Coimisiún na Scrúduithe Stáit
State Examinations Commission

Junior Certificate 2014

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.

General Points regarding the Marking Scheme

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.

SCIENCE ORDINARY LEVEL 2014

Summary of Marking Scheme

BIOLOGY

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

CHEMISTRY

Question 4		(7 × 6 + 1 × 10)
Question 5	(a)	(4 × 3 + 6 + 3)
	(b)	(4 × 3 + 6)
Question 6	(a)	(3 × 3 + 6)
	(b)	(2 × 3 + 6)
	(c)	(12)

PHYSICS

Question 7		(7 × 6 + 1 × 10)
Question 8	(a)	(3 × 3)
	(b)	(2 × 3 + 6)
	(c)	(12), (2 × 3)
Question 9	(a)	(6 + 3 × 3)
	(b)	(3 × 3)
	(c)	(6 + 3 × 3)

BIOLOGY

Question 1

(a) Canine (3)

Tearing /cutting (3)

(b) **O** – Red blood cells (3)

F – White blood cells (3)

O

F

(c) **A** – Lens (3)

Carry message (image / nerve impulse) to brain (3)

(d) **S** – Bread, Potato (2 × 3)

S

S

(e) Any **two** of:

Bacteria / fungi / viruses / named micro-organism (2 × 3)

(f) Ovary (3)

Ovum / egg (3)

(g) Any correct plant e.g. sycamore / ash / grass / dandelion etc (3)

Any **one** of: animal / water / self (explosion) (3)

(h) **A** – Petal (3)

B – Stamen (3)

A
B

Produces pollen / male gamete *(4)

Question 2

(a) **A** – Eyepiece (3)

Part – B / Stage (3)

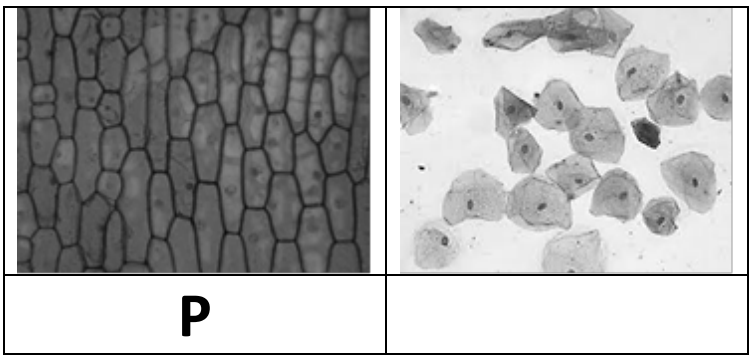
Function – to focus / move stage (B) up and down (3)

T – 400

T

(3)

(3)



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Bonus 3 for all parts of (a) correct

(b) **A** – Kidney (3)

B – Bladder (3)

Function of B – Stores (holds) urine / releases urine (3)

C – Renal (3)

(c) Limewater (3)

Turns milky (cloudy / white / chalky) (3)

Bonus 3 for all parts of (c) correct

Question 3

(a) Water level drops (3)

To prevent evaporation (3)

Plant – A (3)

Plant in beaker A has more leaves (3)

(b) (i) Place tube over animal // suck through tube with gauze (2 × 3)

Any valid piece of equipment e.g. pit fall trap, quadrat, transect, beating tray etc. (3)

(c) (i) **A** – Skull (3)

B – Ribs (3)

C – Backbone / vertebrae / spine (3)

(ii) Brain / eyes / ears (3)

Support (shape) / movement / blood cell production *(6)

CHEMISTRY

Question 4

(a) Filtration (3)

Sand and water / soil and water / any mixture of an insoluble solid and liquid (3)

(b) Strong / light / durable / any valid advantage (3)

Non-biodegradable (doesn't break down easily) / causes pollution / any valid disadvantage (3)

(c) Zinc / iron / calcium / any valid metal (3)

Burns with a pop (3)

(d) **C** – Manganese dioxide

C

*(6)

(e) Methane (3)

Nitrogen (3)

(f) H_2O (3)

Hydrogen (3)

