Coimisiún na Scrúduithe Stáit

State Examinations Commission

JUNIOR CERTIFICATE EXAMINATION, 2006

SCIENCE (Revised Syllabus)

HIGHER 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 ON
CANCELLED OR REPEATED ANSWERS

ALL SHORT ANSWER QUESTIONS

If an answer is cancelled and a second answer given you should accept the cancellation and award marks for the uncancelled answer. If neither answer is cancelled then accept the first answer offered only and mark accordingly. If the only answer offered is cancelled ignore the cancelling and mark as normal.

LONGER ANSWER QUESTTIONS

For answers to "describe an investigation / experiment" multiple attempts should be dealt with as follows:

If candidates answer a question or part of a question only once and then cancels, 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 cancels 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. Points cannot be "mixed and matched from two attempts". The disallowed marks should be enclosed in square brackets.

MATHEMATICAL 'SLIPS' AND CONSEQUENTIAL MARKING

Deduct one mark for a mathematical 'slip' (-1). If the incorrect calculated value is used in a subsequent calculation 'correctly' allow the marks for the subsequent calculation.

DEDUCTION OF MARKS FOR OMITTED DIAGRAM

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

APPLICATION OF MARKING SCHEME

Apply the agreed marking scheme as detailed below.
Assistant Examiners should enter marks in Examiner Column 1.
Column 2 to be used by Appeal Examiners.
Disallowed marks should be placed in square brackets i.e. '[ ]'.

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 and the grade awarded indicated.

Junior Certificate Examination

SCIENCE

Higher Level Paper

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. [See end of this document]. 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. [See end of this document]. Enter the marks for each section in the Coursework B grid on the cover page of the coursework booklet.

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)

SCIENCE (REVISED SYLLABUS) HIGHER LEVEL 2006
Summary of Marking Scheme

BIOLOGY

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

CHEMISTRY

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

PHYSICS

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

Biology (130 MARKS)

Answer <u>each</u> of the questions 1, 2 and 3.

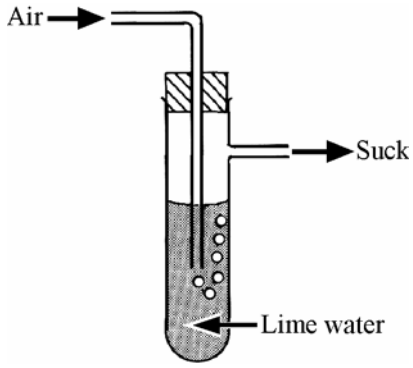
<u>Question 1. (52 Marks) *All* Items, (a), (b), (c), etc. (7 × 6 + 1 × 10 marks)</u>

(a) humerus (3)
hinge/ synovial (3) **[6]**

(b) **any *two* from**: bacteria/ fungi/ worms/ maggots/ nematodes/ woodlice/ ants protozoa/ springtails/ silver fish/ beetles… (2 × 3) **[6]**

(c) transpiration (3)
turns anhydrous (grey) (white) copper sulphate blue
or blue cobalt chloride pink/ cobalt chloride paper pink
or boils at 100 ^{o}C (3) **[6]**

(d) (3)



air entering tube **as shown** (3) (3) **[6]**

gas being removed **as shown** (3)
or
air moving on the right direction shown by only one arrow (3)

limewater labelled (3)
[no diagram no marks]

(e) ovulation/ release of egg (gamete) (3)
thickens (gets larger)/ rich blood supply/prepares for implantation (3) **[6]**

(f) chromosomes (3)
DNA (3) **[6]**

(g) **any *one*: 'how it works' (3) and any *one*: advantage/ disadvantage (3)** (3)
<u>composting</u>: plant (food) wastes are allowed to rot; safe/ useful product/ (3)
reduces use of landfill/ slow/ composter required… **or**
<u>incineration</u>: waste is burnt; toxic (medical) waste made safe/ possible air (3)
pollution… (3)
<u>landfill</u>: waste is put into the ground; quick/ leaching (effluent)/ long term **or**
management required… (3)
<u>recycling</u>: waste material is made into new items/ re-used/ saves resources/ (3)
doesn't go into landfill/ infrastructure (recycling plants) required… **or**
(accept equivalent answers) (3)
(3) **[6]**

(h) **result:any *one* from** <u>covered area</u> **or** <u>uncovered area</u>
<u>covered area:</u> no blue-black/ iodine stays yellow(orange)/no starch produced
<u>uncovered area</u>: goes blue-black/ starch produced (6)
allow (3) for no starch/ iodine stays yellow(orange) alone
conclusion: light required for starch (food) production (photosynthesis) (4) **[10]**

Question 2. (39 marks) *All* items, (a), (b) and (c).

