Coimisiún na Scrúduithe Stáit
State Examinations Commission

Junior Cycle 2023

Marking Scheme

Science

Common Level

Note to teachers and students on the use of published marking schemes

Marking schemes published by the State Examinations Commission are not intended to be standalone documents. They are an essential resource for examiners who receive training in the correct interpretation and application of the scheme. This training involves, among other things, marking samples of student work and discussing the marks awarded, so as to clarify the correct application of the scheme. The work of examiners is subsequently monitored by Advising Examiners to ensure consistent and accurate application of the marking scheme. This process is overseen by the Chief Examiner, usually assisted by a Chief Advising Examiner. The Chief Examiner is the final authority regarding whether or not the marking scheme has been correctly applied to any piece of candidate work.

Marking schemes are working documents. While a draft marking scheme is prepared in advance of the examination, the scheme is not finalised until examiners have applied it to candidates' work and the feedback from all examiners has been collated and considered in light of the full range of responses of candidates, the overall level of difficulty of the examination and the need to maintain consistency in standards from year to year. This published document contains the finalised scheme, as it was applied to all candidates' work.

In the case of marking schemes that include model solutions or answers, it should be noted that these are not intended to be exhaustive. Variations and alternatives may also be acceptable. Examiners must consider all answers on their merits, and will have consulted with their Advising Examiners when in doubt.

Future Marking Schemes

Assumptions about future marking schemes on the basis of past schemes should be avoided. While the underlying assessment principles remain the same, the details of the marking of a particular type of question may change in the context of the contribution of that question to the overall examination in a given year. The Chief Examiner in any given year has the responsibility to determine how best to ensure the fair and accurate assessment of candidates' work and to ensure consistency in the standard of the assessment from year to year. Accordingly, aspects of the structure, detail and application of the marking scheme for a particular examination are subject to change from one year to the next without notice.

Guidelines for Examiners

1. In many cases only key phrases are given in the marking scheme. 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. Words, expressions or statements separated by a solidus (/) are alternatives which are equally acceptable for a particular point. Note, however, that words, expressions or phrases must be correctly used in context. A double solidus (//) separates points for which separate marks are allocated in a part of the question.

4. Cancelled or repeated answers

a. 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.

b. If more than the required number of uncancelled answers are given, surplus incorrect answers nullify the marks awarded for correct answers.

c. If the only answer offered is cancelled, the cancelling is ignored and the answer marked as normal.

5. Recording a mark of zero and recording "No Response" (NR)

A zero should only be recorded when the candidate has attempted the question but does not merit marks.

If a candidate does not attempt a question (or full question part) examiners should record NR.

6. Application of the marking scheme

Apply the marking scheme as agreed in all cases.

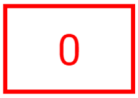
7. Electronic annotation of responses

Annotations should allow your Advising Examiner to understand the mark you awarded. Examiners are expected to annotate parts of the responses as directed at the marking conference. (See **JC Science 2023 – Annotations** on page 5.)

8. Bonus for Irish

Bonus marks at the rate of 10% of the marks obtained in S26T will be given to a candidate who answers S26T entirely through Irish and who obtains 75% or less of the total mark available in S26T (i.e. 270 marks or less). In calculating the bonus to be applied decimals are always rounded down, not up e.g., 4.5 becomes 4; 4.9 becomes 4, etc. See below for when a candidate is awarded more than 270 marks in S26T.

Annotations used in online marking Junior Cycle Science 2023

Annotation	Meaning
	'n' marks awarded; e.g. 1 – 12
	No marks awarded. Answer incorrect or insufficient.
	Used to annotate a blank page; e.g. pages 13 & 26 or when additional space used
	Used to underline valid words/statements
	Cancellation
	Incorrect
	Used to annotate part of an item which has not been attempted

Grading Table

Mark	Descriptor
324 – 360	Distinction
270 – 323	Higher Merit
198 – 269	Merit
144 – 197	Achieved
72 – 143	Partially Achieved
0 – 71	NG

Bonus marks for answering through the medium of Irish

Bonus marks at the rate of 10% of the marks obtained will be given to a candidate who answers entirely through Irish and who obtains 75% or less of the total mark available in (i.e. 270 marks or less). In calculating the bonus to be applied, decimals are always rounded down, not up ¬ e.g., 4.5 becomes 4; 4.9 becomes 4, etc. See below for when a candidate is awarded more than 270 marks.

Marcanna Breise as ucht freagairt trí Ghaeilge – TSCL Eolaíocht 2023

Léiríonn an tábla thíos an méid marcanna breise ba chóir a bhronnadh ar iarrthóirí a ghnóthaíonn níos mó ná 75% d'iomlán na marcanna.

