NATIONAL SENIOR CERTIFICATE EXAMINATION
NOVEMBER 2019

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.

Part 1

Following instructions: five holes made as instructed; A, B, C, D written on paper in correct orientation; well E made in the centre of the petri dish.

Procedural skills: appropriate syringe used (10 ml)

Manipulative skills: 10 ml solution correctly drawn up in syringe

1.5 Diameter of well E (in line with pen tube diameter) (4–10 mm)

1.17 Table showing the presence of a yellow halo around the well/ colour change of gel at 20 minutes for different concentrations of PVSA solutions.

Well	Concentration of PVSA solution (%)	Presence of yellow halo around well after 20 minutes (yes or no)
A	0,16	Yes/ No
B	0,8	Yes/ No
C	4	Yes/ No
D	20	Yes
E	100	Yes

1.18 (a) (Letter) E
(b) Reasonable diameter between 8 and 20 mm

1.19 Any one:

- Well size: each well was made the same way (same diameter/ same distance from edge e.g. 15 mm) using a pen tube/ straw/ glass tube/ ruler
- Amount/ volume of PVSA solution/ total liquid (do not accept "saline"): each well contained 1–3 drops (same amount) using a pipette or dropper.
- Total volume of liquid/ solution left in beaker was 40 ml controlled using a syringe (Do not accept volume of PVSA or volume of saline or concentration).
- Time: each of the solutions in the wells was left for the same amount of time (20 minutes) (or put in at the same time / recorded at the same time) using clock or watch
- Gel in petri dish: the same gel/ same concentration of snake venom/ same depth in the same petri dish was used in the experiment.

Do not accept: environmental conditions (e.g. temperature/ humidity), use of syringe, beakers as these are not relevant to this study.

1.20 Conclusion:
Halo size / colour change; specific reference to concentration / dilution / well identified and effectiveness of antiserum
E.g. diluting the PVSA reduced the effectiveness of the antiserum; halos around wells became smaller with each dilution, but was still effective at lower concentrations.
E.g. Halos around wells C, D and E were present, therefore diluting the antiserum means it was still effective/ active/ neutralised the venom
E.g. There were no halos/ colour changes around wells B and A, therefore at low concentrations the antiserum is not effective/ active/ does not neutralise the venom.

Refer back to the candidate's table in 1.17.

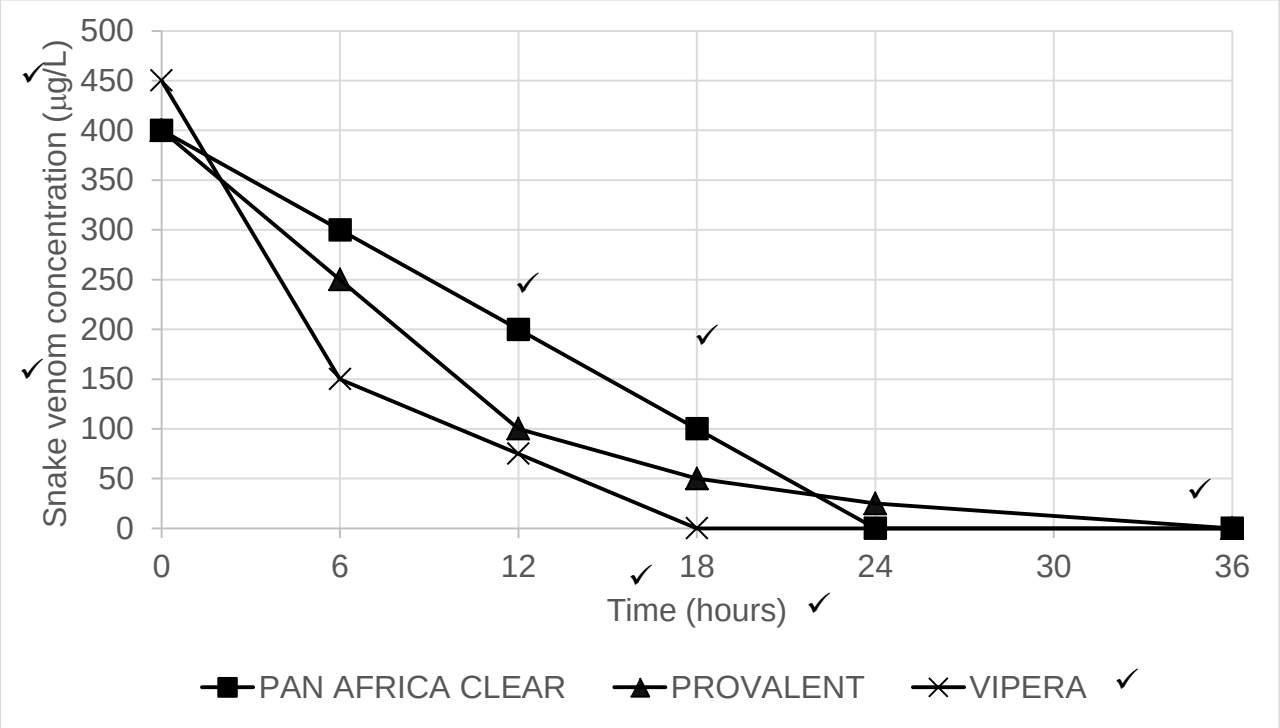
1.21 Measure the diameter/ size of (all) the halos / halos for each dilution using a ruler or compare it to the 100% concentrated PVSA; time taken for the halo to develop/ yellow colour to develop for each well.

