Coimisiún na Scrúduithe Stáit
State Examinations Commission

JUNIOR CERTIFICATE 2009

MARKING SCHEME

SCIENCE (REVISED)

ORDINARY LEVEL

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 schemes. 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 two answers are given and neither answer is cancelled, the first answer offered only is accepted and marked accordingly.

(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. Deduction of marks for omitted labelled diagrams

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

9. Application of the marking scheme

Apply the marking scheme as agreed.
Assistant 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. '[ ]'.

10. Transfer of marks

All marks should be transferred to the grid on the cover page of the examination answer-booklet.
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 5. Note this number in the box on page 5 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 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 (✓) physics 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.

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 (REVISED SYLLABUS) ORDINARY LEVEL 2009
Summary of Marking Scheme

BIOLOGY

Question 1		(7 × 6 + 1 × 10)
Question 2	(a)	(2 × 3)
	(b)	(3 × 3)
	(c)	(6 + 2 × 3)
	(d)	(4 × 3)
Question 3	(a)	(5 × 3)
	(b)	(4 × 3)
	(c)	(6 + 2 × 3)

CHEMISTRY

Question 4		(7 × 6 + 1 × 10)
Question 5	(a)	(6 × 3), (6), (2 × 3)
	(b)	(1 × 6 + 3)

Question 6	(a)	(i)	(4 × 3)		(ii)	(3)	
	(b)	(i)	(12)	(ii)	(6)	(iii)	(2 × 3)

PHYSICS

Question 7		(7 × 6 + 1 × 10)
Question 8	(a)	(6), (6), (6)
	(b)	(i) (6) (ii) (6)
	(c)	(3 × 3)
Question 9	(a)	(3 + 6)
	(b)	(3 + 6)
	(c)	(1 × 6 + 3)
	(d)	(4 × 3)

BIOLOGY

Question 1

(a) Lungs (3)

Rib cage (3)

(b) Freckled skin (3)
Tongue rolling (3)

I
I

(c) Sunlight / light / sun (3)
Phototropism (3)

(d) Eye (3)
Ear (3)

L

S

(e) Womb (3)
Egg (3)

B

A

(f) Snail / earthworm (3)
Thrush / frog (3)

(g) 36-37 ºC (3)
Illness / stress / pain / exercise / environment (qualified) (3)

(h) Rosebush (3)

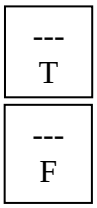
Aphid (greenfly) / ladybird / robin (3)

Greenfly population would increase (4)

Question 2

(a) **T**: Incisor

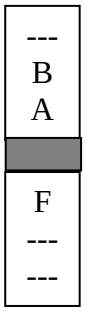
F: Biting



(2 × 3)

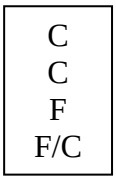
(b) **A**: Oesophagus
B: Stomach

F: Digestion



(3 × 3)

(c) (i) **F**: Cheese / burger



(ii) **C**: Bread / carrots / burger

(iii) Prevents constipation / absorbs water / peristalsis / helps (aids) digestion / helps move food along / provides bulk / prevents cancer *(**6 + 2** × **3**)

(d) **State or show** (any **4** × **3**)

De-starch plant (cover part of leaf /place in dark) / Test leaf for starch (before exposure to light)

Expose plant to light

Leave for a time

Boil in water

Remove chlorophyll / boil in alcohol

*Test leaf with iodine

Result:Iodine turns blue/black

* Compulsory point
[Marks awarded in context of valid experiment.]

Question 3

(a) **A**: Kidney

B: Bladder

Function of B: Stores (holds /collects) urine / releases urine

Waste Product produced by A: Urine

Other Waste Product: Urea / sweat / water / salts / carbon dioxide

(5 × 3)

(b)

A: Skull (cranium)
B: Collar bone (clavicle)

Any two of:

Support
Shape (structure / frame)
Protection
Movement
Production of blood cells (4 × 3)

(c)

Artery

Atrium

Left side has to pump blood around body / right side pumps only to lungs / pumps further (harder)

*(**6 + 2 × 3**)

CHEMISTRY

Question 4

(a) Coal (3)
Water (3)

