



**Coimisiún na Scrúduithe Stáit
State Examinations Commission**

Junior Certificate Examinations 2003

Science

Ordinary Level

Junior Certificate Examination

Science

Ordinary Level Paper

Structure

Five Sections A, B, C, D, E

Section A:	Core	:	1 question: 15 parts (attempt any 12 parts)
Section B:	Physics	:	3 questions (attempt any 2 questions)
Section C:	Chemistry	:	3 questions (attempt any 2 questions)
Section D:	Biology	:	3 questions (attempt any 2 questions)
Section E:	Applied Science	:	6 questions (attempt any 2 questions)

Requirements

Without Local Studies: Section A + any 3 other sections

With Local Studies: Section A + any 2 other sections

Marking

Without Local Studies: $(12 \times 12) + (3 \times 72) = 144 + 216 = 360$ marks

With Local Studies: $(12 \times 12) + (2 \times 72) = 144 + 144 = 288$ marks

Grades

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

SECTION A – Core (144 marks = 12 × 12)

1. (a) 4×3 ; (b) 4×3 ; (c) 4×3 ; (d) 4×3 ; (e) 4×3 ; (f) 4×3 ; (g) 4×3 ; (h) 4×3 ;
(i) 4×3 ; (j) 4×3 ; (k) 4×3 ; (l) 4×3 ; (m) 4×3 ; (n) 4×3 ; (o) 4×3 [Any 12 parts]

SECTION B – PHYSICS (72 marks = 2 × 36)

2. (a) 4×3 ; (b) 4×3 ; (c) 4×3
3. (a) 4×3 ; (b) 4×3 ; (c) 4×3
4. (a) 4×3 ; (b) 4×3 ; (c) 4×3

SECTION B – CHEMISTRY (72 marks = 2 × 36)

5. (a) 4×3 ; (b) 4×3 ; (c) 4×3
6. (a) 4×3 ; (b) 4×3 ; (c) 4×3
7. (a) 4×3 ; (b) 4×3 ; (c) 4×3

SECTION C – BIOLOGY (72 marks = 2 × 36)

8. (a) 4×3 ; (b) 4×3 ; (c) 4×3
9. (a) 4×3 ; (b) 4×3 ; (c) 4×3
10. (a) 4×3 ; (b) 4×3 ; (c) 4×3

SECTION C – APPLIED SCIENCE (72 marks = 2 × 36)

11. (a) 4×3 ; (b) 4×3 ; (c) 4×3
12. (a) 4×3 ; (b) 4×3 ; (c) 4×3
13. (a) 4×3 ; (b) 2×3 ; (c) 6×3
14. (a) 4×3 ; (b) 4×3 ; (c) 4×3
15. (a) 4×3 ; (b) 4×3 ; (c) 4×3
16. (a) 4×3 ; (b) 4×3 ; (c) 4×3

SECTION A – Core (144 MARKS)

Any 12 parts (12 × 12 marks)

1. (a)

Measuring (graduated) cylinder (cylinder only – 0)	(3)	
Funnel	(3)	
Retort (clamp) stand/stand [Accept clamp]	(3)	
Beaker	(3)	[12]

(b)

Any two of: Solar / wind / wave / tidal / hydroelectric / biomass /waterfall

(water only – 0) (2×3)

Any two of: Coal / oil / turf / gas (2×3) **[12]**

Accept “Nuclear” once only for either. Accept trees / timber / wood once only.

(c)

Mass only	(3)	
Volume	(3)	
Electricity (ESB unit of electricity) / energy	(3)	
Area	(3)	[12]

(d)

Toxic	(3)	
Radioactive	(3)	
Irritant	(3)	
Flammable	(3)	[12]

(e)		
Rises	(3)	
Water expands	(3)	
Drops / falls back down	(3)	
Thermometer	(3)	[12]

(f)		
Universal indicator	(3)	
Sodium	(3)	
Carbon	(3)	
Nitrogen	(3)	[12]

(g)		
Test-tube A / Tap water	(3)	
To remove oxygen / air	(3)	
Any two of: Oiling / greasing / painting (lacquering or varnishing) / galvanizing / keep dry / exclusion of air (oxygen) / plastic coating / tin plating / plating	(2×3)	[12]

(h)		
Physical: Melting of ice, dissolving of sugar in tea.	(2×3)	
Chemical: Cooking of food, burning of wood.	(2×3)	[12]

(i)

Magnet / container of water (3)

Heating / by using a Bunsen burner (3)

Any correct example of a mixture: salt and water, sand and water, an alloy or named alloy, soil, concrete, etc. (3)

Any correct example of a compound: NaCl, CO₂, etc. (name or formula) (3) [12]

