Coimisiún na Scrúduithe Stáit

State Examinations Commission

JUNIOR CERTIFICATE EXAMINATION, 2007

SCIENCE (Revised Syllabus)

ORDINARY LEVEL

Marking Scheme

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

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. However, in MCQ-type questions cancelling of an incorrect sand 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 Column 1.
Column 2 to be used by Advising 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 mandatory biology investigations/experiments claimed on page 5 of the Coursework booklet and enter it in the Coursework A grid on the cover page.

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.

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.

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.

Transfer of awarded marks

Marks awarded to Coursework A and Coursework B are transferred to marking grid on the front of the examination paper.

SCIENCE (REVISED SYLLABUS) ORDINARY LEVEL 2007
Summary of Marking Scheme

BIOLOGY

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

CHEMISTRY

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

PHYSICS

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

BIOLOGY

Question 1

(a) Microscope (3)
Examining cells (small objects) / looking at cells / magnifying (3)

(b) **P**: Cheese / fish (3)
C: Potato / carrot (3)

(c) **T**: Molar (3)
F: Chewing (3)

(d) **S**: Brain (3)
R: Heart (3)

(e) **A**: Penis (3)
B: Sperm (3)

(f) Snail / earthworm (3)
Mouse / fox (3)

(g) **A**: Petal / corolla (3)
B: Stamen / anther / pollen (3)

(h) **A**: Arteries (3)
T: Veins (3)
Pumps blood to / around the body / pumps blood further /
right side pumps to the lungs (4)

Question 2

(a) Eye (3)
Kidney (3)
Joint (3)
Muscle (3)

(b) **A**: Oesophagus (3)
B: Stomach (3)
F: Digestion (3)
Reabsorbs water / produces vitamins (K&B) /
forms (stores / egests) faeces (waste) / egestion / to move food (waste) (3)

Prevents constipation / aids peristalsis / moves food along gut /
prevents cancer / provides bulk / absorbs water / helps egestion /
prevents diverticulitis (3)

(c) (i) Turns milky / cloudy / chalky / white (6)
(ii) Turned milky / cloudy / chalky / white (3)
(iii) (More) carbon dioxide in exhaled air / no (less) carbon dioxide in inhaled air (3)

Question 3

(a) **F**: Photosynthesis
P: Leaf
C: Chlorophyll
S: Iodine $(1 \times 6 + 3 \times 3)$

(b) **X**: Water (accept "B") (3)
T: 15°C (accept "tick") (3)

(c) (i) Plant bends <u>towards (it) light</u> / grow <u>towards (it) light</u> (6)
[Accept 'bends' for 3 marks]
(ii) **State or show (4 × 3)**
Equipment: Container of seedlings / plant
Procedure: Place container of seedlings (leafy plant) near a window / light source
Leave for a time / seedling (plant) grow
Result: Towards window (light source)

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

CHEMISTRY

Question 4

(a) Measuring / graduated cylinder (3)
To find volume of liquids / measure (amount of) liquids (3)

(b) **P**: Pipette (3)
B: Burette (3)

B	P

(c) **S**: Solid (top) (3)
G: Gas (lower) (3)

(d) **A**: Brass // solder (Accept "ticks") (2 × 3)

(e) **W**: Hydrogen // Oxygen (Accept "ticks") (2 × 3)

(f) Crude oil (3)
Flexible / mouldable / durable (strong) /hygienic / reusable /recyclable / safer than glass / light / waterproof / doesn't rot / easier to dye / cheap (3)

(g) Elements (3)
Periodic table (3)

(h) A (5)
To remove oxygen (air) / exclude (keep out) oxygen (air) (5)

Question 5

(a) **A**: Thermometer
B: Water out to sink
C: Condenser
D: Cold water in
E: Tripod stand
F: Bunsen

F
D
C
A
E
B

(6 × 3)

Distillation [Accept "evaporation followed by condensation"] (3)

(b) Filtration / filtering (3)
Soil (sand) and water (any insoluble solid and liquid) (3)

(c) **X**: Acid / hydrochloric acid / any other acid (3)
Y: Calcium carbonate ($CaCO_3$) / limestone / marble chips / chalk / any named carbonate or hydrogen carbonate / bread soda / washing soda [Accept "carbonate" or "hydrogen carbonate"] (3)
[Allow 3 marks if X and Y in reverse order]
Doesn't support combustion (*accept:* "acts as a fire extinguisher") // denser than air / heavier than air (2 × 3)

Question 6

(a) **1**: Protons
2: Electrons
3: Neutrons
4: Covalent
5: Ionic

4
2
5
3
1

(1 × 6 + 4 × 3)

(b) Carbon // hydrogen [Accept elemental symbols] (3)
Damage to buildings / statues / metals / lakes / trees (plants) / fish life / leaches minerals from soil (3)
N: Methane (3)

