



Coimisiún na Scrúduithe Stáit

State Examinations Commission

JUNIOR CERTIFICATE EXAMINATION, 2006

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 2006

Marking Scheme

Section A	Q.1		8x6		
	Q.2		8x6		
	Q.3		8x6		
Section B	Q.4	(a)	4x3, 1x3, 3x3		
		(b)	3x3, 3x3, 2x3		
	Q.5	(a)	1x3, 1x3, 2x3, 2x3, 2x3		
		(b)	1x3, 4x3		
		(c)	3x3		
	Section C	Q.6	(a)	4x3, 2x3, 2x3	
(b)			4x3, 2x3, 2x3		
Q.7		(a)	1x3, 2x3, 2x3		
		(b)	1x3, 1x3, 1x6		
		(c)	1x3, 1x3, 2x3, 3x3		
Section D		Q.8	(a)	2x3, 2x3, 1x3, 2x3, 1x3	
	(b)		1x3, 1x3, 1x3, 1x3, 1x3, 2x3, 1x3		
	Q.9	(a)	1x3, 1x3, 3x3, 3x3		
		(b)	4x3, 2x3, 2x3		
	Section E	ANY TWO QUESTIONS			
		Q.10	(a)	2x3, 2x3, 2x3	
(b)			1x3, 3x3, 2x3		
(c)			3x3, 3x3	any two parts	
Q.11		(a)	4x3, 2x3		
		(b)	3x3, 3x3		
		(c)	5x3, 1x3	any two parts	
Q.12		(a)	3x3, 3x3		
		(b)	2x3, 4x3	any one of four (i) – (iv)	
Q.13		(a)	2x3, 4x3		
		(b)	2x3, 1x3, 3x3		
		(c)	2x3, 4x3	any two parts	
Q.14		(a)	1x3, 1x3, 1x3, 1x3, 2x3		
		(b)	3x6		
Q.15		(a)	1x3, 3x3, 2x3		
	(b)	1x3, 1x3, 1x6, 1x3, 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) $0.2 \times 150 / f \times d$
30 (allow 6 marks for '30' alone) | 4 + 2 | [6] |
| (b) $\frac{15}{10}$ or $\frac{v}{t}$ or m/s ²
1.5
(allow 6 marks for 1.5 alone) | 4 + 2 | [6] |
| (c) vertical line from c.g.
stays inside the base
(allow 6 marks for c.g. rises) | 4 + 2 | [6] |
| (d) $1.5 \times 10 / 15 /$ correct conversion to kW alone (i.e. 1.5 kW)
180 c/ €1.8
(allow 6 marks for 180 c or €1.8 alone) | 4 + 2 | [6] |
| (e) it moves/rotates
electric current produces (causes) magnetic force (field) /magnetism | 4 + 2 | [6] |
| (f) live
To protect the appliance/ if the fuse 'blows' there is no electricity | 4 + 2 | [6] |
| (g) vaporisation (turns to vapour/ gas)/ change of state/ reference to latent heat | (6) | [6] |
| (h) alcohol has a lower melting (freezing) point/ will not freeze
or
mercury has a higher boiling point/ will not evaporate | (6)
or
(6) | [6]
[6] |
| (i) $v = f\lambda$ or $f = \frac{v}{\lambda}$ or $\frac{330}{0.33}$

1000/ Hz (Hertz)
(allow 6 marks for 1000 or 1kHz) | 4 + 2 | [6] |
| (j) any two from: A-green, B-blue, C-red