F

P

(b) X: Hydrochloric acid / acid / named acid
(accept chemical formula) (3)
Y: Calcium Carbonate ($CaCO_3$) / limestone / marble chips / chalk /
any named carbonate or hydrogen carbonate / bread soda / washing soda /
(accept chemical formula) (3)

(c) **L**: Liquid **(**Middle) (2 × 3)
G: Gas (Lower)

L
G

(d) Al (3)
Cu (3)

(e) Carbon Dioxide (3)
Oxygen (3)

G

G

(f) Crude Oil / oil (3)
Do not break down / pollution / persist in the environment / cause litter /
unsightly / can damage wildlife (3)

(g) Compound (3)
Element (3)

(h) (i) B (3)

(ii) A (3)

Acids have pH less than 7 (4)
[Allow distilled water is neutral pH =7]

Question 5

(a)

A:	Round bottomed flask	**F**	(3)
B:	Thermometer	**D**	(3)
C:	Condenser	**C**	(3)
D:	Cold water in	**E**	(3)
E:	Beaker	**B**	(3)
F:	Bunsen	**A**	(3)

Distillation (6)

Cobalt chloride / (anhydrous) copper sulphate (3)

Blue to pink / white to blue (3)
[Matched colour changes]

(b) Hydrogen burns with a pop

Oxygen / O / O_2 ***(1 × 6 + 3)**

Question 6

(a)	(i)	Electrons	(3)
		Neutrons	(3)
		Protons	(3)
		Electrons	(3)
	(ii)	Ionic / electrovalent	(3)
(b)	(i)	Correct line on its own	
		5 points correctly plotted and join plotted points	(12)
		Award 2 marks for each correct point plotted	
		Award 2 marks for joining plotted points	
	(ii)	50 ± 2 / correct figure from student graph	(6)
	(iii)	Solubility increases	(3)
		with temperature	(3)

PHYSICS

Question 7

(a) Grip / traction / road holding / stopping (3)
Oiling / waxing / greasing / polishing / lubricants / bearings (3)

(b) Earth (3)
Fuse (3)

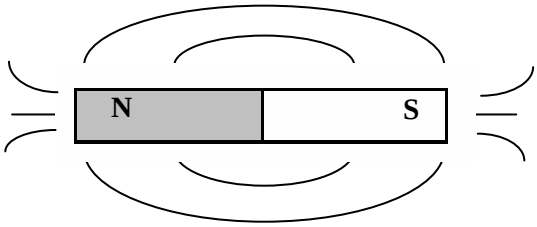
(c) 5 m/s (3)
10 m (3)

S

D

(d) Copper / Cu (3)
Resistor (3)

(e)



(2 × 3)

(f) Coal (3)
Oil (3)

N
N

(g) A (3)
Insulated /cotton wool kept in heat / B has no insulation (3)

(h) Balance / weighing scales (3)

2.1 (3)

g/cm^3 (4)

D

U

Question 8

(a) Spring balance / Newton meter (6)

Ruler / metre stick (6)
[Reference to adding weights – Allow 3 marks only]

Extension is proportional to force applied / as force is increased the extension increases directly (at the same rate) / indication of linearity (6)

[Extension increases with force (i.e. no indication of proportionality) – 3 marks only]

(b) (i) Sound will not travel through a vacuum / sound needs a medium (air) / light can travel through a vacuum / light doesn't need a medium (6)

(ii) Light can travel through a vacuum / light doesn't need a medium (6)

[Note: Answer to (i) and (ii) may be inverted but cannot use same answer twice]

(c) Eye protection / any valid use (3)

Ear protection (muffs, defenders) must be worn / protect your ears (3)

Protect ears (hearing) / prevent damage to hearing (3)

Question 9

(a) Measuring cylinder / graduated cylinder (3)

20 / 90 – 70 = 20 (6)

[If shown operation 90 – 70, Award 3 marks only]

(b) (i) $\boxed{\frac{\text{Force (F)}}{\text{Area (A)}}}$ / force ÷ area (f ÷ a) (3)

(ii) 4 / 20 ÷ 5 = 4 (6)

[If shown operation 20 ÷ 5, Award 3 marks only]

(c) 4

48 ***(1 × 6 + 3)**

[Correct use of an incorrect answer from first part merits marks]

