# 2013 Physics

# Intermediate 1

# Finalised Marking Instructions

**Part One: General Marking Principles for Physics Intermediate 1**

This information is provided to help you understand the general principles you must apply when marking candidate responses to questions in this Paper. These principles must be read in conjunction with the specific Marking Instructions for each question.

**(a)** Marks for each candidate response must <u>always</u> be assigned in line with these general marking principles and the specific Marking Instructions for the relevant question.

**(b)** Marking should always be positive ie, marks should be awarded for what is correct and not deducted for errors or omissions.

**GENERAL MARKING ADVICE: Physics Intermediate 1**

The marking schemes are written to assist in determining the "minimal acceptable answer" rather than listing every possible correct and incorrect answer. The following notes are offered to support Markers in making judgements on candidates' evidence, and apply to marking both end of unit assessments and course assessments.

The current in a resistor is 1·5 amperes when the potential difference across it is 7·5 volts. Calculate the resistance of the resistor.

| | **Answers** | **Mark + Comment** | **Issue** |
|---|---|---|---|
| 1. | $V=IR$ | (½) | Ideal answer |
| | $7·5=1·5R$ | (½) | |
| | $R=5·0\ \Omega$ | (1) | |
| 2. | $5·0\ \Omega$ | (2) Correct answer | GMI 1 |
| 3. | $5·0$ | (1½) Unit missing | GMI 2 (a) |
| 4. | $4·0\ \Omega$ | (0) No evidence/wrong answer | GMI 1 |
| 5. | ____ $\Omega$ | (0) No final answer | GMI 1 |
| 6. | $R=\dfrac{V}{I}=\dfrac{7·5}{1·5}=4·0\ \Omega$ | (1½) Arithmetic error | GMI 7 |
| 7. | $R=\dfrac{V}{I}=4·0\ \Omega$ | (½) Formula only | GMI 4 and 1 |
| 8. | $R=\dfrac{V}{I}=$____ $\Omega$ | (½) Formula only | GMI 4 and 1 |
| 9. | $R=\dfrac{V}{I}=\dfrac{7·5}{1·5}=$____ $\Omega$ | (1) Formula + subs/No final answer | GMI 4 and 1 |
| 10. | $R=\dfrac{V}{I}=\dfrac{7·5}{1·5}=4·0$ | (1) Formula + substitution | GMI 2 (a) and 7 |
| 11. | $R=\dfrac{V}{I}=\dfrac{1·5}{7·5}=5·0\ \Omega$ | (½) Formula but wrong substitution | GMI 5 |
| 12. | $R=\dfrac{V}{I}=\dfrac{75}{1·5}=5·0\ \Omega$ | (½) Formula but wrong substitution | GMI 5 |
| 13. | $R=\dfrac{I}{V}=\dfrac{7·5}{1·5}=5·0\ \Omega$ | (0) Wrong formula | GMI 5 |
| 14. | $V=IR$  $7·5=1·5\times R$  $R=0·2\ \Omega$ | (1½) Arithmetic error | GMI 7 |
| 15. | $V=IR$ | | |
| | $R=\dfrac{I}{V}=\dfrac{1·5}{7·5}=0·2\ \Omega$ | (½) Formula only | GMI 20 |

**Part Two: Marking Instructions for each Question**

**Section A**

| | | | | |
|---|---|---|---|---|
| 1. | B | | 11. | A |
| 2. | A | | 12. | E |
| 3. | D | | 13. | B |
| 4. | B | | 14. | E |
| 5. | C | | 15. | B |
| 6. | B | | 16. | A |
| 7. | A | | 17. | C |
| 8. | A | | 18. | E |
| 9. | C | | 19. | D |
| 10. | D | | 20. | A |

