Coimisiún na Scrúduithe Stáit
State Examinations Commission

Junior Certificate 2017

Marking Scheme

Science

Ordinary 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.

TABLE FOR ASSIGNING GRADES	
GRADE	**RANGE**
A	510 - 600
B	420 - 509
C	330 - 419
D	240 - 329
E	150 - 239
F	60 - 149
NG	0 - 59

GUIDELINES TO EXAMINERS

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 in a subsequent calculation 'correctly' allow the marks for the subsequent calculation.

7. Cancelled & / 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 uncancelled answer.

(b) If more than the required number of (uncancelled) 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. However, in MCQ-type questions cancelling of an incorrect and correct answer applies.

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.

8. Recording a mark of zero

A zero should only be recorded in the question grid when the candidate has attempted the question but does not merit marks.

Do not enter zero for examination components that were not presented.

If a candidate does not attempt a question (or part of) record a dash –

9. Deduction of marks for omitted labelled diagrams

Assign marks in the usual way. Then use square brackets [ ] to deduct the marks.

10. Application of the marking scheme

Apply the marking scheme as agreed.
Examiners should enter marks in Examiner use only Column 1.
Advising Examiners should use Column 1.
Column 2 to be used by Appeal Examiners.
Disallowed marks should be placed in square brackets i.e. [ ].

11. Transfer of marks

All marks should be transferred to the grid on the cover page of the examination paper.

Marks should be totalled, the bonus for answering through Irish applied where relevant.

Junior Certificate Examination

SCIENCE

Ordinary Level Paper

WRITTEN EXAMINATION PAPER

Three Sections: Biology, Chemistry and Physics, *all* questions to be answered by candidates.

Biology Question 1 (52 marks); Question 2 (39 marks); Question 3 (39 marks)
Chemistry Question 4 (52 marks); Question 5 (39 marks); Question 6 (39 marks)
Physics Question 7 (52 marks); Question 8 (39 marks); Question 9 (39 marks)

COURSEWORK A

Count the number of ticked (✓) mandatory biology investigations / experiments claimed on page 6. Note this number in the box on page 6 of the Coursework booklet and enter it in the Coursework A grid on the cover page.

Count the number of ticked (✓) mandatory chemistry investigations / experiments claimed on page 7. Note this number in the box on page 7 of the Coursework booklet and enter it in the Coursework A grid on the cover page.

Count the number of ticked mandatory (✓) physics investigations / experiments claimed on page 8. Note this number in the box on page 8 of the Coursework booklet and enter it in the Coursework A grid on the cover page.

Total the number of investigations / experiments claimed and award 2 marks per investigation/experiment to an amount not exceeding maximum 60 marks.

COURSEWORK B

Mark the SEC nominated investigations according to the agreed criteria. Enter the marks for each section in the Coursework B grid on the cover page of the coursework booklet.

or

Mark the candidate nominated investigation according to the agreed criteria. Enter the marks for each section in the Coursework B grid on the cover page of the coursework booklet.

COURSEWORK A & B

Transfer total marks awarded for Coursework A and Coursework B to grid on the cover page of the examination answer-booklet.

SCIENCE ORDINARY LEVEL 2017

Summary of Marking Scheme

BIOLOGY

Question 1		(7 × 6 + 1 × 10)
Question 2	(a)	(i) 12 (ii) 3 (iii) 2 × 3
	(b)	(i) 3 (ii) 3 (iii) 3 (iv) 3 (v) 6
Question 3	(a)	(i) 6 (ii) 3 (iii) 3 (iv) 3
	(b)	(i) 3 (ii) 3 (iii) 3
	(c)	(i) 3 (ii) 3 (iii) 3 (iv) 3 (v) 3

CHEMISTRY

Question 4		(7 × 6 + 1 × 10)
Question 5	(a)	4 × 3
	(b)	(i) 3 (ii) 3
	(c)	(i) 3 (ii) 3 (iii) 6 (iv) 2 × 3 (v) 3
Question 6	(a)	(i) 4 × 3 (ii) 6 (iii) 3
	(b)	(i) 6 (ii) 3 (iii) 3
	(c)	(i) 3 (ii) 3