(a)	(*i*) Name	alveoli(us)/ air sac	(3)	**[3]**
	(*ii*) How?	carbon dioxide (CO_2) enters/ CO_2 leaves the blood (capillaries)	(3)	
		Oxygen (O_2) leaves/ O_2 enters the blood (capillaries)	(3)	**[6]**
		allow (6) for 'diffusion'		
(b)	(*i*) Name	**any *two* from:** platelets/ red corpuscles (cells)/ white corpuscles (cells) (**accept** plasma)	(2 × 3)	**[6]**
	(*ii*) Give	**any *two* from matched:** clot blood/ transport (carry) oxygen (O_2)/ fight infection/ kill germs/ make antibodies/ transports cells (food) (waste) (hormones)…	(2 × 3)	**[6]**
	(*iii*) Why?	pumps blood around the body (accept right ventricle is thinner as it pumps blood around the lungs)	(3)	**[3]**
(c)	(i) What?	heart beat (pumping blood)/ changes in blood pressure in an artery	(3)	**[3]**
	(*ii*) How?	count the beats (pulses)	(3)	
		for one minute	(3)	**[6]**
	(*iii*) Account	**rise:** need more oxygen (food) (energy)/ need more carbon dioxide removed	(3)	
		fall: need less oxygen (food) (energy)/ need less carbon dioxide removed	(3)	**[6]**

Question 3. (39 marks) *All* items, (a) and (b).

(a) (*i*) What?

any *two* from:
protein: growth/ repair (**accept** 'energy')
accept body (muscle) building for protein
carbohydrate: energy
fat: energy/ insulation/protection
fibre: helps prevent constipation
sodium: water balance…

(2 × 3) **[6]**

(*ii*) Explain

choose the number of helpings (3)
of each food group per day (3)
or **or**
any *two* from: eat some from each layer/ (3)
eat more from the bottom/ eat less from the top (3) **[6]**

(*iii*) Which?

cheese, meat or fish: B (3)
chips or crisps: A (3) **[6]**

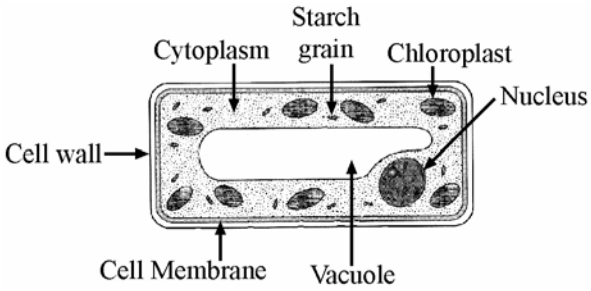
(b) (*i*) What?

A: magnify (enlarge) (make bigger)/ view (3)
B: hold (support) slide (specimen) (3) **[6]**

(*ii*) Describe

put piece of tissue on slide (3)
in water/ in iodine/ cover with slip (3) **[6]**

(*iii*) Draw



any *three* clearly labelled (3 × 3) **[9]**

[no diagram no marks]

Chemistry (130 MARKS)

Answer <u>each</u> of the questions 4, 5 and 6.

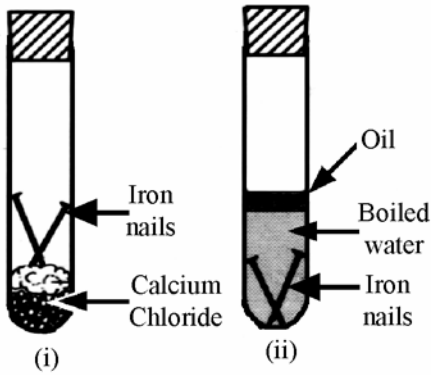
<u>Question 4. (52 marks) *All* items, (a), (b), (c), etc. (7 × 6 + 1 × 10 marks)</u>