Ba chóir marcanna de réir an ghnáthráta a bhronnadh ar iarrthóirí nach ngnóthaíonn níos mó ná 75% d'iomlán na marcanna don scrúdú. Ba chóir freisin an marc bónais sin **a shlánú síos**.

Tábla 360 @ 10%

Bain úsáid as an tábla seo i gcás na n-ábhar a bhfuil 360 marc san iomlán ag gabháil leo agus inarb é 10% gnáthráta an bhónais.

Bain úsáid as an ngnáthráta i gcás 270 marc agus faoina bhun sin. Os cionn an mharc sin, féach an tábla thíos.

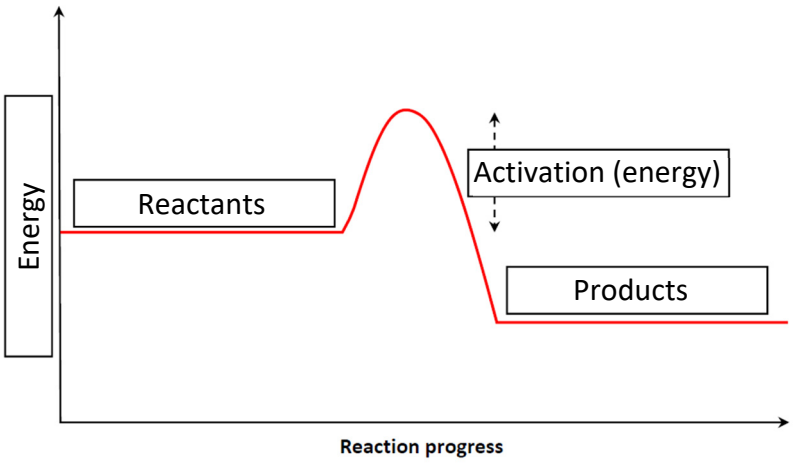
Bunmharc	Marc Bónais
271 - 273	26
274 - 276	25
277 - 280	24
281 - 283	23
284 - 286	22
287 - 290	21
291 - 293	20
294 - 296	19
297 - 300	18
301 - 303	17
304 - 306	16
307 - 310	15
311 - 313	14
314 - 316	13

Bunmharc	Marc Bónais
317 – 320	12
321 – 323	11
324 – 326	10
327 – 330	9
331 – 333	8
334 – 336	7
337 – 340	6
341 – 343	5
344 – 346	4
347 – 350	3
351 – 353	2
354 – 356	1
357 – 360	0

Section A

<table>
<tr><th>Q1</th><th></th><th>Marks</th></tr>
<tr><td>(a)</td><td>N pointing at the nucleus of an onion cell
N pointing at the nucleus of the human cheek cell</td><td>3
3</td></tr>
<tr><td colspan="3">(b): 5 + 2(2)</td></tr>
<tr><td>(b)</td><td colspan="2">
<table>
<tr><th>Description of cell part</th><th>Name</th></tr>
<tr><td>Controls the movement of substances in and out of cells</td><td>(Cell) membrane</td></tr>
<tr><td>Found in plant cells only</td><td>(Cell) wall</td></tr>
<tr><td>All of the material inside a cell, except for the nucleus</td><td>Cytoplasm</td></tr>
</table>
</td></tr>
</table>

Q2		Marks
	(a) – (d): 7 + 2(2) + 1	
(a)	**A** labelling the ovary	
(b)	**B** labelling the testis	
(c)	**C** labelling the Fallopian tube	
(d)	**D** labelling the uterus	
(e)	Valid description of method of contraception	**3**

Q3		Marks
	(a): 7 + 2(2) + 1	
(a)		
(b)	Endothermic	**3**

Q4		Marks
	11 + 4(1)	
Melting		
Evaporation		
Physical		
Chemical		
Conservation		

Q5		Marks
(a)	Current	**3**
(b)	**Y** *Justify:* straight line	**3** **3**
(c)	2 Ω / ohms	**3** **3**

Q6		Marks
(a)	Circle and correct description **<u>Pooter</u>** Place tube over insect *or* animal *or* named insect // Suck through tube with gauze or green tube or short tube *or* other tube ***or*** **<u>Net</u>** Sweep *or* swing *or* draw through grass or air or water // Animal *or* named animal gets caught or trapped ***or*** **<u>Pitfall trap</u>** Place container (named container) in ground // Animal *or* named animal gets caught or trapped	**2(3)**
(b)	Sunlight *or* light // water // nutrients *or* minerals // space // other correct ***Any two***	**2(3)**
(c)	Valid description – e.g. preserve habitats / reduce pesticide use / stop invasive species / create nature preserves / captive breeding / seed banks / reduce pollution / plant trees / any other correct	**3**

