Coimisiún na Scrúduithe Stáit

State Examinations Commission

JUNIOR CERTIFICATE EXAMINATION, 2006

SCIENCE (Revised Syllabus)

ORDINARY LEVEL

Marking Scheme

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 bold text is often used to 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 in bold, 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.

6. There is a deduction of one mark for each arithmetical slip made by a candidate in a calculation.

7. Cancelled &/or Repeated Answers

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

Junior Certificate Examination

SCIENCE

Ordinary Level

COURSEWORK A

Count the number of mandatory biology investigations/experiments claimed on page 5 of the Coursework booklet and enter it in the Coursework A grid on the cover page of the coursework booklet.

Count the number of mandatory chemistry investigations/experiments claimed on page 6 of the Coursework booklet and enter it in the Coursework A grid on the cover page of the coursework booklet.

Count the number of mandatory physics investigations/experiments claimed on page 7 of the Coursework booklet and enter it in the Coursework A grid on the cover page of the coursework booklet.

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. [See end of this document]. 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. [See end of this document]. Enter the marks for each section in the Coursework B grid on the cover page of the coursework booklet.

WRITTEN EXAMINATION PAPER

Three sections A, B, C. All questions to be answered by candidates.

Section A:	Biology	Question 1 (52 marks); Question 2 (39 marks); Question 3 (39 marks)
Section B:	Chemistry	Question 4 (52 marks); Question 5 (39 marks); Question 6 (39 marks)
Section C:	Physics	Question 7 (52 marks); Question 8 (39 marks); Question 9 (39 marks)

Apply the agreed marking scheme as detailed below.
Assistant Examiners should enter marks in Examiner Column 1.
Column 2 to be used by Advising Examiners in the monitoring of scripts.
Disallowed marks should be placed in square brackets i.e. "[]".

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 and the grade awarded indicated.

Grade	Marks
A	510 - 600
B	420 - 509
C	330 - 419
D	240 - 329
E	150 - 239
F	60 - 149
NG	0 - 59

Summary of Marking Scheme

SECTION A: BIOLOGY (130 MARKS)

Question 1 (52)

(a), (5 + 1); (b), (5 + 1); (c), (5 + 1); (d), (5 + 1); (e), (5 + 1); (f), (5 + 1); (g), (5 + 1); (h), (5 + 3 + 2)

Question 2 (39)

(a), (2 × 3); (b), (i), (5 + 1), (ii), (3), (iii), (3); (c), (i), (5 + 3 + 1), (ii), (3), (iii), (3 × 3)

Question 3 (39)

(a), (5 + 1), (3); (b), (i), (3), (ii), (3), (iii), (3), (iv), (3); (c), (i), (3), (ii), (3), (iii), (4 × 3)

SECTION B: CHEMISTRY (130 MARKS)

Question 4 (52)

(a), (5 + 1); (b), (5 + 1); (c), (5 + 1); (d), (5 + 1); (e), (5 + 1); (f), (5 + 1); (g), (5 + 1); (h), (5 + 3 + 2)

Question 6 (39)

(a), (5 + 1); (b), (i), (5 + 1), (ii), (6); (c), (6), (3); (d), (4 × 3)

SECTION C: PHYSICS (130 MARKS)

Question 7 (52)

(a), (5 + 1); (b), (5 + 1); (c), (5 + 1); (d), (5 + 1); (e), (5 + 1); (f), (5 + 1); (g), (5 + 1); (h), (5 + 3 + 2)

Question 8 (39)

(a), (i), (3), (3), (ii), (3); (b), (i), (3), (ii), (3), (iii), (3), (3); (c), (i), (3), (3), (ii), (3), (3); (d), (3), (3)

Question 9 (39)

(a), (i), (3), (ii), (3), (iii), (3); (b), (i), (2 × 3), (ii), (6+ 3), (iii), (3); (c), (3 × 3), (ii), (3)

