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# GCSE

# Science A / Biology

BL1HP

Mark scheme

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4405 / 4401

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Version/Stage: 1.0 Final

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Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts: alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Assessment Writer.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this Mark Scheme are available from [aqa.org.uk](http://aqa.org.uk)

## Information to Examiners

### 1. General

The mark scheme for each question shows:

- the marks available for each part of the question
- the total marks available for the question
- the typical answer or answers which are expected
- extra information to help the Examiner make his or her judgement and help to delineate what is acceptable or not worthy of credit or, in discursive answers, to give an overview of the area in which a mark or marks may be awarded
- the Assessment Objectives and specification content that each question is intended to cover.

The extra information is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme.

At the beginning of a part of a question a reminder may be given, for example: where consequential marking needs to be considered in a calculation; or the answer may be on the diagram or at a different place on the script.

In general the right-hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

### 2. Emboldening and underlining

- 2.1** In a list of acceptable answers where more than one mark is available ‘any **two** from’ is used, with the number of marks emboldened. Each of the following bullet points is a potential mark.
- 2.2** A bold **and** is used to indicate that both parts of the answer are required to award the mark.
- 2.3** Alternative answers acceptable for a mark are indicated by the use of **or**. Different terms in the mark scheme are shown by a / ; eg allow smooth / free movement.
- 2.4** Any wording that is underlined is essential for the marking point to be awarded.

### 3. Marking points

#### 3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which students have provided extra responses. The general principle to be followed in such a situation is that ‘right + wrong = wrong’.

Each error / contradiction negates each correct response. So, if the number of error / contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (indicated as \* in example 1) are not penalised.

Example 1: What is the pH of an acidic solution? (1 mark)

| Student | Response | Marks awarded |
|---------|----------|---------------|
| 1       | green, 5 | 0             |
| 2       | red*, 5  | 1             |
| 3       | red*, 8  | 0             |

Example 2: Name two planets in the solar system. (2 marks)

| Student | Response                    | Marks awarded |
|---------|-----------------------------|---------------|
| 1       | Neptune, Mars, Moon         | 1             |
| 2       | Neptune, Sun, Mars,<br>Moon | 0             |

### 3.2 Use of chemical symbols / formulae

If a student writes a chemical symbol / formula instead of a required chemical name, full credit can be given if the symbol / formula is correct and if, in the context of the question, such action is appropriate.

### 3.3 Marking procedure for calculations

Full marks can be given for a correct numerical answer, without any working shown.

However, if the answer is incorrect, mark(s) can be gained by correct substitution / working and this is shown in the 'extra information' column or by each stage of a longer calculation.

### 3.4 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

### 3.5 Errors carried forward

Any error in the answers to a structured question should be penalised once only.

Papers should be constructed in such a way that the number of times errors can be carried forward is kept to a minimum. Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation e.c.f. in the marking scheme.

### 3.6 Phonetic spelling

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

### 3.7 Brackets

(.....) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

### 3.8 Ignore / Insufficient / Do not allow

Ignore or insufficient are used when the information given is irrelevant to the question or not enough to gain the marking point. Any further correct amplification could gain the marking point.

Do **not** allow means that this is a wrong answer which, even if the correct answer is given, will still mean that the mark is not awarded.

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**Quality of Written Communication and levels marking**

In Question 3(b) students are required to produce extended written material in English, and will be assessed on the quality of their written communication as well as the standard of the scientific response.

Students will be required to:

- use good English
- organise information clearly
- use specialist vocabulary where appropriate.

The following general criteria should be used to assign marks to a level:

**Level 1: basic**

- Knowledge of basic information
- Simple understanding
- The answer is poorly organised, with almost no specialist terms and their use demonstrating a general lack of understanding of their meaning, little or no detail
- The spelling, punctuation and grammar are very weak.

**Level 2: clear**

- Knowledge of accurate information
- Clear understanding
- The answer has some structure and organisation, use of specialist terms has been attempted but not always accurately, some detail is given
- There is reasonable accuracy in spelling, punctuation and grammar, although there may still be some errors.

