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Answer Key to the Theoretical Tests

1. Part A

| No. | A | B | C | D | E | F | No. | A | B | C | D | E | F | No. | A | B | C | D | E | F |
|-----|---|---|---|---|---|---|-----|---|---|---|---|---|---|-----|---|---|---|---|---|---|
| A1 | | | | | X | | A21 | | X | | | | | A41 | X | | | | | |
| A2 | | X | | | | | A22 | | | X | | | | A42 | | | | | | X |
| A3 | | | X | | | | A23 | X | | | | | | A43 | | | X | | | |
| A4 | | | | | X | | A24 | | | X | | | | A44 | | X | | | | |
| A5 | | | | X | | | A25 | | | | X | | | A45 | | X | | | | |
| A6 | | | | | X | | A26 | | X | | | | | A46 | | X | | | | |
| A7 | | | | X | | | A27 | X | | | | | | A47 | | | | | | X |
| A8 | | | | X | | | A28 | | | X | | | | A48 | | X | | | | |
| A9 | | | | | X | | A29 | | X | | | | | A49 | | | | | X | |
| A10 | | | X | | | | A30 | | | | X | | | A50 | | | X | | | |
| A11 | | | X | | | | A31 | | | X | | | | A51 | | | | X | | |
| A12 | | | X | | | | A32 | | | X | | | | A52 | | | | X | | |
| A13 | | | X | | | | A33 | | | | X | | | A53 | | X | | | | |
| A14 | | | X | | | | A34 | | | X | | | | A54 | | | | | | X |
| A15 | | | X | | | | A35 | | | | | | X | | | | | | | |
| A16 | | | X | | | | A36 | | | | X | | | | | | | | | |
| A17 | | | | X | | | A37 | | | X | | | | | | | | | | |
| A18 | | X | | | | | A38 | | | X | | | | | | | | | | |
| A19 | | | X | | | | A39 | | | X | | | | | | | | | | |
| A20 | | | | | X | | A40 | | | | X | | | | | | | | | |

2. Part B

B1. (0.5 points x 6 = 3 points)

| | | | | | | |
|---------|---|---|---|---|---|---|
| | A | B | C | D | E | F |
| Plants | | X | | X | | |
| Mammals | X | | X | | X | X |

B2. (0.5 points x 5 = 2.5 points)

| | | | | |
|---|----|-----|----|---|
| I | II | III | IV | V |
| D | C | E | B | A |

B3. (0.5 points x 6 = 3 points)

$$\frac{735}{3} \times 122 - \left\{ \left(\frac{735}{3} - 1 \right) \times 18 \right\} - \{ 5 \times (2 \times 1) \}$$

$$= 245 \times 122 - 244 \times 18 - 5 \times 2$$

$$= 29890 - 4392 - 10$$

$$= 25488$$

When the N-terminal Met residue is assumed to have been removed,

$$\left(\frac{735}{3} - 1 \right) \times 122 - \left\{ \left(\frac{735}{3} - 1 - 1 \right) \times 18 \right\} - \{ 5 \times (2 \times 1) \}$$

$$= 244 \times 122 - 243 \times 18 - 5 \times 2$$

$$= 29768 - 4374 - 10$$

$$= 25384$$

Partial point:

- (0.5) Division by 3.
- (0.5) Subtraction of water mass of peptide bonds.
- (0.5) Number of peptide bonds: number of amino acids *minus* 1.
- (0.5) Correct molecular mass of one water molecule.
- (0.5) Subtraction of ten hydrogen molecules of five disulfide bonds.
- (0.5) Correct calculations.

B4. (3.5 points)

(1) (0.3 points x 10 = 3 points)

| | |
|---|--------------------|
| A | 6 |
| B | 1, 3, 7, 10 |
| C | |
| D | 4, 9 |
| E | 2, 5, 8 |
| F | |

(2) (0.5 point : if all are correct)

| | | |
|----------|----------|----------|
| 1 | 2 | 3 |
| B | C | A |

B5. (0.5 points x 4 = 2 points)

| | | | |
|----------|----------|----------|----------|
| I | II | III | IV |
| D | A | C | B |

B6. (3 points)

| |
|-------------|
| 2000 |
|-------------|

(or 2007 by using more precise Avogadro's number.)

