Coimisiún na Scrúduithe Stáit
State Examinations Commission

Junior Certificate 2013

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.

SCIENCE ORDINARY LEVEL 2013

Summary of Marking Scheme

BIOLOGY

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

CHEMISTRY

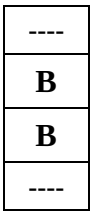
Question 4		(7 × 6 + 1 × 10)
Question 5	(a)	(2 × 3)
	(b)	(4 × 3 + 3)
	(c)	(5 × 3 + 3)
Question 6	(a)	(2 × 3)
	(b)	(3 × 3 + 6 + 3)
	(c)	(12), (3)

PHYSICS

Question 7		(7 × 6 + 1 × 10)
Question 8	(a)	(3 × 3)
	(b)	(5 × 3 + 3)
	(c)	(3 × 3 + 3)
Question 9	(a)	(4 × 3)
	(b)	(5 × 3 + 3)
	(c)	(2 × 3 + 3)

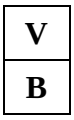
BIOLOGY

Question 1



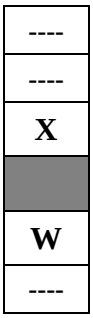
(a) **B** – Nucleus (3)

B – Cell Membrane (3)



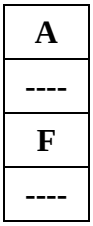
(b) **B** – Appendicitis (3)

V – Common cold (3)



(c) **X** – Kidney (3)

W – Urine (3)



(d) **A** – Penis (3)

F – Produces sperm (3)

(e) **X** – Brain *(6)

(f) Stamen / anther (3)

W – Grass (3)

(g) Root (3)

Water level drops (lowers / falls) (3)

(h) Bread / rice (3)

Chicken / fish (3)

Butter / fish *(4)

Question 2

(a) **T**: Incisor

M: Calcium

T

M

(2 × 3)

(b)

A: Oesophagus

B: Intestine

F: Digestion

B
A

F

(3 × 3)

(c)

(i) Fat (3)

(ii) Blue (3)

Yes (3)

(Reducing) sugar / sugar (3)

(d) **State or show** (4 × 3)

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

Container of water

Burn food

Thermometer / temperature sensor

Result

Relevant labelled diagram
[Diagram must have at least <u>one</u> label – no labelled diagram – deduct [3] marks]

Question 3

(a) **Producer**: Grain (3)

Herbivore: Rabbit (3)

E – Increase

E
----

(3)

(b) (i) **A** – Pooter (3)

Use of A – Collect insects / small animals / named valid animal (3)

B – Pit fall trap (3)

Use of B – Collect animals or named valid animal (3)

(ii) Any ***two*** from

Reduce // reuse // recycle // avoid pollution // no littering // use unleaded petrol // use smokeless fuels // waste management // control emissions // any valid measure (2 × 3)

(c) *(3 × 3 + 3)

Left

Up

G – Phototropism

G

CHEMISTRY

Question 4

(a) Bunsen burner (3)

Heating / burning (3)

(b) Red (3)

Oven cleaner (3)

(c) Filtration (3)

Y / beaker (3)

(d) **R** – Screening (3)

A – Chlorination (3)

R

A

(e) Steel / bronze / brass (3)

Any correct use (must match) (3)

(f) Compounds (3)

Mixtures (3)

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

Proton: Inside the nucleus (3)

(h) **A**: Pipette (3)

B: Burette (3)

Product: Sodium chloride (NaCl) *(4)

Question 5

(a)

	
H	**C**

(2 × 3)

(b) *(4 × 3 + 3)

(i) Carbon dioxide

(ii) Nitrogen

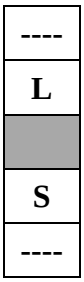
(iii) Oxygen

(iv) Water vapour

(c) *(5 × 3 + 3)

(i) **Liquid L**: Hydrochloric acid

(ii) **Solid S**: Marble chips



(iii) Award 3 marks to all candidates.