**Level 3: detailed**

- Knowledge of accurate information appropriately contextualised
- Detailed understanding, supported by relevant evidence and examples
- Answer is coherent and in an organised, logical sequence, containing a wide range of appropriate or relevant specialist terms used accurately.
- The answer shows almost faultless spelling, punctuation and grammar.

| Question     | Answers                                                                                                                                                                                                                                                                              | Extra information                                                                                                                                                                                               | Mark     | AO / Spec. Ref.     |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|---------------------|
| 1(a)         | leprosy                                                                                                                                                                                                                                                                              | allow bone / blood cancer<br>ignore cancer                                                                                                                                                                      | 1        | AO1<br>1.3.1d       |
| 1(b)(i)      | 6 / six                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                 | 1        | AO2<br>1.3.1a       |
| 1(b)(ii)     | from 1120 to 5600                                                                                                                                                                                                                                                                    | allow from 5600 to 1120<br>allow 4480 (alone)                                                                                                                                                                   | 1        | AO2<br>1.3.1a       |
| 1(c)         | any <b>one</b> from:<br><ul style="list-style-type: none"> <li>• (test for) toxicity</li> <li>• (test for) dosage</li> <li>• (test for) efficacy</li> </ul>                                                                                                                          | ignore side effects, eg allergies<br>ignore safety / harm unqualified<br><br>allow poisonous<br><br>allow idea of amount<br><br>allow to see if it works<br><br>allow to check for interaction with other drugs | 1        | AO1<br>1.3.1b       |
| 1(d)(i)      | any <b>two</b> from:<br><ul style="list-style-type: none"> <li>• more people take / use legal / non-prescribed drugs</li> <li>• legal / non-prescribed drugs are (more) readily available</li> <li>• alcohol causes liver/brain damage</li> </ul> <b>or</b><br>tobacco causes cancer | ignore reference to cost / addiction<br><br><br><br><br><br><br>allow harmful effects of other named legal non-prescribed drugs                                                                                 | 2        | AO1 / AO3<br>1.3.1g |
| 1(d)(ii)     | addiction / dependency                                                                                                                                                                                                                                                               | allow withdrawal or examples of symptoms of withdrawal (if attempting to stop)                                                                                                                                  | 1        | AO1<br>1.3.1h       |
| <b>Total</b> |                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                 | <b>7</b> |                     |

| Question        | Answers                                                     | Extra information          | Mark     | AO / Spec. Ref.          |
|-----------------|-------------------------------------------------------------|----------------------------|----------|--------------------------|
| <b>2(a)</b>     | photosynthesis                                              |                            | 1        | AO2<br>1.6.1a/1.6.2a     |
| <b>2(b)(i)</b>  | 140                                                         |                            | 1        | AO2<br>1.6.1d/<br>1.6.2a |
| <b>2(b)(ii)</b> | (10 billion tonnes) more added (to atmosphere) than removed | allow ecf from part (b)(i) | 1        | AO2<br>1.6.1d/<br>1.6.2a |
| <b>Total</b>    |                                                             |                            | <b>3</b> |                          |

