



Coimisiún na Scrúduithe Stáit
State Examinations Commission

JUNIOR CERTIFICATE EXAMINATION, 2005

SCIENCE

HIGHER LEVEL

Marking Scheme

Junior Certificate Examination

SCIENCE

Higher Level Paper

Structure

Five sections A, B, C, D, E*.

Section A:		3 question (attempt all questions) 10 parts in each question (attempt any 8 parts)
Section B:	Physics	2 questions (attempt any 1 question)
Section C:	Chemistry	2 questions (attempt any 1 question)
Section D:	Biology	2 questions (attempt any 1 question)
Section E:	Applied Sc.	6 questions (attempt any 2 questions)

*Section E does not appear on the Science with Local Studies examination paper.

Marking

Without Local Studies:	$(6 \times 48) + (2 \times 36) = 288 + 72 = 360$ marks
With Local Studies:	$(6 \times 48) = 288$ marks

Grades

Grade	Marks	
	<i>Without LS</i>	<i>With LS</i>
A	306 - 360	245 - 288
B	252 - 305	202 - 244
C	198 - 251	158 - 201
D	144 - 197	115 - 157
E	90 - 143	72 - 114
F	36 - 89	28 - 71
NG	0 - 35	0 - 27

CANCELLED REPEATED OR EXCESS ANSWERS

CANCELLED ANSWERS

SECTION A If an answer is cancelled and a second answer given you should accept the cancellation and award marks for the uncanceled answer. If neither is cancelled then give zero except in the case where both answers are correct.

SECTION B, C, D and E If candidates answer a question or part of a question only once and then cancel, you should ignore the cancelling and mark in the usual way. If candidates answer a question or part of a question more than once and then cancel one attempt, you should ignore the cancelling and mark all the answers whether cancelled or not, however count only the marks gained in respect to the highest scoring answer. The disallowed marks should be enclosed in square brackets.

REPEATED ANSWERS

SECTIONS B, C, D AND E If candidates repeat an answer (answer the same question twice) you should mark both answers and allow marks for the highest scoring answer. The disallowed marks should be enclosed in square brackets.

EXCESS ANSWERS

SECTION A Mark all parts but count only the marks for the eight highest scoring parts. Disallowed marks should be enclosed in square brackets.

SECTION B, C AND D Mark all questions but count only the marks awarded to the highest scoring question in each section. Disallowed marks should be enclosed in square brackets.

SECTION E Mark all questions but count only the marks awarded to the two highest scoring questions. Disallowed marks should be enclosed in square brackets. Extra care should be taken with Q.10 (Earth Science), Q.11 (Horticulture) and Q. 13 (Food):
count only the marks awarded to the two highest scoring parts (a), (b) or (c). Care should also be taken with options in Q.12 (Materials Science).

DEDUCTION OF MARKS FOR OMITTED DIAGRAM

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

**Science – Higher level 2005
Marking Scheme**

Section A	Q.1		8x6	
	Q.2		8x6	
	Q.3		8x6	
Section B	Q.4	(a)	5x3, 1x3, 2x3	
		(b)	3x3, 2x3, 2x3, 1x3	
	Q.5	(a)	4x3, 1x6, 2x3	
		(b)	2x3, 1x3, 2x3, 3x3	
Section C	Q.6	(a)	1x3, 2x3, 1x3, 1x3, 3x3	
		(b)	3x3, 3x3, 2x3	
	Q.7	(a)	5x3, 1x3, 2x3	
		(b)	2x3, 1x3, 3x3, 1x3, 1x3	
Section D	Q.8	(a)	2x3, 2x3, 4x3	
		(b)	4x3, 2x3, 2x3	
	Q.9	(a)	1x3, 1x3, 1x3, 1x3, 2x3, 2x3	
		(b)	1x3, 3x3, 2x3, 2x3	
Section E	ANY TWO QUESTIONS			
	Q.10	(a)	2x3, 1x3, 1x3, 2x3	
		(b)	1x3, 1x3, 2x3, 2x3	
		(c)	2x3, 2x3, 1x6	any two parts
	Q.11	(a)	4x3, 2x3	
		(b)	1x3, 2x3, 1x3, 1x3, 1x3	
		(c)	1x3, 2x3, 2x3, 1x3	any two parts
	Q.12	(a)	4x3, 2x3	
		(b)	2x3, 4x3	any one of four (i) – (iv)
	Q.13	(a)	2x3, 1x3, 3x3	
		(b)	2x3, 2x3, 1x3, 1x3	
		(c)	4x3, 2x3	any two parts
	Q.14	(a)	3x3, 1x3, 2x3	
		(b)	1x3, 3x3, 1x3, 1x3	
	Q.15	(a)	2x6, 1x6	
(b)		1x6, 3x3, 1x3		