B7. (1 points x 4 = 4 points)

| | | | |
|----------|----------|----------|----------|
| I | II | III | IV |
| A | F | E | A |

B8. (3 points)

| | Deficiency symptoms (0.3x3) | Mineral mobility (0.3x3) | Metabolic roles (0.4x3) |
|----|--------------------------------|-----------------------------|----------------------------|
| Mg | B | C | G |
| Fe | A | D | E |
| N | B | C | F |

B9. (1 points x 3 = 3 points)

| | | |
|----------|----------|----------|
| I | II | III |
| C | D | F |

B10. (4 points)

(1) (0.5 points x 4 = 2 points)

| | | can respond to Florigen. | cannot respond to Florigen. |
|-------------------------------------|------------------------------------|-----------------------------|--------------------------------|
| The shoot apical meristems of | cold-treated annual plants | X | |
| | untreated annual plants | X | |
| | cold-treated biennial plants | X | |
| | untreated biennial plants | X | |

(2) (0.5 points x 4 = 2 points)

| | | produce Florigen under the long-day condition. | do not produce Florigen in either photoperiodic condition. |
|---------------|------------------------------|--|--|
| The leaves of | cold-treated annual plants | X | |
| | untreated annual plants | X | |
| | cold-treated biennial plants | X | |
| | untreated biennial plants | | X |

B11. (3 points)

(1) (1 point)

| | | | |
|---|---|----------|---|
| A | B | C | D |
| | | X | |

(2) (1 point)

| | | | |
|---|---|----------|---|
| A | B | C | D |
| | | X | |

(3) (1 point)

| | | | |
|---|---|---|----------|
| A | B | C | D |
| | | | X |

B12. (1 points x 3 = 3 points)

| | | | |
|-----|----------|----------|---|
| | A | B | C |
| I | X | | |
| II | | X | |
| III | X | | |

B13. (1 points x 3 = 3 points)

| | | |
|----------|----------|----------|
| I | II | III |
| A | C | B |

B14. (2.5 points)

(1) (0.5 point)

| | |
|---|----------|
| A | B |
| | X |

(2) (0.5 point)

| | | | |
|---|---|---|---|
| A | B | C | D |
|---|---|---|---|

| | | | |
|--|--|----------|--|
| | | X | |
|--|--|----------|--|

(3) (0.5 points x 3 = 1.5 points)

| | | |
|----------|----------|----------|
| C | E | G |
|----------|----------|----------|

B15. (1 points x 4 = 4 points)

| | Hypothesis 1 | Hypothesis 2 | Hypothesis 3 | Hypothesis 4 |
|--------------|-----------------|-----------------|-----------------|-----------------|
| Rejected | X | X | | |
| Not rejected | | | X | X |

B16. (2 points)

(1) (1 point)

| | | | | |
|---|----------|---|---|---|
| A | B | C | D | E |
| | X | | | |

(2) (1 point)

| | | | | |
|----------|---|---|---|---|
| A | B | C | D | E |
| X | | | | |

B17. (2 points)

(1) (0.2 point x 4 = 0.8 points)

| | | | | |
|-------|----------|----------|----------|----------|
| | A | B | C | D |
| TRUE | X | X | | X |
| FALSE | | | X | |

(2) (0.3 points x 4 = 1.2 points)

| | | | | |
|-------|----------|----------|----------|----------|
| | A | B | C | D |
| TRUE | X | | X | X |
| FALSE | | X | | |

B18. (3 points)

(1) (1 points x 2 = 2 points)

| | | | | |
|----------|---|---|----------|---|
| A | B | C | D | E |
| X | | | X | |

(Choosing more than 2 gives no point.)

(2) (1 point)

| | | | |
|---|---|---|----------|
| A | B | C | D |
| | | | X |

B19. (3 points)

(1) (0.5 point)

| | | | | |
|---|---|---|---|---|
| A | B | C | D | E |
|---|---|---|---|---|

| | | | | |
|--|--|--|----------|--|
| | | | X | |
|--|--|--|----------|--|

(2) (0.5 point)

| | | | |
|---|---|---|----------|
| A | B | C | D |
| | | | X |

(2) (1 points x 2 = 2 points)

| | | | | | |
|---|---|----------|---|----------|---|
| A | B | C | D | E | F |
| | | X | | X | |

(Choosing more than 2 gives no point.)