(iv) Limewater

(v) Photosynthesis / fizzy drinks / fire extinguishers / refrigeration / dry ice / smoke effects / any valid use

Question 6

(a) (i) Chromatography (3)

(ii) Water (H_2O) / named solvent (3)

(b) *(3 × 3 + 6 + 3)

(i) Distillation

(ii) Thermometer

(iii) (Liebig) condenser

(iv) Salt and water / alcohol and water / sand (soil) and water

(c) (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) 40 ± 2 / correct figure from candidate's graph (3)

PHYSICS

Question 7

(a) **A** – Measuring cylinder / graduated cylinder (3)

Volume – 20 ± 1 (3)

(b) **Boils** – 100 ^{o}C (3)

Freezes – 0 ^{o}C (3)

(c) Radiation (3)

Conduction (3)

(d) B (3)

Reflection (3)

(e)

U
C

U - kWh (3)

C - €2.00 (3)

(f) Renewable (3)

Not as efficient / expensive to install / weather dependent / any valid disadvantage (3)

(g) A (3)

Insulated with cotton wool (3)

(h)

V

D

Balance / scales (3)

V – 30 cm^3 (3)

D – 2 g/cm^3 *(4)

Question 8

(a) B (3)

Live (3)

Protection / safety / insulate / prevent shock (electrocution) / break circuit / prevent excess current (overload) / prevent fire (3)

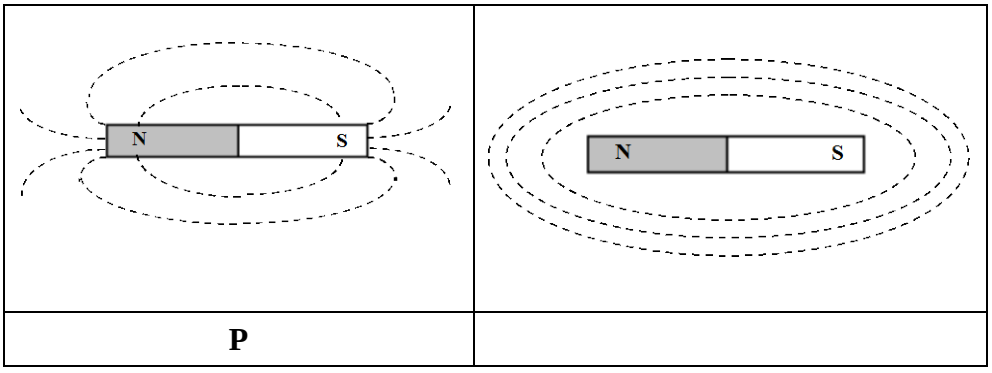
(b) *(5 × 3 + 3)

(i) **N** – North

Attract / cling / move towards

(ii)

Iron filings / plotting compass



P

(iii) Iron / nickel / cobalt / steel / alloys of

(c) *(3 × 3 + 3)

(i) Metals expand

(ii) Yes

The ball has contracted

Question 9

(a) Chemical (3)

Heat (3)

Potential (3)

Kinetic (3)

(b) *(5 × 3 + 3)

Battery

Gets hot / glows / melts / breaks / expands

Bulb / buzzer / bell / LED / ammeter /
galvanometer / motor / any valid device

Any ***two*** valid appliances e.g.

heater // iron // kettle // immersion // tumble drier //
washing machine // dishwasher

(c) *(2 × 3 + 3)

Less

Ohm

BIOLOGY – Marking Criteria for Coursework B

		Guide to mark assignment	
Section	**Total Mark**	**Compare by means of investigation the vitamin C content of a number of commercial and fresh fruit juices.**	**O.L.**
Introduction	5	**1 (i) Statement / identification of problem / topic to be investigated:** **1 (ii) Research:** Any reference to book / internet (web) / person consulted etc. / evidence of research	(3) (2)

Preparation and planning	20	**2 (i) Variables / Controls :**
		Identify ***four*** variables, the **one compulsory** variable and any **three other variables**, and/or indicate how some of these need to be controlled or held fixed.
		