(letters matching colours) | 4 + 2 | [6] |

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

- | | | |
|---|-------|------------|
| (a) filtration
sand and water/ named insoluble solid and named liquid | 4 + 2 | [6] |
| (b) contains only one kind of atom/ all its atoms have the same atomic number/ cannot be broken down to simpler substance

two or more different elements (atoms) chemically combined | 4 + 2 | [6] |
| (c) copper and zinc
conducts electricity/ chemically changed by current/ solution with ions | 4 + 2 | [6] |
| (d) dip pH paper into solution/ drops of universal indicator/ put electrode (probe) of pH meter into solution
match colour with scale/ read value from scale/ read pH meter | 4 + 2 | [6] |
| (e) loss of electrons/ addition of oxygen/ removal of hydrogen
gain of electrons/ removal of oxygen/ addition of hydrogen | 4 + 2 | [6] |
| (f) mortar
pestle (names reversed 3 marks only) | 4 + 2 | [6] |
| (g) same atomic number/ same number of protons
different mass number/ different number of neutrons | 4 + 2 | [6] |
| (h) sodium
electrostatic/ electrical/ ionic bonds | 4 + 2 | [6] |
| (i) acid + base
salt + water | 4 + 2 | [6] |
| (j) bulb glows/ current flows/ conducts
bulb does not glow/ current does not flow/ does not conduct | 4 + 2 | [6] |

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

- (a) **any two from:** assimilation, movement, reproduction, sensitivity, growth, respiration, excretion, feeding 4 + 2 [6]
- (b) group of cells 4 + 2 [6]
that are identical (similar)/ do the same job
- (c) **A:** photosynthesis (makes food)/ transpiration/ gaseous exchange/ stores food 4 + 2 [6]
- B:** anchors (supports) plant/ absorbs water (minerals)/ stores food [6]
- (d) **any one from:** adrenaline/ FSH (growth hormone)/ insulin/ melatonin/ oestrogen/ progesterone/ testosterone/ thyroxine 4 + 2 [6]
- any matched one from:** adrenals/ pituitary/ pancreas/ brain/ ovaries/ testes/ thyroid
- (e) higher blood pressure 4 + 2 [6]
arteries have a pulse/ have no valves/ carry blood from the heart/ mostly carry oxygenated blood/ smaller lumen
- or*
- veins** have no pulse/ have valves/ carry blood to the heart/ mostly carry deoxygenated blood/ larger lumen [6]
- (f) **A** excretion/ removes wastes (urea)/ produce urine 4 + 2 [6]
B ureter
- (g) $C_6H_{12}O_6$ 4 + 2 [6]
 O_2
- (h) insects 4 + 2 [6]
nectar/ smell/carpel inside
- (i) controls life processes of cell (keeps cell alive)/ 4 + 2 [6]
cell can not reproduce without a nucleus/ controls heredity/
contains genes (chromosomes)
- any two**
- (j) capillaries 4 + 2 [6]
oxygen enters/ carbon dioxide (CO_2) leaves/gaseous exchange

SECTION B – PHYSICS (48 marks)

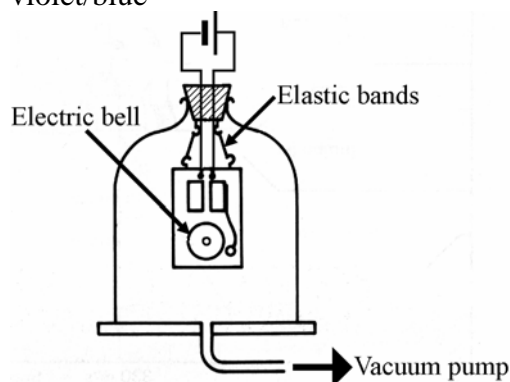
Answer either question 4 or question 5.

Question 4. (48 marks)

- (a) Calculate **area** is $20 \times 10 / 200 \text{ cm}^2 / 0.02 \text{ m}^2$ (3)
- force** is 25 N (allow these marks if these correct values appear, anywhere, in the calculation. Units are not required here) (3)
- If any of the above correct values appear and no other calculation is correct allow (6) for **any one** correct area or force value. (3)
- $P = \frac{F}{A}$ **or** $\frac{2.5}{200}$ **or** $\frac{2.5}{0.02}$ **or** $\frac{25}{200}$ **or** $\frac{25}{0.02}$ (3) [12]
- (the correct ratio, i.e. any of the above, merits 3 marks)
- 0.125 N/cm^2 **or** 1250 N/m^2
- [deduct the final 1 mark if the correct units are not given with the calculated answer]**
- Which? $6 \text{ cm} \times 10 \text{ cm} / 60 \text{ cm}^2 / 0.006 \text{ m}^2 /$ smallest area (3) [3]
- Why? **any two from:** (6)
- the thin wire exerts pressure
- the pressure melts the ice
- the water freezes again above the wire (3) [9]
- (b) Describe **any two from:** (6)
-) fill a bottle (container) with water
- put the bottle in a freezer
- the bottle bursts (cracks)/ level rises (3) [9]
- Draw **diagram showing a circuit with:**
- battery/electrical supply (3)
- bimetallic strip and contact (3)
- heater/ bell/ speaker/siren (3) [9]
- What how good it is at insulation (keeping heat in) (6) [6]

