NATIONAL SENIOR CERTIFICATE EXAMINATION
NOVEMBER 2021

LIFE SCIENCES: PRACTICAL ASSESSMENT TASK

MARKING GUIDELINES

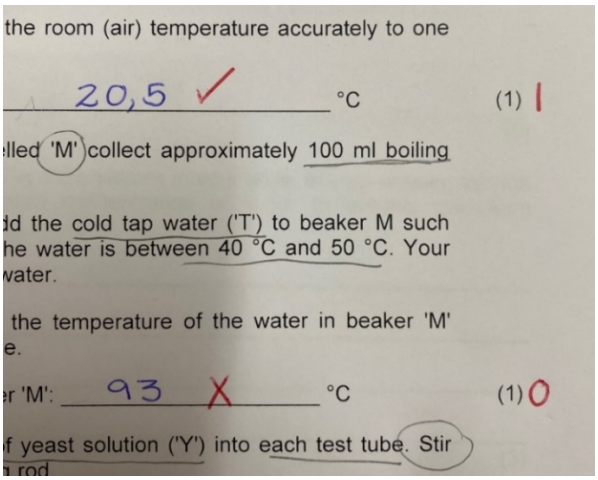
Time: 1½ hours 50 marks

These marking guidelines are prepared to ensure that the guidelines are consistently interpreted and applied in the marking of candidates' scripts.

The IEB will not enter into any discussions or correspondence about any marking guidelines. It is acknowledged that there may be different views about some matters of emphasis or detail in the guidelines. It is also recognised that, without the benefit of attendance at a standardisation meeting, there may be different interpretations of the application of the marking guidelines.

General Instructions

1. Please mark scripts in red pen.
2. Please place the tick (✓) in the answer where the mark is allocated, NOT at the end of the answer/sentence/line. Also place a cross (×) at the mistake if the answer is incorrect.
3. Write the total for each sub-question in red pen next to the mark allocation between brackets. If the mark is zero, please write '0'.
4. Please do NOT circle any marks when marking, e.g. (1)
5. For an example, see image below:



6. Remember to look at the additional back page for answers and mark them and carry these marks forward to the respective questions.
7. Answers must be read in their entirety and alternative wording or equivalent wording expressing the concept or meaning of the concept is acceptable.
8. Front page: please place the procedural skills marks into the block as shown below, and then write in the subtotals for Part 1 and Part 2 (also as indicated below). Calculate the total and initial next to the total.

For an example see image below:

CRITERIA		
Following instructions	0	1
Procedural skills	0	1
Manipulative skills	0	1
TOTAL	**2**	(3)

FOR MARKERS' USE ONLY

Procedure	Skills	Part 1	Part 2	Total	Initials
Marker	**2**	**21**	**12**	**35**	**PMG**
Internal Moderator					
IEB Moderator					

9. Should you moderate a script in a cluster (external), please use PENCIL and record marks on the front cover of the script in the "Internal Moderator" (optional) row.

10. Please place the FINAL mark in the box at the top of the answer script (TOTAL MARKS) in RED pen (as shown in the image below).

11. When returning scripts, remove all loose pieces of paper, e.g. information sheets.
12. However, please DO include the skills mark sheets in a separate envelope.

PART 1 INVESTIGATION

Following instructions: beaker placed in centre of white tile or piece of white paper with initials written on beaker in permanent marking pen. ✓

Procedural skills: 20 ml water under 40 ml oil in the beaker. ✓

Manipulative skills: Red droplets floating on top of the oil layer, submerged in the oil layer or dissolved in the water (evidence of red colour in water)*. ✓ (3)
*should no red colour have been visible, check that Table in 1.8 has ticks and crosses in it and allocate a mark.

