Education and Sport Development

Department of Education and Sport Development
Departement van Onderwys en Sportontwikkeling
Lefapha la Thuto le Tlhabololo ya Metshameko
NORTH WEST PROVINCE

# NATIONAL SENIOR CERTIFICATE

## GRADE 12

## LIFE SCIENCES P2

## SEPTEMBER 2019

## MARKING GUIDELINES

**MARKS: 150**

**These marking guidelines consists of 13 pages and a cognitive grid of 5 pages**

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## PRINCIPLES RELATED TO MARKING LIFE SCIENCES

1. **If more information than marks allocated is given**
   Stop marking when maximum marks is reached and put a wavy line and 'max' in the right-hand margin.

2. **If, for example, three reasons are required and five are given**
   Mark the first three irrespective of whether all or some are correct/incorrect.

3. **If whole process is given when only part of it is required**
   Read all and credit relevant part.

4. **If comparisons are asked for and descriptions are given**
   Accept if differences/similarities are clear.

5. **If tabulation is required but paragraphs are given**
   Candidates will lose marks for not tabulating.

6. **If diagrams are given with annotations when descriptions are required**
   Candidates will lose marks.

7. **If flow charts are given instead of descriptions**
   Candidates will lose marks.

8. **If sequence is muddled and links do not make sense**
   Where sequence and links are correct, credit. Where sequence and links are incorrect, do not credit. If sequence and links becomes correct again, resume credit.

9. **Non-recognised abbreviations**
   Accept if first defined in answer. If not defined, do not credit the unrecognised abbreviation but credit the rest of answer if correct.

10. **Wrong numbering**
    If answer fits into the correct sequence of questions but the wrong number is given, it is acceptable.

11. **If language used changes the intended meaning**
    Do not accept.

12. **Spelling errors**
    If recognisable accept provided it does not mean something else in Life Sciences or if it is out of context**.**

13. **If common names given in terminology**
    Accept, provided it was accepted at the memo discussion meeting.

14. **If only the letter is asked for, and only the name is given (and vice versa)**
Do not credit.

15. **If units are not given in measurements**
Candidates will lose marks. Memorandum will allocate marks for units separately.

16. **Be sensitive to the sense of an answer, which may be stated in a different way**

17. **Caption**
All illustrations (diagrams, graphs, tables, etc.) must have a caption.

18. **Code-switching of official languages (terms and concepts)**
A single word or two that appear(s) in any official language other than the learners' assessment language used to the greatest extent in his/her answers should be credited, if it is correct. A marker that is proficient in the relevant official language should be consulted. This is applicable to all official languages.

19. **Changes to the memorandum**
No changes must be made to the marking memoranda without consulting the provincial internal moderator.

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## SECTION A

## QUESTION 1

| | | | | |
|---|---|---|---|---|
| 1.1 | 1.1.1 | B✓✓ | | |
| | 1.1.2 | D✓✓ | | |
| | 1.1.3 | A✓✓ | | |
| | 1.1.4 | B✓✓ | | |
| | 1.1.5 | C✓✓ | | |
| | 1.1.6 | A✓✓ | | |
| | 1.1.7 | C✓✓ | | |
| | 1.1.8 | B✓✓ | | |
| | 1.1.9 | C✓✓ | | |
| | 1.1.10 | A✓✓ | (10 x 2) | **(20)** |
| 1.2 | 1.2.1 | Allele✓ | | |
| | 1.2.2 | Gene✓ | | |
| | 1.2.3 | Centromere ✓ | | |
| | 1.2.4 | Anaphase I✓ | | |
| | 1.2.5 | Haploid ✓ | | |
| | 1.2.6 | Colour blindness✓ | | **(6)** |
| 1.3 | 1.3.1 | A only✓✓ | | |
| | 1.3.2 | B only✓✓ | | |
| | 1.3.3 | A only ✓✓ | (3 x 2) | **(6)** |
| 1.4 | 1.4.1 | 47✓ | | (1) |
| | 1.4.2 | Down syndrome✓ | | (1) |
| | 1.4.3 | Autosomes✓ | | (1) |
| | 1.4.4 | Female✓ | | (1) |
| | 1.4.5 | Chromosome pair 23/gonosomes XX✓ | | (1) |
| | 1.4.6 | Non-disjunction | | (1) **(6)** |