Question 5. (48 marks)

- (a) (i) Which? B (3) [3]
- (ii) Which? A (3) [3]
- (iii) What? goes out (3)
circuit is broken (3) [6]
- (iv) Calculate $R = \frac{V}{I}$ or $\frac{6}{0.03}$ (3)
(allow 6 marks for 200 alone) (3) [6]
(allow 3 marks for 'Ohms' or Ω only, if no other mark is awarded)
- (v) Distinguish **any one from:**
d.c. current flows in one direction only (6) [6]
a.c. current changes direction
- (b) (i) What? refraction (3) [3]
)
(ii) What? dispersion (3)
What? mixture of coloured lights (3)
Name **no matching required, any order**
red (3) [12]
violet/blue (3)
- (c) Describe



- electric bell in container (bell jar) (3)
vacuum pump/ remove air (3)
bell cannot be heard (3) [9]
[no diagram deduct 3 marks]

SECTION C - CHEMISTRY (48 marks)

Answer either question 6 or question 7.

Question 6. (48 marks)

- (a) (i) Name Water (6)
anhydrous copper sulphate/ cobalt chloride (3)
final colour *only* required
blue (3)
or **or**
to pink (3) [12]
(colours to match named substance)
- (ii) Name limewater (3)
carbon dioxide/ CO₂ (3) [6]
- (iii) Name magnesium oxide (3)
- Result basic/ red to blue/ pH greater than 7 (3) [6]
- (b) Select **any two from:**
) **settling:** particles sink to bottom of water in tank (3)
clarification/ remove solids (3)
- or** **or**
filtration: water passed through sand (3)
clarification/ removal of suspended solids (3)
- or** **or**
chlorination: chlorine added to water (3)
to kill bacteria/microbes/germs (3)
- or** **or**
fluoridation: fluoride added to water (3)
help prevent tooth decay (3) [12]
- Describe soap (6) [6]
- Name calcium/ magnesium (3)
chloride/ sulphate (3) [6]

Question 7. (48 marks)

- (a) (i) What? exothermic (3) [3]
- (ii) Give sodium hydroxide/ sulphuric acid/ anhydrous (3)
copper sulfate/ burning
and water/ a named fuel (3)
(accept any correct example)
(allow respiration/ burning for 6 marks) [6]
- (iii) Give ammonium chloride (3)
and water (3)
(accept any correct example)
(allow cook/photosynthesis for 6 marks) [6]
- (b) Name acetic (ethanoic) acid/ hydrochloric acid/ (3) [3]
) vinegar
sulphuric acid
What? hydrogen (3) [3]
List Ca Mg Zn Fe Cu (6) [6]
(at least *four* in the correct order allow 6
marks)
(at least *three* in the correct order allow 3 marks)
- (c) (i) What? smallest part of an element (3) [3]
- (ii) Define number of protons (3) [3]
- (iii) Define number of protons/nuclear charge (3)
plus number of neutrons (3) [6]
- (vi) Draw **diagram showing any three from:**
central nucleus with 12 protons and/or 12
neutrons (3)
2 electrons in first orbit and 8 electrons in
second orbit (3) [9]
2 electrons in third orbit (3)
[no diagram deduct 3 marks]

SECTION D – BIOLOGY (48 marks)

Answer either question 8 or 9.