(a)	same atomic number/ same number of protons/ same nuclear charge/ atoms of the same element	(3)	
	different mass number/ different number of neutrons/ different nuclear mass	(3)	**[6]**
(b)	hydrogen peroxide (H_2O_2), manganese dioxide (MnO_2)	(3)	
	manganese dioxide (MnO_2)	(3)	**[6]**
(c)	sulfur (sulphur) dioxide/ SO_2		
	(accept sulfur (sulphur) trioxide/ SO_3)	(3)	
	erosion/ dissolves/ damages	(3)	**[6]**
(d)	evaporate/boil off all the water/ distill	(3)	
	residue (solid) (deposit)	(3)	**[6]**
(e)	same size pieces/ same acid/ same concentration (strength)/ same temperature/ same volume (amount) (mass)	(3)	
	calcium, magnesium, zinc , copper/ Ca, Mg, Zn, Cu	(3)	**[6]**
(f)	2,8	(3)	
	8,1	(3)	
	allow (2 × 3) marks for a correct diagram		**[6]**
(g)	$CaCO_3$	(3)	
	H_2O	(3)	**[6]**
(h)	help (improve) electrical conductivity/ produce ions/ so it conducts/ enable electrolysis (the reaction)/ water is a poor conductor	(3)	
	burns with a 'pop' (sound)	(3)	
	two hydrogen atoms to one oxygen atom/ H : O = 2 : 1/ twice as much hydrogen as oxygen/ formula is H_2O	(4)	**[10]**

Question 5. (39 Marks) *All* items, (a), (b), (c), etc.

(a)	(*i*) Name	**A**-burette **or** **B**-pipette if both are named but mismatched with **A** and **B** **allow** (3)	(3)	**[3]**
	(*ii*) Describe	read volume before and after release subtract **or** set to zero read at end **or** read volume of acid at colour change	(3) (3) **or** (3) (3) **or** (3) (3)	**[6]**
	(*iii*) Name	hydrochloric acid sodium hydroxide/ sodium carbonate **accept** correct formulae HCl (3); NaOH/ Na_2CO_3 (3) **[calcium carbonate no marks]**	(3) (3)	**[6]**
	(*iv*) Write	HCl + NaOH NaCl + H_2O **accept** HCl + Na_2CO_3 NaCl + H_2O + CO_2	(3) (3) **or** (3) (3)	**[6]**
(b)	Give	**A: any *one* from:** flexible/ tough/ hard wearing/strong/ can be formed into fibres (filaments) (bristles)… **B: any *one* from:** can be moulded/ light weight/ rigid/ does not corrode/ colourful… **accept** 'strong' once only for **A or B**	(3) (3)	**[6]**
(c)	(*i*) What?	different colours appear (separation)	(3)	**[3]**
	(*ii*) What?	colour remains the same (no separation)/ moves up	(3)	**[3]**
(d)	Give	**gas:** no fixed shape (volume)/ takes volume of container/ compressible/ expansible/ diffuses/ lower density/ flows… **solid:** definite shape (volume)/ incompressible/ higher density/ does not flow… (**accept** 'does not diffuse' for solid)	(3) (3)	**[6]**

Question 6. (39 marks) *All* items, (a), (b) and (c).

(a)	(*i*) Why?	gases expand (contract) on heating (cooling) **matched** **or** compare (measure) volumes at same temperature **or** volume of gas depends on temperature	(3)	**[3]**
	(*ii*) Why?	oxygen removed (used)/ only some air reacts	(3)	**[3]**
	(*iii*) What?	nitrogen	(3)	**[3]**
	(*iv*) Give	**any *one* from:** **A**: more oxygen removed/ product is a solid/ gas syringe measures volume more accurately… **B**: candle flame will not use all oxygen/ product is a gas/ graduated cylinder not as accurate as gas syringe/ more water vapour in the air/ volumes at different pressures…	(6)	**[6]**
(b)	(*i*) Show	second column of table shaded/ clearly labelled	(3)	**[3]**
	(*ii*) Name	**any *one* from:** beryllium/ magnesium/ calcium/ strontium/ barium/ radium **[symbols get no marks]**	(3)	**[3]**
(c)	Give	**any *one* from:** change of colour/ becomes flakey/ change of texture/ becomes softer/ looses strength tarnish/ rust	(3)	**[3]**
	Describe	 nail/s in (i) nail/s in (ii) **(*i*)** calcium chloride/ drying agent **labelled/ clearly named in text** **(*ii*)** boiled (de-gassed) water/ water with no air **labelled/ clearly named in text** oil **labelled/ clearly named in text** **stoppers *not* required** **[no diagram/s deduct 3 *or* 6 marks]**	(3) (3) (3) (3) (3)	**[15]**

Physics (130 MARKS)

Answer <u>each</u> of the questions 7, 8 and 9.