SECTION A (144 MARKS)
Answer each of the questions 1, 2 and 3.

Question 1. Any eight items, (a), (b), (c), etc. (8 X 6 marks)

- (a) $s = \frac{d}{t}$ or $\frac{6}{0.5}$ or 6/30 (3)
 12 (allow 6 marks for 12 alone) (3) [6]
- (b) biomass/ solar (sun)/ tidal /wave/ wind/ geothermal/ hydroelectric (3)
 energy that is replaced/ does not run out (3) [6]
- (c) **C** (earth)/ **D** (fuse) (3)
C carries electricity to earth/ **D** melts, breaking the circuit (3) [6]
 (second 3 marks is not available independently)
- (d) **help:** tyres grip the road/ brakes/ shoes grip pedals/ hands grip handle bar (3)
hinder: friction with air/ friction in the bearings slows the cyclist/wears out parts **any correct example** (3) [6]
- (e) ball & ring (3)
 show expansion/ contraction (3) [6]
- (f) force (3)
 N/m² or Pa/ psi/ bars/ atmospheres/ N/cm² or words (3) [6]
- (g) number of waves/crests/ troughs/ times (3)
 per second (3) [6]
 (accept $v = f \times \lambda$ for 3 marks)
- (h) **heat:** form of energy/ Joule/ calories (3)
temperature: degree of hotness/ a scale/ Centigrade (Kelvin) (Fahrenheit) (3) [6]
- (i) **rod A:** electrons move from cloth (to rod)/gains electrons (3)
rod B: electrons move from rod (to cloth)/ loses electrons (3) [6]
 reversed allow only 3 marks
- (j) circle (dots) around wire on card (3)
 clockwise indicated by arrow on circle (3) [6]

Question 2. Any eight items, (a), (b), (c), etc. (8 X 6 marks)

- (a) **rod:** carbon/ graphite (accept symbols) (3)
container: zinc (3) [6]
- (b) water/ CO₂ (carbon dioxide)/ powder/ halon/ foam/ fire (wet) (3)
blanket/ sand (3)
water (foam) removes heat/ all exclude air (oxygen) (3) [6]
- (c) **A** tongs (3)
B beaker (3) [6]
- (d) Exclude (reacts with) air (oxygen)/ moisture (water) (3)
lithium/ potassium/ rubidium/ caesium/ francium (3) [6]
- (e) **A** corrosive (3)
B explosive (3) [6]
- (f) **acid:** lemon juice (lemon)/ vinegar/ any carbonated drink/ (3)
shampoo etc. (3) [6]
base: bread soda/ washing soda/ toothpaste/ oven (window) (3)
(drain) cleaner/ hair conditioner etc. (3)
- (g) Acid/ named acid or formula (3)
Correct formula CaCO₃/ Na₂CO₃/ NaHCO₃ etc. (3) [6]
- (h) Changes the speed of a reaction (3)
not used up (3) [6]
- (i) Covalent (3)
Nitrogen/ N₂ (accept Neon/ Argon/ Krypton/ Xenon/ Radon) (3) [6]
- (j) paint/ grease/ plastic coat/ alloy it/ galvanise (zinc coat)/ (3)
electroplating/ (**not** anodising for iron) (3)
- all, except 'alloying', exclude air (oxygen)/ moisture (water) (3)
for galvanising: zinc is more reactive than iron and so reacts (3) [6]
first (3)
iron atoms held more strongly in alloy (3)