Question 8. (48 marks)

- | | | | | |
|-----|-----------------------|--|-------------------------|-----|
| (a) | (i) <u>Name</u> | A-oesophagus
C-small intestine | (3)
(3) | [6] |
| | (ii) <u>What?</u> | any one from: digestive (gastric) juice added/
acid added/ enzymes added/ food is churned
(mixed)/ digestion (breakdown)of protein starts/
disinfected | (6) | [6] |
| | (iii) <u>Where?</u> | C/small intestine/ ileum | (3) | [3] |
| | (iv) <u>What?</u> | food
enters (used by) the cells of our body | (3)
(3) | [6] |
| | (v) <u>Give</u> | remove water/ solidify (receive) (move)
undigested food (waste) | (3) | [3] |
| (b) | (i) <u>Name</u> | amylase | (3) | [3] |
| | (ii) <u>Name</u> | starch/ named starch-rich food | (3) | [3] |
| | (iii) <u>Describe</u> | mix food with water/ no preparation is required if
the starch is already in solution (suspension) | (3) | [3] |
| | (iv) <u>Give</u> | 37 °C/ body temperature/ 30-40 °C | (3) | [3] |
| | (v) <u>How?</u> | 4 to 5 minutes/ or longer | (3) | [3] |
| | (vi) <u>Describe</u> | any one from: add iodine solution
no blue-black colour | (3)
(3) | |
| | | or
add Benedict’s solution and heat
turns orange/red | or
(3)
(3) | |
| | | or
add Fehling’s solution and heat
turns orange/red | or
(3)
(3) | [6] |
| | (vii) <u>Name</u> | maltose (accept ‘glucose’) | (3) | [3] |

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) Explain **solar system:** sun (3)
and the planets (3)
- galaxy:** very large group (3)
of stars (3)
- universe:** all the matter (3)
and energy that exists (3) [18]
- (b) Name cumulus (3) [3]
)
- How? water vapour in the air (3)
cools/ condenses (3)
into tiny droplets (3) [9]
- Why? air heats up (3)
the tiny droplets evaporate (3) [6]
- (c) Describe **sea breeze:** land heats faster than the sea (3)
hot air over land will rise (3)
cooler air, from the sea, replaces it (3)
- land breeze:** land cools faster than the sea (3)
hot air over sea will rise (3)
cooler air, from the land, replaces (3) [18]
it

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

- (a) Outline **aphid**
- | | | | |
|--|-----------------------------------|---------------------|-------------|
| | Eggs (3) → wingleless females (3) | (3) | |
| | ↑ | ↓ | |
| | Adult | winged females (3) | (3) |
| | (females and males) (3) | ← | (3) |
| | or | | |
| | butterfly | | |
| | Eggs (3) → Caterpillar (3) | (3) | |
| | ↑ | ↓ | |
| | Adult | pupa/ chrysalis (3) | (3) |
| | (female and male) (3) | ← | (3) |
| | butterflies | | [12] |
- Give **biological:** ladybirds eat aphids (3)
- chemical:** insecticide (pesticides) on leaf kills caterpillars that eat the leaf (3) **[6]**
- (b) Name bent (3)
- fescue (3)
- ryegrass (3) **[9]**
- Describe sow grass seeds in tray of compost/ sow grass in a plot (3)
- transfer grass from tray into a lawn/ allow to germinate (3)
- (grow)
- observe effects (3) **[9]**
- (c) (i) Describe mass of fresh soil (3)
- heat at 100 °C to constant mass (3)
- mass of dry soil (3)
- subtract/ find loss (decrease) in mass (3)
- % water = loss in mass/mass of fresh soil × 100 (3) **[15]**
- (ii) Give **any one from** remove lower leaves/ use rooting powder/ (3) **[3]**
- put cutting in propagator (suitable soil)

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

- (a) Name any *two from*: keys/pot/dish/hurley/towel (2 × 3)
- Give any *two from (matched)*: brass/steel/
polypropylene/ ash/ cotton (2 × 3)
- State any *two from (matched)*: hard-
wearing/strong/unbreakable/ flexible/ absorbent (2 × 3) [18]