(d) **State or show** **(4 × 3)**

Ball and ring apparatus

Ball fits through ring

Source of heat

Result / conclusion (Ball does not fit through ring)

[Marks awarded in context of valid experiment.
No diagram deduct 3 marks – diagram must include at least one label]

BIOLOGY – Marking Criteria for Coursework B

			Guide to mark assignment	
Section	**Aims**	**Total Mark**	Investigate the relationship between reaction temperature and the effectiveness of action of the enzyme amylase on starch	**O.L.**
Introduction	Clear statement of the problem/topic to be investigated, background research undertaken in preparation for the investigation: people, books, websites, etc. as sources of relevant information.	5	**Statement / identification of problem / topic to be investigated:** **Research:** Any reference to book / internet (web) / person consulted etc.	(3) (2)
Preparation and planning	Identification of variables and controls as required	20	**Variables / Controls :** Identify ***four*** variables, the **two essential** variables and any **two other** variables, and/or indicate how some of these need to be controlled or held fixed: <u>Essential Variables</u>: Temperature // Time taken for (effectiveness of) breakdown of starch <u>Other Variables</u>: source of enzyme (same / named) / volume of enzyme / mass (conc.) of enzyme / volume of starch / concentration (same) starch solution / same iodine / same pH (buffer) / same thermometer (temp. probe) / time sampling intervals / identical containers /	 (3) (3) (2 + 2)
	List of equipment needed for the investigation		**Equipment needed:** Identify any ***four*** pieces of equipment used: Containers / water bath / thermometer (temp. probe) / ice / starch solution / enzyme (amylase) solution / iodine solution (Fehling's / Benedict's Solns.) / droppers / labels / measuring cylinder (pipette) / white tile / balance (scales) / stopclock (timer)	(2 + 1 + 1 + 1)
	List of tasks to be carried out during the investigation		**List of tasks**: Identify any ***three*** tasks carried out in investigation: make up solutions / set (vary) temperature / mix solutions / take samples at time intervals / test samples (monitor) / record data / graph	(2 + 2 + 1)

Procedure	Procedure, apparatus, safety, data collection/observations ▪ Safety precautions required for this investigation ▪ Procedures followed in the investigation ▪ Recorded data/observations	20	**Safety:** Identify any ***two* specific** safety precautions followed in conducting the investigation **Procedure: <u>State or Show</u>** Identify any ***five*** steps taken in conducting investigation: label containers in water baths / set the temperature of water baths / repeat for different temperatures / make up solution of starch / make up solution of enzyme / measure starch solution into test tubes / add fixed amount of enzyme (solution) / add buffer / put containers in water bath / remove samples at time intervals / test with iodine (Benedict's / Fehlings) / record data / graph **Recorded Data / Observations:** Identify any ***two*** points related to method used: **Temperature** // **time taken** for colour change [Table presentation likely]	(3 + 2) (3 + 3 + 2 + 1 + 1) (3 + 2)
Analysis & Conclusions	Analysis ▪ Calculations/data analysis ▪ Conclusion(s) and evaluation of results(s)	20	**Calculations / Data analysis:** ***One*** relevant comment analysing data **or** calculation **or** graph Limited manipulation of data **OR** Good manipulation of data **Conclusion:** ***One*** relevant conclusion drawn **or** evaluation of results obtained Limited treatment **OR** Good treatment	 (7) (10) (7) (10)
Comment	Comments (e.g. refinements, extensions, sources of error etc.)	10	***One*** comment on **refinement / extension / source of error**: reliability of data / how process could be improved / sources of error / possible reason for unexpected result / possible extension of investigation Limited comprehension **OR** Good comprehension	 (7) (10)

