



Coimisiún na Scrúduithe Stáit
State Examinations Commission

Junior Certificate 2015

Marking Scheme

Science

Higher Level

Note to teachers and students on the use of published marking schemes

Marking schemes published by the State Examinations Commission are not intended to be standalone documents. They are an essential resource for examiners who receive training in the correct interpretation and application of the scheme. This training involves, among other things, marking samples of student work and discussing the marks awarded, so as to clarify the correct application of the scheme. The work of examiners is subsequently monitored by Advising Examiners to ensure consistent and accurate application of the marking scheme. This process is overseen by the Chief Examiner, usually assisted by a Chief Advising Examiner. The Chief Examiner is the final authority regarding whether or not the marking scheme has been correctly applied to any piece of candidate work.

Marking schemes are working documents. While a draft marking scheme is prepared in advance of the examination, the scheme is not finalised until examiners have applied it to candidates' work and the feedback from all examiners has been collated and considered in light of the full range of responses of candidates, the overall level of difficulty of the examination and the need to maintain consistency in standards from year to year. This published document contains the finalised scheme, as it was applied to all candidates' work.

In the case of marking schemes that include model solutions or answers, it should be noted that these are not intended to be exhaustive. Variations and alternatives may also be acceptable. Examiners must consider all answers on their merits, and will have consulted with their Advising Examiners when in doubt.

Future Marking Schemes

Assumptions about future marking schemes on the basis of past schemes should be avoided. While the underlying assessment principles remain the same, the details of the marking of a particular type of question may change in the context of the contribution of that question to the overall examination in a given year. The Chief Examiner in any given year has the responsibility to determine how best to ensure the fair and accurate assessment of candidates' work and to ensure consistency in the standard of the assessment from year to year. Accordingly, aspects of the structure, detail and application of the marking scheme for a particular examination are subject to change from one year to the next without notice.

General Points regarding the Marking Scheme for Junior Certificate Science

1. In many cases only key phrases are given in the marking scheme. These points contain the information and ideas that must appear in the candidate's answer in order to merit the assigned marks.
2. The descriptions, methods and definitions given in a marking scheme are not exhaustive and alternative valid answers are acceptable.
3. The detail required in any answer is determined by the context and the manner in which the question is asked and by the number of marks assigned to the answer in the examination paper. This may vary from year to year.
4. The word(s)/phrase(s) used in the scheme indicate the essential points required in the candidate's answer. A double solidus (//) separates points for which separate marks are allocated in a part of the question. Words, expressions or statements separated by a solidus (/) are alternatives which are equally acceptable for a particular point. A word or phrase given in brackets is an acceptable alternative to the preceding word or phrase. Note, however, that words, expressions or phrases must be correctly used in context and not contradicted. Where there is evidence of incorrect use or contradiction, the marks may not be awarded.
5. In general, names and formulas of elements and compounds are equally acceptable except in cases where either the name or the formula is specifically asked for in the question. However, in some cases where the name is asked for, the formula may be accepted as an alternative. This is clarified within the scheme.
6. There is a deduction of one mark for each arithmetical slip made by a candidate in a calculation. If the incorrect calculated value is used 'correctly' in a subsequent calculation, allow the marks for the subsequent calculation.
7. **Cancelled and/or Repeated Answers**
 - a. In the case of short-answer questions, if an answer is cancelled and a second answer given, the cancellation is accepted and marks are awarded for the uncanceled answer.
 - b. If more than the required number of (uncanceled) answers are given, surplus incorrect answers cancel the marks awarded for correct answers.
 - c. If the only answer offered is cancelled, the cancelling is ignored and the answer marked as normal.

For answers to "describe an investigation / an experiment", multiple attempts will be dealt with as follows: If a candidate answers a question or part of a question once only and then cancels, the cancelling is ignored and the answer marked as normal. If a candidate answers a question or part of a question more than once and then cancels one attempt, the cancelling will be ignored and all the answers, whether cancelled or not, marked as normal. However, only the marks gained in respect to the highest scoring attempt will be counted. Points cannot be mixed and matched from two attempts. The disallowed marks should be enclosed in square brackets.

