        $= 15$ (cm/s)    Allow e.c.f. from **(ii)** [1]    [3]

**(vi)** Any **two** examples of E.M. or S-waves [2]    11

**2** **(a)** **(i)** Arrow perpendicular to wavefront A [1]

**(ii)** Wavefronts should be:
        parallel, [1]
        equally spaced, [1]
        equal to incident wavelength [1]    [3]

**(b)** **(i)** Electromagnetic [1]

**(ii)** X-rays, infrared, radio [1]

**(iii)** Gamma or ultraviolet [1]

**(c)** Use: cooking/remote control/etc. [1]
Danger: burning [1]    [2]    9

**3** **(a)** **(i)** Angle correct [1]

**(ii)** Angle correct [1]

**(iii)** Normal [1]

**(b)** Air and glass labelled in correct order [1]

**(c)** **(i)** (A –) Prism [1]

**(ii)** Red ray [1]

**(iii)** Violet ray (refraction at first surface [1] refraction at second
surface [1])    Dependent marking [2]

**(iv)** **(**Different) colours or wavelengths refract by different
amounts
**or (**different) colours/wavelength/travel at different
speeds [2]
} [2] or [0]

**(v)** Dispersion [1]    11

**4 (a) (i)** electrons [1]    object [1]    Dependent marking                [2]

    **(ii)** Negative                                                                        [1]

    **(iii)** Any suitable insulator                                              [1]

**(b) (i)** Circuit should include the following:
1. Battery and variable resistor or variable voltage supply    [1]
2. Bulb, ammeter, voltmeter – for symbols                      [1]
3. Ammeter in series with bulb and battery                     [1]
4. Voltmeter in parallel with lamp                             [1]
5. Working circuit – which will cause the bulb to light        [1]    [5]

    **(ii)** 4 (V)                                                                        [1]

    **(iii)** R = V/I    **or** equivalent formula                          [1]
       = 4/0.5  Allow e.c.f. from **(ii)**                       [1]
       = 8                                                             [1]
       $\Omega$ – free-standing mark                        [1]    [4]    **14**

**5 (a) (i)** = 6 **or** 6.0 (kWh)                                          [1]

    **(ii)** Cost = 78 p – must be in pence                          [1]
       Allow e.c.f. from **(a)(i)**

**(b) (i)** (Pin) B                                                              [1]

    **(ii)** Brown                                                              [1]

    **(ii)** Blue                                                                [1]

**(c) (i)** A large current flows [1] to the earth wire [1] – dependent on first mark
      The fuse blows [1] – free-standing mark                    [3]

    **(ii)** It has double insulation or it is encased in plastic      [1]

**(d) (i)** Current = Power/Voltage                                      [1]
       = 2800/250                                                  [1]
       = 11.2 (A)                                                  [1]    [3]

    **(ii)** Fuse = 13 (A)    Allow e.c.f. from **(i)**              [1]    **13**
       If **(d)(i)** $>$ 13 they forfeit mark for **(d)(ii)**

| | | | | | AVAILABLE MARKS |
|---|---|---|---|---|---|

**6** **(a)** **(i)** Ammeter gives a negative reading [1]

      **(ii)** No current    or    Stays at zero [1]

  **(b)** a.c. current changes **direction** [1]
regularly/periodically [1] – Dependent mark [2]

  **(c)** **(i)** Increases the voltage [1]

      **(ii)** Reduces the current [1]
Reduces energy/heat loss [1] [2]

      **(iii)** Reduces voltage [1]
for safety reasons [1] [2]     **9**

**7** **(a)** **(i)** (Planet C) Earth [1]
(Planet D) Mars [1] [2]

      **(ii)** Curved arrow similar to A's [1]

      **(iii)** Jupiter or Saturn or Uranus or Neptune [1]

  **(b)** • Gravity pulled (the gas and dust particles together).
    • The cloud began to spin.
    • The cloud was denser in the centre or pressure increases.
    • The centre got so hot that it became a star or fusion began.
    • Idea of accretion

| Bands | Response | Marks |
|---|---|---|
| A | 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] |
| B | 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] |
| C | 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] |
| D | Response not worthy of credit. | [0] |

[6]

  **(c)** **(i)** Gravity/Gravitational force. [1]

      **(ii)** Observation/weather/navigation/communication
Any **two**, [1] each [2]     **13**

**8** **(i)**

| | 2.0 | 4.0 | | 7.8 | 10.2 |
|---|---|---|---|---|---|

[$\frac{1}{2}$] each, round down                                                                    [2]

**(ii)** Suitable scale for D [1]
5 or 6 points for [2] ⎤
3 or 4 points for [1] ⎦ tolerance ± 1 square

[3]

**(iii)** Straight line                                                                    [1]

**(iv)** k = grad [1]

k = $\frac{1}{4}$ from coordinates from graph [1]
k = 0.25 [1]
    m/s$^2$ [1]                                                                    [4]

10

**Total**          **90**