Marking Scheme

SECTION A: BIOLOGY **(130 MARKS)**

Question 1 **(52)**

(a) **Pooter** (5 + 1)
Collecting / **sucking up** / **small animals (insects** / **named)**

(b) **Femur (thigh bone)** [Award 5 marks to all candidates – syllabus error] (5 + 1)
Brain / eye / inner ear [accept ear]

(c) **Petal** (5 + 1)
To collect **nectar** / **by the fragrance (smell** / **odour** / **scent)** / **colour**

(d) Right **atrium** / **auricle** (5 + 1)
Left **ventricle**

(e) **Ovary** [accept reference to egg / ovule] (5 + 1)
Womb / **uterus**

(f) **Incisor** (5 + 1)
Calcium [accept fluoride]

(g) **Bread** / **cereal** / **pasta** / **rice** / **potatoes** [accept example] (5 + 1)
Not good for health / **contains too much sugar (fat)**

(h) **Roots** (5 + 3 + 2)
Drops / **lowers**
To prevent evaporation (to prevent water loss)

Question 2 **(39)**

(a) **Plasma** (3)

White [accept platelets] (3)

(b) (i) **Trachea / windpipe** [accept rings of cartilage / cartilage] (5 + 1)

Alveolus / alveoli / airsac(s)

(ii) **Carbon dioxide** (3)

(iii) **Smoking** [accept exposure to named allergens] (3)

(c) (i) **A =** **Oesophagus** [accept food pipe / gullet] (5 + 3 + 1)

B = **Stomach**

C = **Large intestine** / **colon** / **bowel** [accept intestine]

(ii) **Digest food** / **breakdown food** / **to mix food** / **produce acid** / **produce enzymes** / **kill bacteria** / **holds food** (3)

(iii) **Iodine** (3)

Maltose [accept glucose or sugar] (3)

Fehling's reagent / **Benedict's reagent** (3)

Question 3 **(39)**

(a) **Wind / air** (5 + 1)
Self / explode

Space / water/ light / minerals (3)

(b) (i) **It's the only one with all the necessary conditions /**
[accept *Candidates give one valid reason why it germinates*] (3)

(ii) **To remove oxygen (air)** (3)

(iii) **Too cold / wrong temperature** (3)

(iv) **Only one thing changed at a time in each one / example of one thing done to make investigation fair** (3)

(c) (i) **Earthworm / woodlice / bacteria (named example) / dung beetle / fungi (named example)** (3)

(ii) **Cheese making / brewing / making antibiotics / baking / named valid example** (3)

(iii) State or show [award a maximum of any 4 × 3]
Petri dishes with (3)
Sterile nutrient **agar (medium)** (3)
Method of "infecting" / inoculate / add soil (3)
Growing culture / incubation / leave for a while (3)
Sterile **control / agar dish with no inoculation (soil)** (3)
Examination / observation (3)
[Marks awarded in context of valid experiment.
No diagram deduct 3 marks – diagram must include at least one label]

SECTION B: CHEMISTRY (130 MARKS)

Question 4 (52)

(a) **Tri-pod** stand (5 + 1)
Support objects for heating / **place Bunsen underneath**

(b) **Hydrogen** / **carbon** (5 + 1)
Carbon dioxide / **carbon monoxide** / **water** vapour / **steam** [accept correct formulae]

(c) **Air** (5 + 1)
Table salt

(d) **A (or indication of first one)** (5 + 1)
To keep it dry / **exclude moisture**

(e) **Positively** (5 + 1)
Negatively

(f) **Hydrogen** / **oxygen** [accept symbols] (5 + 1)
Anhydrous copper sulphate / **cobalt**(II) **chloride**

(g) **Oil** (5 + 1)
Do not break down in nature

(h) **Quenches** (5 + 3 + 2)
Carbon dioxide **doesn't support combustion** /
Carbon dioxide **is denser (heavier)** than air
Limewater