<u>Question 7. (52 marks) *All* items, (a), (b), (c), etc. (7 × 6 + 1 × 10marks)</u>

(a)	**weight:** is a force/ depends on location (gravity)/pull of gravity/	(3)		
	mass: amount of matter/ resistance to force/ independent of location (gravity)	(3)		
	allow (6) for 'weight = mass × g' **or** w = mg			**[6]**
	accept 10 for 'g' in the formula above			
(b)	sound	(3)		
	reflected/ bounced	(3)		**[6]**
(c)	**calculate work:** 3600	(3)		
	calculate average power: 240	(3)		**[6]**
	no marks for formulae *or* units			
	apply mathematical 'slip' and consequential marking here			
(d)	bending of light	(3)		
	any *one* from rod partly in water appears bent/ water appears to be shallower than it really is/ formation of an image by a lens/ rainbow/ mirage…	(3)		**[6]**
(e)	measure (degree) of hotness/ coldness	(3)		
	Celsius (Centigrade) (^{o} C)/ Kelvin (K)/ Fahrenheit (^{o} F)	(3)		**[6]**
(f)	fuse melts/ breaks/ blows/ excess current	(3)		
	breaks the circuit/ cutting off supply	(3)		
	allow (6) for prevents overload (excess current)/ limits current			**[6]**
(g)	conduction	(3)		
	any *one* from: particles of liquid move carrying the heat with them/ current/ hot liquids rise/ cold liquids fall/ particles of a solid do not move around/ heat is transferred from one particle to another in a solid	(3)		**[6]**
(h)	**A:** LED glows	(3)		
	B: LED does not glow	(3)		
	current changes direction/ LEDs are dim as they only pass half the current (current passes for only half the time)/ diodes in both circuits are forward biased half (some) of the time	(4)		**[10]**

Question 8. (39 marks) *All* items, (a), (b), (c), etc.

(a)	(*i*) Why?	When drivers look in their mirrors they see 'Ambulance'	(3)	**[3]**
	(*ii*) Did?	image **A**	(3)	
	Give	Double reflection	(6)	**[9]**
(b)	Describe	**show *or* state:**		
		fill a bottle with water	(3)	
		put the bottle in a freezer	(3)	
		the bottle bursts	(3)	
		or		
		ice	(3)	
		floats	(3)	
		lower density/ some above the surface	(3)	**[9]**
		note: diagram is optional		
		accept equivalent experiments		
(c)	(*i*) What?	freezing/ solidifying/ changing from a liquid to a solid	(3)	**[3]**
	(*ii*) What?	latent/ heat of fusion	(3)	**[3]**
(d)	(*i*) List	**any *two* from:** CO_2 production/ global warming (greenhouse effect) / fines for not meeting agreed emission levels (Kyoto protocol)/ electricity shortages / possibly insecure supplies/ acidification of oceans/ non-renewable/ rising fuel (electricity) costs/ carbon tax…	(2 × 3)	**[6]**
	(*ii*) Suggest	**any *two* from:** biomass/ nuclear/ geothermal/ solar/ tidal/ wave/ wind/ hydroelectric	(2 × 3)	**[6]**

Question 9. (39 marks) *All* items, (a) and (b).

(a) State

extension (increase in length) (3)

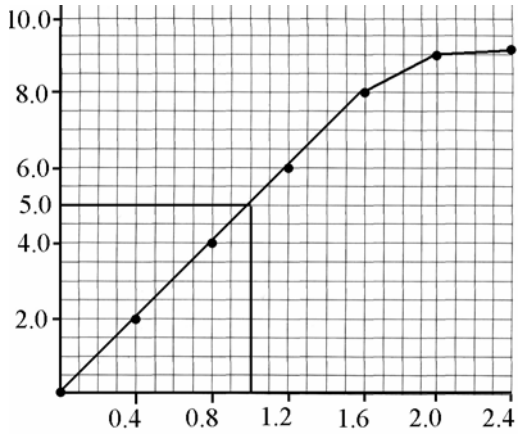
depends directly on force applied (3)

or

allow (6) for $\frac{force}{extension}$ = a constant **[6]**

allow (3) for $\frac{f}{e} = k$

(*i*) Plot



appropriate scales on both axes (3)

points plotted must include the origin and the last three points (3)

line drawn (3) **[9]**

note: for the sake of clarity a simplified grid is used in this marking scheme

(*ii*) Use

1.0 N (accept range 0.9 to 1.1)

value indicated, clearly, on graph merits (3) (3) **[3]**

[no graph no marks]

(*iii*) Estimate

1.6 N (accept range 1.6 to 2.0)

value indicated, clearly, on graph merits (3) (3) **[3]**

[no graph no marks]

(b) (*i*) State

parallel (3)

Give

safety/ if one blows the other stays on/ both bulbs have full brightness (current) (brightness) (voltage)/ if they were in series both would go out/ two separate paths (circuits) (3) **[6]**

(*ii*) What?

series (3)

Explain

circuit is broken (3) **[6]**

(iii) Calculate

2.4 (3)

What?

