**SECONDARY SCHOOL IMPROVEMENT PROGRAMME (SSIP) JUNE 2017**

**HIGH RISK**



**GRADE 12**

**SUBJECT: LIFE SCIENCES**

**LEARNER SOLUTIONS**

**(Page 1 of 17)**

**SESSION 1 and 2: Genetics and Heredity**

**QUESTION 1**

1.1 D 🗸🗸

1.2 C 🗸🗸

1.3 B 🗸🗸

1.4 C 🗸🗸

1.5 B 🗸🗸

1.6 B 🗸🗸

1.7 C 🗸🗸 (7x2) (14)

**QUESTION 1. 2**

|  |  |  |  |
| --- | --- | --- | --- |
| 1.2.1  1.2.2  1.2.3  1.2.4  1.2.5  1.2.6  1.2.7  1.2.5  1.2.9  1.2.10  1.2.11  1.2.12  1.2.13  1.2.14  1.2.15 | Complete dominance 🗸  Cloning 🗸  Locus 🗸  Discontinuous variation 🗸  Phenotype 🗸  Homologous/bivalent🗸  Allele /Multiple alleles🗸  Dihybrid cross🗸  Haemophilia 🗸  Incomplete dominance🗸  Sex linked 🗸  Homologous🗸  Co dominance🗸  Recessive 🗸  Monohybrid cross🗸 |  | **(15)** |

**QUESTION 1.3**

|  |  |  |
| --- | --- | --- |
| 1.3.1 | Both A and B 🗸🗸 |  |
| 1.3.2 | B only 🗸🗸 |  |
| 1.3.3 | B only 🗸🗸 |  |
| 1.3.4 | None 🗸🗸 |  |
| 1.3.5 | A only 🗸🗸 | (5X2)  **(10)** |

**QUESTION 1.4**

|  |  |  |
| --- | --- | --- |
| 1.4.1 | There are two characteristics being studied 🗸 | (1) |
| 1.4.2 | (a) ttnn 🗸 | (1) |
|  | (b) TN; Tn; tN; tn 🗸🗸 | (2) |
| 1.4.3 | Taste-blind 🗸 with normal skin pigmentation 🗸 | (2) |
|  |  | **(6)** |

**QUESTION 2**

|  |  |  |  |
| --- | --- | --- | --- |
| 2.1 | (a)  (b) | XAY🗸🗸  XAXa🗸🗸 | (2)  (2)  **[4]** |

**QUESTION 3**

|  |  |  |  |
| --- | --- | --- | --- |
| 3.1  3.2 | (a) wwyy 🗸🗸  (b) WY, Wy🗸🗸  Pea comb🗸, yellow legs🗸 |  | (2)  (2)  (2)  **[6]** |

**QUESTION 4**

|  |  |  |
| --- | --- | --- |
| 4.1  4.2 | (a) homozygous dominant🗸or heterozygous🗸  (b) homozygous recessive🗸  - Normal is dominant and the dominant condition🗸  - can show up in either homozygous🗸  - or heterozygous state🗸  OR  - To have a normal child 🗸  - the person **O** must have at least one dominant gene🗸  - phenotype is normal 🗸 | (2)  (1)  (3)  [6] |

**QUESTION 5:**

P1 Phenotype: Blood group A x Blood group B 🗸

Genotypes IAi x IB i🗸

meiosis

gametes IA , i x IB , i🗸

🗸

|  |  |  |
| --- | --- | --- |
|  | IA | i |
| IB | IAIB | IBi |
| i | IAi | ii |

🗸 fertilisation

F1 Genotype IAIB IBiIAiii 🗸

Phenotype, blood group: AB, B, A, O 🗸

**[7]**

**QUESTION 6**

|  |  |  |
| --- | --- | --- |
| 6.1  6.2  6.3 | - Because they were normal they must each have one dominant  allele🗸  - and in order for their children to be affected each parent must have  one recessive allele🗸  NN🗸or Nn🗸  - The father would have been affected🗸if it was sex-linked  - in order for the daughter to be affected🗸 | (2)  (2)  (2)  [6] |

**QUESTION 7**

|  |  |  |
| --- | --- | --- |
| 7.1 | (a) GgTt 🗸  (b) Yellow 🗸 leaves no thorns 🗸 | (1)  (2)  [3] |