(g) **Outside the nucleus**: Electron (3)

No charge: Neutron (3)

(h) **A** – Beaker

A

B

(3)

B – Pipette (3)

B / Pipette *(4)

Question 5

(a) (i) **I** – Fe

I
----

(3)

(ii) Removes moisture (water) (3)

To prevent oxygen (air) entering (3)

No oxygen (air) (3)

Both moisture (water) and oxygen (air) present (3)

Bonus 3 for all parts of (a) correct

(iii) Galvanising / painting / plastic coating (3)

(b) (i) Black coffee (3)

(ii) Any **one** of: (3)

Sea water / baking soda / milk of magnesia / ammonia solution / soapy water / oven cleaner

(iii) Distilled water (3)

(iv) **R** – Neutralisation

R

(3)

(v) Wear goggles / gloves / lab coat / any valid safety precaution (3)

Bonus 3 for all parts of (b) correct

Question 6

(a) (i) Non-metal (3)

(ii) Yellow (3)

(iii) Iron sticks to magnet / sulphur doesn't stick (3)

(iv) Nothing / It doesn't stick to it *(6)

(b) Fluoride (3)

Kills bacteria (3)

Calcium / magnesium *(6)

(c) **State or show** (4 × 3)

[Marks awarded in the context of a valid experiment.]

Equal volume of water samples in container

Add soap (flakes)

Shake to form lather

Result

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

PHYSICS

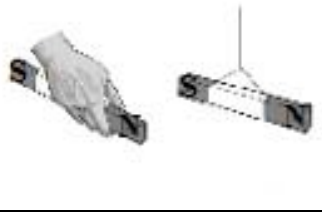
Question 7

(a)	Distance ÷ time	(2 × 3)
(b)	Measuring tape / metre stick / trundle wheel	(3)
	20	(3)
(c)	Prism	(3)
	Made up of different colours	(3)
(d)	Thermometer	(3)
	100 ºC	(3)
(e)	Bulb lights	(3)
	Metal / any named metal / graphite	(3)
(f)	Any **two** of:	
	Coal / oil / natural gas / peat	(2 × 3)
(g)	2	(3)
	Ammeter	(3)
(h)	Bunsen burner / hairdryer / hot plate	(3)
	Rises / goes up	(3)
	Water (liquid) expands when heated	*(4)

Question 8

(a) (i) Magnet won't stick to it / wood is not attracted to a magnet (3)

(ii) (2 × 3)

	
A	**R**

(b) (i) Measuring (graduated) cylinder (3)

(ii) 10 ± 2 (3)

(iii) 2 *(6)

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

Award 2 marks for each correct point plotted

Award 2 marks for joining plotted points

(ii) 7.5 ± 0.5 / correct figure from candidate's graph (3)

(iii) Spring breaks / won't return to original shape / stand falls over / spring exceeds elastic limit (3)

Question 9

(a) (i) Gravity / weight (3)

(ii) Potential // (2 × 3)
Kinetic

(iii) Increase (3)

Bonus 3 for all parts of (a) correct

(b) (i) a.c. (3)

(ii) **F** – Live

F

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(3)

(iii) **V** – 230 V

V

(3)

(c) (i) Light travels faster than sound (3)

(ii) Sound reflects (bounces) off wall (3)

(iii) **M** – Vibration

M
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(3)

(iv) Damaged hearing / hearing loss / deafness (3)

