



# JENN

**Training and Consultancy**

**The path to enlightened education**

**SUBJECT: LIFE SCIENCES (LFSCZ)**

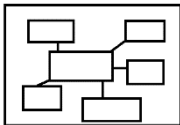



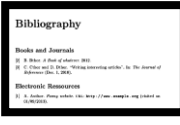
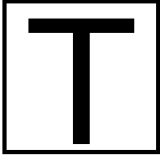
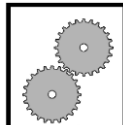

**GRADE 12**

**ACTIVITY SOLUTION MANUAL**

**Topic(s)**

- 1. Response to the environment (Humans)**
- 2. Endocrine system and Homeostasis**
- 3. Response to the environment (Plants)**

## ICON DESCRIPTION

 <p><b>MIND MAP</b></p>	 <p><b>EXAMINATION GUIDELINE</b></p>	 <p><b>CONTENTS</b></p>	 <p><b>ACTIVITIES</b></p>
 <p><b>BIBLIOGRAPHY</b></p>	 <p><b>TERMINOLOGY</b></p>	 <p><b>WORKED EXAMPLES</b></p>	 <p><b>STEPS</b></p>



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### Activity 1

- 1.1 Peripheral nervous system✓✓
- 1.2 Brain✓and spinal cord✓  
**(Mark first TWO only)**
- 1.3 **No answer**
- 1.4 Cranial✓and spinal nerves✓  
**(Mark first TWO only)**
- 1.5
  - To increase heart rate✓
  - Dilate blood vessels of the skeletal muscles✓
  - Dilates the pupil✓
  - Constrict the blood vessels of the gut and skin✓
  - To increase breathing rate✓
  - Stimulates the adrenal gland✓
  - Producing more adrenalin✓
  - Stimulates the secretion of sweat✓

### Activity 2

- 2.1 A-cerebrum ✓, B - corpus callosum ✓, C - cerebellum
- 2.2 a) C - cerebellum ✓; b) A ✓ - cerebrum ✓
- 2.3 a) controls breathing, peristalsis, heartbeat and swallowing ✓  
transmits impulses from the spinal cord to the brain✓  
controls less important reflexes such as blinking, coughing, sneezing,  
vasodilation, vasoconstriction and salivating ✓ - **any two**
- b) control center for things such as hunger, thirst, sleep, body temperature and emotions (✓ - **any two**)

### Activity 3

- 3.1 B ✓- Cerebellum✓
- 3.2
  - Coordinates voluntary movement✓
  - Controls balance and equilibrium✓**(Mark first TWO only)**
- 3.3
  - Heart beat✓
  - Breathing✓**(Mark first TWO only)**

6

### Activity 4

- 4.1 B – Cerebellum✓  
Coordinates of voluntary movements✓/control of muscle tone to maintain balance/body posture
- 4.2 Cerebrum✓/Part A
- 4.3 Medulla oblongata✓
- 4.4 **Changes in the direction and speed of movement:**
  - Causes the endolymph in the semi-circular canals to move✓
  - The cristae (found in the ampulla) are stimulated✓
  - and converts the stimulus into an impulse✓
  - which is transmitted via the auditory nerve✓/vestibular nerve to the cerebellum✓

- from which impulses are transmitted via motor neurons✓
- to the effector✓/voluntary muscles/skeletal muscles
- to maintain/restore balance (do not credit, this is in the question)

10

### Activity 5

- 5.1 (a) F ✓Corpus callosum✓  
 (b) B ✓Cerebellum✓  
 (c) E ✓Pituitary gland/Hypophysis✓
- 5.2 - Cranium ✓ Meninges ✓ [ cerebrospinal fluid]
- 5.3 (a) Cerebrum✓  
 (b) – The medulla oblongata that controls heartrate✓  
 -that is not affected ✓by the concussion

11

### Activity 6

- 6.1 (a) Corpus callosum✓  
 (b) Medulla oblongata✓
- 6.2 D✓
- 6.3 meninges✓
- 6.4 - Coordinates all voluntary movements✓  
 - (Controls muscle tension) to maintain balance✓
- 6.5 - No/less ADH will be secreted✓  
 - resulting in renal tubules to be less permeable✓  
 - no/less water will be reabsorbed ✓  
 - more water is lost✓/diluted urine will be excreted

9

### Activity 7

- 7.1 (a) Spinal cord✓  
 (b) Pituitary gland✓/hypophysis
- 7.2 A✓
- 7.3 Between the two hemispheres of the cerebrum✓✓
- 7.4 (a) - Part D/ medulla oblongata which controls breathing  
 - was not injured✓  
 (b) - The learner (occasionally) lost balance✓  
 - due to no coordination of voluntary movements by part B✓  
 (c) - The loss of memory indicates a possible injury to part A/the cerebrum✓  
 - which is also responsible for hearing / (interpretation of) sound✓

11

### Activity 8

- 8.1.1 a) Central nervous system✓  
 b) Peripheral nervous system✓
- 8.1.2 a) A✓ and B✓  
 b) C✓ and D✓

8.2.1	CENTRAL NERVOUS SYSTEM	PERIPHERAL NERVOUS SYSTEM
	Consists of the brain and spinal cord✓	Sensory receptors, sensory neurons and motor neurons✓