1.8 Heading: Any one of the following:
- Table showing whether the blood droplets/samples ✓ sank within 10 seconds ✓
- Table showing whether samples ✓ sank in 10 seconds ✓
- Table showing whether blood sample ✓ has enough iron ✓

[Looking for: (1) the independent variable: blood samples/droplets and (2) dependent variable: sinking within 10 seconds / *enough* iron to donate blood]

(Blood) sample ✓	**(Blood droplets/sample) sinking ✓ through the oil / whether *enough/sufficient* ✓iron in blood to donate (Max 1 mark)**		
	Trial 1	**Trial 2**	**Trial 3**
X	×	☑	×
Y	☑	☑	☑

(4)

1.9 1.9.1 Any of the following (MAX 1):
- Blood sample X ✓ or Y ✓
- Neither ✓ sample X nor sample Y
- Both ✓ samples X and Y (1)

1.9.2 Did/did not sink✓ / neither sank✓ / both sank✓ (in any of the trials within the 10 seconds)
These questions need to be marked according to the candidate's data in table (Question 1.8) (1)

1.10 *Any two points from the following (one mark each):*

- Performing more repeats ✓
- Using a different batch of chemicals / blood from different people ✓
- Use real blood (rather than simulated) ✓
- Ensure droplets of same size ✓
- Use a stopwatch/timing device for timing droplets ✓

OR

Any one point (one mark) with the given explanation (one mark):

- Performing more repeats ✓ to get consistent results/pattern of results ✓ (do not accept 'average' as an explanation).
- Use real blood ✓ instead of simulated blood for a more realistic result. ✓
- Ensure droplets of same size ✓ as this could affect the sinking/floating of droplets. ✓
- Use a stopwatch/timing device ✓ for timing droplets more consistently. ✓

(Do not accept 'accuracy' as an explanation for any of the above)

(2)

1.11 Any one, explained:

- Size of droplet (volume) of blood ✓: the blood droplet was the same for both samples X and Y, ✓ administered using a pipette ✓
- Same mixture of oil and water ✓ at a ratio of 20 ml water: 40 ml oil ✓ was used for both blood samples using a syringe ✓
- Same volume of testing oil ✓ was used: 40 ml ✓ controlled using a syringe ✓
- Time taken for blood droplet to sink or float ✓: each blood droplet was added and 10 seconds ✓ was counted each time ✓
- Height from which blood droplets dropped ✓: 1 cm height from which dropped ✓ using a pipette/ruler/estimation of 1 cm in some way ✓
- Temperature of the oil/water mixture ✓: the sample was dropped into the same beaker of oil/water each time / for all trials, ✓ which was at a constant room temperature ✓

  Irrelevant fixed variables that are NOT acceptable are:
  Size of beaker; type of oil, etc. as these were not controlled by the candidate.

(3)

1.12 Any of the following (MAX 2):

- Use gloves ✓ when handling blood as blood products may have HIV/viral/ bacterial/infectious matter ✓
- Dispose ✓ of blood products safely ✓
- Keep blood sterile ✓ and/or prevent cross-contamination of samples ✓
- Use sterile/new/fresh needles/lancets/tools (apparatus)✓ to prevent cross-contamination of blood ✓

(2)

1.13 Cost of oil test: R40 for 100 tests / R20 for 50 tests / R0,40 per test
Cost of copper sulphate test: R240 for 100 tests / R120 for 50 tests / R2,40 per test
R240 ✓ ÷ R40 ✓ = 6 ✓ × cheaper / R120✓ ÷ R20 ✓ = 6✓ × cheaper / R2,40 ✓ ÷ R0,40 ✓ = 6 ✓ × cheaper
[if candidate only provides the (correct) answer with no working, then max 1 mark]

(3)

1.14 Any one similarity of the following *in relation to testing iron levels*:

- Both involve dropping blood into liquid to see if droplet sinks (or floats for anaemics) ✓
- Both work within (10–15) seconds ✓
- Both are used at room temperature ✓
- Both require the dropping of blood from about 1 cm into the testing liquid ✓
- Both methods rely on density of blood in a liquid ✓ (1)

Do NOT accept the following as these do not relate to the context of whether iron levels are sufficient for donation:

- Both methods are easy to use
- Both methods do not require calculations
- Both use only one testing beaker/container

1.15 Any one of the following, described:

- Applied exactly ONE droplet of blood on top of the oil layer – the size of the droplet was controlled by depressing the pipette/dropper the same each time to produce a droplet of the same size. ✓
- When measuring with the syringe, the plunger was pulled/pushed to be in line with the mark (and eye level). ✓
- When counting, the same pace of counting was used when observing the droplets sink or float in the 10 seconds. ✓
- Taking care when using the syringe to prevent air bubbles in the oil ✓ (which would influence the droplets).
- Using the kebab stick to remove as many interfering air bubbles. ✓
- Rinsing the pipette between samples to prevent cross-contamination. ✓ (1)