BIOLOGY

Question 1 $(7 \times 6 + 1 \times 10)$

Question 2 *(a)* (6)
 (b) (18)
 (c) (15)

Question 3 *(a)* (12)
 (b) (9)
 (c) (18)

CHEMISTRY

Question 4 $(7 \times 6 + 1 \times 10)$

Question 5 *(a)* (24)
 (b) (6)
 (c) (9)

Question 6 *(a)* (15)
 (b) (6)
 (c) (18)

PHYSICS

Question 7 $(7 \times 6 + 1 \times 10)$

Question 8 *(a)* (12)
 (b) (6)
 (c) (21)

Question 9 *(a)* (24)
 (b) (9)
 (c) (6)

Biology (130 MARKS)

Question 1 (52)

- (a)(i) nucleus (3)
- (ii) carbon dioxide (CO₂) // oxygen (O₂) // water (H₂O) // hormones //
(named) product of respiration/digestion/excretion (3)
- (b)(i) xylem / phloem / vascular // dermal // ground (3)
- (ii) transport // protection // storage / photosynthesis (3)
- (c)(i) geotropism / gravitropism (3)
- (ii) helps (root) get water/minerals // helps anchorage (3)
- (d)(i) time during which fertilisation/pregnancy can occur (3)
- (ii) days 1 – 5 ± 2 (3)
- (e)(i) 37 ± 1 (3)
- (ii) respiration (3)
- (f) Y: oxygen / O₂ (3)
- capillary (3)
- (g) Any two of:
salt // urea // water // sweat (perspiration) (2 × 3)
- (h)(i) 23
- (ii) genes
- (iii) freckles // eye colour // hair colour // any valid trait
- (iv) DNA (deoxyribonucleic acid)
protein (6 + 4 × 1)

Question 2 (39)

(a) (named) sugar (3)
fibre / roughage / cellulose (3)
(in any order)

(b)(i) energy (3)

(ii) (biological/protein) catalyst // speeds up (biological) reaction (3)

(iii) (salivary) amylase (3)

(iv) maltose (3)

(v) mouth (3)

small intestine (3)

(in any order)

(c)(i) so as to see colour change (3)

(ii) (named) alcohol (3)

(iii) **Award marks for any 3 of 5 points:** (3 × 3)

Remove from liquid X / alcohol

Dip in boiling (hot) water / water bath

Add iodine

Place it on a white surface / tile / clock glass

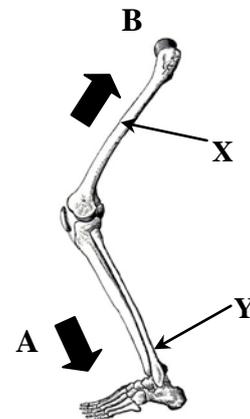
Result: colour change to blue / black / purple

Question 3

(39)

- (a)(i) interdependence (3)
- (ii) provide food (nectar/pollen) // provide shelter (habitat) (3)
- (iii) pollination (3)
- (iv) fewer apples caused by less pollination (3)
- (b)(i) iris (3)
- (ii) **A** (3)
- (pupil enlarges/dilates) to allow more light into eye (3)

- (c) (i) **X** femur / thigh bone (3)
- Y** fibula (3)
- (ii) letter **B** at upper region of thigh bone (3)
- (iii) **A** near arrow going downwards (3)



- (iv) **State or show** (2 × 3)

Any two of:

arteries have a thick wall (of muscle) / veins have a thin wall (of muscle) //

arteries have a small lumen / veins have a larger lumen //

arteries have no valves / veins have valves

veins have valves, arteries do not have valves

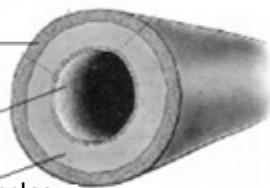
Artery

thick outer wall

small lumen

thick layer of muscles

and elastic fibres

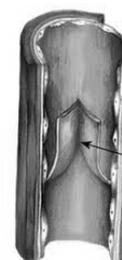
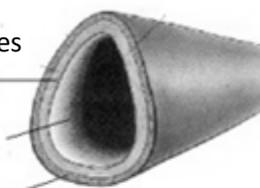


Vein

thin layer of muscles
and elastic fibres

large lumen

fairly thin outer wall



valve in
a vein

Chemistry (130 MARKS)

Question 4 (52)

(a)(i) methane / CH₄ (3)

(ii) water (vapour) / H₂O (3)

(b)(i) 2 molecules/moles (of hydrogen peroxide (H₂O₂) present) (3)