Question 3. Any eight items, (a), (b), (c), etc (8 X 6)

- (a) **A:** membrane (3)
B: nucleus (3) [6]
- (b) **any two from:** heat (temperature /sun)/light (sun)/ humidity/
wind/ soil moisture (water) (2×3) [6]
Accept sun only once
- (c) **A:** incisor (3)
B: crush/ grind/ chew (3) [6]
- (d) **red cells:** transport oxygen (3)
white cells: fight infection/ produce antibodies/ kill bacteria (3) [6]
(germs)



- (i) correct name or correct location of vein
or pulmonary (3)
- (ii) correct name or correct location of chamber
or left ventricle (3) [6]
- (f) **any two from:** body surface (skin)/ gills/ spiracles (2×3) [6]
- (g) **producer:** any named plant e.g. grass (3)
carnivore: any one from: dog/ cat/ eagle/ fox/ hawk etc. (3) [6]
- (h) **any two from:** cotton/ dyes/ drugs(medicines)/ fibres/ paper/
linen /timber/ rubber/ gum/ resin/ fuel/ seeds/ flowers/
perfumes/ humus (compost)
Accept any product/ processed product/ manufactured item (2×3) [6]
- (i) **A:** produces pollen/ male gametes (3)
B: ovary/ ovule/ ovum/ female gamete/ egg/ carpel (3) [6]
- (j) **How?:** put bait/ fruit/ food in trap (3)
Name: beating sheet (tray)/ net/ pooter/ tullgren funnel/
sieve (3) [6]

SECTION B – PHYSICS (48 marks)

Answer either question 4 or question 5.

Question 4. (48 marks)

- (a) Describe **Show or state:**
- Measure mass of beaker (container)/
tare (zero) balance (3)
- measure volume of liquid using burette/
measuring cylinder/ pipette (3)
- mass of beaker & liquid/ add liquid to
beaker (container) (3)
- subtract mass of beaker from mass of
beaker & liquid /read tared scale (3)
- calculate: $density = \frac{mass}{volume}$ (3) **[15]**
- [no diagram – deduct 3 marks]**
- Give g/cm^3 **or** kg/m^3 (3) **[3]**
- Explain have a lower (3)
density (3) **[6]**
- (b) Describe **show or state:**
-) Crookes’ radiometer (3)
- Switch on light/ in light (3)
- plates/ vanes turn (rotate) (3)
- or** **or**
- light meter (3)
- switch on light/ in light (3)
- needle moves/ shows a reading (3)
- or** **or**
- solar cell, connected to motor (3)
- switch on light/ in light (3)
- motor turns (3) **[9]**
- Give **any two from:** eclipses/ shadows/
cannot see through a bent drinking
straw(around corners) / beam (ray) of (2×3) **[6]**
light/ pinhole camera
- Draw **diagram showing:**
- convex lens (shape thicker in the
middle) (3)
- two rays , leaving the lens, converging (3) **[6]**
- Name Concave/ diverging (3) **[3]**

Question 5. (48 marks)

- (a) Draw Label (scale) for voltage on one axis (3)
Label (scale) for current on other axis (3)
points plotted (3)
line drawn (3) [12]

either axis can be used for current/ voltage
[graph paper not used – deduct 3 marks]

State current is proportional to voltage/ $I \propto V$ (6) [6]
or any of the forms of $V = IR$
(current increases with voltage – allow 3 marks)

Calculate 20 (3)
Ohms/ Ω (3) [6]
allow 3 marks for any correct ratio using data
from the table: 1/0.05, 2/0.1 etc

- (b) What? poor conductor/ convection/ hot water (3)
of heat/ of heat/ rises (3) [6]

What? KiloWatt-hour/ kWh (3) [3]

If... Units used = $(2 \times 3 \times 7) + (3 \times 1 \times 7) = 63$ (3)
cost = $63 \times 10 = 630$ **or** €6.3 (3) [6]

allow 6 marks for the correct answer
allow 3 marks for result of incorrect units x 10

If... $P = IV$ **or** $3000 = I \times 230$ **or** other correct (3)
expression (3)
3000 (3)
13 / 13.04 (unit *not* required) [9]
(3)

allow 9 marks for the correct answer

SECTION C - CHEMISTRY (48 marks)

Answer either question 6 or question 7.