PHYSICS

Question 7		(7 × 6 + 1 × 10)
Question 8	(a)	(i) 3 (ii) 3 (iii) 2 × 3 (iv) 6 (v) 3
	(b)	(i) 2 × 3 (ii) 3 (iii) 3 (iv) 6
Question 9	(a)	(i) 3 (ii) 3 (iii) 3 (iv) 3
	(b)	(i) 2 × 3 (ii) 3 (iii) 2 × 3
	(c)	(i) 3 (ii) 3 (iii) 3 (iv) 3

BIOLOGY

Question 1

(*a*) (*i*) Plant cell (3)

(*ii*) Nucleus (3)

(*b*) (*i*) Genes (3)

(*ii*) **Any inheritable characteristic** e.g. skin colour, hair colour, eye colour etc. (3)

(*c*) Any **two** illnesses caused by viruses (2 × 3)

e.g. cold // flu // measles // mumps // chicken pox // meningitis // AIDS etc.

(*d*) (*i*) Carbohydrate (3)

(*ii*) Bread (3)

(*e*) (*i*) **Any valid resource** e.g. Food, shelter, mate, territory (space) (3)

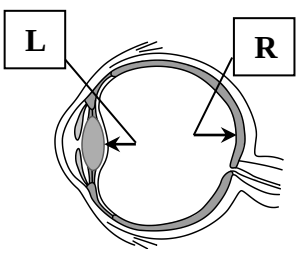
(*ii*) **Any valid resource** e.g. Light, water, minerals, space (3)

(*f*) (*i*) Water / Animal / Self (explosion) (3)

(*ii*) Movement of seeds (3)

(*g*) Throw / Place appropriately (3)

Count number / Note presence of a plant (organism) (3)



(*h*) (*i*) **L** in the box on the left (3)

(*ii*) **R** in the box on the right (3)

(*iii*) Carries impulse (message) // to the brain *or* from the eye (2 × 2)

Question 2

(*a*) (*i*) Correct line on its own / points plotted correctly and join plotted points (12)

Note: Award 2 marks for each correct point plotted

Award 2 marks for joining plotted points

(*ii*) 4000 ± 200 / Answer consistent with graph drawn (3)

(*iii*) Nutrients // Water // Heat (warmth) // oxygen (air) (2 × 3)

(*b*) (*i*) **A** – Testis (3)

(*ii*) **B** – Sperm Duct (3)

(*iii*) **C** – Penis (3)

A
C
B

(*iv*) Sperm (3)

(*iv*) Urine / Water / Urea / Salts / Semen / Sperm / Male gamete (sex cell) *(6)

Question 3

(*a*) (*i*) Water / Carbon dioxide / Light (energy) * (6)

(*ii*) Chlorophyll (3)

(*iii*) Glucose / Sugar / Starch / Carbohydrate (3)

(*iv*) Any valid benefit (3)

(*b*) (*i*) **X** marked on the **right** side of either box  (3)

(*ii*) Phototropism (3)

(*iii*) Growth / Response (sensitivity) / Movement (3)

(*c*) (*i*) Oxygen (3)

(*ii*) Thermometer / Temperature probe (3)

(*iii*) Temperature (3)

(*iv*) It increases (rises) (3)

(*v*) Any correct reference to carbon dioxide (3)

CHEMISTRY

Question 4

(*a*) (*i*) Chemical (3)

(*ii*) Painting (varnishing)/Galvanising /Oiling /Coating / Electroplating/Alloying (3)

(*b*) (*i*) $0 \leq \mathbf{A} < 7$ (3)

(*ii*) $7 > \mathbf{B} \leq 14$ (3)

(*c*) (*i*) One fifth (⅕)

O	**One fifth (⅕)**
	Two thirds (⅔)

(3)

(*ii*) Breathing / Burning / Respiration / Welding / Steel production etc (3)

(*d*) **C** // **N** (2 × 3)

(*e*) (*i*) Mixture (3)

(*ii*) Compound (3)

(*f*) 1. Chromatography (3)

2. Distillation (3)

(*g*) **Left side of equation**: Hydrochloric acid (3)

Right side of equation: Water (3)

(*h*) (*i*) Peat (turf) / Coal / Natural gas (methane) (3)

(*ii*) **Effect on limestone:** Dissolves / erodes /wears away /corrodes (3)

OR

Effect on plants: Kills / harms

(*iii*) Pollution / Causes litter / Unsightly / Damage to wildlife / (4)
Do not break down etc.