(ii) 2 atoms of oxygen (present in hydrogen peroxide (H₂O₂)) (3)

(c)(i) gases can be compressed / squashed / change volume (3)

(ii) water cannot be compressed / squashed / change volume (3)

(d) Any two of:
oiling // greasing // plastic coating // galvanising // electroplating // painting (2 × 3)

(e) $\text{CaCO}_3 + 2\text{HCl} \longrightarrow \text{CO}_2 + \text{H}_2\text{O} + \text{CaCl}_2$ (6 × 1)

(f)(i) ionic (3)

(ii) blue (3)

(g)(i) hydrogen / H₂ (3)

(ii) copper // mercury // silver // gold // lead // tin // iron // any valid metal (3)

(h)(i) neutralisation

(ii) salt

water

(in any order)

(iii) burette not filled below the tap // tap of burette is open // should have used a conical flask instead of a beaker // no white tile // no stand / clamp

(6, 2, 1, 1)

Question 5 (39)

(a)(i) screening (3)

litter // plastics // sticks // any valid debris (3)

(ii) water at the top is clean // solids have settled to the bottom (3)

(iii) to remove suspended (small / insoluble) solids (particles) (3)

(iv) chlorine / Cl_2 (3)

(v) fluoridation / adding fluoride // pH adjustment (3)

(vi) water is safe/suitable to drink // water is free from micro-organisms (bacteria) // prevents disease // healthy (helps) teeth (3)

(vii) water expands (when it freezes) (3)

(b)(i) calcium // magnesium (3)

(ii) ion exchange // deionisation // boiling // bath salts // washing soda // distillation (3)

(c)(i) hydrogen / H_2

(ii) carbon // graphite // platinum // gold // rhodium

(iii) sulfuric acid / H_2SO_4 // sodium sulfate / Na_2SO_4

(6, 2, 1)

Question 6

(39)

(a)(i) Alkali metals

(3)

(ii) correct location of neutrons and protons

(3)

2 electrons in first shell

(3)

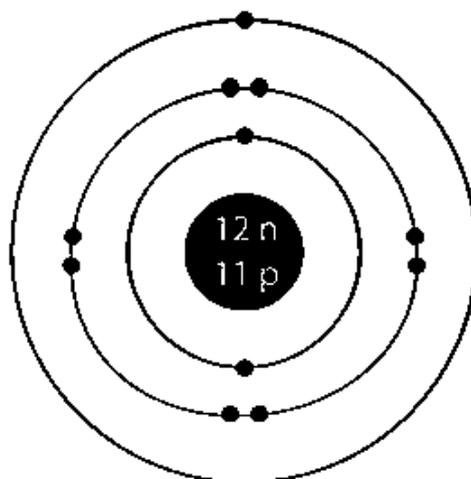
8 electrons in second shell

(3)

1 electron in third shell

(3)

[No diagram – no marks]



(b)(i) same number of electrons on the outer shell

(3)

(ii) hydrogen & potassium hydroxide

(3)

(c) **Award 6 marks for first correct answer in (c)**

(i) oxygen / O₂

(3)

(ii) nitrogen / N₂

(3)

(iii) **State or show**

limewater

(3)

turns milky

(3)

(iv) composition of air changes (depending on location / weather) // % carbon dioxide composition changes (from inhaled to exhaled) // % water vapour composition changes (depending on the weather) // (if air is cooled) the different gases can be separated

(3)

Physics (130 MARKS)

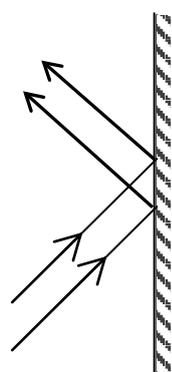
- Question 7** (52)
- (a)(i) dispersion (3)
(ii) prism // diffraction grating (3)
- (b) added to (3)
energy needs to be added to break the forces (in the ice to form water) // correct reference to latent heat (3)
- (c) resistance increases // the current flowing decreases (6)
- (d)(i) $V = \pi r^2 h$
 $\frac{22}{7} \times 4 \times 7$ // $\pi \times 4 \times 7$ // $3.14 \times 4 \times 7$ [Incomplete calculation – Slip -1]
 88 cm^3 // $28\pi \text{ cm}^3$ // 87.92 cm^3 (3)
- (ii) $D = M \div V$
 $\frac{66}{88} \text{ g/cm}^3$ // $66 \div$ answer from (i) above [Incomplete calculation – Slip -1]
 0.75 g/cm^3 // $2.357 \div \pi \text{ g/cm}^3$ // 0.7507 g/cm^3 (3)
- (e)(i) solids (road) expand(s) (3)
(ii) radiation (3)
- (f) 1.8×30 // 54 (2)
distance = $1.8 \times 30 \div 2.7$ // Answer from line 1 $\div 2.7$ // 20 cm (2)
70 cm mark // Answer from line 2 added to 50 (2)
- (g) lower boiling point // due to lower pressure (at higher altitude) (6)
- (h)(i) non-renewable
(fuel) is used up // cannot be reused // a different atom each time
(ii) very efficient fuel // lots of energy released from a small amount of fuel // less carbon emissions // reducing use of fossil fuels (6, 2, 2)