**QUESTION 8**

P1 Phenotype: Pink x Pink 🗸

Genotypes RW x RW🗸

meiosis

gametes R, W x R, W🗸

🗸

|  |  |  |
| --- | --- | --- |
|  | R | W |
| R | RR | RW |
| W | RW | WW |

🗸 fertilisation

F1 Genotype RRRWRWWW 🗸

Phenotype: Red, Pink, White 🗸

**[6]**

**QUESTION 9:**

|  |  |  |
| --- | --- | --- |
| 9.1  9.2 | (a) BbTt 🗸🗸  (b) Black coat 🗸 short tail 🗸  (c) BbTt 🗸  0🗸% | (2)  (2)  (1)  (1)  [6] |

**QUESTION 10:**

|  |  |  |
| --- | --- | --- |
| 10.1 | (a) Male 🗸 with Tay Sachs disease 🗸/all 4 symptoms must be given  blind, deaf, mentally retarded and paralysed/lose motor skills and  mental functions  (b) Nn 🗸 🗸  (c) Nn 🗸🗸 | (2)  (2)  (2)  [6] |

**SECTION B: HOMEWORK SOLUTIONS**

**QUESTION 1:**

|  |  |  |  |
| --- | --- | --- | --- |
| 1.1 | 3🗸 |  | (1) |

|  |  |  |  |
| --- | --- | --- | --- |
| 1.2 | **P1: Phenotype** : Blood group A X Blood group B 🗸  **Genotype** : IAi X IBi 🗸    **Meiosis**    **Gametes** : IA ;IA ; i; iI B;I B ;i;i 🗸    **Fertilisation**  **F1**: **Genotype** : 25 % I*A*IB  25%🗸IAi  🗸  25% IBi  25% ii    **Phenotype**:  25% Blood group AB  25% 🗸 Blood group A 🗸  25% Blood group B  25% Blood group O  🗸- indicating P1 and F1  🗸- indicating meiosis and fertilisation Any 7 |  | (7)  **[8]** |

**QUESTION 2:**

|  |  |  |
| --- | --- | --- |
| 2.1  2.2  2.3 | When the gene that causes the disorder is located on the sex chromosomes🗸/gonosomes  (a) Colour blind male 🗸  (b) Normal female 🗸  (a) XBXb🗸  (b) XbXb 🗸 | (1)  (1)  (1)  (1)  (1)  (5) |

**QUESTION 3:**

|  |  |  |
| --- | --- | --- |
| 3.1 | (a) Big🗸 and green🗸 fruit  (b) BG, Bg, bG, bg🗸🗸 | (2)  (2)  **[4]** |

**QUESTION 4**

|  |  |  |  |
| --- | --- | --- | --- |
| 4.1.1  4.1.2 | Two 🗸  bR 🗸, br 🗸 |  | (1)  (2) |

|  |  |  |  |
| --- | --- | --- | --- |
| 4.1.3 | (a)  (b)  (c) | Bbrr 🗸  White rough coat 🗸  **3** black rough: **3** black smooth: **1** white rough: **1** white smooth 🗸🗸  ( Ratio can be in any order) | (1)  (1)  (2)  **[7]** |

QUESTION 5

|  |  |  |
| --- | --- | --- |
| 5.1 | (a) normal female🗸  (b) X H X h 🗸🗸 | (1)  (2) |
| 5.2 |  | (3)  **(13)** |

question 6

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 6.1. | P1 Phenotype red apple tree X yellow apple tree🗸  Genotype Rr X rr 🗸  Meiosis R; R; r; r r; r; r; r 🗸    F1  Fertilization   |  |  |  | | --- | --- | --- | |  | R | r | | r | Rr | rr | | r | Rr | rr |   🗸  **OR**  F1 Genotype 2x Rr; 2x rr 🗸  F1 Phenotype 2 x red apple trees; 2 x yellow apple trees🗸  P1 and F 1 🗸  Meiosis and fertilization 🗸 (Any 6) | (6) |
| 6.2 | 50%🗸 | (1) |