(c) **State or show (4 × 3)**
Equipment and chemicals:
Litmus paper / universal indicator / pH paper (meter) (3)
Procedure:
Drop / spot / add (3)
Observe / note colour (3)
Result:
Litmus:
Blue in a base / red in acid //
Universal indicator or pH meter or pH paper:
pH less than 7 in an acid/greater than 7 in a base /
Compare colour to chart (3)
[Marks awarded in context of valid experiment.
No diagram deduct 3 marks – diagram must include at least one label]

PHYSICS

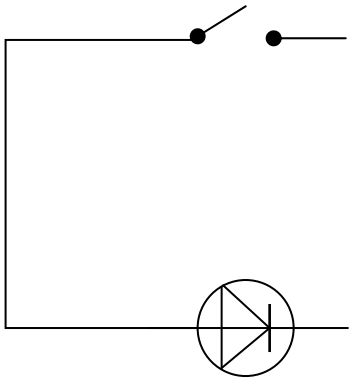
Question 7

(a) **L**: Metre (3)
W: Newton (3)

(b) **X**: Neutral (3)
C: (**Y**) Brown (3)

(c) **D**: 75 m (3)
F: Acceleration (3)

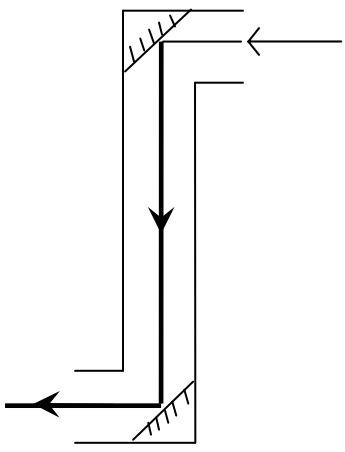
(d) **A**: Diode (3)
(3)



(e) Repel (3)
Attract (3)

(f) **Advantage**: Efficient energy release / non polluting emissions / doesn't produce greenhouse gases / doesn't cause global warming / can be used to produce electricity (3)
Disadvantages: Waste is harmful (dangerous, radioactive, lasts for a very long time) / risk of accident (3)

(g) Down // out (2 × 3)



(h) **V**: 10 cm^3 (5)
D: 2.1 g cm^{-3} (5)

Question 8

(a) Conduction (3)
Convection (3)
Radiation (3)

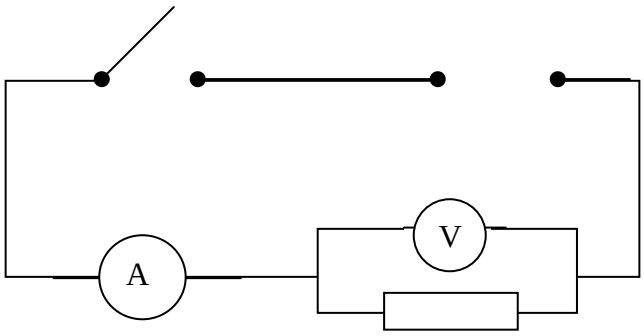
(b) Solids (metals) expand (when heated) / ball expands (when heated) (6)
It would fit through the ring / contracts / get smaller (3)

(c) Bubbles (of air coming from flask into water trough) (6)
Air (gases) expand when heated (3)

(d) (i) Sound will not travel through a vacuum / sound needs medium (substance) to travel (6)

(ii) Light can travel through a vacuum / light doesn't need a medium (substance) (3)

(iii) Light travels (is) faster than sound (3)



Question 9

(a) Ammeter in series (3)

Voltmeter in parallel (3)

(b) 5 points correctly plotted and correct line drawn (9)
[5 points correctly plotted and no correct line drawn – 6 marks;
3 or 4 points and no correct line drawn – 3 marks;
3 or 4 points and a correct line drawn – 6 marks]

Relationship of proportionality (3)

(c) 98 or 14 × 7 (6)
[14 or 7 × 2 (3 marks)]
1078 or 98 × 11
[€10.78 (3 marks), 10.78 No €, (Allow 2 marks)] (3)
[Allow 3 marks for correct operation on incorrect answer to first part]

(d) **State or show (4 × 3)**

Equipment:	Three pieces of card with holes in centre	(3)
Procedure:	Set up cards with holes in straight line	(3)
	Place lit lamp at one end / look through to lamp at other end	(3)
Result:	Light travels straight through / light can be seen / move the card and light cannot be seen	(3)
	//	
	Ray-box	(3)
	Slit	(3)
	Plot / track ray	(3)
Result:	Light travels straight	(3)
	//	
	Light source	(3)
	Object	(3)
	Rays of light	(3)
Result:	Light travels straight / shadow formed	(3)
	//	
	Laser	(3)
	Beam of light	(3)
	Dust to show beam	(3)
Result:	Light travels straight	(3)