Question 8

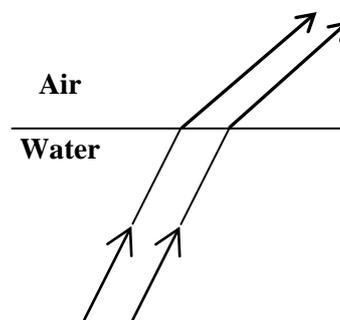
(39)

(a) correct rays for diagrams A, B and C

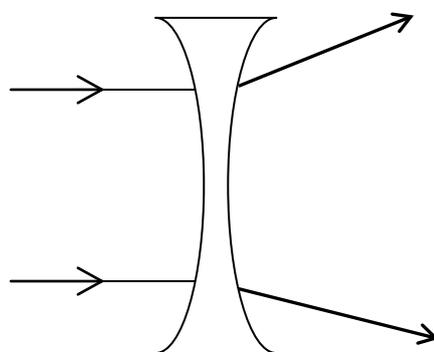
(3 × 3)



A



B



C

refraction

(3)

(b) reference to gas / gap / vacuum

(3)

reference to insulator / insulation // poor conductor

(3)

(c)(i) 15 m/s

(3)

(ii) distance = speed × time // any correct formula (substituted formula) // 10 × 60

(3)

600 m

(3)

Correct answer on its own – Award 6 marks

(iii) $a = \frac{v_2 - v_1}{t}$ // (15 – 10) ÷ 40

(3)

0.125 // $\frac{22}{7}$

(3)

Correct answer on its own – Award 6 marks

(iv) m/s/s // ms^{-2} // m/s^2

(3)

(v) decelerating // negative acceleration // slowing down // coming to a stop

(3)

Question 9

(39)

(a)(i) iron // nickel // steel // cobalt

(3)

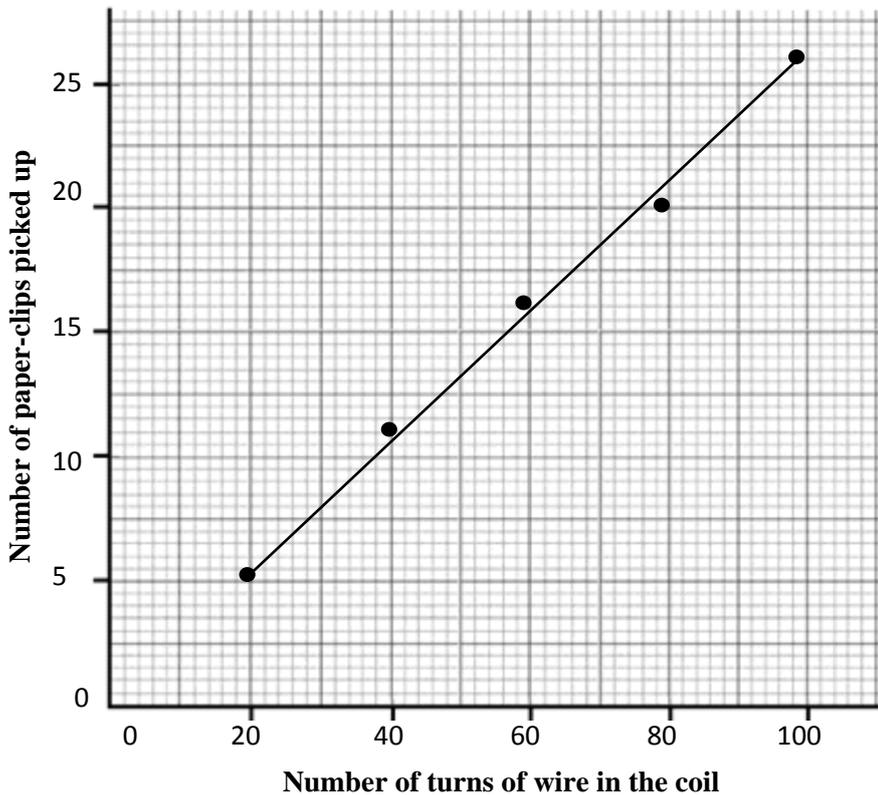
(ii) ammeter

(3)