| Question  | Answers                                                                                                                                                                                                                                                                                                                                            | Extra information                                                                                                                                                                                                                                                                                                       | Mark | AO / Spec. Ref. |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-----------------|
| 3(a)(i)   | <p>any <b>one</b> from:</p> <ul style="list-style-type: none"> <li>• (same) (type of) weed killer</li> <li>• (same) volume / 5dm<sup>3</sup> of solution used (on each area)</li> <li>• effect on daisies (not other weeds / plants)</li> <li>• (same) area / 10m<sup>2</sup></li> <li>• (same) time <b>or</b> (effect after) two weeks</li> </ul> | <p>ignore references to same lawn / weather / soil, which are not given in the question.</p> <p>allow amount of solution used</p> <p>do <b>not</b> allow amount / volume / concentration of weed killer</p> <p>do <b>not</b> allow number of daisy plants</p>                                                           | 1    | AO2<br>1.2.3d   |
| 3(a)(ii)  | more (daisies) growing after use of weed killer <b>or</b> after two weeks                                                                                                                                                                                                                                                                          | allow it does not fit pattern (of other results)                                                                                                                                                                                                                                                                        | 1    | AO3<br>1.2.3d   |
| 3(a)(iii) | <p>any <b>one</b> from:</p> <ul style="list-style-type: none"> <li>• as a control</li> <li>• to compare (to the other areas)</li> <li>• to check other factor(s) are not affecting the results / daisies</li> </ul>                                                                                                                                | <p>ignore to see if it / water has an effect</p> <p>do <b>not</b> allow as a control variable</p>                                                                                                                                                                                                                       | 1    | AO2<br>1.2.3d   |
| 3(a)(iv)  | 80 (arbitrary units of weed killer) also killed all the daisies                                                                                                                                                                                                                                                                                    | <p>allow ref to possible experimental design flaws such as 'only tested once' or 'not repeated' or 'different number of daisies in each area at first'</p> <p>allow idea that other weed species may not respond in the same way as daisies</p> <p>allow idea that 100 (units) may also kill wanted species / grass</p> | 1    | AO3<br>1.2.3d   |

| Question                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Answers                                                                                                                  | Extra information                                                                                                                                                                                                                                                                                                                                                                         | Mark                                                                                                                                               | AO / Spec. Ref    |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| 3(b)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                           | 6                                                                                                                                                  | AO1<br>1.2.3a/b/c |
| Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information on page 5 and apply a 'best-fit' approach to the marking.                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                    |                   |
| 0 marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Level 1 (1–2 marks)                                                                                                      | Level 2 (3–4 marks)                                                                                                                                                                                                                                                                                                                                                                       | Level 3 (5–6 marks)                                                                                                                                |                   |
| No relevant content.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Reference to at least one environmental factor plants respond to<br>or<br>at least one response<br>or<br>a named hormone | Reference to at least one environmental factor plants respond to<br>and<br>at least one associated response<br>or<br>reference to a named hormone<br>and<br>at least one associated response                                                                                                                                                                                              | Reference to at least one environmental factor plants respond to<br>and<br>at least one associated response<br>and<br>reference to a named hormone |                   |
| examples of biology points made in the response:<br><br><i>environmental factors</i> <ul style="list-style-type: none"><li>• light</li><li>• (direction of the force of) gravity</li><li>• moisture / water</li></ul><br><i>effects on direction of growth</i> <ul style="list-style-type: none"><li>• shoots grow upwards</li><li>• shoots grow towards light</li><li>• shoots grow against (the force of) gravity</li><li>• roots grow downwards</li><li>• roots grow towards moisture</li><li>• roots grow towards (the force of) gravity</li></ul><br><i>hormone</i> <ul style="list-style-type: none"><li>• reference to auxin</li><li>• unequal distribution of hormone causes unequal growth (rates)</li></ul> |                                                                                                                          | extra information<br><br>allow phototropism<br>allow gravi/geotropism<br>allow hydrotropism<br><br>allow reference to 'positive' and 'negative' in terms of tropisms as indicating direction of growth<br><br>allow other named hormone(s)<br>allow higher concentration of hormone causes faster growth in shoots<br>allow higher concentration of hormone causes slower growth in roots |                                                                                                                                                    |                   |
| Total                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                           | 10                                                                                                                                                 |                   |

| Question     | Answers                                                                                                                                                                  | Extra information                                                           | Mark       | AO / Spec. Ref.            |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|------------|----------------------------|
| 4(a)         | microorganism / bacteria / virus / fungus that causes (infectious) disease                                                                                               |                                                                             | 1          | AO1<br>1.1.2a              |
| 4(b)         | reduce / stop use of (current) antibiotics<br><br>(reduce / stop use) for non-serious / mild / viral infections                                                          | allow ensure course is completed<br><br>allow use of variety of antibiotics | 1<br><br>1 | AO1<br>1.1.2j/k/<br>1.8.1f |
| 4(c)(i)      | 40 °C                                                                                                                                                                    |                                                                             | 1          | AO2<br>1.1.2o              |
| 4(c)(ii)     | any <b>one</b> from:<br><ul style="list-style-type: none"> <li>microorganisms grow / reproduce / work / act faster</li> <li>results / product acquired sooner</li> </ul> |                                                                             | 1          | AO1<br>1.1.2o              |
| <b>Total</b> |                                                                                                                                                                          |                                                                             | <b>5</b>   |                            |