| Sample Answer and Mark Allocation | | Notes | Inner Margin | Outer Margin |
|---|---|---|---|---|
| 21. (a) | The number of waves/**cycles** produced in one second. | **Not 'signals'**<br><br>**Amount of waves per second is OK** | 1 | 3 |
| (b) (i) | Higher | **Any clear indication of choice** | 1● | |
| (b) (ii) | Moray (Firth Radio)<br>**accept Murray (MFR) etc.**<br><br>**Must be name not frequency.** | **If more than one answer apply +/- rule.** | 1+ | |

| Sample Answer and Mark Allocation | Notes | Inner Margin | Outer Margin |
|---|---|---|---|
| 22. (a)    36 000 (kilometres) | **Watch for 360 000 –0 mark**<br><br>**Incorrect unit -½** | 1● | 4 |
| (b)    graph drawn correctly | ½ mark for line of best fit. **e.g. line forced through origin does not gain this ½ mark.**<br><br>-½ for each point drawn incorrectly.<br><br>**Watch for only one point plotted correctly (½ max for line)**<br><br>**Watch for a graph does not cover the full range of points. No mark for line (max 1 mark)**<br><br>**Line does not need to extend beyond the range of the points.**<br><br>**Points only max 1 ½.**<br><br>**Line must be straight.**<br><br>**If candidates have a point wrong and then join the dots (max 1 mark)**<br><br>**If candidates plot a point incorrectly and then draw a best fit straight line max 1 ½.** | 2+ | |
| (c)    19.5 hours | Accept 19 to 20 hours<br><br>**Accept answer that agrees with an incorrect graph. Apply same tolerance +/- ½ hour.**<br><br>**If they have no graph but have a correct answer award the mark.**<br><br>**Missing unit – ½** | 1+ | |

| Sample Answer and Mark Allocation | Notes | Inner Margin | Outer Margin |
|---|---|---|---|
| 23. (a)     X –rays | | 1 | 6 |
| (b)     Resistance = voltage/current <br> = 220/4·0 = 55 ohms | standard 2 marks | 2● | |
| (c) (i)     0·03 x 5000 = 150 (microsieverts) | 1 mark for multiplication. 1 mark for answer <br><br> **Wrong substitution is 0 marks.** | 2+ | |
| (c) (ii)     Protects them from the harmful x-rays/**radiation** | **Effected by radiation 0 marks.** <br><br> **Harmed by radiation 1 mark.** <br><br> **Blocks radiation/x-rays 1 mark.** <br><br> **Stops radiation/x rays 1 mark.** <br><br> **Prevents radiation poisoning 0 marks.** <br><br> **Type of radiation consistent with (a).** | 1● | |

| Sample Answer and Mark Allocation | Notes | Inner Margin | Outer Margin |
|---|---|---|---|
| 24. (a)  Current = power/voltage<br>= 1725/230 = 7·5 amperes | Standard 2 marks<br><br>**Accept amps/a/A**<br><br>**If round off to 8 A -½ for sig figs** | 2● | 5 |
| (b)  Yellow and Green<br>Brown<br>Blue | 3 correct (1 mark).<br>2 correct (½ mark)<br><br>**Do not accept old colour system.** | 1 | |
| (c) (i)  3 (amperes) | | 1+ | |
| (c) (ii)  13 (amperes) | | 1+ | |

| Sample Answer and Mark Allocation | Notes | Inner Margin | Outer Margin |
|---|---|---|---|
| 25. (a)    E | | 1 | 3 |
| (b) (i)    Z | | +1 | |
| (b) (ii)    highest <u>current</u>, (smallest resistance) | **Not higher amps/amperes**<br><br>**If they say highest resistance gives smallest current 1 mark BUT must make full statement.** | +1 | |