Question 5

(*a*) True (3)

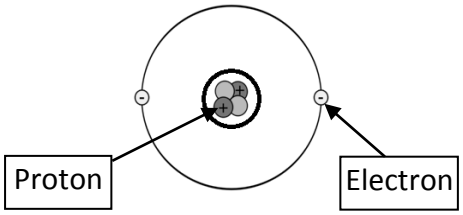
False (3)

False (3)

True (3)

(*b*) (*i*) **Proton** in the box on the left (3)

(*ii*) **Electron** in the box on the right (3)



(*c*) (*i*) Al (3)

(*ii*) Au (3)

(*iii*) Jewellery / Coins / Medals etc. *(6)

(*iv*) Light // Strong // Unreactive // Malleable // High melting point // Non-toxic // Good conductor etc. (2 × 3)

(*v*) Elements (3)

Question 6

(*a*) (*i*) **State or show** [Marks awarded in the context of a valid experiment]

Equal volumes of water (3)

Add soap (3)

Shake (3)

Reference to comparing volume (amount) of lather (3)

Relevant labelled diagram
Diagram must have at least ***one*** label. No labelled diagram – deduct [3] marks

(*ii*) **X** – Calcium

X	**Calcium**
	Sodium

*(6)

(*iii*) Boiling / Ion exchange (deionizer) / Softener / Washing soda /Bath salts (3)

(*b*) (*i*) **Y** – Alum ***or*** **Y** – Copper Sulfate

Y	**Alum**
	Iron
Y	**Copper sulfate**

*(6)

(*ii*) Stir / Heat / Grind up solid / Add more water (3)

(*iii*) Cool / Evaporate (3)

(*c*) (*i*) **L** – Hydrogen peroxide

L	**Hydrogen peroxide**
	Limewater

(3)

(*ii*) Substance that speeds up (*or* changes rate of) a reaction (3)

PHYSICS

Question 7

(*a*) Any named metal / Graphite / Water (3)

Any named non-metal / Water (3)

(*b*) Water expands (3)

When it freezes (3)

(*c*) (*i*) **M** – electronic balance (3)

(*ii*) **L** – opisometer (3)

L	**Opisometer**
M	**Electronic balance**
	Stopwatch

(*d*) (*i*) **30** / 40 – 10 = 30 (3)

If correct operation shown, e.g. 40 – 10 and no/incorrect answer given deduct 1 mark

(*ii*) **6** / 30 ÷ 5 = 6 (3)

If correct operation shown, e.g. 30 ÷ 5 and no/incorrect answer given deduct 1 mark

(*e*) (*i*) Luminous (3)

(*ii*) Radiation (3)

(*f*) (*i*) 100 (3)

(*ii*) Increase (3)

(*g*) Rub / Friction (3)

With a cloth (3)

(*h*) (*i*) Light Emitting Diode (3 × 1)

(*ii*) Less (3)

(*iii*) Any common use (4)

Question 8

(*a*) (*i*) Friction (3)

(*ii*) Newton / N (3)

(*iii*) **First word:** Electrical // Kinetic (3)

Second word: Kinetic / Heat / Sound // Heat / Sound (3)

(*iv*) **Any valid electrical safety precaution e.g.** Do not overload sockets / Replace damaged cables / Keep away from water / Fuse / Earth etc. *(6)

(*v*) Less friction / Parts can move more freely (3)

(*b*) (*i*) Force (3)

÷

Area (3)

(*ii*) Less pressure (3)

(*iii*) Smaller (3)

(*iv*) **P** – Barometer

P	**Barometer**
	Ohmmeter

* (6)

Question 9

(*a*) (*i*) Blocks Sound or explained (3)

(*ii*) Echoes / Ultrasound (3)

(*iii*) Ear (3)

(*iv*) Less (3)

(*b*) (*i*) Arrow away from N (3)

Arrow towards S (3)

(*ii*) Iron / Steel / Nickel /Cobalt (3)

(*iii*) Region / Area / Where (3)

There is a magnetic force (3)

(*c*) (*i*) Ammeter (3)

(*ii*) Voltmeter (3)

(*iii*) **X** – 3

X	**3**
	8

(3)

(*iv*) **U** – Ohm (Ω)

U	**Ohm (Ω)**
	Kilowatt-hour (kWh)

(3)