		Compulsory Variable:
		Types of fruit juices
		
		Other Variables:
		Volume of fruit juice // <u>volume</u> of test reagent: DCPIP / starch and iodine / iodine & thiosulfate / fruit juice / vitamin C (Ascorbic acid) // vitamin C content // same treatment of juice // same concentration of test reagent (not vitamin C) // same method of adding test reagent e.g. droppers / burettes // same containers
		
		2 (ii) Equipment needed:
		Identify any ***five*** pieces of equipment used:
		Fruit juices // test reagent // water // vitamin C // containers // test tubes // test tube rack // droppers // syringes // mortar and pestle // graduated cylinder (burette / pipette) // fruit juicer // beakers // sieve (filter paper and funnel) // dimpled tile // stirrer // Any valid piece of equipment pertinent to procedure (except safety equipment)
		
		2 (iii) List of tasks:
		Identify any **three** tasks carried out in investigation:
		Procure fruit juices (fruit) // process (make) fruit juices // get (make) test reagent // fixed volume of test reagent ***or*** juice // add juice to test reagent in container ***or*** test reagent to juice // measure amount of solution added // record data
			(3)
			
			(3 + 2 + 2)
			
			(5 × 1)
			
			(2 + 2 + 1)

Procedure	20	**3 (i) Safety:** Identify any ***two*** **specific** safety precautions followed in conducting the investigation **3 (ii) & (iii) Procedure: <u>State or Show</u>** Identify any ***five*** steps taken in conducting investigation: Obtain commercial juice(s) // obtain fruit(s) // make fresh fruit juice(s) // make (get) test reagent // label test tubes (containers) // measure volume of test reagent ***or*** juice // place test reagent ***or*** juice into containers // add vitamin C to test reagent // add juice ***or*** test reagent // stir // note amount of test reagent ***or*** juice added for colour change // repeat for other juices // repeat for accuracy // record data // graph (present data) **3 (iv) Recorded Data / Observations:** [Table presentation likely] Identify any ***two*** points related to method used: 1 commercial juice and Vitamin C content 1 fresh juice and Vitamin C content	(3 + 2) (3 + 3 + 2 + 1 + 1) (3 + 2)
Analysis & Conclusions	20	**4 (i) Calculations / Data analysis:** ***One*** relevant comment analysing data ***or*** calculation ***or*** graph Limited manipulation of data Good manipulation of data Excellent manipulation of data **4 (ii) Conclusion:** ***One*** relevant conclusion drawn ***and*** evaluation of results obtained Limited treatment Good treatment Excellent treatment	(4) (7) (10) (4) (7) (10)
Comments	10	**5** ***Two*** comments 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 Good comprehension Excellent comprehension	Good comments (2 × 3) Excellent comments (2 × 5)

CHEMISTRY – Marking Criteria for Coursework B

		Guide to mark assignment	
Section	**Total Mark**	**Compare by means of investigation methanol, propan-1-ol and candle wax in terms of their effectiveness as fuels.**	**O.L.**
Introduction	5	**1 (i) Statement / identification of problem / topic to be investigated:**	(3)
		1 (ii) Research: Any reference to book / internet (web) / person consulted etc. / evidence of research	(2)
Preparation and planning	20	**2 (i) Variables / Controls :** Identify ***four*** variables, the **one compulsory** variable and any **three other variables**, and/or indicate how some of these need to be controlled or held fixed.	
		Compulsory Variable: Type of fuel	(3)
		Other Variables: Rise in temperature // mass (volume) of fuel consumed // time taken for fuel to burn out // fixed mass (volume) of water // fixed period of time // same (area of base of) calorimeter (container) // distance of fuel container to calorimeter // methods of burning fuels // same thermometer (temperature sensor) // container open or covered // same type of wick // fixed starting temperature (of water) // same room temperature	(3 + 2 + 2)
		2 (ii) Equipment needed: Identify any ***five*** pieces of equipment used: Fuels // spirit burner // matches (lighter) // thermometer (temperature sensor) // calorimeter (container) // cover for container // water // timer // graduated cylinder (pipette) // retort stand (clamps) // balance // Any valid piece of equipment pertinent to procedure (except safety equipment)	(5 × 1)
		2 (iii) List of tasks: Identify any ***three*** tasks carried out in investigation: Prepare fuels // measure volume of water // pour water into calorimeter (container) // burn fuel // measure initial and final temperature // measure initial and final mass // measure time for fuel to burn // record data // reference to calculation	(2 + 2 + 1)