(j)

100 (3)

0 (3)

Tension / skin (3)

Walk on water / not sink (3) [12]

(k)

Food / produce antibiotics / medicine / flavour of cheese / decomposer /

To kill germs (3)

Disease (named disease e.g. athlete's foot) / food spoilage / poison /

Rot (3)

Medicine / antibiotics / yoghurt making / cheese making / silage /

Research / biological warfare / genetic engineering /

help immune system / build up antibodies (3)

Cold / 'flu / pneumonia / meningitis / AIDS / chicken pox /SARS

(bacterial or fungal diseases – 0) (3) [12]

(l)

Constipation / cancer	(3)	
Vegetables / Cereals / Fruit (or named example of either)	(3)	
Energy	(3)	
Iodine	(3)	[12]

(m)

Slurry / silage effluent (farm waste) / oil / sewage / litter / fertilizers / Milk / acid rain / heat from factories / nuclear	(3)	
Any correct suggestion i.e. storage tanks / litter bins / litter regulations / Fines	(3)	
Smoke / smog / car fumes / factory fumes / acid rain / CO ₂ / CFCs Accept source of pollution	(3)	
Any correct suggestion i.e. smokeless coal / unleaded petrol / car pools / Using public transport etc.	(3)	[12]

(n)

Testes / testicle	(3)	
Ovary	(3)	
Fertilisation / conception (accept zygote)	(3)	
14 th (fourteenth) / (12 th – 16 th incl.)	(3)	[12]

(o)

Heart	(3)	
Breathing system	(3)	
Kidney	(3)	
Nerves	(3)	[12]

SECTION B – PHYSICS (72 marks)

Any two questions (2 × 36 marks)

Question 2 [36 marks]

- (a) Callipers (3)
Opisometer (3)
Overflow can (3)
Balance (3) [12]

- (b) Metre / kilometer / mile etc. or appropriate symbol (3)
Seconds / hours (3)
Divided / over (3)
m/s or km/hr or mph. (3) [12]

(c) **State or show (4 × 3)**

- Two surfaces (hands) (3)
Action / movement (rub / pull) (3)
Repeat with oil / lubricant (3)
Observation (3) [12]

(Award a maximum mark of 6 for a correctly described application rather than an experiment)

[No labelled diagram – deduct 3 marks]

[A diagram must have at least one label to merit marks]

Question 3 [36 marks]

- (a) Convection (3)
Energy (3)
Insulator (3)
Radiation / convection (3) [12]

- (b) A = Ice (3)
B = Freezing (3)
C = Evaporation / boiling (3)
D = Steam / water vapour / cloud (3) [12]

(c) **State or show (4 × 3)**

- Rods set-up (3)
Wax / vaseline (3)
Heat source applied to one end of rods (3)
Result / conclusion (3) [12]

[No labelled diagram – deduct 3 marks]

Question 4 [36 marks]

- (a) Battery / cell / power source (3)
Bulb / buzzer / ammeter (3)
Gets warm (hot) / heats up / glows / melts (3)
Kettle / immersion / toaster / electric fire / light bulb (3) [12]

- (b) Blue (3)
Yellow and green (3)
Live / brown (3)
Overload / shock / fire / electrocution / accident (3) [12]

(c) **State or show (4 × 3)**

- Three pieces of card, holes in straight line / Drinking straw(straight)(3)
Light bulb (light source) can be seen / shine light through (3)
Move one card out of line / bend straw (3)
Conclusion / result (3) [12]

Or

- | | | | | |
|------------------------|-----|-----------|------------------------|-----|
| Light | (3) | or | Laser | (3) |
| Obstacle | (3) | | Dust / smoke | (3) |
| Shadow | (3) | | Light beam can be seen | (3) |
| Directly behind object | (3) | | in a straight line | (3) |

[No labelled diagram – deduct 3 marks]

SECTION C – CHEMISTRY (72 marks)

Any two questions (2 × 36marks)

Question 5 [36 marks]

- (a) Li (3)
 Nucleus (3)
 Electron cloud / shells / orbiting the nucleus (3)
 Positive / +1 (3) [12]

- (b) Solvent (3)
 Dissolves (3)
 Concentrated (3)
 Dilute (3) [12]

(c) **State or show (4 × 3)**

Pour	Mixture in container	Mixture in container
Filter paper (bed)	Allow to settle	Heat
Water passes through	Pour off (decant)	Boils off
Sand remains behind	Sand remains behind	Sand remains behind
(4 × 3) [12]		

(Award a maximum of 6 marks for a correctly applied application)

[No labelled diagram – deduct 3 marks]

Question 6 [36 marks]