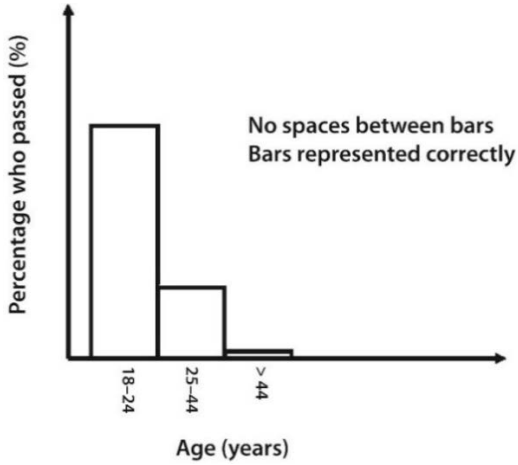
1.16 1.16.1 Any one of the following: Gender/Sex ✓ / Age ✓ / Donation status ✓ (1)

1.16.2 Sample size: 400
%18–24-year-olds passing iron-level test = 71,5%
Any one of the following (MAX 3):

- (71,5 ÷ 100) ✓ × 400 ✓ = 286 ✓
- 71,5% ✓ × 400 ✓= 286 ✓
- (400 ÷ 100)✓ × 71,5 ✓ = 286 ✓ (3)

1.16.3 B ✓✓ (2)

1.16.4 Sketch histogram:



Symbols to be used in assessment of the histogram. Use these symbols with a ✓ or ✗ alongside the key (one mark each):

V : correct variables identified/indicated: Age in years or Age or Age category/groups AND % passed ✓
XY : Variable labels are on correct axes (age on x-axis ; % pass on y-axis) ✓
NS : no spaces between bars ✓
B : height of bars represented correctly (estimate; no data points/scale needs to be included) ✓
A : age ranges/groups on x-axis AND **are in increasing age** ✓

NOTE:

- There does NOT need to be a space between the first bar and the y-axis.
- If the candidate sketched a LINE graph – then will not be awarded the NS and B marks.
- If the candidate sketched a BAR graph – then will not be awarded the NS mark.

(5)

1.17 1.17.1 Percentage mild, moderate & severe = 42% + 11% + 2% = 55 ✓% (working does not need to be shown) (1)

1.17.2 Any one of the following (MAX 2 marks):

- Increase from 45% to 74% ✓ / 29 % increase ✓ with no symptoms ✓
- Decrease from 42% to 23% ✓ / 19 % decrease ✓ with mild symptoms ✓
- Decrease from 11% to 3% ✓ / 8% decrease ✓ with moderate symptoms ✓
- Decrease from 2% to 0 ✓ / 2 % decrease ✓ with severe symptoms ✓
- Decrease from 55% to 26% ✓ / 29 % decrease ✓ with mild, moderate & severe symptoms ✓

(2)
[35]

PART 2

2.1 Looking for independent variable (<u>treatment with iron tablets **for two weeks**</u>) and dependent variable (<u>reduction in anaemia (or sinking of blood in copper sulphate within 15 seconds)</u>
e.g. Any one of the following:
- To find out whether there is an improvement in blood iron levels ✓ after two weeks of treatment with iron tablets ✓.
- To determine if anaemic patients will have raised iron levels ✓ two weeks after treatment with iron tablets ✓.
- To test whether treatment with iron tablets reduces anaemia ✓ within two weeks of being treated ✓.

NOTE:
- Do NOT accept: To determine how long it takes for the improvement in blood iron levels to take place.
- If the <u>hypothesis</u> is rewritten as is, then MAX 1 mark can be awarded.

(2)

2.2 Any one of the following (MAX 2):
- Treatment / use of iron tablets ✓ for at least two weeks / at different times (period) ✓
- The different ✓ blood samples ✓
- The blood✓ from <u>before treatment</u> (with iron tablets) and two weeks <u>after treatment</u> / time in weeks of treatment ✓

Do NOT accept just 'time' as an answer on its own. (2)

2.3 Any one of the following (MAX 2):
- Whether blood droplet ✓ sinks or floats ✓
- Time frame ✓ (15 seconds) of blood sinking ✓ (through the copper sulphate solution)
- Presence / absence ✓ of anaemia ✓
- Blood iron✓ levels ✓ (2)