| | | | |
|---|---|---|---|
| 1.5 | 1.5.1 | Cloning✓ | (1) |
| | 1.5.2 | (a) A✓ | (1) |
| | | (b) C✓ | (1) |
| | 1.5.3 | (a) 4✓ | (1) |
| | | (b) 5✓<br>6✓<br>**(Mark first TWO only)** | (2) |
| | 1.5.4 | Bone marrow✓<br>Umbilical cord✓<br>Amniotic fluid✓<br>**(Mark first TWO only)** | (2)<br>**(8)** |
| 1.6 | 1.6.1 | (a) F✓ | (1) |
| | | (b) D✓ | (1) |
| | | (c) E✓/A | (1) |
| | | (d) C✓ | (1)<br>**(4)** |

**TOTAL SECTION A: 50**

## SECTION B

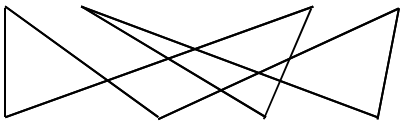
## QUESTION 2

| | | | | |
|---|---|---|---|---|
| 2.1 | 2.1.1 | (a) DNA✓ | | (1) |
| | | (b) mRNA✓ | | (1) |
| | 2.1.2 | CGT✓✓ | | (2) |
| | 2.1.3 | GCA✓✓ | | (2) |
| | 2.1.4 | Translation<br>- Each tRNA carries a specific amino acid✓<br>- When the anticodon on the tRNA✓<br>- matches the codon on the mRNA✓<br>- then tRNA brings the required amino acid to the ribosome✓<br>- Amino acids become attached by peptide bonds✓<br>- to form the required protein✓ | Any | (5)<br>**(11)** |
| 2.2 | 2.2.1 | The sudden, random change in the genetic code✓ of a cell | | (1) |
| | 2.2.2 | Gene mutation✓ | | (1) |
| | 2.2.3 | - Gene mutation affect a single or a few base pairs in the single gene✓<br>- the base sequence CCT is changed to CAT✓<br>- which produces a different polypeptide✓ | Any | (2) |
| | 2.2.4 | (a) Glutamic acid✓ | | (1) |
| | | (b) Valine✓ | | (1) |
| | 2.2.5 | - The two strands would not separate✓<br>- The DNA will not replicate✓<br>- and protein synthesis will not take place✓ | Any | (2)<br>**(8)** |

| | | | | |
|---|---|---|---|---|
| 2.3 | 2.3.1 | Cell membrane✓ | | (1) |
| | 2.3.2 | - To contract and pull the chromosomes to the poles✓<br>- To hold the chromosomes / facilitates the attachment of the centromere ✓<br>(**Mark first ONE only)** | | (1) |
| | 2.3.3 | Metaphase II✓ | | (1) |
| | 2.3.4 | - Chromosomes are aligned in a single row✓<br>- on the equator✓ | | (2) |
| | 2.3.5 | Crossing over✓<br>Random arrangement of chromosomes✓ | Any | (1)<br>**(6)** |
| 2.4 | 2.4.1 | (a) BbNn✓ | | (1) |
| | | (b) bbnn✓ | | (1) |
| | 2.4.2 | BN, Bn, bN, bn ✓✓ | (All or none) | (2) |
| | 2.4.3 | (a) Bitter fruit with no spots✓ | | (1) |
| | | (b) Sweet fruit with yellow spots✓ | | (1)<br>**(6)** |

2.5.1 - The parents have the dominant phenotype✓/have one dominant allele
- To have children with the recessive characteristic✓/bb
- The other allele of each parent must be recessive✓/ b (3)

2.5.2

| | | | | |
|---|---|---|---|---|
| **$P_1$**/parent | Phenotype | Bent little fingers | x | Straight little fingers✓ |
| | Genotype | Bb | x | bb ✓ |
| *Meiosis* | | | | |
| | **G**/gametes | B , b | x | b ; b✓ |
| *Fertilisation* | |  | | |
| **$F_1$** | Genotype | Bb ; Bb ; bb ; bb✓ | | |
| | Phenotype | **2 Bent little fingers, 2 straight little fingers✓ *** | | |

Parents and offspring✓/$P_1$ and $F_1$
Meiosis and fertilisation✓
**(*compulsory mark + 5)**