Q7		Marks
2(6) + 2 + 1		
(a)	30	
(b)	0.25	
(c)	Deceleration / slowing down	
(d)	Stationary / not moving	

<table>
<tr><th>Q8</th><th></th><th>Marks</th></tr>
<tr><td>(a)</td><td>Correct base named</td><td>3</td></tr>
<tr><td>(b)</td><td>Correct acid named</td><td>3</td></tr>
<tr><td>(c)</td><td>Greater than 7</td><td>3</td></tr>
<tr><td>(d)</td><td>
<table>
<tr><th>(i) Indicator</th><th>(ii) Colour in base</th></tr>
<tr><td>Methyl orange</td><td>Yellow / orange</td></tr>
<tr><td>Universal</td><td>Blue / purple</td></tr>
<tr><td>Litmus</td><td>Blue</td></tr>
<tr><td>Phenolphthalein</td><td>Pink</td></tr>
<tr><td>Red cabbage</td><td>Blue / green</td></tr>
</table>
Accept other valid named indicator and correct colour in base</td><td>2(3)</td></tr>
</table>

Q9

(a)

Compound	First element	Second element	Ratio	Formula	Marks
Magnesium chloride	Magnesium (Mg)	Chlorine (Cl)	1 : 2	$MgCl_2$	
Potassium chloride	Potassium (K)	Chlorine (Cl)	**1 : 1**	**KCl**	**1+2**
Hydrogen sulfide	Hydrogen (H)	Sulfur (S)	**2 : 1**	**H_2S**	**1+2**
Aluminium oxide	Aluminium (Al)	Oxygen (O)	**2 : 3**	**Al_2O_3**	**1+2**

(b) Metals conduct electricity ***or*** non-metals do not conduct electricity (electrical insulators) // metals conduct heat ***or*** non-metals do not conduct heat (thermal insulators) // metals are lustrous (shiny) ***or*** non-metals are dull // metals are solid at room temperature ***or*** non-metals can be solid, liquid or gas at room temperature // metals are sonorous ***or*** non-metals are not sonorous // metals are malleable ***or*** non-metals are not malleable // metals form positive ions ***or*** non-metals form negative ions // metals are ductile ***or*** non-metals are not ductile // metals have a high melting (boiling) point ***or*** non-metals have a low melting (boiling) point

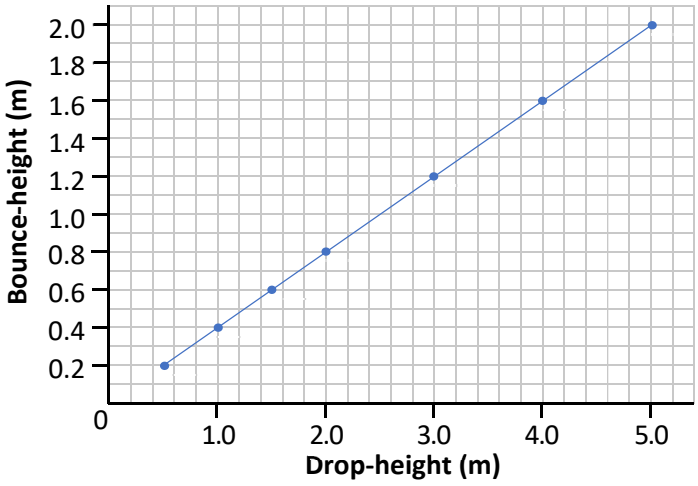
Any two **2(3)**

Q10

		Marks
(a)	**(i)** Neutron	**3**
	(ii) *Proton:* positive or +1 or + **and** *Neutron:* neutral or 0 or no charge	**3**
(b)	Diagram	**3**
	Label	**3**
(c)	Low carbon footprint (reduces carbon emissions) / reliable / efficient / clean / doesn't produce greenhouse gases / cost effective	**3**

Section B

Q11			Marks
(a)	Respiration		**3**
(b): 7 + 2(2) + 1			
(b)	**(i)**	Photosynthesis	
	(ii)	Water / H_2O	
		Oxygen / O_2	
	(iii)	Chlorophyll	
(c)	Decay / decomposition		**3**
(d)	Coal / oil / petrol / diesel / kerosene / turf / natural gas / methane / propane / butane / other correct		**3**
(e)	Extreme weather events *or* described / flooding / global warming / species extinction/ climate change / melting of icecaps / rise in sea levels / other correct ***Any two***		**2(3)**
(f)	True / false **and** valid justification		**3**