Marking Criteria for Coursework B (OL) - BIOLOGY

	Guide to mark assignment	
Total Marks	Investigate quantitatively, to determine the impact of each additive, the effects on samples of a garden soil of adding 20% by mass of (a) sand, (b) potting compost, and (c) clay* on (i) the soil's ability to retain water, (ii) the rate of drainage of water through the soil. ***Some readily available cat litter is composed of dry clay.**	**Mark Assignment**
5	**<u>Introduction to the investigation</u>** **1 (i) Statement/identification of problem/topic to be investigated** **1 (ii) Background research** *Any <u>one</u> reference to book or internet or person consulted or evidence of research*	 (2) (3)
20	**<u>Preparation and planning</u>** **2 (i) Identify any relevant variables and necessary controls** *Identify <u>four</u> variables (at least two compulsory) and/or indicate how some of these need to be controlled or held fixed* *Compulsory variables* • volume or mass of water retained • rate of drainage *or* time for known volume to drain *or* volume drained in known time • soil additives *or* soil composition *or* soil mixture *Other variables* • soil source • moisture content (of soil *or* of additives) • quantity of soil used • quantity of additive used • particle size • volume/mass of water added • volume/mass/height of water above level of soil • temperature • funnel dimensions **2 (ii) List of the equipment needed for the investigation** *Identify any <u>five</u> pieces of equipment pertinent to procedure* **2 (iii) List of tasks to be carried out during the investigation** *Identify any <u>three</u> tasks carried out in investigation* • procure soil • add/mix in additives *or* find weight/mass of additives • add water to soil • measure volume/mass of water retained • measure volume/mass of water drained • repeat for different soil and additive mixtures • record *or* graph data	 (3 + 3) *any others* (2 + 2) (5 × 1) (2 + 2 + 1)

20	**<u>Procedure, Apparatus, Safety, Data Collection / Observations</u>** **3 (i) Safety precautions** *Identify any <u>two</u> specific safety precautions followed* **3 (ii) & (iii) Procedure followed in the investigation** *(state or show)* *Identify any <u>seven</u> steps taken in conducting investigation* • sieve soil • measure/note mass of soil • measure/note mass of additive • mix in additive • measure/note mass/volume of water to be added • place soil in funnel/container • add water to soil • measure/note mass of wet soil • keep level of water above soil constant • measure/note mass/volume of water drained • measure/note time taken • repeat for different soil and additive mixtures • repeat to verify data • record *or* graph data **3 (iv) Recorded Data / Observations** *Identify <u>two</u> data sets - with value(s) for each of the three additives for both sets* • effect of soil additives on water retention by soil • effect of soil additives on rate of water drainage through soil	(3 + 2) (2 + 2 + 2) + (1+ 1 + 1 + 1) (3 + 2)
20	**<u>Analysis</u>** **4 (i) Calculations / Data analysis** *Relevant analysis of data or calculations or graph(s)* • **Excellent** manipulation of two data sets with a data point for each additive in each set using accurate graphs / correct calculations / clear statements of analysis of data • **Good** manipulation of two data sets with a data point for each additive in each set using graphs / calculations / statements of analysis of data • **Limited** manipulation of one data set of with a data point for each additive using graphs / calculations / statement of analysis of data **4 (ii) Conclusion(s) and Evaluation of Result(s)** *Relevant conclusion(s) drawn and evaluation of result(s)* • **Excellent** treatment (clear, supported statements about both sets of data) • **Good** treatment (statements about both sets of data, not fully clear *or* not fully supported) • **Limited** treatment (clear, supported statements about one set of data only)	(10) (7) (4) *Only if 3(iv) and/or 4(i) attempted* (10) (7) (4)
10	**<u>Comments</u>** *Any <u>two</u> comments on refinement or improvement or extension or possible application or source of error, etc.* • **Excellent** comprehension • **Good** comprehension	(5) (3) } × 2