Question 6. (48 marks)

- (a) Name Distillation (3) [3]
- Name water (3)
alcohol/ ethanol (3) [6]
- Which? A (3) [3]
- Why? condense/ cool the vapour/ cold surface/
exclude air bubbles/ ensure it is full (3) [3]
- Explain separating funnel shown (3)
two liquid layers in funnel (3)
bottom layer removed by opening tap (3) [9]
[no diagram – deduct 3 marks]
- (b) Draw central nucleus with eleven protons (3)
) central nucleus with twelve neutrons (3)
2, 8, 1 electrons in three orbits (3) [9]
[no diagram – deduct 3 marks]
- Describe sodium atom loses one electron/ $\text{Na} \rightarrow \text{Na}^+ + \text{e}^-$ (3)
chlorine atom gains one electron/ $\text{Cl} + \text{e}^- \rightarrow \text{Cl}^-$ (3)
(Accept word equations)
positive sodium ion (Na^+)/
or
negative chloride (Cl^-) formed (3) [9]
- (If either of the above equations are given allow
2 x 3 marks)
- Give **any two from:** brittle/ crystalline (solid at room
temperature)/ high melting point/ high boiling
point/ soluble in water/
solutions conduct electricity/ molten conducts
electricity/ poor conductors when solid (2×3) [6]
)

Question 7. (48 marks)

(a)	<u>Study</u>	(i)	C	(3)	
	<u>...</u>	(ii)	C	(3)	
		(iii)	D	(3)	
		(iv)	A	(3)	
		(v)	B	(3)	[15]
	<u>Give</u>		calcium hydrogen carbonate (bicarbonate)/ Ca(HCO ₃) ₂ / magnesium hydrogen carbonate (bicarbonate)/ Mg(HCO ₃) ₂	(3)	[3]
	<u>Name</u>		Chlorination (add chlorine)/ filtration/ fluoridation (add fluoride)/ screening/flocculation sedimentation (settling) / pH adjustment (reduce acidity)	(3)	[3]
	<u>Give</u>		matched with name: kills harmful organisms (germs)/ removes suspended solids (makes water clear)/ prevent tooth decay/ removes large solids/ small particles stick together (coagulate) suspended solids allowed to sink (makes water clear) (removes colour)/ reduce corrosion of metal pipes (stop damage to pipes)	(3)	[3]
(b)	<u>Explain</u>		chemical decomposition (breaking up) (reaction) using electric current (electricity)	(3) (3)	[6]
	<u>What?</u>		sulphuric acid	(3)	[3]
	<u>Name</u>		Oxygen/ O ₂ relights glowing splint (correct test for hydrogen allow only 3 marks)	(3) (3) (3)	[9]
	<u>Name</u>		Graphite (carbon)/ platinum	(3)	[3]
	<u>Give</u>		anodising/ charging battery/ electrolytic capacitor/ electrolytic machining/ electrolytic polishing/ refining (purifying) aluminium (copper)/ electroplating/ preventing corrosion/ remove hair	(3)	[3]

Question 9. (48 marks)

- | | | | | |
|-----|-------|--|------------|-----|
| (a) | (i) | keep heat in/ insulation | (3) | [3] |
| | (ii) | kill them/ control/ stop respiration | (3) | [3] |
| | (iii) | let carbon dioxide (CO ₂) out/ trap heat | (3) | [3] |
| | (iv) | respiration | (3) | [3] |
| | (v) | turns limewater
milky | (3)
(3) | [6] |
| | (vi) | grows
into plant | (3)
(3) | [6] |

(b) xylem (3) [3]

Describe Celery (any named plant) in coloured (dyed) water (3)
leave for a few days/ cut the stem (3)
dye in veins (petals) (3) [9]

No diagram less 3 marks

What? response (3)
of plant to light (3) [6]

How? **show or state:**
plant with light from one side (3)
plant grows (bends) (moves) towards light (3) [6]

SECTION E – APPLIED SCIENCE (72 marks)

Answer two questions from this section.