Procedure	20	**3 (i) Safety:** Identify any ***two* specific** safety precautions followed in conducting the investigation **3 (ii) & 3 (iii) Procedure: <u>State or Show</u>** Identify any ***five*** steps taken in conducting investigation: Measure volume of water // place water in calorimeter (container) // fix calorimeter (container) in position // place methanol in spirit burner // find initial mass of methanol in spirit burner (container) ***or*** burner with fuel // place thermometer (temperature sensor) in water // measure initial temperature of water // light the wick / heat water // burn for set period of time // stir water as it heats // extinguish the flame // measure final temperature of water // measure time taken for fuel to burn out // measure final mass of methanol in spirit burner // repeat for propan-1-ol // repeat for candle wax // repeat for accuracy // calculate average // record data // present data (table, graph) **3 (iv) Recorded Data / Observations:** [Table presentation likely] Methanol and result Propan-1-ol and result Candle wax and result [Result linked to method used e.g. temperature change / mass used / time taken]	(3 + 2) (3 + 3 + 2 + 1+ 1) *(2 + 2 + 1)
Analysis & Conclusions	20	**4 (i) Calculations / Data analysis:** ***One*** relevant comment analysing data ***or*** calculation ***or*** graph Limited manipulation of data Good manipulation of data Excellent manipulation of data **4 (ii) Conclusion:** ***One*** relevant conclusion drawn ***and*** evaluation of results obtained Limited treatment Good treatment Excellent treatment	 (4) (7) (10) (4) (7) (10)
Comments	10	**5 *Two*** comments 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 Good comprehension Excellent comprehension	 Good comments (2 × 3) Excellent comments (2 × 5)

PHYSICS – Marking Criteria for Coursework B

		Guide to mark assignment	
Section	**Total Mark**	**Investigate any two factors that affect the output from a solar cell when light is shone on it.**	**O.L.**
Introduction	5	**1 (i) Statement / identification of problem / topic to be investigated:** **1 (ii) Research:** Any reference to book / internet (web) / person consulted etc. / evidence of research	(3) (2)

Preparation and planning	20	**2 (i) Variables / Controls:**
		Identify ***four*** variables, any **two essential v**ariables and any **two other variables**, and/or indicate how some of these need to be controlled or held fixed.
		
		Essential Variables:
		Size (exposed area) of solar cell (panel) // type of solar cell (panel) // distance from light source // angle of tilt of solar cell // angle of tilt of light source // coloured light filters // light intensity (bulb wattage) // type of light source (halogen / fluorescent / incandescent etc.) // output (current, voltage, power etc.)
		
		Depending on variable student changes, essential variables can become other variables.
		
		Other Variables:
		Type of solar cell (panel) // same method of measuring output // same background light // same room temperature
		
		2 (ii) Equipment needed:
		Identify any ***five*** pieces of equipment used:
		Solar cell (panel) // light source // leads // crocodile clips // multimeter (current sensor / ammeter / voltmeter) // resistor // metre stick (ruler) // protractor // light meter // card // coloured light filters // output electrical device (motor / bulb) // Any valid piece of equipment pertinent to procedure (except safety equipment)
		
		2 (iii) List of tasks:
		Identify any ***three*** tasks carried out in investigation:
		Arrange circuit // set (vary) factor 1 // set (vary) factor 2 // expose to light // measure output // record data
			