B20. (3 points)

(1) (1 points x 2 = 2 points)

| | | |
|-----|------------|---|
| Acc | 190 | m |
| Aml | 340 | m |

(2) (1 point)

| | | | |
|---|----------|---|---|
| A | B | C | D |
| | X | | |

B21. (0.5 points x 4 = 2 points)

| | | | |
|----------|----------|----------|----------|
| i | ii | iii | iv |
| C | D | B | A |

B22. (2 points)

(1) (1 point)

| | | | |
|---|----------|---|---|
| A | B | C | D |
| | X | | |

(2) (1 point)

| | | | | | |
|----------|---|---|---|---|---|
| A | B | C | D | E | F |
| X | | | | | |

B23. (4 points)

(1) (2 points)

| | | | | | |
|---|----------|---|---|---|---|
| A | B | C | D | E | F |
| | X | | | | |

(2) (2 points)

| | | | | |
|---|---|----------|---|---|
| A | B | C | D | E |
| | | X | | |

B24. (4 points)

(1) (1 point)

| | | | | |
|---|---|---|---|---|
| A | B | C | D | E |
| | X | | | |

(2) (1 point)

| | | | | |
|---|---|---|---|---|
| A | B | C | D | E |
| | | X | | |

(3) (2 points)

| | |
|----|---|
| 26 | % |
|----|---|

B25. (3 points)

(1) (2 points)

| | | |
|-------------|---|--------|
| 2.5 | X | 10^6 |
| (2,500,000) | | years |

5×10^6 (5,000,000) years: 1 point

(2) (1 point)

| | | |
|---|---|---|
| A | B | C |
| | | X |

B26. (3 points)

(1) (1 point)

| | | | |
|---|---|---|---|
| A | B | C | D |
| | | | X |

(2) (1 point)

| | | | |
|---|---|---|---|
| A | B | C | D |
| | | | X |

(3) (1 point)

| | | | |
|---|---|---|---|
| A | B | C | D |
| | | X | |

B27. (4 points)

(1) (2 points)

| | |
|----|---|
| 34 | % |
|----|---|

or 0.34

(2) (1 point)

| | | | |
|---|----|-----|----|
| I | II | III | IV |
| | | | X |

(3) (1 point)

| | | | |
|---|---|---|---|
| A | B | C | D |
|---|---|---|---|

| | | | |
|---|--|--|--|
| X | | | |
|---|--|--|--|

B28. (1 points x 3 = 3 points)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| A | B | C | D | E | F | G | H |
| | X | | | X | X | | |

B29. (3 points)

(1) (0.5 point x 2 = 1 points)

| | | | | | | |
|---|---|---|---|---|---|---|
| A | B | C | D | E | F | G |
| | | X | X | | | |

(Choosing more than 2 gives no point.)

(2) (1 point)

| | | | | | | |
|---|---|---|---|---|---|---|
| A | B | C | D | E | F | G |
| | X | | | | | |

(3) (1 point)

| | | | | | | |
|---|---|---|---|---|---|---|
| A | B | C | D | E | F | G |
| X | | | | | | |

B30. (1 points x 3 = 3 points)

| | | |
|---|----|-----|
| I | II | III |
| D | C | B |

B31. (0.5 points x 5 = 2.5 points)

| | | | | | |
|-------|---|---|---|---|---|
| | A | B | C | D | E |
| TRUE | X | X | | X | |
| FALSE | | | X | | X |

B32. (1 points x 3 = 3 points)

| | | | |
|-------|---|---|---|
| | A | B | C |
| TRUE | | | X |
| FALSE | X | X | |

B33. (0.5 points x 6 = 3 points)

| | | | | | |
|---|----|-----|----|---|----|
| I | II | III | IV | V | VI |
| D | C | B | D | E | B |

B34. (5 points)

(1) (1 point)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| A | B | C | D | E | F | G | H |
| | | X | | | | | |

(2) (0.5 points x 6 = 3 points)

| | Domain I | Domain II | Function |
|-------|----------|-----------|----------|
| Older | 3 | 1 | 4 |
| Newer | 1 | 4 | 1 |

(3) (1 point: if all are correct)

| | | |
|----------|----------|----------|
| I | II | III |
| B | C | A |

B35. (4 points)

(1) (2 points)

| | | |
|---|----------|---|
| A | B | C |
| | X | |

(2) (1 point)

| |
|-------------|
| 2, 6 |
|-------------|

Since the number of correct choice is not stated in the question, the points are calculated by (number of the correct answer) x 0.5 – (number of the wrong answer) x 0.3.

(3) (1 point)

| | | | | | | | | |
|---|---|---|---|----------|---|---|---|---|
| A | B | C | D | E | F | G | H | I |
| | | | | X | | | | |

Since the answer of (3) is consequence of the question (1), the combination of the wrong answer (1) A and the answer of (3) B gives 0.5 point for (3), and that of (1) C and (3) H, gives 0.5 point for (3).