Question 10 – Earth Science (36 marks). Answer any two of (a), (b), (c).

- (a) Name **closer:** mercury/ venus (3)
further: mars/ jupiter/ saturn/ uranus/ neptune/ pluto (3) [6]
- What? Nuclear/ fusion (3) [3]
- Name moon (3) [3]
- Give **any two from:** suitable temperature (not too hot)
(not too cold)/ presence of water/ presence of oxygen/
atmosphere with some carbon dioxide for
photosynthesis/ suitable for photosynthesis/
enough light for photosynthesis (2×3) [6]
- (b) What? moon (3) [3]
- Explain very high tide (3) [3]
- Draw **diagram showing:** sun, moon, earth/ sun, earth, moon (3)
note the first or last **must** be the **sun**
the three bodies in a straight line (3) [6]
[no diagram – deduct 3 marks]
- Why? **show or state:**
moon orbits (3)
producing three in straight line twice (3) [6]
- (c) Describe read volume from syringe and pressure from guage (3)
move piston and take more readings (3) [6]
- How? multiply each pair of readings together (3)
the same number (result) is obtained for each
multiplication (3)
or or
plot a graph of volume vs. 1/pressure (vice versa) (3)
straight line is obtained (3) [6]
- State $PV = k$ **or any other correct** form of this equation/
is inversely proportional (6) [6]

Question 11 – Horticulture (36 marks). Answer any two of (a), (b), (c).

- (a) Describe **show or state:**
- mass of evaporating basin (3)
- mass of basin & soil sample (3)
- heat at 100° C to constant mass/ until all water removed (3)
- $\% \text{ water} = \frac{\text{loss in mass of soil} \times 100}{\text{original mass of soil}}$
- or
- calculate mass loss (3) [12]
- Name **any two from:** compost/ nutrient solution/ perlite/ vermiculite (2×3) [6]
- (b) Name grafting (3) [3]
- What? **A:** scion (3)
- B:** stock (3) [6]
- Name raffia and wax/ polythene tape (3) [3]
- Give ensure that cambium layers of scion & stock meet/ clean cut/ cover scion/ wax joint (3) [3]
- Name apple/ beech/ cherry/ chestnut/ hibiscus/ pear/ plum/ rose/ rowan/ash etc. (3) [3]
- (c) What? layer of material on top of soil (3) [3]
- Give control weeds (prevent germination of weeds) (3)
- reduce loss of moisture (3) [6]
- What? using a natural ‘enemy’ (predator) (3)
- to control its numbers/ kill the pest (3)
- Give Ladybirds eat aphids (3) [9]

Question 12 – Materials Science (36 marks). Answer both parts, (a) and (b).

- (a) (i) Polythene/ PVC (3)
(ii) Window/ frames/ door/ frames/ door handles/ letter boxes/ downpipes/ gutters/ roofing/ cladding (3)
(iii) cotton/ linen/ nylon/ polyester/ wool/ named fabric (3)
(iv) cladding/ door/ door frame/ floors/ joists/ rafters/ skirting stairs/.window/ door/ frames/ window sills (boards) (3) [12]
- Select **any correctly matched pair** of deterioration & protection:
plastic: light makes brittle, UV protect with added chemicals
aluminium: corrosion, protect with oxide layer (anodise)/ paint/ plastic coating
fabric: moths/ rot, protect with chemicals/ keep dry (2×3) [6]
pine: rot/ wood worm, protect with chemicals/ keep dry (paint) (varnish)

(b) Answer any one of the following (i), (ii), (iii), (iv).