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

(i) Plastics

- Explain large molecules (3)
made by joining smaller molecules (monomers) together (3) [6]

- Describe **show or state**
- wrap two identical metal cans with different plastics (3)
fill each can with hot water and record the temperature (3)
leave the cans for 10 minutes, read the temperatures (3)
the smaller drop in temperature, is the better insulator (3) [12]
- accept equivalent experiments**

(ii) Metals

- What? compound of a metal (3)
found in nature (3) [6]

- Describe **show or state**
- mix copper ore with charcoal (3)
wrap mix in kitchen foil, heat strongly for 5 minutes (3)
empty contents of foil into cold water (3)
small pieces of copper seen (3) [12]
- accept equivalent experiments**

(iii) Textiles

<u>Name</u>	any one from: acrylic/ cotton/ linen/ nylon/ polyester	(3)	
<u>Say</u>	by spinning	(3)	[6]
<u>Describe</u>	show or state		
	find weight of two samples of textile	(3)	
	soak samples in water	(3)	
	reweigh and find increase in weight	(3)	
	the greater weight is the more absorbent	(3)	[12]
	accept equivalent experiments		

(iv) Timber

<u>Name</u>	hardwood, any one from: ash/ beech/ hawthorn/ oak...	(3)	
	softwood, any one from: fir/ larch/ pine/spruce...	(3)	[6]
<u>Describe</u>	show or state		
	weigh/ measure length, breadth and height of the dry block of wood	(3)	
	soak the block in water overnight	(3)	
	reweigh/ measure again	(3)	
	block is bigger, moisture causes wood to expand/ block is heavier, moisture causes wood to get heavier	(3)	[12]
	accept equivalent experiments		

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

- (a) (i) What? a device that lets electric current flow through it in one direction only (3) [3]
- (ii) Which? A/ short leg (3) [3]
- (iii) Why? to control (limit) the current (3) [3]
- (iv) Why? only one LED lights at a time (3) [3]
- (v) Match C with plus (D with minus) (3)
Which? red LED lights (3)
- or** (3)
 C with minus (D with plus) (3)
 green LED lights (3) [6]

(b) Draw

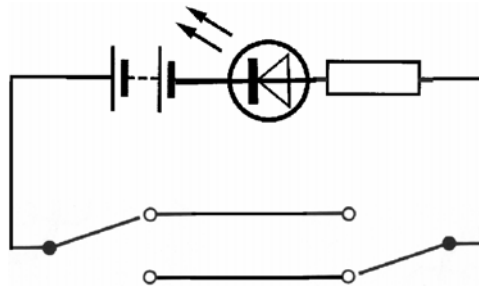


diagram showing:

battery, LED and resistor in series (6)

LED in forward bias (6)

two type **B** switches correctly connected into the circuit (6) [18]

note there are four different switch throw (the bit of the switch that moves) combinations possible, all are correct

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

(a) What? it moves (3) [3]

Draw

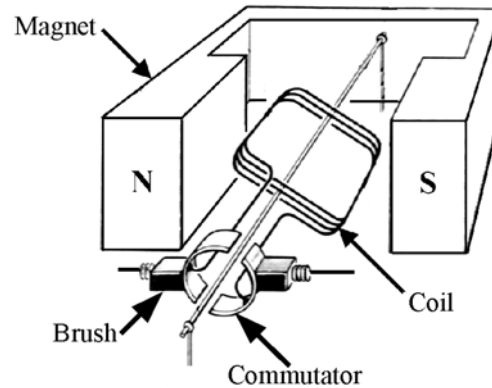


diagram showing:

coil between magnetic poles (3)

magnetic poles (3)

commutator/ brush (3) [9]
[no labels deduct 3 marks]

Give electrical energy to kinetic energy (6) [6]

(b) (i) Name Potential (3) [3]

(ii) What? Kinetic (3) [3]

(iii) Give kinetic energy to electrical energy (6) [6]

(iv) What? Chemical (3) [3]

(v) Identify **any one from:** wind/ tidal/.wave/ solar/
 geothermal/ biomass (3) [3]