Bonus 3 for all parts of (c) correct

Marking Criteria for Coursework B (OL) - BIOLOGY

	Guide to mark assignment	
Total Marks	**Investigate and compare the effects of pH on the catalytic effect of the enzyme *catalase*, found in (a) celery and (b) animal liver, on the rate of breakdown of hydrogen peroxide.**	**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 five variables (two compulsory variables and any three other variables) and/or indicate how some of these need to be controlled or held fixed* *Compulsory variables* • pH • type of tissue (celery or liver) *Other variables (any three)* • volume/height/mass of gas/lather produced • time/rate • temperature • volume/mass/concentration/dimension of tissue/catalase used • volume/mass of buffer solution used • volume/mass of soap (solution) used • volume/mass of hydrogen peroxide used • concentration of hydrogen peroxide used • size/shape of container **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 four tasks carried out in investigation* • procure tissues and/or solutions • fix pH (e.g. by adding buffer solution) • add hydrogen peroxide to tissue • measure factor indicative of rate (measure change in volume/height/mass for chosen time *or* measure time for chosen change in volume/height/mass) • record/graph data • repeat for other pHs • repeat for second tissue	 (2 + 2) (2 + 2 + 2) (5 × 1) (2 + 1 + 1 + 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* • chop/prepare tissue • measure volume of hydrogen peroxide solution • measure mass/volume/dimension of tissue • measure volume of buffer solution • measure mass/volume of soap (solution) • measure/note pH of buffer solution and/or mixture • set up apparatus to collect and/or measure gas produced • place solutions in water bath / measure temperature • mix solutions and tissue • measure volume/height/mass of gas produced • measure time taken • record/graph data • clean/dry equipment for reuse • repeat for same pH and tissue (to verify data) • repeat for different pH • repeat for different tissue • calculate rates of reactions **3 (iv) Recorded Data / Observations** *Identify <u>two</u> data sets* • effect of pH for celery catalase • effect of pH for liver catalase	(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)* • Limited manipulation/presentation of data • Good manipulation/presentation of data • Excellent manipulation/presentation of data **4 (ii) Conclusion(s) and Evaluation of Result(s)** *Relevant conclusion(s) drawn and evaluation of result(s)* • Limited treatment • Good treatment • Excellent treatment	(4) (7) (10) (4) (7) (10)
10	**<u>Comments</u>** *Any <u>two</u> comments on refinement or extension or source of error etc.* • Good comprehension • Excellent comprehension	(3) (5) } × 2

Marking Criteria for Coursework B (OL) - CHEMISTRY

	Guide to mark assignment	
Total Marks	**Investigate and compare how the solubilities, in water, of (a) potassium chloride and (b) sodium carbonate (anhydrous) change with temperature.**	**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 (two compulsory variables and any two other variables) and/or indicate how some of these need to be controlled or held fixed* *Compulsory variables* • temperature • type of salt (potassium chloride or sodium carbonate) *Other variables (any two)* • volume of water used • mass of salt used • concentration/solubility of salt • size/shape of container **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 four tasks carried out in investigation* • procure salts • heat water • mix salt and water • measure factor indicative of solubility (measure maximum mass dissolved in chosen volume at chosen temperature *or* measure minimum volume needed to dissolve chosen mass at chosen temperature *or* measure minimum temperature needed to dissolve chosen mass in chosen volume) • record/graph data • repeat for other temperatures • repeat for second salt	 (3 + 3) (2 + 2) (5 × 1) (2 + 1 + 1 + 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* • measure mass of salt used • measure volume of water/solution • measure temperature of solution • heat water/solution • cool water/solution (or allow to cool) • grind salt • mix salt and water • stir to dissolve salt in water • note saturation of solution • record/graph data • clean/dry equipment for reuse • repeat for same salt/mass/volume/temperature (to verify data) • repeat for different mass/volume/temperature • repeat for different salt • calculate solubilities **3 (iv) Recorded Data / Observations** *Identify <u>two</u> data sets* • solubility of potassium chloride • solubility of sodium carbonate	(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)* • Limited manipulation/presentation of data • Good manipulation/presentation of data • Excellent manipulation/presentation of data **4 (ii) Conclusion(s) and Evaluation of Result(s)** *Relevant conclusion(s) drawn and evaluation of result(s)* • Limited treatment • Good treatment • Excellent treatment	(4) (7) (10) (4) (7) (10)
10	**<u>Comments</u>** *Any <u>two</u> comments on refinement or extension or source of error etc.* • Good comprehension • Excellent comprehension	(3) (5) } × 2