| Question     | Answers                                                                                                                                                                                                                                                                                                           | Extra information                                                                                                                                           | Mark     | AO / Spec. Ref.         |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-------------------------|
| <b>5(a)</b>  | gets more light (near surface)                                                                                                                                                                                                                                                                                    | allow warmer (near surface)                                                                                                                                 | 1        | AO2 / AO3<br>1.4.1a/b/d |
|              | (so) photosynthesises more                                                                                                                                                                                                                                                                                        | allow bladders contain (more) carbon dioxide                                                                                                                | 1        |                         |
|              | (because) bladders aid floating (when tide is in)<br><br><b>or</b><br>(so) more biomass / glucose / starch produced                                                                                                                                                                                               | ref to 'more' needed only once, eg gets more light for photosynthesis gains <b>two</b> marks<br>if 'more' not given do not award mark on the first occasion | 1        |                         |
| <b>5(b)</b>  | lets angler fish see /attract its prey / mates <b>or</b> see predators as it is dark (at 1000m)<br><br><b>or</b><br>lets angler fish see / attract prey to get food<br><br><b>or</b><br>lets angler fish see / attract mates to reproduce<br><br><b>or</b><br>lets angler fish see predators to avoid being eaten | must be in a correct pair to gain <b>two</b> marks                                                                                                          | 2        | AO2<br>1.4.1a/c/d/f/g   |
| <b>Total</b> |                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                             | <b>5</b> |                         |

| Question        | Answers                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Extra information                                                                                                                                                                                                                         | Mark     | AO / Spec. Ref. |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-----------------|
| <b>6(a)</b>     | any <b>three</b> from: <ul style="list-style-type: none"> <li>blackbirds seen in higher % of / more gardens</li> <li>multiplying mean number by percentage of gardens seen in shows blackbird is higher</li> <li>only done on one day / month / hour</li> <li>only done in gardens (one bird may prefer a different habitat)</li> <li>problem of (correct) identification</li> <li>may re-count same ones</li> <li>people may quote false numbers / may make it up</li> </ul> | allow <b>1</b> additional mark for correct figures showing this, ie 264 sparrows: 305 blackbirds<br>eg only done in January<br><br>if neither point 5 or 6 given allow <b>1</b> mark for idea of error / miscounted                       | 3        | AO3<br>1.4.2    |
| <b>6(b)(i)</b>  | 60.3                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | award <b>2</b> marks for correct answer, irrespective of working<br>award <b>1</b> mark for $33.5 + (33.5 \times 80/100)$ or equivalent with no answer or incorrect answer <b>or</b><br>award <b>1</b> mark for 26.8                      | 2        | AO2<br>1.4.2    |
| <b>6(b)(ii)</b> | any <b>two</b> from: <ul style="list-style-type: none"> <li>change in temperature</li> <li>fewer predators</li> <li>more food <b>or</b> less competition for food</li> <li>more nesting space <b>or</b> less competition for nesting space</li> <li>less disease (in 2012)</li> </ul>                                                                                                                                                                                         | a comparison is required<br>eg cooler / warmer / less frost (in 2012)<br><br>allow idea that people may be better / worse at identifying birds / goldfinches<br><br>allow idea of movement to gardens (due to poor food supply elsewhere) | 2        | AO2<br>1.4.2b   |
| <b>Total</b>    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                           | <b>7</b> |                 |