1.22 Lab precaution: any one of the following:
- Wear gloves/ masks/ goggles/ eye protection during testing
- Do not consume venom or antivenom
- Wash hands after handling venom or antivenom samples
- Do not discard the samples down the drain / dispose of them correctly

(Accept other suitable safety precautions)

1.23 (L) Drawing is larger than the original
(P) Drawing is in pencil
(G) Groove correctly labelled (Do not accept **arrow-heads.**)
(S) Shape and proportion (length and width proportions must be correct)
(C) No colouring or shading
No marks are awarded for the heading. However, it is best practice to encourage candidates to include a heading.
Please use the codes in brackets when assigning marks.

1.24 Correct key provided (■ = PAN AFRICA CLEAR (PAC); ▲ = PROVALENT and X = VIPERA)
Time (hours) on the x-axis
Snake venom concentration (μg/ L) on the y-axis
Two points (12 and 18 hours) correctly plotted for all three antisera AND points joined correctly to produce three lines (one for each antiserum) and all lines must end on zero at 36 hours.
No marks are awarded for the heading although encourage candidates to include headings.



(a) VIPERA

(b) Not all three of the antisera started out at the same concentration of snake venom OR VIPERA started at 450 μg/ L and not 400 μg/ L OR VIPERA was (50 μg/ L) higher than the other antisera; OR PAN AFRICA CLEAR and PROVALENT were 50 μg/ L lower than VIPERA; OR The starting/ initial concentration of snake venom for each antiserum was not the same
OR: Omission of 30 hours from table/ graph means that PROVALENT neutralisation time cannot be determined. (NOTE: "30 hours was skipped/ left out" / "no value for 30 hours" without "PROVALENT" is not acceptable).

Part 2

2.1 Statement / one sentence – do not award statement mark if reasons given in hypothesis (e.g. "because of …") do not award mark if aim is given.
Need to mention one or more specific antiserum (do not accept PVSA).
Need to mention neutralisation or colour change of gel from blue to yellow / halo forming.
E.g. Antiserum "W/ X/ Y/ Z" will neutralise the cobra venom.
OR Antiserum "W/ X/ Y/ Z" will produce a yellow halo in the blue gel.
OR Antiserum W and Z will neutralise the venom whereas Y and X will not.

2.2 Antisera W, X, Y and Z; types of antisera; different antisera; do NOT accept **concentration of antisera**.

2.3 colour change; neutralisation of venom; size/ diameter of halo; blue to yellow gel; yellow halo

2.4 Sample method:

- Place the petri dish in the middle of the sheet of white paper.
- Using a marker, make a mark at the "12 o'clock", "3 o'clock", "6 o'clock" and "9 o'clock" positions. Use the petri dish as the clock face. On the paper, write "W", "X", "Y" and "Z".
- Using the pen tube/ straw/ glass tube, pierce five holes in the gel as shown in Figure B on your information sheet.
- Use the dissecting needle or forceps to remove the five "plugs" from the five "wells" you have created above. Discard the plugs.
- Using a pipette, place 1–3 drops of antiserum W into well W, antiserum X into well X, antiserum Y into well Y and antiserum Z into well Z.
- Leave the petri dish undisturbed for 20 minutes.
- Record the colour changes and/ or presence of yellow halos around the wells.

Layout (L): Neat, numbered/ listed/ bulleted.

Aim (A): needs to make use of antisera W, X, Y and Z AND involve a colour change/ neutralisation in the infused blue gel.

Method (M):

1. *Original* – must make use of W, X, Y and Z; **no marks awarded** if dilutions made with saline nor if PVSA is used as in Part 1 (look for solutions "W" to "Z" rather than "A" to "E").
2. *Equipment* – must make use of petri dish with infused blue gel (can make use of wells punched with tube, or cut cubes from the dish using knife)
3. *Measuring* – same amount of solutions W, X, Y and Z (must be undiluted) used AND wells made the same way/ cubes of gel cut from the petri dish are the same size.
4. *Valid* – order of instructions makes sense AND W, X, Y and Z (must be undiluted) come into contact with the blue gel for the same amount of time.
5. *Measurable results* – recording of colour change/ neutralisation/ halo formation in the blue gel (either yellow halo or cube of gel changes from blue to yellow. (This mark cannot be awarded if W, X, Y and Z not used). **Do not accept** "record the results" with no indication of what is being measured and recorded.

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.

e.g.
L
A
M
1 2 3 4 5

OR

L
A×
M ××××
1 2 3 4 5

Do NOT place any other ticks in the method.

Method Rubric

Method Rubric Criteria	5	4	3	2	1	0
L Layout – appearance of method					Layout meets criteria below: neat and tidy and bulleted/ numbered.	Layout is untidy and hard to read. **OR** Method is not formatted correctly with bullet points or 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 does not relate to the prescribed aim or does not achieve the desired result. Method given is the same as the given experiment.
M Method – this needs to be appropriate and relevant to the aim; clear, 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 this assists 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 a copy of the original, given experiment.

Total: 50 marks