**OR**

| | | | | |
|---|---|---|---|---|
| **$P_1$**/parent | Phenotype | Bent little fingers | x | Straight little fingers✓ |
| | Genotype | Bb | x | bb✓ |
| *Meiosis* | | | | |
| | **G**/gametes | B, b | x | b, b ✓ |

| Gametes | **b** | **b** |
|---|---|---|
| **B** | Bb | Bb |
| **b** | bb | bb |
| Correct genotypes ✓ | | |

*Fertilisation*

| | | |
|---|---|---|
| **$F_1$** | Phenotype | **2 bent little fingers, 2 straight little fingers✓ *** |

Parents and offspring✓/$P_1$ and $F_1$ (6)
Meiosis and fertilisation✓ **(* compulsory mark + 5)** **(9)**
**[40]**

## QUESTION 3

| | | | | |
|---|---|---|---|---|
| 3.1 | 3.1.1 | *Ceratotherium*✓ | | (1) |
| | 3.1.2 | - Ancestors of rhinos had very small horns✓<br>- Due to the need for clearing bush✓/to fight with other rhinos to get mating partners,<br>- the horns become stronger/overuse✓<br>- Over time the horns would grow longer/stronger in a single rhino's lifetime<br>- This trait is inherited to the next generation✓ | Any | (4)<br>**(5)** |
| 3.2 | 3.2.1 | Genetic engineering✓/ genetic modification/artificial selection | | (1) |
| | 3.2.2 | - Taller plants✓<br>- Having shorter life cycle✓<br>- Greater yield✓<br>- Able to grow in rich aluminium soil✓<br>- More competitive with weeds✓<br>**(Mark first THREE only)** | | (3) |
| | 3.2.3 | - Expensive✓<br>- Reducing variation✓<br>- Health risk✓<br>(**Mark first TWO only)** | Any | (2)<br>**(6)** |
| 3.3 | 3.3.1 | - The original shrimp population was separated into two different populations✓<br>- by land bridge Panama✓/Caribbean sea and Pacific ocean<br>- which acted as a geographical barrier✓<br>- There was no gene flow between the populations✓<br>- Each population was exposed to different environmental conditions✓<br>- Natural selection occurred independently in each population✓<br>- and individuals of each population became different✓ over time<br>- genotypically and phenotypically✓<br>- Even if the two populations were to mix again✓<br>- they would not be able to interbreed✓<br>The two populations are now different species | Any | (6) |
| | 3.3.2 | Continental drift✓ | | (1)<br>**(7)** |

3.4 3.4.1 (a) Colour of the rock rabbits✓ (1)

(b) Survival rate of the rock rabbits✓ (1)

3.4.2 - It decreases survival✓/rock rabbits may die / is harmful / is lethal to the white rock rabbits/rock rabbits may become extinct
- They will be seen✓on the black rock by the predators

**OR**

- They could not escape predators✓
- as white rock rabbits did not warm up fast on cold days✓

Any (2)

3.4.3 - To allow enough time for reproduction and survival✓
- To be able to calculate the percentage to ensure reliability ✓of results

**OR**

- A change in population proportions will not be seen over a shorter time period✓
- To ensure reliability of results✓. Any (2)

3.4.4 - Rock rabbits must be of the same size✓/age
- Conducted the investigation in the same habitat✓/ environment
- Used the same sampling technique✓
- Captured the same number of rock rabbits in each sampled generation✓
- Took each sample at the same time of the day✓
- Weather conditions should have been the same✓ (1)

**(Mark first ONE only)**

3.4.5 - There is variation to colour ✓amongst the rock rabbits
- White and brown rock rabbits✓
- are not camouflaged ✓/ cannot warm up fast enough to have energy to run away
- Are killed by predators✓
- The black rock rabbits✓
- are better camouflaged✓/ warm up faster to have energy to avoid predators
- and survived✓/ reproduced
- The allele for black colour is passed on to the next generation✓

. Any (6)