| Sample Answer and Mark Allocation | Notes | Inner Margin | Outer Margin |
|---|---|---|---|
| 26. (a) a <u>high frequency</u> sound beyond the range of human hearing | Accept "(sound with a) frequency <u>greater</u> than 20 000 Hz"<br><br>**Noise is acceptable instead of sound.**<br><br>**Sounds that humans can't hear 0 marks**<br><br>**Outwith human hearing 0 marks.**<br><br>**dB instead of Hz 0 marks.**<br><br>**Sound level 0 marks.**<br><br>**1 OR 0** | 1 | 4 |
| (b) (i)   0·6 seconds | **No unit - ½**<br><br>**No secs in physics**<br><br>**If they show calculation but wrong answer 0 marks in this case.** | 1● | |
| (b) (ii) $$speed = \frac{distance}{time}$$ $$speed = \frac{900}{0\cdot6}$$ speed = 1500 metres per second | Standard 2 marks<br><br>**Time must agree with (b) (i) or be 0.6 seconds otherwise max ½**<br><br>**mps -½**<br><br>**If the double the distance instead of halving the time 2 marks** | 2 | |

| Sample Answer and Mark Allocation | Notes | Inner Margin | Outer Margin |
|---|---|---|---|
| 27. (a) people/**bodies** give off IR radiation (heat) | **Heat signals is OK**<br><br>**Heat signature is OK**<br><br>**Must indicate that IR/heat is emitted by humans**<br><br>**'people are hot' 0 marks** | 1 | 5 |
| (b) (i) converging (convex) | | 1 | |
| (b) (ii) converging rays (½ mark) ,<br><br>**tending** to a focus point (½ mark) | **Ignore rays inside lens** | 1 | |
| (c) | 3 correct (2 marks), 2 correct (1 mark), 1 correct (½ mark)<br><br>**Must use terms from the list – heat is not acceptable for infra red BUT IR and UV are acceptable as abbreviations.** | 2 • | |

Table for (c):

| Type of Radiation |
|---|
| X-Rays |
| Gamma rays |
| Infrared |
| Ultraviolet |

| Sample Answer and Mark Allocation | | | | Notes | Inner Margin | Outer Margin |
|---|---|---|---|---|---|---|
| 28. | (a) | Output signal should have a greater <u>amplitude</u> **(1 mark)** and same <u>frequency</u> **(1 mark)** | | **Independent marks**<br><br>**Inverted signal is OK**<br><br>**Square waves max 1 mark (for frequency)**<br><br>**e.g. just redraw original pattern = 1**<br><br>**Does not need to be centred on axis.** | 2+ | 5 |
| | (b) | **They absorb sound <u>energy</u>.**<br><br>**OR**<br><br>**Stop <u>vibrations</u> going into the ear** | | "reduces sound level to below 80 db to protect hearing"<br><br>**Blocks loud sounds 0 marks**<br><br>**Sound waves are reflected 0 marks**<br><br>**Sound cancelling 0 marks**<br><br>**Dampen noise 0 marks**<br><br>**Dampening sound 1 mark** | 1+ | |
| | (c) | energy<br><br>vibrates<br><br>hertz<br><br>decibels | (½)<br><br>(½)<br><br>(½)<br><br>(½) | **Must use terms from the list** | 2 | |

| Sample Answer and Mark Allocation | Notes | Inner Margin | Outer Margin |
|---|---|---|---|
| 29. (a)    Gain = output voltage / input voltage<br><br>= 5/0·02<br><br>= 250 | Standard 2 marks<br><br>**If unit is given deduct ½ mark.** | 2● | 4 |
| (b)    Tuner<br><br>Amplifier | **receiver is incorrect 0 marks** | 2 | |