CHEMISTRY – Marking Criteria for Coursework B

			Guide to mark assignment	
Section	**Aims**	**Total Mark**	Qualitatively investigate the effectiveness of three methods of preventing an object containing iron from corrosion	**O.L.**
Introduction	Clear statement of the problem/topic to be investigated, background research undertaken in preparation for the investigation: people, books, websites, etc. as sources of relevant information.	5	**Statement / identification of problem / topic to be investigated:** **Research:** Any reference to book / internet (web) / person consulted etc	(3) (2)
Preparation and planning	Identification of variables and controls as required	20	**Variables / Controls :** Identify ***four*** variables, the **two essential** variables and any **two other** variables, and/or indicate how some of these need to be controlled or held fixed: <u>Essential Variables</u>: Coating // Time taken for corrosion to occur / amount of corrosion <u>Other Variables</u>: Iron objects (fixed mass/size of object/exposed surface area) / same iron source samples (i.e. not different samples) / same conditions (temperature /exposure) / volume of coating (i.e. same treatments) / same containers / same amount of water / same time /	 (3) (3) (2 + 2)
	List of equipment needed for the investigation		**Equipment needed:** Identify any ***four*** pieces of equipment used: iron objects / containers / coating materials (e.g. paints / desiccants etc.)/ plating arrangements / measuring cylinder /paintbrush / water / balance / labels / sandpaper	 (2 + 1 + 1 + 1)
	List of tasks to be carried out during the investigation		**List of tasks**: Identify any ***three*** tasks carried out in investigation: coating / exposing / leave (time) / monitor / record data / graph	 (2 + 2 + 1)

Procedure	Procedure, apparatus, safety, data collection/observations ▪ Safety precautions required for this investigation ▪ Procedures followed in the investigation ▪ Recorded data/observations	20	**Safety:** Identify any ***two* specific** safety precautions followed in conducting the investigation **Procedure: <u>State or Show</u>** Identify any ***five*** steps taken in conducting investigation: Sanding / treatment 1 / treatment 2 / treatment 3 (galvanising is an acceptable treatment) / equality of coating / control / same volume (measure) water / label / adding iron object / set up in similar conditions (exposure/time) / describe monitoring process / repeat to verify / record data / graph **Recorded Data / Observations:** Identify any ***two*** points related to method used: indication of **type of coating** and **corrosion occurring/effectiveness of prevention** [Table presentation likely]	(3 + 2) (3 +3 + 2 + 1 + 1) (3 + 2)
Analysis & Conclusions	Analysis ▪ Calculations/data analysis ▪ Conclusion(s) and evaluation of results(s)	20	**Calculations / Data analysis:** ***One*** relevant comment analysing data **or** calculation **or** graph Limited manipulation of data **OR** Good manipulation of data **Conclusion:** ***One*** relevant conclusion drawn **or** evaluation of results obtained Limited treatment **OR** Good treatment	 (7) (10) (7) (10)
Comment	Comments (e.g. refinements, extensions, sources of error etc.)	10	***One*** comment on **refinement / extension / source of error** e.g. Reliability of data / how process could be improved / sources of error / possible reason for unexpected result / possible extension of the investigation Limited comprehension **OR** Good comprehension	 (7) (10)

PHYSICS – Marking Criteria for Coursework B

			Guide to mark assignment	
Section	**Aims**	**Total Mark**	Investigate the relationship between the size of the electric current passing through a length of wire and its heating effect	**O.L.**
Introduction	Clear statement of the problem/topic to be investigated, background research undertaken in preparation for the investigation: people, books, websites, etc. as sources of relevant information.	5	**Statement / identification of problem / topic to be investigated:** **Research:** Any reference to book / internet (web) / person consulted etc.	(3) (2)
Preparation and planning	Identification of variables and controls as required	20	**Variables / Controls:** Identify ***four*** variables, the **two essential** variables and any **two other** variables, and/or indicate how some of these need to be controlled or held fixed: <u>Essential Variables</u>: Current // Temperature <u>Other Variables</u>: Voltage / same run time / named wire / length of wire / diameter of wire / resistance of wire / volume (mass) of water / lagging (insulation) / container / same ammeter (multimeter) / same thermometer (temp. probe) / same start temperature	 (3) (3) (2 + 2)
	List of equipment needed for the investigation		**Equipment needed:** Identify any ***four*** pieces of equipment used: calorimeter (container) / thermometer (temp probe) / ammeter (multimeter) / connecting wires / water /lagging (insulation) / power supply (battery) / rheostat (potentiometer) (variable resistor) / balance (measuring cylinder) / stop clock (timer) / wire (nichrome) (heating coil)(coil of wire) / switch	 (2 + 1 + 1 + 1)
	List of tasks to be carried out during the investigation		**List of tasks**: Identify any ***three*** tasks carried out in investigation<u>:</u> same volume of water / set up circuit / measure (note) temperature change (rise) / repeat at different currents / record data / graph	 (2 + 2 + 1)