**(13)**

| | | | |
|---|---|---|---|
| 3.5 | 3.5.1 | *Homo habilis*✓ | (1) |
| | 3.5.2 | - Genetic✓/mitochondrial DNA<br>- Cultural✓<br>**(Mark first TWO only)** | (2) |
| | 3.5.3 | *Ardipithecus ramidus*✓ | (1) |
| | 3.5.4 | (1400 - 500)✓<br>= 900✓$cm^3$ | (2) |
| | 3.5.5 | There is an overlap in their period of existence✓/they both existed between 2 and 1,6 mya | (1) |
| | 3.5.6 | - They would measure the volume✓<br>- of the cranium✓of the fossil | (2)<br>**(9)**<br>**[40]** |

**TOTAL SECTION B: 80**

## SECTION C

## QUESTION 4

**Trend towards bipedalism (B)**

**Foramen magnum, curvature of the spine and pelvic girdle**

- The foramen magnum was in a backward position in the ape-like beings✓
- but in a forward position in modern humans✓
- Modern humans have a more curved ✓/ S-shaped spine
- for better balance✓
- Ape-like beings have a less curved✓/ C-shaped spine
- Modern humans have a short wide pelvis✓/cup shaped pelvis
- which makes it suitable to carry the core of the body✓
- whereas ape-like beings have a long, narrow pelvis✓
- Decrease in length of arms in humans✓ indicates
- decreased dependency on its use in locomotion✓
- and therefore shows a more advanced stage of bipedalism✓

Any 8 (8)

**Change in diet from raw food to cooked food (D)**

**Prognathism, Dentition/teeth, shape of palate**

- Humans have jaws that are non-prognathous✓/ flat face for eating cooked food
- compared to the jaws of ape-like beings which are prognathous✓/sloping face for scooping the food/ to reduce dependency on arms✓
- Brow ridges became less developed in humans✓
- since the action of smaller jaws did not create forces great enough for skull to have increased strength from the brow ridges✓
- Ape-like beings have stronger jaws✓
- to break and chew raw food✓
- Absence of gaps(diastema) in humans between incisors and canines✓
- indicating diet that is more refined✓
- Humans have smaller teeth✓/incisors and canines
- and flatter molars and pre-molars✓for better chewing
- compared to long and rectangular palates of ape-like beings✓

Any 9 (9)

Content: (17)

Synthesis: (3)

**(20)**

## ASSESSING THE PRESENTATION OF THE ESSAY

| Criterion | Relevance (R) | Logical sequence (L) | Comprehensive (C) |
|---|---|---|---|
| **Generally** | All information provided is relevant to the topic | Ideas are arranged in a logical/cause-effect sequence | Answered all aspects required by the essay in sufficient detail |
| **In this essay in Q4** | Only information relevant to trend towards bipedalism and change in diet from raw to cooked food are discussed.<br><br>There is no irrelevant information | All the information regarding the:<br>- Bipedalism and<br>- Change in diet is arranged in a logical manner | At least the following points should be included:<br><br>- Bipedalism **(5/8)**<br>- Change in diet **(6/9)** |
| **Mark** | 1 | 1 | 1 |

**TOTAL SECTION C: 20**
**GRAND TOTAL: 150**

| | **Life Sciences P2** | **September Prep 2019** | | | **Analysis Grid** | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Question | Topic | A Basic Knowledge | B Comprehension | C Application | D Analysis, Synthesis, Evaluation | DNA code of life | Meiosis | Genetics | Evolution |
| 1.1.1 | DNA nucleotide | 2 | | | | 2 | | | |
| 1.1.2 | Characteristics of tRNA | 2 | | | | 2 | | | |
| 1.1.3 | Blood group | | 2 | | | | | 2 | |
| 1.1.4 | Mutation | 2 | | | | | | 2 | |
| 1.1.5 | DNA % of Guanine | | | 2 | | 2 | | | |
| 1.1.6 | Order of evolution | 2 | | | | | | | 2 |
| 1.1.7 | Isolating mechanisms | 2 | | | | | | | 2 |
| 1.1.8 | Co-dominance | 2 | | | | | | 2 | |
| 1.1.9 | Punctated equilibrium | | 2 | | | | | | 2 |
| 1.1.10 | DNA profile | | | | 2 | 2 | | | |
| **TOTAL** | | **12** | **4** | **2** | **2** | **8** | **0** | **6** | **6** |
| 1.2.1 | Allele | 1 | | | | | | 1 | |
| 1.2.2 | Gene | 1 | | | | | | 1 | |
| 1.2.3 | Centromere | 1 | | | | | 1 | | |
| 1.2.4 | Anaphase I | 1 | | | | | 1 | | |
| 1.2.5 | Haploid | 1 | | | | | | 1 | |
| 1.2.6 | Colour blindness | 1 | | | | | | 1 | |
| **TOTAL** | | **6** | **0** | **0** | **0** | **0** | **2** | **4** | **0** |
| 1.3.1 | A only | | 2 | | | | | 2 | |
| 1.3.2 | B only | | 2 | | | | | 2 | |
| 1.3.3 | A only | | 2 | | | | | 2 | |
| **TOTAL** | | **0** | **6** | **0** | **0** | **0** | **0** | **6** | **0** |
| 1.4.1 | 47 chromosomes | 1 | | | | | | 1 | |