| Question | Answers                                                                                                                                                                                                      |                                                         | Extra information                                                                                                                                                                                                                     | Mark       | AO / Spec. Ref. |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-----------------|
| 7(a)     | detect changes in surroundings<br><b>or</b> detect stimuli<br><br>convert information to impulse                                                                                                             |                                                         | allow any named stimulus for skin<br><br>allow send impulse to sensory neurones / brain                                                                                                                                               | 1<br><br>1 | AO1<br>1.2.1a/b |
| 7(b)(i)  |                                                                                                                                                                                                              |                                                         | 1 mark for each effector<br>1 mark for each response<br><br>response must match type of effector (if given)<br>ignore examples<br><br>ignore relax(ation) / movement for contraction<br><br>do <b>not</b> allow expansion for muscles | 4          | AO1<br>1.2.1e   |
|          | muscle                                                                                                                                                                                                       | contract(ion)                                           |                                                                                                                                                                                                                                       |            |                 |
|          | gland                                                                                                                                                                                                        | release / secrete / produce chemical / hormone / enzyme |                                                                                                                                                                                                                                       |            |                 |
| 7(b)(ii) | any <b>one</b> from: <ul style="list-style-type: none"><li>(maintain temperature at which) enzymes work best</li><li>so chemical reactions are fast(est)</li><li>prevent damage to cells / enzymes</li></ul> |                                                         | allow prevent enzymes being denatured (by temperature being too high)                                                                                                                                                                 | 1          | AO1<br>1.2.2a   |
| Total    |                                                                                                                                                                                                              |                                                         |                                                                                                                                                                                                                                       | 7          |                 |



| Question         | Answers                                                                                                                                                                                          | Extra information                                                                                                                                                                                                                            | Mark       | AO / Spec. Ref.        |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|------------------------|
| <b>9(a)</b>      | any <b>two</b> from: <ul style="list-style-type: none"> <li>right amount of nutrients <b>or</b> different / all foods</li> <li>right amount of energy</li> <li>for (individual) needs</li> </ul> | 'right amount' only needed once for both marks to be awarded                                                                                                                                                                                 | 2          | AO1<br>1.1.1a          |
| <b>9(b)(i)</b>   | ovaries / ovary                                                                                                                                                                                  | allow placenta                                                                                                                                                                                                                               | 1          | AO1<br>1.2.2d          |
| <b>9(b)(ii)</b>  | any <b>one</b> from: <ul style="list-style-type: none"> <li>inhibits follicle stimulating hormone / FSH production</li> <li>inhibits maturation of eggs</li> </ul>                               | ignore ref to site of production of FSH<br><br>allow stimulates LH production <b>or</b> stimulates preparation of womb lining                                                                                                                | 1          | AO1<br>1.2.2d          |
| <b>9(b)(iii)</b> | any <b>one</b> from: <ul style="list-style-type: none"> <li>stimulate muscle growth</li> <li>used in (oral) contraceptives</li> </ul>                                                            |                                                                                                                                                                                                                                              | 1          | AO1<br>1.3.1i / 1.2.2e |
| <b>9(c)</b>      | small (rate of) decrease then bigger (rate of) decrease<br><br>idea that change of rate (of decrease) at 900 (mg per day)                                                                        | If no other mark awarded allow <b>1</b> mark for decrease                                                                                                                                                                                    | 1<br><br>1 | AO2<br>1.3             |
| <b>9(d)(i)</b>   | gene(s) / nucleus / chromosome(s) / DNA                                                                                                                                                          | allow ribosome                                                                                                                                                                                                                               | 1          | AO2<br>1.7.1a/b/c/d    |
| <b>9(d)(ii)</b>  | reduces production of cholesterol (by liver)                                                                                                                                                     | allow idea of switching off gene for reductase (production)<br>allow switch off / reduce / inhibit reductase (production)<br>allow reduces absorption of cholesterol (by intestine)<br>allow statins (might) breakdown / destroy cholesterol | 1          | AO2<br>1.1.1d          |
| <b>Total</b>     |                                                                                                                                                                                                  |                                                                                                                                                                                                                                              | <b>9</b>   |                        |