Procedure	Procedure, apparatus, safety, data collection/observations ▪ Safety precautions required for this investigation ▪ Procedures followed in the investigation ▪ Recorded data/observations	20	**Safety:** Identify any ***two* specific** safety precaution followed in conducting the investigation **Procedure: <u>State or Show</u>** Identify any ***five*** steps taken in conducting investigation: measure (cut) wire / measure same volume of water / add water to calorimeter (container) / put lagging on calorimeter / measure initial temperature / set up circuit / keep current constant (adjust rheostat) / stir water / run for fixed time / measure final temperature / replace water for next 'run' / repeat to get averages / repeat using different current value / record data / graph **Recorded Data / Observations:** Identify any ***two*** points related to method used: **temperature** increase // for **current** value [Table presentation likely]	(3 + 2) (3 +3 + 2 + 1 + 1) (3 + 2)
Analysis & Conclusions	Analysis ▪ Calculations/data analysis ▪ Conclusion(s) and evaluation of results(s)	20	**Calculations / Data analysis:** ***One*** relevant comment analysing data **or** calculation **or** graph Limited manipulation of data **OR** Good manipulation of data **Conclusion:** ***One*** relevant conclusion drawn **or** evaluation of results obtained Limited treatment **OR** Good treatment	 (7) (10) (7) (10)
Comment	Comments (e.g. refinements, extensions, sources of error etc.)	10	***One*** comment on **refinement / extension / source of error**: Reliability of data / how process could be improved / sources of error / possible reason for unexpected result / possible extension of the investigation Limited comprehension **OR** Good comprehension	 (7) (10)

OWN INVESTIGATION – Marking Criteria for Coursework B

Guide to mark assignment				
Section	**Aims**		**Total Mark**	**O.L.**
Introduction	Clear statement of the problem/topic to be investigated, background research undertaken in preparation for the investigation: people, books, websites, etc. as sources of relevant information.	10	**Statement / identification of problem / hypothesis statement / topic to be investigated:** (must elaborate on title) **Research:** Any ***two*** references to book / web / person consulted etc (must qualify why this person was a suitable consultant)	(6) (2 × 2)
Preparation and planning	Identification of variables and controls List of equipment needed for the investigation List of tasks to be carried out during the investigation	40	**Variables & Controls*:** Identify any ***four*** variables / controls: Must include **two** essential variables with respect to title. Any two other relevant variables **Equipment needed:** Identify any ***five*** pieces of equipment used **List of tasks:** Identify any ***three*** tasks carried out in investigation * If variables/controls not relevant to the type of investigation undertaken allow 10 marks for stating so and then readjust equipment to (5 × 3) and tasks to (3 × 5)	 (2 × 6) (2 × 4) (5 × 2) (4 + 4 + 2)
Procedure	Procedure, apparatus, safety, data collection/observations ▪ Safety precautions required for this investigation ▪ Procedures followed in the investigation ▪ Recorded data/observations	40	**Safety:** Identify any ***two*** safety precautions followed in conducting the investigation **Procedure:** State <u>or</u> Show Identify any ***eight*** steps taken in conducting investigation **Recorded Data / Observations:** Identify any ***two*** points related to method used [Table presentation likely]	(2 × 3) (8 × 3) (2 × 5)
Analysis & Conclusions	Analysis ▪ Calculations/data analysis ▪ Conclusion(s) and evaluation of results(s)	40	**Calculations / Data analysis:** ***Two*** relevant comments analysing data **or** calculation **or** graph Limited manipulation of data **OR** Good manipulation of data **Conclusion:** ***Two*** relevant conclusions drawn **or** evaluation of results obtained Limited treatment **OR** Good treatment	(7) (10) } × 2 (7) (10) } × 2
Comment	Comments (e.g. refinements, extensions, sources of error etc.)	20	***Three*** comments on **refinements / extensions / sources of error** e.g. What was learnt* / reliability of data / how process could be improved / sources of error / extension of investigation / possible reason for unexpected result * Other than conclusions already stated	(10 + 5 + 5)