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

PHYSICS – Marking Criteria for Coursework B

			Guide to mark assignment	
Section	**Aims**	**Total Mark**	Investigate the relationship between the length of a metallic conductor and its resistance	**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 as required	20	**Variables / Controls:** Identify any ***three*** variables and/or indicate how some of these need to be controlled or held fixed: Material of the wire (same wire) / Cross-sectional area (thickness) / Length / Temperature / Resistance / Extended wire but not stretched / Same leads or ohmmeter (meters)	(4 + 3 + 3)
	List of equipment needed for the investigation		**Equipment needed:** Identify any ***three*** pieces of equipment used: wire / metre stick / ohm meter (multimeter) / thermometer / voltmeter / ammeter / metre bridge / wheatstone bridge / leads / crocodile clips / wire cutters	(2 + 2 + 1)
	List of tasks to be carried out during the investigation		List of tasks: **Identify any** *three* **tasks carried out in investigation**: measuring (cutting) length of wire / measuring resistance / varying length / recording resistance and length (note results) / calculations / graphing	(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:** State <u>or</u> Show Identify any ***five*** steps taken in conducting investigation: measure wire / attach ohm meter (ammeter & voltmeter) / take reading / vary length and measure again / how to keep variable such as cross-section or temperature fixed / record results / repeat to verify / make metre bridge / measure resistance of cables (probes) **Recorded Data / Observations:** Identify any ***two*** points related to method used: length of wire // resistance of wire	(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)

CHEMISTRY – Marking Criteria for Coursework B

			Guide to mark assignment	
Section	**Aims**	**Total Mark**	Investigate how the conc. Of a H_2O_2 solution affects the speed at which it decomposes to produce oxygen gas	**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 as required	20	**Variables / Controls :** Identify any ***three*** variables and/or how some of these can controlled or held fixed: concentration of peroxide / volume of peroxide solution / amount of catalyst / particulate size of catalyst / activity of catalyst (or the H_2O_2) / temperature / rate of reaction (volume over time) / same catalyst / volume of washing up liquid	(4 + 3 + 3)
	List of equipment needed for the investigation		**Equipment needed:** Identify any ***three*** pieces of equipment used: buchner flask (reaction flask) and delivery tube / stopper / bee-hive shelf / graduated cylinder / trough of water / gas syringe / water bath / H_2O_2 solution / MnO_2 (celery) / thermometer / washing up liquid / timer	(2 + 2 + 1)
	List of tasks to be carried out during the investigation		List of tasks: **Identify any** *three* **tasks carried out in investigation**: vary concentration / weigh catalyst / measuring rates / prepare catalyst in suitable manner / calculation / record results / 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:** State <u>or</u> Show Identify any ***five*** steps taken in conducting investigation: known concentrations / how to create stock solutions (use different known concentrations) / viable apparatus* / how to start reaction / how to measure rate / recording of data / repeating for different concs. / preparation of catalyst / ensuring uniformity of catalyst activity** / measure volume of H_2O_2 / measure volume of washing up liquid / repeat to get averages * Apparatus <u>must</u> allow valid measurement of data ** Must have reference to how catalyst activity was held constant * & ** Compulsory points [Could do one rate curve and take tangents - adapt scheme accordingly] **Recorded Data / Observations:** Identify any ***two*** points related to method used: table of data / presented in some way from which comparison could be drawn	(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 manipulation of data **OR** Good manipulation of data	 (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)

BIOLOGY – Marking Criteria for Coursework B

			Guide to mark assignment	
Section	**Aims**	**Total Mark**	Quantitative survey of the plant species in a local habitat	**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 as required	20	**Variables / Controls:** Investigation doesn't involve normal variables/controls // ***or*** Identify any ***one*** factors which contributed to a kept fair: quadrat size / habitat / distance between transect intervals / randomness / on one visit	(5)
	List of equipment needed for the investigation		**Equipment needed:** Identify any ***three*** pieces of equipment used: quadrats / transect / equipment used to measure area / key / notepad (clipboard) / something to throw (for randomness)	(2 + 2 + 2)
	List of tasks to be carried out during the investigation		List of tasks: **Identify any** *three* **tasks carried out in investigation**: choose a habitat / throw pen (quadrat) randomly (do quadrat study) / set out transect (do transect study) / area measurement / identify / count / note (record data) / repeat what's to be measured / calculation / graph	(3 + 3 + 3)

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: State <u>or</u> Show
			Identify any ***five*** steps taken in conducting investigation:
			mark out (measure) area (habitat) /
			throw randomly /
			set out quadrat /
			stations (knots /
			set out transect /
			identify (use key) /
			count (estimate, presence or absence) /
			note (record data) /
			repeat
			
			Recorded Data / Observations: Identify any ***two*** points related to method used:
			range of species (min. 4 species) //
			pattern of population //
			[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)

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 * 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)	(4 × 5) (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 or 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)