			(3 + 3)
			
			(2 + 2)
			
			(5 × 1)
			
			(2 + 2 + 1)

Procedure	20	**3 (i) Safety:** Identify any ***two*** **specific** safety precautions followed in conducting the investigation
		
		3 (ii) & (iii) Procedure: <u>State or Show</u>
		Identify any ***five*** steps taken in conducting investigation:
		Position solar cell (panel) // attach meter // set up light source // set factor 1 // method of varying factor 1 // measure output // set factor 2 // method of varying factor 2 // repeat for accuracy // calculate average // record data // graph (present data)
		
		Note: Factors 1 and 2 may be taken from the following list:
		Size (exposed area) of solar cell (panel) // type of solar cell (panel) // distance from light source // angle of tilt of solar cell // angle of tilt of light source // coloured light filters // light intensity (bulb wattage) // type of light source
		
		3 (iv) Recorded Data / Observations:
		[Table presentation likely]
		Identify any **two** points related to method used:
		
		Factor 1 *versus* output from solar cell (panel)
		
		Factor 2 *versus* output from solar cell (panel)
			(3 + 2)
			
			(3 + 3 + 2 + 1 + 1)
			
			(3 + 2)

Analysis & Conclusions	20	**4 (i) Calculations / Data analysis:** ***One*** relevant comment analysing data ***or*** calculation ***or*** graph Limited manipulation of data Good manipulation of data Excellent manipulation of data **4 (ii) Conclusion:** ***One*** relevant conclusion drawn ***and*** evaluation of results obtained Limited treatment Good treatment Excellent treatment	 (4) (7) (10) (4) (7) (10)
Comments	10	**5** ***Two*** comments 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 Good comprehension Excellent comprehension	 Good comments (2 × 3) Excellent comments (2 × 5)

OWN INVESTIGATION – Marking Criteria for Coursework B

Section	Total Mark		O.L.
Introduction	10	**1 (i) Statement / identification of problem / hypothesis statement / topic to be investigated:** Limited treatment Good treatment Excellent treatment **1 (ii) Research:** Any ***two*** references to book / website / person consulted etc. (must qualify why this person was a suitable consultant) / evidence of research	 (2) (4) (6) (2 × 2)
Preparation and planning	40	**2 (i) Variables & Controls*:** Identify any ***seven*** variables / controls: Must include **two** essential variables with respect to title. Any **five** other relevant variables / control **2 (ii) Equipment needed:** Identify any ***eight*** pieces of equipment used **2 (iii) List of tasks:** Identify any ***four*** tasks carried out in investigation * If variables/controls not relevant to the type of investigation undertaken allow 9 marks for stating so, then readjust equipment to (8 × 2) and tasks to (5 × 3)	 (3 + 2) (5 × 3) (2 + 2 + 6 × 1) (3 + 3 + 2 + 2)
Procedure	40	**3 (i) Safety:** Identify any ***three*** safety precautions followed in conducting the investigation **3 (ii) & (iii) Procedure:** State <u>or</u> Show Identify any ***ten*** steps taken in conducting investigation **3 (iv) Recorded Data / Observations:** Identify any ***three*** points related to method used [Table presentation likely]	(3 × 3) (10 × 2) (4 + 4 + 3)
Analysis & Conclusions	40	**4 (i) Calculations / Data analysis:** ***Two*** relevant comments analysing data ***or*** calculation ***or*** graph Limited manipulation of data ***OR*** Good manipulation of data ***OR*** Excellent manipulation of data **4 (ii) Conclusion:** ***Two*** relevant conclusions drawn ***and*** evaluation of results obtained Limited treatment ***OR*** Good treatment ***OR*** Excellent treatment	 (4) (7) (10) } × 2 (4) (7) (10) } × 2
Comments	20	**5** ***Four*** 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	Limited comments (4 × 2) Excellent comments (4 × 5)