Ohm/ Ω (3) **[6]**

apply mathematical 'slip' and consequential marking here

BIOLOGY – Marking Criteria for Coursework B

Guide to mark assignment				
Section	**Aims**	**Total Mark**	**Germination**	**H.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	20	**Variables:** Identify any ***three*** variables: e.g. Number of peas / length of time peas left soaking / amount of water used in soaking / temperature at which seeds were left to germinate / volume of water added during growth period / time taken for radicle to emerge **Control:** Identify control e.g. set of peas left un-soaked	(1 + 2 + 2) (5)
	List of equipment needed for the investigation		**Equipment needed:** Identify any ***four*** pieces of equipment used e.g. peas / growth containers / growth medium / water / labels / graduated cylinder	(2 + 1 + 1 + 1)
	List of tasks to be carried out during the investigation		**List of tasks:** Identify any ***three*** tasks carried out in investigation e.g. soaking of peas / set up / monitoring / noting results	(2 + 2 + 1)
Procedure	Procedure, apparatus, safety, data collection/observations 1. Safety precautions required for this investigation 2. Procedures followed in the investigation 3. Recorded data/observations	20	**Safety:** Identify any ***two*** safety precaution followed in conducting the investigation **Procedure:** State <u>or</u> Show Identify any ***five*** steps taken in conducting investigation e.g. soaking one set of seeds / leaving one set of seeds un-soaked / number of seeds / leave peas soaking for time period / preparation of growth container / addition of seeds / stated growth condition – same temperature /	(3 + 2) (5 × 2)

			stated growth condition – add same amount water / observation of results **Recorded Data / Observations:** Identify any ***two*** points related to method used e.g. Time taken for soaked seeds to germinate / time taken for un-soaked seeds to germinate / number of soaked seeds that germinate / number of un-soaked seeds that germinate	 (3 + 2)
Analysis & Conclusions	Analysis 1. Calculations/data analysis 2. 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** Fair manipulation of data **OR** Good manipulation of data **Conclusion:** ***One*** relevant conclusion drawn **or** evaluation of results obtained Limited treatment **OR** Fair treatment **OR** Good treatment	 (4) (7) (10) (4) (7) (10)
Comment	Comments (e.g. refinements, extensions, sources of error etc.)	10	***Two*** comments on **refinements / extensions / sources of error** e.g. What was learnt* / reliability of data / how process could be improved / sources of error / possible reason for unexpected result	(2 × 5)

* Other than the conclusions already stated

CHEMISTRY – Marking Criteria for Coursework B

Guide to mark assignment				
Section	**Aims**	**Total Mark**	**Indicators**	**H.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	20	**Variables:** Identify any ***three*** variables: e.g. same test acid *or* same test base / same conc of acid *or* same conc of base / same vol of acid *or* same vol of base / same extraction technique / same vol of indicator added / same mass of plant material **Control:** Identify control e.g. test acid & base with known indicator	(1 + 2 + 2) (5)
	List of equipment needed for the investigation		**Equipment needed:** Identify any ***four*** pieces of equipment used e.g. different plants / mortar and pestle / filter paper & funnel / test tubes / Bunsen burner / Water / Ref. acid & ref. base	(2 + 1 + 1 + 1)
	List of tasks to be carried out during the investigation		**List of tasks:** Identify any ***three*** tasks carried out in investigation e.g. steps to extract plant pigment / set up / observing colour changes	(2 + 2 + 1)
Procedure	Procedure, apparatus, safety, data collection/observations 4. Safety precautions required for this investigation 5. Procedures followed in the investigation 6. Recorded data/observations	20	**Safety:** Identify any ***two*** safety precaution followed in conducting the investigation **Procedure:** State <u>or</u> Show Identify any ***five*** steps taken in conducting investigation e.g. obtaining plant / cutting, chopping etc / addition of solvent / heating / filtering setting up test solutions / addition of indicator / observation of results / repeat **Recorded Data / Observations:** Identify any ***two*** points related to method used e.g. state the pigment changes colour / the colour change for each pigment in acid /	(3 + 2) (5 × 2) (3 + 2)