Marking Criteria for Coursework B (OL) - PHYSICS

	Guide to mark assignment	
Total Marks	**Investigate and compare how the rates of flow of powdered or granulated solids through a funnel are affected by (a) the size of the solid particles and (b) any one of the funnel dimensions.**	**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 (<u>two</u> compulsory variables and any <u>two</u> other variables) and/or indicate how some of these need to be controlled or held fixed* *Compulsory variables* • one named funnel dimension (which is varied) • varying particle size (*accept "different solid"*) *Other variables (any two)* • mass/volume/number of particles • time/rate • one <u>other</u> named funnel dimension (which is not varied) (*accept "same funnel"*) • pouring height • same solid (*as control*) **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>four</u> tasks carried out in investigation* • procure solids • arrange funnels suitably • allow solid particles to flow through funnel • measure factor indicative of rate (measure change in volume/mass/number of particles for chosen time *or* measure time for chosen change in volume/mass/number of particles) • record/graph data • repeat for other solids • repeat for other funnel dimensions	 (3 + 3) (2 + 2) (5 × 1) (2 + 1 + 1 + 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* • construct funnel(s) • measure (varying) funnel dimension • measure particle size • clamp funnel in place • test particle flow • place solid particles in funnel • prevent solid particles from flowing • allow solid particles to flow • measure volume/mass/number of particles • measure time • record/graph data • clean/dry equipment for reuse • repeat for same funnel dimension and solid (to verify data) • repeat for different solid particle size • repeat for different funnel dimension • calculate rates of flow **3 (iv) Recorded Data / Observations** *Identify <u>two</u> data sets* • rate for varied particle size • rate for varied funnel dimension	(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)* • Limited manipulation/presentation of data • Good manipulation/presentation of data • Excellent manipulation/presentation of data **4 (ii) Conclusion(s) and Evaluation of Result(s)** *Relevant conclusion(s) drawn and evaluation of result(s)* • Limited treatment • Good treatment • Excellent treatment	(4) (7) (10) (4) (7) (10)
10	**<u>Comments</u>** *Any <u>two</u> comments on refinement or extension or source of error etc.* • Good comprehension • Excellent comprehension	(3) (5) } × 2

Marking Criteria for Coursework B (OL) – OWN INVESTIGATION

10	**<u>Introduction to the investigation</u>** **1 (i) Statement/identification of problem/topic to be investigated** • Limited treatment • Good treatment • Excellent treatment **1 (ii) Background research** *Any <u>two</u> references to book or internet or person consulted or evidence of research*	 (2) (4) (6) (2 + 2)
40	**<u>Preparation and planning</u>** **2 (i) Identify any relevant variables and necessary controls** *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* [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)] **2 (ii) List of the equipment needed for the investigation** *Identify any <u>eight</u> pieces of equipment pertinent to procedure* **2 (iii) List of tasks to be carried out during the investigation** *Identify any <u>six</u> tasks carried out in investigation*	 (4 + 4) (6 × 2) (8 × 1) (6 × 2)
40	**<u>Procedure, Apparatus, Safety, Data Collection/Observations</u>** **3 (i) Safety precautions** *Identify any <u>four</u> specific safety precautions followed* **3 (ii) & (iii) Procedure followed in the investigation** *(state or show)* *Identify any <u>twelve</u> steps taken in conducting investigation* **3 (iv) Recorded Data / Observations** *Identify <u>eight</u> data points*	 (4 × 2) (4 × 3) + (4 × 2) + (4 × 1) (8 × 1)
40	**<u>Analysis</u>** **4 (i) Calculations / Data analysis** *<u>Two</u> relevant analyses of data or calculations or graph(s)* • Limited manipulation/presentation of data • Good manipulation/presentation of data • Excellent manipulation/presentation of data **4 (ii) Conclusion(s) and Evaluation of Result(s)** *<u>Two</u> relevant conclusions drawn and evaluation of results* • Limited treatment • Good treatment • Excellent treatment	 (4) (7) (10) } × 2 (4) (7) (10) } × 2
20	**<u>Comments</u>** *Any <u>four</u> comments on refinement or extension or source of error etc.* • Limited comprehension • Good comprehension • Excellent comprehension	 (1) (3) (5) } × 4