- (a) Carbon dioxide (3)
Oxygen (3)
Vinegar / carbon dioxide (3)
Water (accept vinegar) (3) [12]
- (b) Temporary / permanent (3)
Tastes nice / good for your teeth / contains minerals / calcium
Good for tanning / brewing (3)
Clogs pipes / damages boilers / wastes soap / produces scum (3)
Boiling / ion exchange / heat / bath salts / water softeners (3)[12]
- (c) Quenches (goes out) (3)
More dense (3)
Any two of:
Fire extinguisher / dry ice / smoke effects / refrigeration
fizzy drinks / photosynthesis / greenhouse effect (2×3)[12]

Question 7 [36 marks]

- (a) Copper (3)
Mercury (3)
Aluminium (3)
Silver / copper (3)[12]
- (b) Potassium (3)
Magnesium (3)
Bronze / brass / steel / Alnico (3)
Any correct use (must be matched to get 6 marks) (3)[12]
- (c) Coating / covering / depositing a layer (3)
metal (3)
Gets smaller / used up / wears away / dissolves / covers key (3)
Cutlery / named cutlery item / correctly named kitchen utensil /
Taps (3)[12]

SECTION D – BIOLOGY (72 marks)

Any two questions (2 × 36 marks)

Question 8 [36 marks]

- (a) Enamel / crown (3)
Calcium / P /Mg / F (3)
Bacteria and food / bacteria (3)
Disclosing tablet (explanation of) (3)[12]
- (b) Stomach (3)
Large intestine / colon (3)
Mixes food / forms chyme (soupy liquid) / breaks down food /
Digests food / produces enzymes / produces acid / stores food (3)
Water (3)[12]
- (c) Windpipe / trachea (3)
Ribcage/ ribs / chest wall (3)
Lung (3)
Balloons inflate (fill up) / lungs inflate (3)[12]

Question 9 [36 marks]

- (a) **Living:** Frog (3)
Daisy (3)
Non-Living: Stone (3)
Wind (3)[12]

- (b) Sepal / calyx (3)
Female gamete (sex cell) / eggs / ovules / seeds (3)
Petal / corolla / nectary (3)
Male gamete (sex cell) / pollen (3) [12]
(Accept gamete / sex cell once only for 3 marks in place of point 2 or 4)

- (c) Pit fall trap (Accept pit trap) (3)
Prevent rain entering (drowning) / shelter /
Protect trapped animals from predators (3)

Any two of:

- Beetle / spider / millipede / centipede / slug / woodlouse /
earwig / ladybird / caterpillar (2×3)[12]

Any two questions (2 × 36 marks)

Question 10 [36 marks]

- (a) Microscope (3)
Cell wall (3)
Nucleus (3)
Any one of:
Cytoplasm / vacuole / cell membrane / chloroplast (3)[12]
- (b) Drops / gets lower (3)
Prevents evaporation (3)
Root / root hair (3)
Photosynthesis (makes food) / transpiration (water loss) /
Food storage / gaseous exchange (3)[12]
- (c) **State or show (4 × 3)**

Known volume of water (3)
Known volume of soil (3)
Note combined volume (3)
Expected result – actual result = Volume of air (3)[12]

[No labelled diagram – deduct 3 marks]

Question 11 – Earth Science

[36 marks]

(a)

Stars	(3)
Satellite	(3)
Light	(3)
Year	(3)[12]

(b)

Thermometer	(3)
Temperature / degrees / °C	(3)
Rain gauge	(3)
Wind speed	(3)[12]

(c) State or show (4 × 3)

Definite amount of water on surface / in beaker	(3)
Fan	(3)
Record time to evaporate	(3)
Repeat without fan	(3)[12]

[No labelled diagram – deduct 3 marks]

Question 12 – Horticulture

[36 marks]

(a)

Growth (of a seed) (3)

Any two of:

Water / oxygen / warmth (temperature) (2 × 3)

Photosynthesis (to make food) / to make chlorophyll (3)[12]

(b)

Growth (of plants in water) (3)

with nutrients added (3)

Nutrients / Aeration / Drainage / Pest free / Retains water /
weed free / correct pH / contains nutrients (3)

Wilts / Dies / withers (3)[12]

(c) State or show (4 × 3)

(Cabbage-white butterfly) Aphid Rabbit / Bird / Snail

Egg	(3)		Egg	(3)		2 adults	(3)
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Larva (caterpillar)	(3)		Wingless female	(3)		mating / fertilisation	(3)
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Pupa (Chrysalis)	(3)		Winged female	(3)		egg / pregnancy	(3)
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Adult (Butterfly)	(3)		Adult	(3)		hatch / birth	(3)
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[12]