(electric) current

(3)

(iii)



five correctly plotted points

(5 × 1)

line of best fit

(4)

line from joining dots – Allow 2 marks

(iv) 8 // answer consistent with graph

(3)

(v) same size/mass of paper clips // same magnet // same metal (bar) // same circuit // same type of wire // same laboratory conditions // same battery etc.

(3)

(b)(i) current which flows in one direction (only)

(3)

(ii) alternating current / a.c.

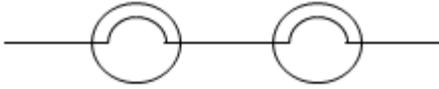
(3)

(iii) electrical to chemical

(3)

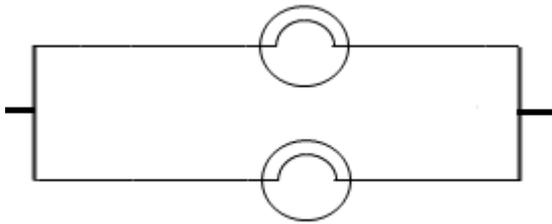
(c)(i) two bulbs in series

(3)



(ii) two bulbs in parallel

(3)



Marking Criteria for Coursework B (HL) - BIOLOGY

	Guide to mark assignment	
Total Marks	Investigate and compare the quantitative effects of changing (a) wavelength of illumination and (b) either intensity or duration of illumination on the phototropic growth response of recently germinated plant shoots/seedlings.	Mark Assignment
5	<p><u>Introduction to the investigation</u></p> <p>1 (i) Statement/identification of problem/topic to be investigated</p> <p>1 (ii) Background research <i>Any <u>one</u> reference to book or internet or person consulted or evidence of research</i></p>	<p>(2)</p> <p>(3)</p>
20	<p><u>Preparation and planning</u></p> <p>2 (i) Identify any relevant variables and necessary controls <i>Identify <u>five</u> variables (<u>three</u> compulsory variables & any <u>two</u> other variables) and/or indicate how some of these need to be controlled or held fixed</i></p> <p><i>Compulsory variables</i></p> <ul style="list-style-type: none"> • wavelength (frequency/colour) of light • intensity (<i>or</i> distance from source to plant) <i>or</i> duration of illumination • factor indicative of growth response (e.g. length, angle) <p><i>Other variables (any two)</i></p> <ul style="list-style-type: none"> • duration of illumination <i>or</i> intensity (<i>or</i> distance from source to plant) • type of plant • temperature • type of growth media • water content of growth media • thickness of light filters • number of seedlings • background light <p>2 (ii) List of the equipment needed for the investigation <i>Identify any <u>five</u> pieces of equipment pertinent to procedure</i></p> <p>2 (iii) List of tasks to be carried out during the investigation <i>Identify any <u>four</u> tasks carried out in investigation</i></p> <ul style="list-style-type: none"> • procure seeds/seedlings and/or growth media and/or lights/filters • plant and/or water seeds/seedlings • shine light • measure factor indicative of growth response • record/graph data • repeat for other wavelength(s) • repeat for other intensity <i>or</i> duration of illumination 	<p>(2 + 2 + 2)</p> <p>(2 + 2)</p> <p>(5 × 1)</p> <p>(1 + 1 + 1 + 2)</p>