Question 5 **(39)**

(a) (i) **Distillation** (3)

(ii) **Water & dye**
Water & salt [accept water & alcohol or water & a suitable miscible liquid, water and a soluble solid or an insoluble solid] (3)

(iii) **Condenser** (3)

(iv) **Filtration / filtering** (3)

(b) **Covalent** (3)
Ionic / electrovalent (3)

(c) **Hydrogen** [accept symbol] //
Burns (ignites) with a "pop"("squeak") (6 + 3)

(d) (i) **Burette** (3)

(ii) **Sodium chloride** [accept table salt] (3)

(iii) **A / burette** (3)

(iv) **It changes colour** (3)

Question 6 **(39)**

(a) **Vinegar** (5 + 1)

Oven cleaner

[accept water for either or both answers]

(b) (i) **Hydrogen peroxide / H_2O_2** (5 + 1)

Manganese dioxide / MnO_2

(ii) **Catalyst** (6)

(c) **Re-ignites / lights** (6)

Oxygen supports combustion / substances burn in oxygen (3)

(d) State or show [any 4 × 3]

Dissolve solute (3)

In hot water (3)

Generate hot saturated solution / keep adding (add more) until no more dissolves (3)

Allow cool slowly (3)

Crystals grow (3)

[Marks awarded in context of valid experiment.

No labelled diagram deduct 3 marks]

OR

State or show [any 4 × 3]

Copper oxide & conc. **sulphuric acid** (3)

Filter (3)

Heat aqueous solution / Generate hot saturated solution (3)

Allow cool slowly (3)

Crystals grow (3)

[Marks awarded in context of valid experiment.

No labelled diagram deduct 3 marks]

SECTION C: PHYSICS **(130 MARKS)**

Question 7 **(52)**

(a) **24** (5 + 1)
cm^2

(b) **Graduated cylinder / measuring cylinder** (5 + 1)
15

(c) **Convection** (5 + 1)
Radiation

(d) **Static electricity** [accept electrical] (5 + 1)
Light travels faster than sound

(e) **C** (5 + 1)
Melting

(f) **Force** (on top) **& Area** (on bottom) (5 + 1)
Barometer [accept pressure gauge / pressure monitor]

(g) **Nothing / card / no light** (5 + 1)
Light travels in straight lines

(h) **Two correctly drawn lines (one above <u>and</u> one below)** (5 + 3 + 2)
Fridge magnets / in motors / in speakers [general answers must be qualified]

Question 8 **(39)**

(a) (i) **Earth** [accept E or correct colours] (3)

Live [accept L or correct colour] (3)

(ii) **To prevent shock (electrocution)** / **safety** / **insulates** (3)

(b) (i) **Cooker / kettle / toaster / washing machine / dish washer** [accept vacuum cleaner or any appliance with a heating element or any heavy power tool] (3)

(ii) **Reading lamp** / **radio** / **television** (3)

(iii) **20** kWh (3)

[allow 2 marks for $2.5 \times 2 \times 4$]

240 cent (3)

[allow 3 marks for correct operation on incorrect answer to first part]

[allow 2 marks for 20×12]

(c) (i) **Bulb lights** (3)

The circuit is closed / **material conducts** / **completes circuit** (3)

(ii) **Bulb doesn't light** / **nothing happens** (3)

The circuit is still broken / **the material doesn't conduct** (3)

(d) **Diode inserted forward bias** (3)

Protect the led / **limit current** (3)

Question 9 **(39)**

(a) (i) **Gravity** / **weight** / **push** / **pull** / **magnetic** / **electric** / **twist** (3)

(ii) **Oiling** / **lubrication** / **wax** / **polish** / ball **bearings** (3)

(iii) **Newton** (3)

(b) (i) **Add (hang) weight** (3)

Measure extension using metre stick (3)

(ii) **All points plotted** (6)