**SESSION 3: Nervous system**

**QUESTION 1:**

1.1 A🗸🗸

1.2 C🗸🗸

1.3 A🗸🗸

1.4 B🗸🗸

1.5 C🗸🗸

1.6 B🗸🗸

1.7 C🗸🗸

1.8. B🗸🗸

1.9. C🗸🗸

1.10. A🗸🗸

1.11 C 🗸🗸 **(11x2=22)**

**QUESTION 2.1:**

2.1.1 Neurons🗸

2.1.2 Peripheral nervous system🗸

2.1.3 Parasympathetic nervous system🗸

2.1.4 Multiple sclerosis🗸

2.1.5 Cerebrospinal fluid 🗸

2.1.6. Medulla Oblongata🗸

2.1.7. Meninges🗸

2.1.8. Stimulus🗸

2.1.9. Sensory neuron🗸

2.1.10 Reflex arc 🗸 **(10 x 1 =10)**

**Question 2.2**

2.2.1 None🗸🗸

2.2.2 A only🗸🗸

2.2.3 A only🗸🗸

2.2.4 B only 🗸 🗸 **(2 x 4 =8)**

**QUESTION 3:**

|  |  |
| --- | --- |
| 3.1 C🗸  3.2 B🗸  3.3 A🗸  3.4 A🗸  3.5 B 🗸 (5 x 1) **[5]** |  |

**QUESTION 4:**

4.1. (a) Grey matter✓ (1)

(b) Interneuron✓/connector neuron (1)

4.2. (a) A ✓ (1)

(b) C ✓ (1)

**[4]**

**QUESTION 5:**

|  |  |  |
| --- | --- | --- |
| 5.1 | Motor/efferent/multipolar neuron. | (1) |
| 5.2 | A – Dendrites ✓  B – Nucleus ✓  D – Axon✓ | (3) |
| 5.3 | (a) A- Dendrites  (b) D- Axon.   (c) C– Myelin sheath | (6)  **[10]** |

**QUESTION 6**

|  |  |  |
| --- | --- | --- |
|  | **Sensory Neurons** | **Motor Neurons** |
| Structure | **Unipolar** (one pole) 🗸or **bipolar** (two poles)🗸. | **Multipolar** 🗸with many dendrites🗸 |
| Function | Always conducts impulses  ***from*** the receptor (sense organ) 🗸  ***to*** the CNS (spinal cord and brain).🗸 | Always conducts impulses  ***from*** the CNS (spinal cord and brain) 🗸***to*** the effectors 🗸 (muscles and glands) to bring about a response. |

**[8]**

**QUESTION 7**

7.1.1 A reflex action is a rapid🗸, automatic response🗸 to a stimulus (2)

7.1.2. A- Sensory neuron🗸 (1)

B Interneuron/ connector neuron🗸 (1)

C- Motor neuron/efferent/multipolar🗸 (1)

7.1.3 (a) C🗸 (1)

(b**)** A🗸 (1)

7.1.4 It protects the body from dangerous situations🗸 (1)

**(8)**

**QUESTION 8**

8.1.1. (a) Medulla oblongata🗸 (1)

(b) Corpus callosum🗸 (1)

(c) Cerebellum🗸 (1)

8.1.2. –Controls all voluntary activities🗸

-It contains centres that receives and interprets all the sensations🗸

-it is the seat of higher mental functions🗸

- Influences emotional behaviour🗸 (Any 3) (3)

**(6)**

**QUESTION 9**

|  |  |  |
| --- | --- | --- |
| 9.1 | Motor/efferent/multipolar neuron. | (1) |
| 9.2 | – Transmits impulse away from the cell body ✓  – Transmits impulse to effector ✓  **Any one** | (1) |
| 9.3  9.4 | - Causing it to conduct impulse faster/prevent a short circuit  - Insulates the neuron  - Nerve impulse will not be carried to the effector/muscle/gland  - There will not be a responseto the particular stimulus | (2)  (2)  **[6]** |

**SECTION B: HOMEWORK SOLUTIONS**

**QUESTION 1:**

1.1 (a) E 🗸 (1)

(b) A 🗸 (1)

(c) C 🗸 (1)

1.2 F🗸 - motor neuron 🗸 (2)

1.3 D to E 🗸 (1)

**[6]**

**QUESTION 2:**

2.1 **The reflex action:** is a **rapid automatic response** 🗸to a stimulus that is

received by a sensory organ🗸, to ensure a quick response. 🗸

**The reflex arc:**  is the ***path*** 🗸travelled by the nerve impulses from the sensory neuron🗸, through the connector neuron🗸, to the motor neuron and then to the

effector.🗸 Any 6 (6)