<p>20</p>	<p><u>Procedure, Apparatus, Safety, Data Collection/Observations</u></p> <p>3 (i) Safety precautions <i>Identify any <u>two</u> specific safety precautions followed</i></p> <p>3 (ii) & (iii) Procedure followed in the investigation (<i>state or show</i>)</p> <p><i>Identify any <u>seven</u> steps taken in conducting investigation</i></p> <ul style="list-style-type: none"> • prepare/water growth media • plant seeds/seedlings • measure factor indicative of growth response (<i>before</i> illumination) • turn on light source • measure/note wavelength/frequency/colour of light source • measure/note intensity (power) of light source • measure/note distance of light source from plants • leave for a period of time • measure factor indicative of growth response (<i>after</i> illumination) • clean/dry equipment for reuse • repeat for same wavelength and intensity/duration (to verify data) • repeat for different wavelength • repeat for different intensity/duration • record/graph data <p>3 (iv) Recorded Data / Observations <i>Identify <u>two</u> data sets</i></p> <ul style="list-style-type: none"> • effect of changing wavelength (for fixed intensity/duration) • effect of changing intensity/duration (for fixed wavelength) 	<p>(2 + 3)</p> <p>(4 × 1) + (3 × 2)</p> <p>(2 + 3)</p>
<p>20</p>	<p><u>Analysis</u></p> <p>4 (i) Calculations / Data analysis <i>Relevant analysis of data or calculations or graph(s)</i></p> <ul style="list-style-type: none"> • Limited manipulation/presentation of data • Good manipulation/presentation of data • Excellent manipulation/presentation of data <p>4 (ii) Conclusion(s) and Evaluation of Result(s) <i>Relevant conclusion(s) drawn and evaluation of result(s)</i></p> <ul style="list-style-type: none"> • Limited treatment • Good treatment • Excellent treatment 	<p>(4) (7) (10)</p> <p>(4) (7) (10)</p>
<p>10</p>	<p><u>Comments</u></p> <p><i>Any <u>two</u> comments on refinement or extension or source of error etc.</i></p> <ul style="list-style-type: none"> • Limited comprehension • Good comprehension • Excellent comprehension 	<p>(1) } (3) } × 2 (5) }</p>

Marking Criteria for Coursework B (HL) - CHEMISTRY

Guide to mark assignment		
Total Marks		Mark Assignment
5	<p><u>Introduction to the investigation</u></p> <p>1 (i) Statement/identification of problem/topic to be investigated</p> <p>1 (ii) Background research <i>Any <u>one</u> reference to book or internet or person consulted or evidence of research</i></p>	<p>(2)</p> <p>(3)</p>
20	<p><u>Preparation and planning</u></p> <p>2 (i) Identify any relevant variables and necessary controls <i>Identify <u>five</u> variables (<u>three</u> compulsory variables & any <u>two</u> other variables) and/or indicate how some of these need to be controlled or held fixed</i></p> <p><i>Compulsory variables</i></p> <ul style="list-style-type: none"> • metal types • fruit/vegetable type • (factor indicative of) emf/voltage <p><i>Other variables (any two)</i></p> <ul style="list-style-type: none"> • mass/volume of metal • area/length of metal (in contact with electrolyte) • temperature • type/length of connecting wires in circuit • distance between electrodes • mass of fruit/vegetable • “ripeness” (or similar) of fruit/vegetable • number of cells in battery <p>2 (ii) List of the equipment needed for the investigation <i>Identify any <u>five</u> pieces of equipment pertinent to procedure</i></p> <p>2 (iii) List of tasks to be carried out during the investigation <i>Identify any <u>four</u> tasks carried out in investigation</i></p> <ul style="list-style-type: none"> • procure fruit/vegetables and/or metals • place electrodes in fruit/vegetable • connect electrodes across meter <i>or</i> set meter to read voltage • measure emf/voltage • record/graph data • repeat for other metal types • repeat for other fruit/vegetables 	<p>(2 + 2 + 2)</p> <p>(2 + 2)</p> <p>(5 × 1)</p> <p>(1 + 1 + 1 + 2)</p>