[allow 3 marks for 3 correctly plotted points]

Straight line drawn (3)

(iii) **3** N [accept 2.8 to 3.2 *or* incorrect value correctly deduced from their graph] (3)

(c) (i) State or show

Nut (some combustible material) ignited / **lighting Bunsen burner** (3)

Heating something (e.g. beaker of water) (3)

Method of detecting (proving that it is) heating e.g. thermometer (3)

[No labelled diagram deduct 3 marks]

OR

Circuit containing battery and heating coil (bulb) (3)

Heating something e.g. container of water (3)

Method of detecting (proving that it is) heating e.g. thermometer (bulb feels hot) (3)

[Marks awarded in context of valid experiment.]

[No labelled diagram deduct 3 marks]

(ii) **Electric car (e.g. Smart** / **Prius)** / **Device containing electric motor** / **tv** (3)

BIOLOGY – Marking Criteria for Coursework B

Guide to mark assignment				
Section	**Aims**	**Total Mark**	**Germination**	**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 / web / person consulted etc	(3) (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	20	**Variables & Controls:** Identify any ***three*** variables / controls: e.g. Number of peas / length of time peas left soaking / amount of water used in soaking / temperature at which seeds were left to germinate / volume of water added during growth period / time taken for radicle to emerge Identify control e.g. set of peas left un-soaked **Equipment needed:** Identify any ***three*** pieces of equipment used e.g. peas / growth containers / growth medium / water / labels / graduated cylinder **List of tasks:** Identify any ***two*** tasks carried out in investigation e.g. soaking of peas / set up / monitoring / noting results	(4 + 3 + 3) (2 + 2 + 1) (3 + 2)
Procedure	Procedure, apparatus, safety, data collection/observations 1. Safety precautions required for this investigation 2. Procedures followed in the investigation 3. Recorded data/observations	20	**Safety:** Identify any ***one*** safety precaution followed in conducting the investigation **Procedure:** State <u>or</u> Show Identify any ***five*** steps taken in conducting investigation e.g. soaking one set of seeds / leaving one set of seeds un-soaked / number of seeds / leave peas soaking for time period / preparation of growth container / addition of seeds / stated growth condition – same temperature / stated growth condition – add same amount water /	(5) (5 × 2)

			observation of results **Recorded Data / Observations:** Valid data or observations (related to method used) e.g. Time taken for soaked seeds to germinate / time taken for un-soaked seeds to germinate / number of soaked seeds that germinate / number of un-soaked seeds that germinate	(5)
Analysis & Conclusions	Analysis 1. Calculations/data analysis 2. 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*** comments on **refinements / extensions / sources of error** e.g. What was learnt* / reliability of data / how process could be improved / sources of error / possible reason for unexpected result	(10)

* Other than the conclusions already stated

CHEMISTRY – Marking Criteria for Coursework B

Guide to mark assignment				
Section	**Aims**	**Total Mark**	**Indicators**	**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 / web / person consulted etc	(3) (2)
Preparation and planning	Identification of variables and controls	20	**Variables & Control:** Identify any ***three*** variables/controls: e.g. test acid / test base / conc of acid / conc of base / vol of acid / vol of base / extraction technique / vol of indicator added / mass of plant material Identify control e.g. test acid & base with known indicator	(4 + 3+ 3)
	List of equipment needed for the investigation		**Equipment needed:** Identify any ***three*** pieces of equipment used e.g. different plants / mortar and pestle / filter paper & funnel / test tubes / Bunsen burner / Water / Ref. acid & ref. base	(2 + 2 + 1)
	List of tasks to be carried out during the investigation		**List of tasks:** Identify any ***two*** tasks carried out in investigation e.g. steps to extract plant pigment / set up / observing colour changes	(3 + 2)
Procedure	Procedure, apparatus, safety, data collection/observations 4. Safety precautions required for this investigation 5. Procedures followed in the investigation 6. Recorded data/observations	20	**Safety:** Identify any ***one*** safety precaution followed in conducting the investigation **Procedure:** State <u>or</u> Show Identify any ***five*** steps taken in conducting investigation e.g. obtaining plant / cutting, chopping etc / addition of solvent / heating / filtering setting up test solutions / addition of indicator / observation of results / repeat **Recorded Data / Observations:** Valid data or observation(s) presented (related to method used) e.g. state the pigment changes colour / the colour change for each pigment in acid / colour change for each pigment in base / colour range of one pigment in solutions	(5) (5 × 2) (5)