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|---|---|---|---|---|---|---|---|---|---|
| Question | Topic | A Basic Knowledge | B Comprehension | C Application | D Analysis, Synthesis, Evaluation | DNA code of life | Meiosis | Genetics | Evolution |
| 1.4.2 | Down syndrome | 1 | | | | | 1 | | |
| 1.4.3 | Autosomes | 1 | | | | | | 1 | |
| 1.4.4 | Female | 1 | | | | | | 1 | |
| 1.4.5 | Reason for a female | 1 | | | | | | 1 | |
| 1.4.6 | Non-disjunction | | 1 | | | | 1 | | |
| **TOTAL** | | **5** | **1** | **0** | **0** | **0** | **2** | **4** | **0** |
| 1.5.1 | Cloning | 1 | | | | | | 1 | |
| 1.5.2 | A, C | | 2 | | | | | 2 | |
| 1.5.3 (a) | 4 | 1 | | | | | | 1 | |
| 1.5.4 (b) | 5, 6 | 2 | | | | | | 2 | |
| 1.5.5 | Umbilical cord, bone marrow | 2 | | | | | | 2 | |
| **TOTAL** | | **6** | **2** | **0** | **0** | **0** | **0** | **8** | **0** |
| 1.6.1 | (a) F | | 1 | | | | 1 | | |
| | (b) D | | 1 | | | | 1 | | |
| | (c) E | | 1 | | | | 1 | | |
| | (d) C | | 1 | | | | 1 | | |
| **TOTAL** | | **0** | **4** | **0** | **0** | **0** | **4** | **0** | **0** |
| **TOT Q 1** | | **29** | **17** | **2** | **2** | **8** | **6** | **30** | **6** |
| 2.1.1 | DNA & mRNA | 2 | | | | 2 | | | |
| 2.1.2 | DNA genetic codes | | | 2 | | 2 | | | |
| 2.1.3 | Anticodons | | | 2 | | 2 | | | |

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| | Life Sciences P2 | September Prep 2019 | | | Analysis Grid | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Question | Topic | A Basic Knowledge | B Comprehension | C Application | D Analysis, Synthesis, Evaluation | DNA code of life | Meiosis | Genetics | Evolution |
| 2.1.4 | Describe translation | 5 | | | | 5 | | | |
| **TOTAL** | | **7** | **0** | **4** | **0** | **11** | **0** | **0** | **0** |
| 2.2.1 | Definition mutation | 1 | | | | 1 | | | |
| 2.2.2 | Gene mutation | 1 | | | | 1 | | | |
| 2.2.3 | Explanation for a gene mutation | 2 | | | | 2 | | | |
| 2.2.4 | Glutamic acid, Valine | | | | 2 | 2 | | | |
| 2.2.5 | DNA replication would not | | | 2 | | 2 | | | |
| **TOTAL** | | **4** | **0** | **2** | **2** | **8** | **0** | **0** | **0** |
| 2.3.1 | Cell membrane | 1 | | | | | 1 | | |
| 2.3.2 | To pull the chromosomes to the poles | 1 | | | | | 1 | | |
| 2.3.3 | Metaphase II | 1 | | | | | 1 | | |
| 2.3.4 | Explanation for 2.3.3 | 2 | | | | | 2 | | |
| 2.3.5 | Crossing over | 1 | | | | | 1 | | |
| **TOTAL** | | **6** | **0** | **0** | **0** | **0** | **6** | **0** | **0** |
| 2.4.1 | Genotype of A and B | | | 2 | | | | 2 | |
| 2.4.2 | Genotype of all gametes | | | 2 | | | | 2 | |
| 2.4.3 | Phenotype of Bbnn, bbNN | | 2 | | | | | 2 | |
| **TOTAL** | | **0** | **2** | **4** | **0** | **0** | **0** | **6** | **0** |