(i) Plastics

- Name hydrocarbons/ oil (3)
What? Plants (animals) that lived millions of years ago (3) [6]

- Describe **show or state**
scrape a piece of plastic with a sharp point (3)
repeat for a second plastic (3)
compare the marks (3)
the deeper mark is the softer plastic (3) [12]
accept equivalent experiments

(ii) Metals

- Give to change the properties of the metal/prevent corrosion/ harden/ improve appearance etc. (3)
Name brass/ bronze/ duralumin/ steel/ solder (3) [6]

- Describe **show or state**
coat rods (strips) of the metals with wax (3)
put ends of rods into boiling water (3)
the wax melts quicker on one of the rods (3)
that metal is a better conductor of heat (3) [12]
accept equivalent experiments

(iii) **Textiles**

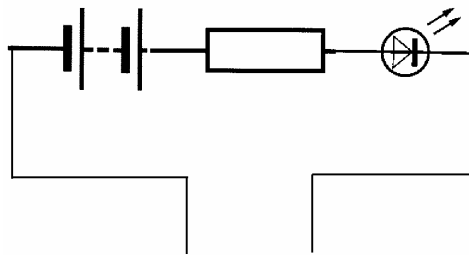
<u>Name</u>	cotton & polyester or nylon & wool	(2x3)	[6]
	(in any order)		
<u>Describe</u>	show or state hang two fabrics over circular file attach weight to ends of fabric rotate file, counting turns, until hole appears smaller number of turns wears most accept equivalent experiments	(3) (3) (3) (3)	[12]

(iv) **Timber**

<u>Name</u>	any one with name and manufacture: <u>block board</u> , wooden blocks (laths) glued together covered with veneer (thin sheets) <u>chip board</u> , wood chips glued and compressed <u>fibre board</u> , wood fibres glued, compressed (heated) <u>plywood</u> , wood veneers (thin sheets) glued together	(2x3)	[6]
<u>Describe</u>	show or state clamp wooden lath at one end add weights to other end & measure bend repeat with second lath having grain at right angles to the first the weaker lath bends more accept equivalent experiments	(3) (3) (3) (3)	[12]

Question 14 – Electronics (36 marks). Answer both parts (a) and (b).

(a) Draw



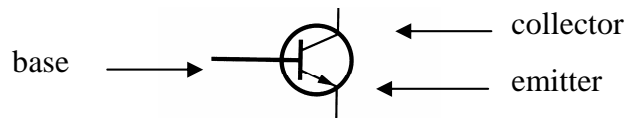
symbol for LED (3)
 LED symbol wired correctly to battery (3)
 Resistor symbol & probes (3) [9]
note order of components does not matter

Why? Control (limit) the current in the LED/ protect the LED (3) [3]

Would? no (3)
Give LED would be in reverse bias/
 current can flow in only one direction in a diode (3) [6]

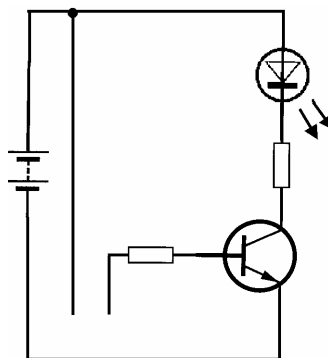
(b) Name transistor (3) [3]

Draw



collector correctly labelled (3)
 base correctly labelled (3)
 emitter correctly labelled (3) [9]

Copy



switch can be anywhere (on the connecting wires) in the outer rectangle or on either of the probes (3) [3]

If buzzer / relay and bell (3) [3]

Question 15 – Energy Conversions (36 marks). Answer both parts (a) and (b).

- (a) Write Any two
chemical to heat (6)
heat to kinetic (6) [12]
chemical to kinetic (6)
- What? electrical to chemical (6) [6]
- (b) What? kinetic to electrical/ kinetic to magnetic/ magnetic
to electrical (6) [6]
- Draw **diagram showing:**
coil (3)
being turned (rotated) (moved) (3)
in a magnetic field/ between a north & a south pole (3)
- or** or
- magnet (3)
being turned (rotated) (moved) (3)
in a coil (3) [9]
[no diagram – deduct 3 marks]
- Name transformer (3) [3]