<p>20</p>	<p><u>Procedure, Apparatus, Safety, Data Collection/Observations</u></p> <p>3 (i) Safety precautions <i>Identify any <u>two</u> specific safety precautions followed</i></p> <p>3 (ii) & (iii) Procedure followed in the investigation (<i>state or show</i>) <i>Identify any <u>seven</u> steps taken in conducting investigation</i></p> <ul style="list-style-type: none"> • prepare fruit/vegetables • prepare metals • measure/note mass/volume of metals • insert metals into fruit/vegetable • measure/note area/length of metal (in contact with electrolyte) • measure/note distance between electrodes • set voltmeter/multimeter to appropriate scale • connect voltmeter/multimeter across electrodes • measure emf/voltage • clean/dry equipment for reuse • repeat for same fruit/vegetable and metal types (to verify data) • repeat for different metal types • repeat for different fruit/vegetables • record/graph data <p>3 (iv) Recorded Data / Observations <i>Identify <u>two</u> data sets</i></p> <ul style="list-style-type: none"> • effect of changing metal types (for fixed fruit/vegetable) • effect of changing fruit/vegetable (for fixed metal types) 	<p>(2 + 3)</p> <p>(4 × 1) + (3 × 2)</p> <p>(2 + 3)</p>
<p>20</p>	<p><u>Analysis</u></p> <p>4 (i) Calculations / Data analysis <i>Relevant analysis of data or calculations or graph(s)</i></p> <ul style="list-style-type: none"> • Limited manipulation/presentation of data • Good manipulation/presentation of data • Excellent manipulation/presentation of data <p>4 (ii) Conclusion(s) and Evaluation of Result(s) <i>Relevant conclusion(s) drawn and evaluation of result(s)</i></p> <ul style="list-style-type: none"> • Limited treatment • Good treatment • Excellent treatment 	<p>(4) (7) (10)</p> <p>(4) (7) (10)</p>
<p>10</p>	<p><u>Comments</u></p> <p><i>Any <u>two</u> comments on refinement or extension or source of error etc.</i></p> <ul style="list-style-type: none"> • Limited comprehension • Good comprehension • Excellent comprehension 	<p>(1) } (3) } × 2 (5) }</p>

Marking Criteria for Coursework B (HL) - PHYSICS

	Guide to mark assignment	
Total Marks	Investigate and compare the quantitative effects of changing (a) material type and (b) material thickness on the level of sound insulation provided by a range of materials.	Mark Assignment
5	<p><u>Introduction to the investigation</u></p> <p>1 (i) Statement/identification of problem/topic to be investigated</p> <p>1 (ii) Background research <i>Any <u>one</u> reference to book or internet or person consulted or evidence of research</i></p>	<p>(2)</p> <p>(3)</p>
20	<p><u>Preparation and planning</u></p> <p>2 (i) Identify any relevant variables and necessary controls <i>Identify <u>five</u> variables (<u>three</u> compulsory variables & any <u>two</u> other variables) and/or indicate how some of these need to be controlled or held fixed</i></p> <p><i>Compulsory variables</i></p> <ul style="list-style-type: none"> • material type • material thickness (<i>or</i> number of layers) • intensity/loudness of sound recorded <p><i>Other variables (any two)</i></p> <ul style="list-style-type: none"> • intensity/loudness of sound emitted • frequency/wavelength of sound emitted • distance between source and sound level meter • distance between source and insulation • temperature • intensity/loudness of background sound • mass/volume of insulating material • shape/dimensions of laboratory (“acoustics”/ “echoes” etc.) <p>2 (ii) List of the equipment needed for the investigation <i>Identify any <u>five</u> pieces of equipment pertinent to procedure</i></p> <p>2 (iii) List of tasks to be carried out during the investigation <i>Identify any <u>four</u> tasks carried out in investigation</i></p> <ul style="list-style-type: none"> • procure source of sound and/or insulating materials and/or sound level meter • position insulating material • produce sound • measure factor indicative of sound intensity level • record/graph data • repeat for other material types • repeat for other material thicknesses (or number of layers) 	<p>(2 + 2 +2)</p> <p>(2 + 2)</p> <p>(5 × 1)</p> <p>(1 + 1 + 1 + 2)</p>