Marking Criteria for Coursework B (OL) - CHEMISTRY

	Guide to mark assignment	
Total Marks	Investigate quantitatively, at room temperature, the effect of dilution on the pH of (i) vinegar, (ii) a solution containing 5 g washing soda per litre of water, (iii) a solution containing 5 g sucrose per litre of water.	**Mark Assignment**
5	**<u>Introduction to the investigation</u>** **1 (i) Statement/identification of problem/topic to be investigated** **1 (ii) Background research** *Any <u>one</u> reference to book or internet or person consulted or evidence of research*	 (2) (3)
20	**<u>Preparation and planning</u>** **2 (i) Identify any relevant variables and necessary controls** *Identify <u>four</u> variables (at least two compulsory) and/or indicate how some of these need to be controlled or held fixed* *Compulsory variables* • pH of solution • concentration / dilution • substance *or* solution tested *Other variables* • liquid used for dilution • volume of solution • volume of solvent • mass of substance • temperature of solutions • temperature of surroundings **2 (ii) List of the equipment needed for the investigation** *Identify any <u>five</u> pieces of equipment pertinent to procedure* **2 (iii) List of tasks to be carried out during the investigation** *Identify any <u>three</u> tasks carried out in investigation* • procure pH meter *or* procure colour chart for universal indicator • procure solutions • change concentration of solutions • read pH • repeat for different concentrations • repeat for different solutions • record *or* graph data	 (3 + 3) *any others* (2 + 2) (5 × 1) (2 + 2 + 1)

20	**<u>Procedure, Apparatus, Safety, Data Collection/Observations</u>** **3 (i) Safety precautions** *Identify any <u>two</u> specific safety precautions followed* **3 (ii) & (iii) Procedure followed in the investigation** *(state or show)* *Identify any <u>seven</u> steps taken in conducting investigation* • calibrate pH meter • measure/note pH of water (buffer) • measure/note mass of substance • measure/note volume of liquid • make up *or* measure out stock solution • add solvent to solution to dilute • stir *or* mix • place pH meter *or* universal indicator into solution • measure/note pH • rinse/wash pH meter *or* return pH meter to water • repeat for different concentrations • repeat for other stock solutions • repeat to verify data • record *or* graph data **3 (iv) Recorded Data / Observations** *Identify <u>three</u> data sets* • effect of dilution on pH of vinegar • effect of dilution on pH of washing soda solution • effect of dilution on pH of sucrose solution	(3 + 2) (2 + 2 + 2) + (1+ 1 + 1 + 1) (2 + 2 + 1)
20	**<u>Analysis</u>** **4 (i) Calculations / Data analysis** *Relevant analysis of data or calculations or graph(s)* • **Excellent** manipulation of three data sets with at least 2 data points in each set using accurate graphs / correct calculations / clear statements of analysis of data • **Good** manipulation of three data sets with at least 2 data points in each set using graphs / calculations / statements of analysis of data • **Limited** manipulation of two data set of with at least 2 data points using graphs / calculations / statement of analysis of data **4 (ii) Conclusion(s) and Evaluation of Result(s)** *Relevant conclusion(s) drawn and evaluation of result(s)* • **Excellent** treatment (clear, supported statements about all sets of data) • **Good** treatment (statements about all sets of data, not fully clear or not fully supported) • **Limited** treatment (clear, supported statements about two sets of data only)	(10) (7) (4) *Only if 3(iv) and/or 4(i) attempted* (10) (7) (4)
10	**<u>Comments</u>** *Any <u>two</u> comments on refinement or improvement or extension or possible application or source of error, etc.* • **Excellent** comprehension • **Good** comprehension	(5) (3) } × 2

Marking Criteria for Coursework B (OL) - PHYSICS

	Guide to mark assignment	
Total Marks	Using conductors made of children's play (modelling) dough, investigate quantitatively the effect on resistance, calculated from measurements of voltage across and current through the conductors, of changing the conductor length *and* obtain data to establish whether dough colour has an effect on its resistance.	**Mark Assignment**
5	**Introduction to the investigation** **1 (i) Statement/identification of problem/topic to be investigated** **1 (ii) Background research** *Any one reference to book or internet or person consulted or evidence of research*	 (2) (3)
20	**Preparation and planning** **2 (i) Identify any relevant variables and necessary controls** *Identify four variables (at least two compulsory) and/or indicate how some of these need to be controlled or held fixed* *Compulsory variables* • length of modelling dough • colour of modelling dough • resistance of modelling dough *Other variables* • temperature • current *or* voltage • diameter *or* cross sectional area of modelling dough • moisture content of modelling dough • amount of kneading of modelling dough • brand/source of modelling dough • method of making electrical connections **2 (ii) List of the equipment needed for the investigation** *Identify any five pieces of equipment pertinent to procedure* **2 (iii) List of tasks to be carried out during the investigation** *Identify any three tasks carried out in investigation* • procure modelling dough • shape modelling dough to have fixed diameter *or* cross sectional area • cut/measure lengths of modelling dough • measure current and voltage • calculate resistance from current and voltage • repeat for different lengths of modelling dough • repeat for different colours of modelling dough • record *or* graph data	 (3 + 3) *any others* (2 + 2) (5 ×1) (2 + 2 + 1)