			with different pH values / colour change for one pigment in different acids & bases	
Analysis & Conclusions	Analysis* 3. Calculations/data analysis 4. 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*** comments on **refinements / extensions / sources of error** e.g. What was learnt* / reliability of data / how process could be improved / sources of error / possible reason for unexpected result	(10)

* Other than the conclusions already stated

PHYSICS – Marking Criteria for Coursework B

Guide to mark assignment				
Section	**Aims**	**Total Mark**	**Squash Ball**	**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 / web / person consulted etc	(3) (2)
Preparation and planning	Identification of variables and controls	20	**Variables & Controls:** Identify any ***three*** variables / controls: e.g. same ball / floor (surface) / height / method of release / method of measurement of bounce height / length of time heating at a given temperature / method of keeping all hot / time between heating and release of ball Identify control e.g. height of bounce of unheated ball (ball at room temperature)	(4 + 3 + 3)
	List of equipment needed for the investigation		**Equipment needed:** Identify any ***three*** pieces of equipment used e.g. ball / metre stick / water bath / thermometer / beaker / fridge / water / camera / motion sensor	(2 + 2 + 1)
	List of tasks to be carried out during the investigation		**List of tasks:** Identify any ***two*** tasks carried out in investigation e.g. obtaining squash ball / heating / cooling / release of ball / measuring height of bounce	(3 + 2)
Procedure	Procedure, apparatus, safety, data collection/observations 7. Safety precautions required for this investigation 8. Procedures followed in the investigation 9. Recorded data/observations	20	**Safety:** Identify any ***one*** safety precaution followed in conducting the investigation **Procedure:** State <u>or</u> Show Identify any ***five*** steps taken in conducting investigation e.g. release ball at room temperature / measure height of bounce at room	(5) (5 × 2)

			temperature / heat ball / cool ball / release ball / measure height of bounce of heated ball / repeat at various temperatures / record results / repeat to verify **Recorded Data / Observations:** Valid data or observation(s) presented (points related to method used) e.g. temperature of the ball / height of bounce	(5)
Analysis & Conclusions	Analysis 5. Calculations/data analysis 6. 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*** comments on **refinements / extensions / sources of error** e.g. What was learnt* / reliability of data / how process could be improved / sources of error / possible reason for unexpected result	(10)

* Other than the conclusions already stated

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:** **Research:** Any ***two*** references to book / web / person consulted etc	(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: **Equipment needed:** Identify any ***five*** pieces of equipment used **List of tasks:** Identify any ***three*** tasks carried out in investigation	(4 × 5) (5 × 2) (4 + 4 + 2)
Procedure	Procedure, apparatus, safety, data collection/observations 10. Safety precautions required for this investigation 11. Procedures followed in the investigation 12. Recorded data/observations	40	**Safety:** Identify any ***two*** safety precaution 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	(2 × 3) (8 × 3) (2 × 5)
Analysis & Conclusions	Analysis 7. Calculations/data analysis 8. Conclusion(s) and evaluation of results(s)	40	**Calculations / Data analysis:** ***Two*** relevant comment analysing data **or** calculation **or** graph Limited manipulation of data **OR** Good manipulation of data **Conclusion:** ***Two*** relevant conclusion 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 / possible reason for unexpected result	(10 + 5 + 5)

* Other than the conclusions already stated