Q12		Marks
(a)	 <u>Line graph</u> First and third points plotted correctly Other five points plotted correctly Line drawn through all 7 plotted points <u>Bar chart</u> First and third bars plotted correctly Other five bars plotted correctly All 7 bars correct	**2(3)** **5(2)** **2** **2(3)** **5(2)** **2**

Q12 continued		
(b)	4	**3**
(c)	Drop-height	**3**
	Valid explanation	**3**
(d)	1.6 m **and** valid explanation	**3**
(e)	Valid safety precaution	**3**
(f)	Potential to kinetic	**6**
(g)	Yes	**3**
	Valid justification	**3**

Q13			**Marks**
(a): 5 + 2(2)			
(a)	**(i)**	Sun // and the objects that orbit it	
	(ii)	Collection of stars	
(b)	**(i)**	Mercury / Venus	**3**
	(ii)	Phobos	**3**
(c)	Any reference to eye damage		**3**
(d)	**(i)**		**6**
	(ii)		**6**
(e)	Large distance		**3**
(f)	Long distance // lack of resources *or* oxygen *or* water *or* food // low gravity // isolation // high cost // high amounts of carbon dioxide in atmosphere // cold temperatures // exposure to radiation // thin atmosphere (difficult to descend) // severe weather (sandstorms) // toxic soil // other correct ***Any two***		**2(3)**
(g)	Any valid description (before and after) of a change in our scientific understanding		**2(3)**

<table>
<tr><th>Q14</th><th colspan="2"></th><th>Marks</th></tr>
<tr><td>(a)</td><td colspan="2">Newton</td><td>3</td></tr>
<tr><td>(b)</td><td colspan="2">Callipers / ruler / metre stick</td><td>3</td></tr>
<tr><td colspan="4">(c): 5 + 1</td></tr>
<tr><td>(c)</td><td colspan="3">Thickness of bread // temperature // humidity // air pressure // where (area) force applied // depth of compression // other valid variable Any two</td></tr>
<tr><td colspan="4">(d): 7 + 2(2) + 1</td></tr>
<tr><td>(d)</td><td colspan="3"><table><tr><th>Conclusion</th><th>✓ or ×</th></tr><tr><td>White bread is easier to compress as it gets older.</td><td>×</td></tr><tr><td>Old white bread is harder to compress than fresh brown bread.</td><td>✓</td></tr><tr><td>Brown bread is healthier for you than white bread.</td><td>×</td></tr><tr><td>White bread becomes harder to compress faster than brown bread.</td><td>×</td></tr></table></td></tr>
<tr><td colspan="4">(e): 5 + 2(2)</td></tr>
<tr><td>(e)</td><td>(i)</td><td colspan="2">Correctly named other nutrient – protein / fat / vitamins or named vitamin / minerals or named mineral</td></tr>
<tr><td></td><td>(ii)</td><td colspan="2">Correctly named source of other nutrient</td></tr>
<tr><td></td><td>(iii)</td><td colspan="2">Correct description of why other nutrient is essential</td></tr>
<tr><td colspan="4">(f): 7 + 2(2) + 1</td></tr>
<tr><td>(f)</td><td colspan="3">Any reference to physical (mechanical) digestion
Any correct reference to chemical digestion
Any reference to absorption / blood transport
Any reference to respiration / release of energy</td></tr>
</table>

Q15			Marks
(a)	**(i)**	Trachea / windpipe	**3**
	(ii)	Lung(s)	**3**
(b)	Inflate		**3**
(c)	*Limitation:*	bell jar is rigid (does not move) / balloons are not attached to the wall of the bell jar / rubber sheet does not recoil / air in bell jar	**3**
	Explain:	rib cage is flexible (can move) / lungs lie against wall of rib cage / diaphragm recoils / no air in chest cavity ***Explanation must match stated limitation***	**3**
(d)	**(i)**	Moves from lungs into blood / used up during respiration	**3**
	(ii)	Not used / does not move into the blood / has poor (low) solubility in blood	**3**
(e) – (f): 10 + 2(1)			
(e)	Heart		
(f)	Correct arrows on right side of heart		
	Correct arrows on left side of heart		
(g)	Rate increases // increase in energy // more collisions // more effective collisions (more product formed) // more collisions reach activation energy // gases expand when heated ***Any two***		**2(3)**
(h)	*Positive:*	aid digestion / produce vitamins / make antibiotics / used to make vaccines / produce short chain fatty acids / prevent the growth of pathogenic bacteria / other valid positive role	**3**
	Negative: cause infection / other valid negative role		**3**