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| | **Life Sciences P2** | **September Prep 2019** | | | **Analysis Grid** | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Question | Topic | A Basic Knowledge | B Comprehension | C Application | D Analysis, Synthesis, Evaluation | DNA code of life | Meiosis | Genetics | Evolution |
| 2.5.1 | Explanation A and B are heterozygous | | | | 3 | | | 3 | |
| 2.5.2 | Drawing of a genetic cross | | | 6 | | | | 6 | |
| **TOTAL** | | **0** | **0** | **6** | **3** | **0** | **0** | **9** | **0** |
| **TOT Q2** | | **17** | **2** | **16** | **5** | **19** | **6** | **15** | **0** |
| 3.1.1 | *Ceratotherium* | 1 | | | | | | | 1 |
| 3.1.2 | Lamarck and rhino horn | | | | 4 | | | | 4 |
| **TOTAL** | | **1** | **0** | **0** | **4** | **0** | **0** | **0** | **5** |
| 3.2.1 | Genetic engineering | 1 | | | | | | | 1 |
| 3.2.2 | Advantages | 3 | | | | | | | 3 |
| 3.2.3 | Disadvantages | | | 2 | | | | | 2 |
| **TOTAL** | | **4** | **0** | **2** | **0** | **0** | **0** | **0** | **6** |
| 3.3.1 | Speciation of shrimp | | | 6 | | | | | 6 |
| 3.3.2 | Continental drift | 1 | | | | | | | 1 |
| **TOTAL** | | **1** | **0** | **6** | **0** | **0** | **0** | **0** | **7** |
| 3.4.1 | Variables | | | | 2 | | | | 2 |
| 3.4.2 | Effect of mutation on survival | | | | 2 | | | | 2 |
| 3.4.3 | For reliability | | | | 2 | | | | 2 |
| 3.4.4 | Validity | | | | 1 | | | | 1 |
| 3.4.5 | Explain natural selection | | 6 | | | | | | 6 |

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|---|---|---|---|---|---|---|---|---|---|
| Question | Topic | A Basic Knowledge | B Comprehension | C Application | D Analysis, Synthesis, Evaluation | DNA code of life | Meiosis | Genetics | Evolution |
| **TOTAL** | | **0** | **6** | **0** | **7** | **0** | **0** | **0** | **13** |
| 3.5.1 | Brain volume | 1 | | | | | | | 1 |
| 3.5.2 | Evidence for evolution | 2 | | | | | | | 2 |
| 3.5.3 | Extinction | | 1 | | | | | | 1 |
| 3.5.4 | Calculation | | 2 | | | | | | 2 |
| 3.5.5 | *Australopithecus* | | 1 | | | | | | 1 |
| 3.5.6 | Brain volume | | | 2 | | | | | 1 |
| **TOTAL** | | **3** | **4** | **2** | **0** | **0** | **0** | **0** | **9** |
| **TOT Q3** | | **9** | **10** | **10** | **11** | **0** | **0** | **0** | **40** |
| **TOT Q4** | Essay | **0** | **8** | **9** | **3** | **0** | **0** | **0** | **20** |
| | | | | | | | | | |
| **Q1** | | **29** | **17** | **2** | **2** | **8** | **6** | **30** | **6** |
| **Q2** | | **17** | **2** | **16** | **5** | **19** | **6** | **15** | **0** |
| **Q3** | | **9** | **10** | **10** | **11** | **0** | **0** | **0** | **40** |
| **Q4** | | **0** | **8** | **9** | **3** | **0** | **0** | **0** | **20** |
| **MARKS** | | **55** | **37** | **37** | **21** | **27** | **12** | **45** | **66** |
| **%** | | **37.0** | **25.0** | **25.0** | **14.0** | **18.0** | **8.0** | **30.0** | **44.0** |
| **NORM MARKS** | | **60** | **38** | **30** | **22** | **27** | **12** | **45** | **66** |
| **NORM %** | | **40** | **25** | **20** | **15** | **18** | **8** | **30** | **44** |

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