			colour change for each pigment in base / colour range of one pigment in solutions with different pH values / colour change for one pigment in different acids & bases	
Analysis & Conclusions	Analysis 3. Calculations/data analysis 4. 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** Fair manipulation of data **OR** Good manipulation of data **Conclusion:** ***One*** relevant conclusion drawn **or** evaluation of results obtained Limited manipulation of data **OR** Fair manipulation of data **OR** Good manipulation of data	 (4) (7) (10) (4) (7) (10)
Comment	Comments (e.g. refinements, extensions, sources of error etc.)	10	***Two*** comments on **refinements / extensions / sources of error** e.g. What was learnt* / reliability of data / how process could be improved / sources of error / possible reason for unexpected result	(2 × 5)

* Other than the conclusions already stated

PHYSICS – Marking Criteria for Coursework B

Guide to mark assignment				
Section	**Aims**	**Total Mark**	**Squash Ball**	**H.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	20	**Variables:** Identify any ***three*** variables: e.g. same ball / same floor (surface) / same height / same method of release / same method of measurement of bounce height / same length of time heating at a given temperature / method of keeping all hot / same time between heating and release of ball **Control:** Identify control e.g. height of bounce of unheated ball (ball at room temperature)	(1 + 2 + 2) (5)
	List of equipment needed for the investigation		**Equipment needed:** Identify any ***four*** pieces of equipment used e.g. ball / metre stick / water bath / thermometer / beaker / fridge / water / camera / motion sensor	(2 + 1 + 1 +1)
	List of tasks to be carried out during the investigation		**List of tasks**: Identify any ***three*** tasks carried out in investigation e.g. obtaining squash ball / heating / cooling / release of ball / measuring height of bounce	(2 + 2 + 1)
Procedure	Procedure, apparatus, safety, data collection/observations 7. Safety precautions required for this investigation 8. Procedures followed in the investigation	20	**Safety:** Identify any ***two*** safety precaution followed in conducting the investigation **Procedure:** State <u>or</u> Show Identify any ***five*** steps taken in conducting investigation	(3 + 2) (5 × 2)

	9. Recorded data/observations		e.g. release ball at room temperature / measure height of bounce at room temperature / heat ball / cool ball / release ball / measure height of bounce of heated ball / repeat at various temperatures / record results / repeat to verify **Recorded Data / Observations:** Identify any ***two*** points related to method used e.g. temperature of the ball / height of bounce	(3 + 2)
Analysis & Conclusions	Analysis 5. Calculations/data analysis 6. 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** Fair manipulation of data **OR** Good manipulation of data **Conclusion:** ***One*** relevant conclusion drawn **or** evaluation of results obtained Limited treatment **OR** Fair treatment **OR** Good treatment	(4) (7) (10) (4) (7) (10)
Comment	Comments (e.g. refinements, extensions, sources of error etc.)	10	***Two*** comments on **refinements / extensions / sources of error** e.g. What was learnt* / reliability of data / how process could be improved / sources of error / possible reason for unexpected result	(2 × 5)

* Other than the conclusions already stated

OWN – Marking Criteria for Coursework B

Guide to mark assignment				
Section	**Aims**	**Total Mark**		**H.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:** Identify any ***three*** variables: **Control:** Identify control(s) **Equipment needed:** Identify any ***six*** pieces of equipment used **List of tasks:** Identify any ***three*** tasks carried out in investigation	(4 + 4 + 4) (6) (6 × 2) (4 + 3 + 3)
Procedure	Procedure, apparatus, safety, data collection/observations 10. Safety precautions required for this investigation 11. Procedures followed in the investigation 12. Recorded data/observations	40	**Safety:** Identify any ***two*** safety precaution followed in conducting the investigation **Procedure:** State <u>or</u> Show Identify any ***eight*** steps taken in conducting investigation **Recorded Data / Observations:** Identify any ***two*** points related to method used	(2 × 3) (8 × 3) (2 × 5)
Analysis & Conclusions	Analysis 7. Calculations/data analysis 8. Conclusion(s) and evaluation of results(s)	40	**Calculations / Data analysis:** ***Two*** relevant comment analysing data **or** calculation **or** graph Limited manipulation of data **OR** Good manipulation of data **Conclusion:** ***Two*** relevant conclusion 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	***Four*** comments on **refinements / extensions / sources of error** e.g. What was learnt* / reliability of data / how process could be improved / sources of error / possible reason for unexpected result	(4 × 5)

* Other than the conclusions already stated