2.2 A reflex actionallows the body to respond very quickly🗸, to protect itself against possible injury🗸, e.g.: pricking finger/ knee jerk reaction/ removing hand from a candle flame/hot stove plate etc.🗸 (3)

**[9]**

**QUESTION 3**

3.1.1 A- Cerebrum🗸

B- Cerebrum🗸 (2)

3.1.2. (a) B🗸 (1)

(b) C🗸 (1)

**[4]**

**QUESTION 4**

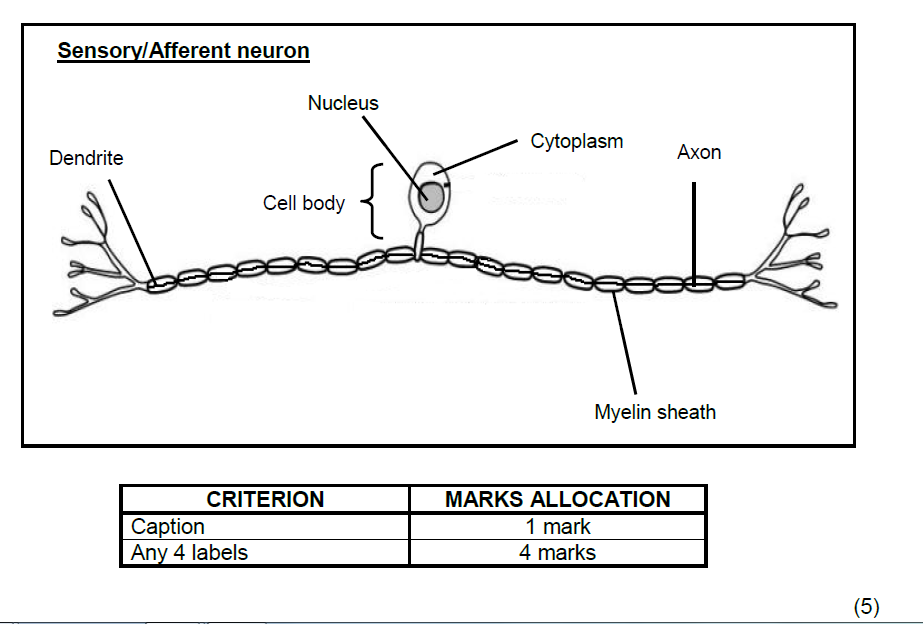
4.1.1. (a) Synapse🗸 (1)

(b) inter-neuron/connector neuron🗸 (1)

🗸 🗸

4.1.2. A B C (2)

4.1.3.



**(9)**

**SESSION 4 and 5: EYE AND EAR**

**1.1**

1.1.1. B🗸🗸

1.1.2. D🗸🗸

1.1.3. C🗸🗸

1.1.4. C🗸🗸

1.1.5. B🗸🗸

1.1.6. C🗸🗸

1.1.7. A🗸🗸

1.1.8. D🗸🗸

1.1.9. B 🗸🗸

1.1.10 C🗸🗸 **10 x2= (20)**

**1.2.**

1.2.1. Grommets🗸

1.2.2. Pinna🗸

1.2.3. Aqueous humour🗸

1.2.4. Choroid🗸

1.2.5. Iris 🗸

1.2.6. Yellow spot🗸

1.2.7. Ossicles🗸

1.2.8. Cerebellum. 🗸  **(8)**

**1.3.**

1.3.1. A🗸🗸

1.3.2. A🗸🗸

1.3.3. A🗸🗸

1.3.4. None🗸🗸

1.3.5. B🗸🗸

1.3.6. Both A and B🗸🗸

1.3.7. None🗸🗸

1.3.8. B 🗸🗸 8x2=(16)

**QUESTION 2:**

2.1 B - tympanic membrane to vibrate and transfer the sound wave to the

Ossicles / hammer  (2)

C - malleus/hammer to vibrate and transfer the sound to the anvil

/amplify sound (2)

F – cochleato convert the stimulus of the sound waves into an

impulse (2)

2.2 Pinna has many ridges to direct the sound waves along the auditory

canal Extends outside the head / large flaps / funnel shapedto trap

sound waves  **(Mark first answer only)** (any 2) (2)

2.3 a) D  (1)

(b) A  (1)

(c) E  (1)

(d) G (1)