<p>20</p>	<p><u>Procedure, Apparatus, Safety, Data Collection/Observations</u></p> <p>3 (i) Safety precautions <i>Identify any <u>two</u> specific safety precautions followed</i></p> <p>3 (ii) & (iii) Procedure followed in the investigation (<i>state or show</i>)</p> <p><i>Identify any <u>seven</u> steps taken in conducting investigation</i></p> <ul style="list-style-type: none"> • prepare source of sound • prepare insulating materials • prepare suitable environment/housing • measure/note mass/volume of insulating material • measure/note thickness (or number of layers) of insulating material • turn on sound level meter and/or set to appropriate scale • measure/note distance of sound source from sound level meter • measure/note intensity/loudness of emitted sound • measure/note intensity/loudness of background sound • measure intensity/loudness of detected sound • repeat for same material type and material thickness (to verify data) • repeat for different material types • repeat for different material thicknesses (or number of layers) • record/graph data <p>3 (iv) Recorded Data / Observations <i>Identify <u>two</u> data sets</i></p> <ul style="list-style-type: none"> • effect of changing material types (for fixed material thickness) • effect of changing thickness (for fixed material type) 	<p>(2 + 3)</p> <p>(4 × 1) + (3 × 2)</p> <p>(2 + 3)</p>
<p>20</p>	<p><u>Analysis</u></p> <p>4 (i) Calculations / Data analysis <i>Relevant analysis of data or calculations or graph(s)</i></p> <ul style="list-style-type: none"> • Limited manipulation/presentation of data • Good manipulation/presentation of data • Excellent manipulation/presentation of data <p>4 (ii) Conclusion(s) and Evaluation of Result(s) <i>Relevant conclusion(s) drawn and evaluation of result(s)</i></p> <ul style="list-style-type: none"> • Limited treatment • Good treatment • Excellent treatment 	<p>(4) (7) (10)</p> <p>(4) (7) (10)</p>
<p>10</p>	<p><u>Comments</u></p> <p><i>Any <u>two</u> comments on refinement or extension or source of error etc.</i></p> <ul style="list-style-type: none"> • Limited comprehension • Good comprehension • Excellent comprehension 	<p>(1) } (3) } × 2 (5) }</p>

Marking Criteria for Coursework B (HL) – OWN INVESTIGATION

10	<p><u>Introduction to the investigation</u></p> <p>1 (i) Statement/identification of problem/topic to be investigated</p> <ul style="list-style-type: none"> • Limited treatment • Good treatment • Excellent treatment <p>1 (ii) Background research</p> <p>Any <u>two</u> references to book or internet or person consulted or evidence of research</p>	<p>(2)</p> <p>(4)</p> <p>(6)</p> <p>(2 + 2)</p>
40	<p><u>Preparation and planning</u></p> <p>2 (i) Identify any relevant variables and necessary controls</p> <p>Identify <u>eight</u> variables (<u>two</u> compulsory variables – which refer to the investigation title – and any <u>six</u> other variables) and/or indicate how some of these need to be controlled or held fixed</p> <p>[If variables/controls not relevant to the type of investigation undertaken allow 6 marks for stating so, then readjust equipment to (8 × 2) and tasks to (6 × 3)]</p> <p>2 (ii) List of the equipment needed for the investigation</p> <p>Identify any <u>eight</u> pieces of equipment pertinent to procedure</p> <p>2 (iii) List of tasks to be carried out during the investigation</p> <p>Identify any <u>six</u> tasks carried out in investigation</p>	<p>(4 + 4)</p> <p>(6 × 2)</p> <p>(8 × 1)</p> <p>(6 × 2)</p>
40	<p><u>Procedure, Apparatus, Safety, Data Collection/Observations</u></p> <p>3 (i) Safety precautions</p> <p>Identify any <u>four</u> specific safety precautions followed</p> <p>3 (ii) & (iii) Procedure followed in the investigation (state or show)</p> <p>Identify any <u>twelve</u> steps taken in conducting investigation</p> <p>3 (iv) Recorded Data / Observations</p> <p>Identify <u>eight</u> data points</p>	<p>(4 × 2)</p> <p>(4 × 1) + (4 × 2) + (4 × 3)</p> <p>(8 × 1)</p>
40	<p><u>Analysis</u></p> <p>4 (i) Calculations / Data analysis</p> <p><u>Two</u> relevant analyses of data or calculations or graph(s)</p> <ul style="list-style-type: none"> • Limited manipulation/presentation of data • Good manipulation/presentation of data • Excellent manipulation/presentation of data <p>4 (ii) Conclusion(s) and Evaluation of Result(s)</p> <p><u>Two</u> relevant conclusions drawn and evaluation of results</p> <ul style="list-style-type: none"> • Limited treatment • Good treatment • Excellent treatment 	<p>(4) } (7) } × 2 (10)</p> <p>(4) } (7) } × 2 (10)</p>
20	<p><u>Comments</u></p> <p>Any <u>four</u> comments on refinement or extension or source of error etc.</p> <ul style="list-style-type: none"> • Limited comprehension • Good comprehension • Excellent comprehension 	<p>(1) } (3) } × 4 (5)</p>