| Sample Answer and Mark Allocation | Notes | Inner Margin | Outer Margin |
|---|---|---|---|
| 30. (a)  $\text{average speed} = \dfrac{\text{distance}}{\text{time}}$<br><br>$\text{average speed} = \dfrac{750}{60}$<br><br>$\text{average speed} = 12 \cdot 5 \text{ metres per second}$ | Standard 2 marks<br><br><br><br><br>**Not mps**<br><br>**Rounded to 13 m/s is OK.** | 2 | 4 |
| (b) The forces are balanced | **'The forces are equal' on its own 0 marks.**<br><br>**The forces are equal but opposite 1 mark.** | 1 | |
| (c) **The friction force decreases.**<br><br>**OR**<br><br>**There is an unbalanced force.**<br><br>**OR**<br><br>**The forces are no longer balanced.**<br><br>**OR**<br><br>**There is more friction on the water than in the air.** | **Some friction in the water but <u>none</u> in the air – 0 marks**<br>**No friction between the surfer and the water – 1 mark**<br>**No water resistance 1 mark**<br>**Less force <u>against</u> them 1 mark** | 1+ | |

| Sample Answer and Mark Allocation | Notes | Inner Margin | Outer Margin |
|---|---|---|---|
| 31. Metre stick/measuring tape | **Ignore anything already given e.g. tennis ball.**<br><br>**Ignore anything irrelevant e.g. ladder, stopwatch.** | 1● | 3 |
| (Height from which tennis ball is dropped)<br><br>rebound height | **How <u>high</u> the ball travels/bounces 1 mark**<br><br>**Where the ball bounces to – 0 marks** | 1● | |
| The tennis ball is always dropped from the same height<br><br>**OR**<br><br>**The method of release is the same e.g. always dropped rather than thrown downwards, the speed of release is always the same etc.**<br><br>**OR**<br><br>**Ensure the thickness of the surface is the same each time.** | **Look for one factor/variable that could affect the experiment.**<br><br>**Answers must be in the correct box.** | 1● | |

| Sample Answer and Mark Allocation | | | Notes | Inner Margin | Outer Margin |
|---|---|---|---|---|---|
| 32. (a) | | Newton(s)/N/n<br><br>Earth | ½ mark each<br><br>**Must be from list** | 1 | 5 |
| | (b) | weight = 10 x mass<br><br>weight = 10 x 0·5<br><br>weight = 5 newtons | Standard 2 marks<br><br>**Watch for unit errors** | 2 | |
| | (c) | acting up the hill/against the motion of the ball/in the opposite direction to the ball | **Not 'up' on its own**<br><br>**To the left 0 marks**<br><br>**Backwards is OK**<br><br>**An arrow showing direction is OK.**<br><br>**Against the ball 0 marks**<br><br>**Against the direction of the ball 1 mark.** | 1+ | |
| | (d) | Less (than) | | 1+ | |

| Sample Answer and Mark Allocation | | Notes | Inner Margin | Outer Margin |
|---|---|---|---|---|
| 33. (a) | Input<br><br>Output | | 1 | 5 |
| (b) (i) | thermistor | Must be from list<br><br>Circuit symbols are OK | 1● | |
| (b) (ii) | buzzer | Must be from list<br><br>Circuit symbols are OK | 1● | |
| (b) (iii) | switch | **If give two answers 0 marks.**<br><br>Circuit symbols are OK | 1+ | |
| (c) | electrical (energy) to light (energy) | **1 or 0**<br><br>**Electric is OK**<br><br>**Electricity 0 marks** | 1 | |

| Sample Answer and Mark Allocation | Notes | Inner Margin | Outer Margin |
|---|---|---|---|
| 34. (a) (i)  AND | | 1 | 4 |
| (a) (ii)  (electric) motor | | 1● | |
| (b) | **1 or 0.**<br><br>**Or Consistent with (a) (i)**<br><br>**High = 1 = on**<br>**Low = 0 = off** | 1● | |
| (c)  Both inputs must be "high" for the output to be "high" (so when the master switch is off only one input is "high") | **High = 1 = on** | 1+ | |

Table for (b):

| Input A | Input B | Output Z |
|---|---|---|
| 0 | 0 | **0** |
| 0 | 1 | **0** |
| 1 | 0 | **0** |
| 1 | 1 | **1** |

[END OF MARKING INSTRUCTIONS]