**[12]**

**QUESTION 3:**

|  |  |  |
| --- | --- | --- |
| 3.1 | Diagram showing the ossicles /middle ear | (1) |
| 3.2 | A – Malleus/Hammer   B – Auditory canal/meatus  | (2) |
| 3.3 | Structure C (Tympanum) is wider in diameter than structure E/ (the oval window) . This would cause sound to be amplified | (2)  **[5]** |

**QUESTION 4:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | 4.1 | A – Ciliary🗸muscle/(body)  B – Iris🗸  E – Choroid🗸 |  | (3) |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | 4.2 | (a) F🗸  (b) D🗸  (c) C🗸  (d) A🗸 |  | (1)  (1)  (1)  (1)  **[7]** |

**QUESTION 5:**

5.1 (a) Round window 🗸 (1)

(b) Cochlea🗸 (1)

(c) Auditory nerve🗸 (1)

5.2 Cristae🗸 (1)

**QUESTION 6:**

6.1. a) A🗸- ciliary muscle🗸 (2)

b) C🗸 – iris/ radial/circular muscles🗸 (2)

c) D 🗸– cornea🗸 (2)

6.2. Accommodation 🗸🗸 2)

**QUESTION 7:**

|  |  |  |  |
| --- | --- | --- | --- |
| 7.1 | A - Pinna✓  D - Semi-circular canal✓ |  | (2) |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 7.2 | (a)  (b)  (c)  (d)  (e)  (f)  (g)  (h) | B✓  G✓    F✓    C✓    E✓  D✓  E✓  B✓ |  | (1)  (1)  (1)  (1)  (1)  (1)  (1)  (1)  **(10)** |

**QUESTION 8**

a) B✓ Sclera✓

b) D✓ Cochlea✓

c) E✓ Round window✓

d) A✓ Iris✓

e) F✓ Eustachian tube✓

f) C✓ Auditory✓/Cochlear nerve/Vestibular nerve

**(12)**

**QUESTION 9**

9.1. Maculae✓ (1)

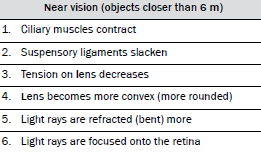
9.2. Cristae✓ (1)

9.3. Rods✓ and cones✓ (2)

**QUESTION 10**

10.1. Near vision**✓** (1)

10.2

 Any 5= (5)

**QUESTION 11**

11. 1. A - Tympanic membrane**✓**

D – Round window**✓**

E – Eustachian tube**✓** (3)

11.2. The Eustachian tube will not be able to equalise the pressure **✓**both

sides of tympanic membrane which will cause the membrane to

bulge**✓**/pain (2)

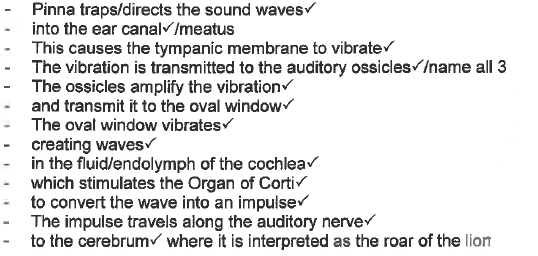
11.3. Hammer**✓**, anvil**✓**, stirrup**✓** (3)

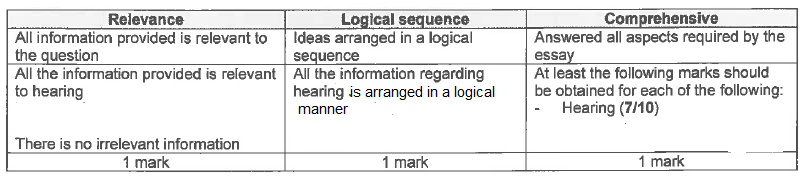
**SECTION B: HOMEWORK SOLUTIONS**

**QUESTION 1**

|  |  |  |  |
| --- | --- | --- | --- |
| 1.1  1.2  1.3  1.4  1.5 | (a) Lens🗸  (b) Choroid🗸  Long-sightedness 🗸/hyperopia/hypermetropia  - Cannot see near objects clearly 🗸  - Causing the image to be blurred 🗸  - Since part A have no receptors 🗸 present  - Light will not be converted into an impulse 🗸  - therefore no image will be formed 🗸/cannot see the object  - Lens is elastic 🗸  therefore can change shape 🗸/convexity/can allow for  accommodation  - Lens is transparent 🗸  to allow light rays to pass through🗸  - Lens is biconvex 🗸  To refract light rays 🗸 Any (2x2) |  | (1)  (1)(1)  (2)  (3)  (4) |