2.4 (a) ✓ (1)

2.5 Example of method:
1. Using a balance (scale), measure 15,96 g copper sulphate into a beaker.
2. Using a syringe, add 100 ml distilled water. Using a glass rod, stir until dissolved.
3. Label the blood samples as follows: 'B' for before treatment; '2' for two weeks into treatment. (Note: accept: "0, 2, 6" or "A, B, C" or "1, 2, 3" or 'first, second' etc – any indication that the two/three samples are taken from those provided).
4. Using a pipette, drop sample B into the copper sulphate from a height of 1 cm above the liquid.
5. Using a timer, observe whether the blood droplet sinks within 15 seconds. Record (in a table) whether droplet sank. (optional, repeat the experiment)
6. Rinse the pipette using rinsing water.
7. Repeat steps 4 and 5 for sample 2.
8. Rinse the pipette using rinsing water.

NOTE: *do not penalise candidates for adding an additional controls or additional weeks of treatment.*

Layout (L): neat, numbered (if not numbered, then no marks) ✓
Aim (A)*: (A1) Must use two blood samples including before treatment with iron, two weeks post-treatment ✓
(A2) Must observe the droplet sinking or floating in specified time – count to 10–15 (or 10–15 seconds timed) ✓
*Mark this Aim after reading and marking the entire method; indicate on the candidate's method where these two marks are awarded using **A1** and **A2**

Method (M):

- (O) **O**riginal – look for use of copper sulphate solution and two blood samples (i.e. NOT oil/water and NOT samples X and Y from Part 1) ✓
- (E) **E**quipment – look for a scale/balance, syringe or measuring cylinder or beaker used for water measurement, syringe or pipette used appropriately for blood droplets ✓ (all three elements need to be used to receive this mark)
- (C) Measuring (**c**ontrolled variables) – same amount of blood dropped from the same height each time ✓
- (V) **V**alid – order of steps in method allows for achievable result; must make use of a copper sulphate solution; Do not penalise if candidate uses a test tube rather than a beaker ✓
- (R) Measurable **R**esults – recording whether blood droplet sinks through the copper sulphate solution within 10–15 seconds or not (or within the given time frame). ✓

The rubric has been interpreted in this way for this experimental design. Please do NOT attach a copy of the rubric. Use the following key when marking where L = layout, A = aim and M = method.

e.g.
L ✓
A ×✓
M ×✓×××
1 2 3 4 5

OR
L ✓
A ✓✓
M ✓✓✓✓✓
OECVR

Do NOT place **any other** ticks in the method.
You may circle or underline elements in the candidate's method to indicate that a mark will be awarded or highlight a sentence or phrase when an element is missing from the method.

It is helpful if an indication is made as to why a mark is not awarded for a particular element of the method (next to the cross), for example:

L	✓	
A1	×	only one sample used
A2	✓	
M	×	use of oil
	×	no scale used
	×	no height given
	✓	
	×	no recording

(8)
[15]

METHOD RUBRIC

Method Rubric Criteria	5	4	3	2	1	0
L Layout – appearance of method					Layout meets criteria below: neat and tidy and numbered.	Layout is untidy and hard to read. **OR** Method is not formatted correctly with numbers.
A Aim – method relates to prescribed experiment.				Method clearly tests an aim that relates to the prescribed experiment and achieves the required result.	Method relates to the prescribed aim given, but is a little confusing and does not achieve the required result.	Method neither relates to the prescribed aim nor achieves the desired result. Method given is the same as the given experiment.
M Method – This needs to be appropriate and relevant to the aim, clearly logical and sequential. If apparatus is given in the examination paper, the method should resemble the one given in the marking guidelines.	All 5 criteria given below are met: 1. An original experiment provided. 2. Equipment is appropriate and used correctly. 3. Measuring of solutions, reagents and marking of equipment are explained and assist in the control of variables. 4. Instructions are scientifically valid and ordered. 5. Instructions are complete to produce measurable results that are recorded.	An original experiment provided. Plus 3 of 5 criteria are met.	An original experiment provided. Plus 2 of 5 criteria are met.	An original experiment provided. Plus 1 of 5 criteria is met.	An original experiment provided.	None of the 5 criteria are met. **OR** Method is a copy of the original, given experiment.

Total: 50 marks