[No labelled diagram – deduct 3 marks]

Question 13 Materials Science

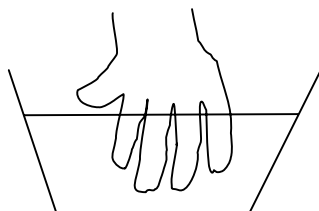
[36 marks]

(a)

- Pine (3)
- Polythene (3)
- Cotton (3)
- Oil (3)[12]

(b)

- Warm iron (3)



(3)[6]

(c)

A - PLASTICS

- Any correct use (3)
- Oil (crude) (3)

State or show (4 × 3)

- Weights / load (3)
- Measure bend (3)
- Repeat with second plastic (3)
- Comparison (3)[18]

[No labelled diagram – deduct 3 marks]

B – TEXTILES

Treatment (of material) / Use of chemicals (3)

To prevent fire (3)

State or show (4 × 3)

Mass of two fabrics or Immerse in water (3)

Soak in water Remove / allow to drip (3)

Allow to drip Repeat with second fabric (3)

Comparison / Result Compare volumes of water absorbed (3)[18]

[No labelled diagram – deduct 3 marks]

C – METALS

Gold / Silver / Copper / Platinum (3)

Iron / Copper / Aluminium (3)

State or show (4 × 3)

Implement to scratch (nail / ball bearing / other metal) (3)

Scratch / Squeeze in vice / mark (3)

Repeat with second metal (3)

Comparison / Result (3)[18]

[No labelled diagram – deduct 3 marks]

D – TIMBER

Oak / Ash / Sycamore / Teak / Mahogany etc (not coniferous) (3)

Any correct use: Furniture / Flooring etc (3)

State or show (4 × 3)

Add weights (3)

Measure bend (3)

Repeat with second timber (3)

Compare (3)[18]

[No labelled diagram – deduct 3 marks]

Question 14 – Food

[36 marks]

(a)

Calcium	(3)
Sugar	(3)
Orange juice	(3)
Lean meat	(3)[12]

(b)

Changing or altering / canning / freezing / smoking / pasteurization / cold storage / dehydration / vacuum packing / additives / irradiation / cooking / slicing / mincing / UHT / pickling etc. (3)

Any two of:

Cheese / Yoghurt / Butter / chocolate / whey / ice cream / buttermilk etc. (2×3)

Any other correctly named processed food except those listed in 1 and 2 (3)[12]

(c) State or show (4 × 3)

Container / pit / clamp / silo / bale	(3)
Exclude air / bale	(3)
Sealed / wrapped	(3)
Leave for a time / Leave	(3)[12]

[No labelled diagram – deduct 3 marks]

Question 15 – Electronics

[36 marks]

(a)

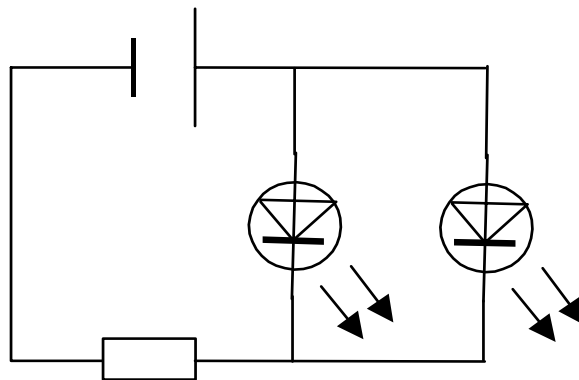
- Voltmeter (3)
- Ammeter (3)
- Variable resistor (3)
- LED (3)[12]

(b)

- Dependent (3)
- Dark / Dim (3)
- Bright (3)
- Switch on lights in the evening / Switch off lights in the morning / burglar alarms / light meter / street lights (3)[12]

(c)

- Battery (3)
- Two LEDs in parallel (3)
- Forward bias (3)
- Resistor in correct location (3)[12]



Question 16 – Energy Conversions

[36 marks]

(a)

Kinetic	(3)
Potential	(3)
Light	(3)
Sound	(3)[12]

(b)

Iron / Steel	(3)
Lifts (attracts) pins (paper clips / nails)	(3)
Electrical	(3)
Crane in scrap-yards / Doorbells / Relays / motor / generator	(3)[12]

(c) State or show (4 × 3)

Container of water / Custard powder (in tin)	(3)
Burn peanut or other food / Candle lighting	(3)
Thermometer (measure temperature) / Ignite custard (blow through tube)	(3)
Result i.e. Rise in temperature (water gets hot) / Lid blown off tin	(3)[12]

[No labelled diagram – deduct 3 marks]