**QUESTION 2**

**(10)**

****

**QUESTION 3**

|  |  |  |  |
| --- | --- | --- | --- |
| 3.1  3.2  3.3 | (a) Semi-circular canals🗸  (b) Eustachian tube🗸  (c) Oval window 🗸/fenestra ovalis  - A/the tympanic membrane is larger🗸/ larger surface area  - than D/the oval window 🗸/smaller surface area  - Therefore the incoming sound waves are concentrated onto a  smaller area 🗸  thus amplifying the sound  Allows ossicles/tympanum to vibrate freely🗸 |  | (1)  (1)(1)  (3)  (1)  **(7)** |

**SESSION 6: HUMAN ENDOCRINE SYSTEM**

**QUESTION 1:**

|  |  |
| --- | --- |
| 1.1 - The blood glucagon levels increase🗸 /from 100 to 210  (picograms/ml)  - from 0 to 20 min🗸  - and become constant🗸 thereafter  1.2 - during exercise more energy is needed🗸  - therefore the rate of cellular respiration increased🗸 -  - Increased cellular respiration requires more glucose🗸  - hence more glucagon is secreted🗸  - to stimulate the conversion of glycogen to glucose🗸 **Any** | (3)  (3) |

**QUESTION 2:**

2.1 0.25 🗸 g /cm3 (1)

2.2 15 🗸 Minutes (1)

2.3 - Blood glucose level of a person with diabetes mellitus is

higher 🗸 than that of a normal person at all times 🗸

- There is a greater increase in the blood glucose level of a person

with diabetes mellitus after ingestion of glucose! compared to

the normal person 🗸

- It takes longer for the blood glucose level to stabilise

for the person with diabetes mellitus 🗸 compared to a normal

person🗸 Any (2x2) (Mark first TWO only) (4)

**[6]**

**QUESTION 3:**

3.1 - Gland that secretes hormones 🗸

- directly into the blood🗸 /(rather than through ducts) (2)

3.2 (a) Insulin🗸 (1)

(b) Glucagon🗸 (1)

3.3 Pancreas🗸 /Islets of Langerhans (1)

**[5]**

**QUESTION 4:**

4.1 (a) Amount of thyroxin🗸 (1)

(b) Body weight🗸 (1)

4.2 - Same number of rats in each group🗸

- All rats were of the same species🗸

- All groups were investigated for the same period of time🗸

- All rats were the same gender🗸

- All groups were weighed after the same interval🗸 (Any 3) (3)

4.3 Group A🗸 (1)

**[6]**

**SECTION B: HOME WORK SOLUTIONS**

**QUESTION 1**:

1. Hormones
2. Pituitary gland / hypophysis
3. Pituitary gland / hypophysis
4. Endocrine
5. Goitre
6. Adrenal glands
7. Diabetes
8. Insulin
9. Nervous system
10. Adrenal glands
11. Reflex action
12. Thyroxin
13. TSH
14. Adrenalin
15. Negative feedback (15 x 1) **[15]**

**QUESTION 2:**

2.1. a) 16:40 ✓ b) 09:00 ✓ (2)

2.2. a) 130 mg/10 cm3 blood ✓ b) 98 mg/100 cm3 blood ✓ (2)

2.3. a) 08:00 to 09:00 ✓ b) 16:00 to 17:00 ✓ (2)

2.4. a) 08:00 to 09:00 ✓ b) 15:00 to 16:00 ✓ (2)

2.5. After a meal rich in carbohydrates √, digestion takes place √ and glucose is absorbed into the blood stream √ thereby increasing √ the blood sugar level.

(4)

2.6. a) Insulin (1)

b) Beta cells √ of the Islets of Langerhans in the pancreas √ (2)

2.7. a) glucagon (1)

b) alpha cells √ of the Islets of Langerhans in the pancreas √ (2)

**QUESTION 3:**

3.1 Pituitary gland √ (1)

3.2 Mouse I √ (1)

3.3 - Growth hormone (GH) / Somatotrophic hormone (STH) √ (1)

3.4 - for the same time period √

- it showed a greater increase in mass √ (2)

3.5 Fourth / 4th √ month √ (2)