20	**<u>Procedure, Apparatus, Safety, Data Collection/Observations</u>** **3 (i) Safety precautions** *Identify any <u>two</u> specific safety precautions followed* **3 (ii) & (iii) Procedure followed in the investigation** *(state or show)* *Identify any <u>seven</u> steps taken in conducting investigation* • knead modelling dough • shape modelling dough to have fixed diameter *or* cross sectional area • cut/measure/note length of modelling dough • attach leads to modelling dough • set up circuit with power supply (*or* battery), ammeter and modelling dough in series • connect voltmeter across modelling dough • switch on circuit • measure/note current • measure/note voltage • calculate resistance • repeat for different lengths of modelling dough • repeat for different colours of modelling dough • repeat to verify data • record *or* graph data **3 (iv) Recorded Data / Observations** *Identify <u>two</u> data sets* • effect on resistance of changing length of conductor • effect on resistance of changing colour of conductor	(3 + 2) (2 + 2 + 2) + (1+ 1 + 1 + 1) (3 + 2)
20	**<u>Analysis</u>** **4 (i) Calculations / Data analysis** Relevant analysis of data or calculations or graph(s) • **Excellent** manipulation of two data sets with at least 2 data points in each set using accurate graphs / correct calculations / clear statements of analysis of data • **Good** manipulation of two data sets with at least 2 data points in each set using graphs / calculations / statements of analysis of data • **Limited** manipulation of one data set of with at least 2 data points using graphs / calculations / statement of analysis of data **4 (ii) Conclusion(s) and Evaluation of Result(s)** Relevant conclusion(s) drawn and evaluation of result(s) • **Excellent** treatment (clear, supported statements about both sets of data) • **Good** treatment (statements about both sets of data, not fully clear *or* not fully supported) • **Limited** treatment (clear, supported statements about one set of data only)	(10) (7) (4) *Only if 3(iv) and/or 4(i) attempted* (10) (7) (4)
10	**<u>Comments</u>** Any two comments on refinement (or improvement) or extension or possible application or source of error, etc. • **Excellent** comprehension • **Good** comprehension	(5) (3) } × 2

Marking Criteria for Coursework B (OL) – OWN INVESTIGATION

10	**Introduction to the investigation** **1 (i) Statement/identification of problem/topic to be investigated** • **Excellent** treatment • **Good** treatment • **Limited** treatment **1 (ii) Background research** *Any two references to book or internet or person consulted or evidence of research*	 (6) (4) (2) (2 + 2)
40	**Preparation and planning** **2 (i) Identify any relevant variables and necessary controls** *Identify eight variables (two compulsory variables – which refer to the investigation title – and any six other variables) and/or indicate how some of these need to be controlled or held fixed* [If variables/controls are not relevant to the type of investigation undertaken, allow 6 marks for stating so, then re-adjust equipment to (8 × 2) and tasks to (6 × 3)] **2 (ii) List of the equipment needed for the investigation** *Identify any eight pieces of equipment pertinent to procedure* **2 (iii) List of tasks to be carried out during the investigation** *Identify any six tasks carried out in investigation*	 (2 × 4) + (6 × 2) (8 × 1) (6 × 2)
40	**Procedure, Apparatus, Safety, Data Collection/Observations** **3 (i) Safety precautions** *Identify any four specific safety precautions followed* **3 (ii) & (iii) Procedure followed in the investigation** *(state or show)* *Identify any twelve steps taken in conducting investigation* **3 (iv) Recorded Data / Observations** *Identify eight data points*	 (4 × 2) (4 × 3) + (4 × 2) + (4 × 1) (8 × 1)
40	**Analysis** **4 (i) Calculations / Data analysis** *Two relevant analyses of data or calculations or graph(s)* • **Excellent** manipulation of data • **Good** manipulation of data • **Limited** manipulation of data **4 (ii) Conclusion(s) and Evaluation of Result(s)** *Two relevant conclusions drawn and evaluation of results* • **Excellent** treatment • **Good** treatment • **Limited** treatment	 (10) (7) (4) } × 2 *Only if 3(iv) and/or 4(i) attempted* (10) (7) (4) } × 2
20	**Comments** *Any four comments on refinement or improvement or extension or possible application or source of error, etc.* • **Excellent** comprehension • **Good** comprehension	 (5) (3) } × 4