Nerve axons consists of slender projections and carry significantly short nerve impulses✓	Composed of long nerve fibres with a length up to 1 meter✓
Major function is to organize and analyse the information obtained from sensory organs✓	Major function is to transmit sensory information to be central nervous system and pass out motor impulses to the effector organs✓
A damage causes a global effect on the body✓	A damage causes a local effect on the body✓
Most of the nerves are incapable of regenerating its nerve fibres✓	Most of the nerves can be regenerated✓

8.2.2 Sensory✓ and motor nerves✓

8.2.3 Sensory carries impulses from senses to CNS✓

Motor nerves receives messages from CNS to muscle or glands✓

21

8.3.1 Receptors✓

8.3.2 Effectors✓

8.3.3 B sensory division ✓

C Motor division✓

8.3.5 Brain✓

8.4	A	Constricts pupils✓
	B	Inhibits saliva✓
	C	Decrease heartrate✓
	D	Increase heartrate✓
	E	Relax airways✓
	F	Stimulates digestive activity✓
	G	Inhibits gall bladder✓
	H	Stimulates activity of intestines✓
	I	Secretes adrenalin and noradrenalin✓
	J	Relaxes bladder✓

### Activity 9

9.1 Motor neuron/Multipolar ✓

9.2 The **cell body is located at one end of the neuron**, and it has **long axons** connecting to **muscles or effectors**, which is characteristic of a motor neuron✓✓.

9.3 A motor neuron carries impulses from the central nervous system (CNS) to an effector such as a muscle or gland, causing a response or action. ✓✓

9.4 **C→A→B**✓✓

9.5 Multiple Sclerosis (MS) ✓

8

### Activity 10

10.1 A complex brain structure embedded deep into the temporal lobe✓

10.2 (a) Cerebrum✓

(b) Medulla oblongata✓

10.3 - blocks signals between brain cells✓/makes chemical and molecular modifications to the brain  
- decrease the brain volume /**makes neurons to shrink** (cerebrum/frontal lobe) ✓

- decrease the brain volume / **makes neurons shrink** (cerebellum) ✓
- damages the liver/pancreas ✓

10

### Activity 11

- 11.1 (a) Motor ✓ neuron
- (b) sensory ✓ neuron
- 11.2 Cell body ✓
- 11.3 (a) B ✓
- (b) A ✓
- 11.4 II ✓

6

### Activity 12

- 12.1 Motor Neuron/multipolar ✓
- 12.2 **Neuron 1 (Myelinated):**

Impulses travel faster due to saltatory conduction, where the electrical impulse "jumps" from one node of Ranvier to the next.  
Myelin acts as an insulator, reducing energy loss and increasing conduction speed. ✓✓

#### Neuron 2 (Non-myelinated):

Impulses travel more slowly because the signal must move continuously along the entire axon, rather than jumping. Lacks the insulating benefit of a myelin sheath. ✓✓

4

### Activity 13

- 13.1. - Brain tissue is generally shrunken ✓
- 1 - Abnormal levels of a naturally occurring protein clump together to form Amyloid plaques that collect between neurons ✓
- Synaptic loss ✓

**(Mark first ONE only)**

- 13.1. Motor ✓ neuron
- 2
- 13.1. Myelin sheath ✓
- 3 Provides insulation to neurons/speeds up transmission of impulses
- 13.1. - Loss of memory ✓
- 4 - confusion ✓
- Poor judgment ✓
- Trouble understanding visual images ✓
- Difficulty with language ✓
- Issues with social behavior ✓

**(Mark first TWO only)**

6

- 1  
13.2. - Synapse allows for impulses to travel in one direction from one neuron to another✓/prevents continuous stimulation of the neurons  
2 - (Synapse loss in the) cerebrum ✓will lead to Alzheimer's symptoms.  
13.2. (a) Dendrites✓  
3 (b) Axon✓

5

#### Activity 14

- 14.1 (a) Sensory neuron✓  
(b) Synapse✓  
14.2 C✓ - Effector muscle✓  
14.3 Transmits impulses from sensory to the motor neurons/connects a sensory neuron to a motor neuron✓  
**(Mark FIRST one only)**  
14.4 There will be no reaction to the stimulus✓  
14.5 - Transmits impulses from receptors to the brain and from the brain to the effectors✓  
- contains reflex centers that function automatically to protect the body✓  
**(Mark first ONE only)**

7

#### Activity 15

- 15.1  
15.2  
15.3  
15.4  
15.5  
15.6  
15.7

16

#### Activity 16 MEMO NA

- 16.1  
16.2  
16.3

6

#### Activity 17 MEMO NA

- 17.1  
17.2  
17.3 (a)  
(b)  
(c)  
17.4

7

#### Activity 18 MEMO NA

- 18.1 (a)  
(b)  
18.2 (a)  
(b)  
18.3



**ACTIVITY 19**

19.1 (a) 5✓ um

(b) 800✓ um

19.2 (a) (The impulse speed) is faster in myelinated neuron than in an unmyelinated neuron✓✓

**OR**

(The impulse speed) is slower in an unmyelinated neuron than in a myelinated neuron✓✓

(b) As the axon diameter increases, the impulse speed is faster✓✓

6

**Activity 20**

20.1 A pathway taken by an impulse from a receptor to the effector to bring about the response to a stimulus✓

20.2 (a) Synapse✓ /Synaptic gap

(b) Connector neuron✓ / inter-neuron

20.3 - It ensures that the impulse moves in one direction only✓

- it prevents continuous stimulation of the neuron ✓/ filters weak or constant impulses

- able to transfer impulses to multiple neurons simultaneously✓

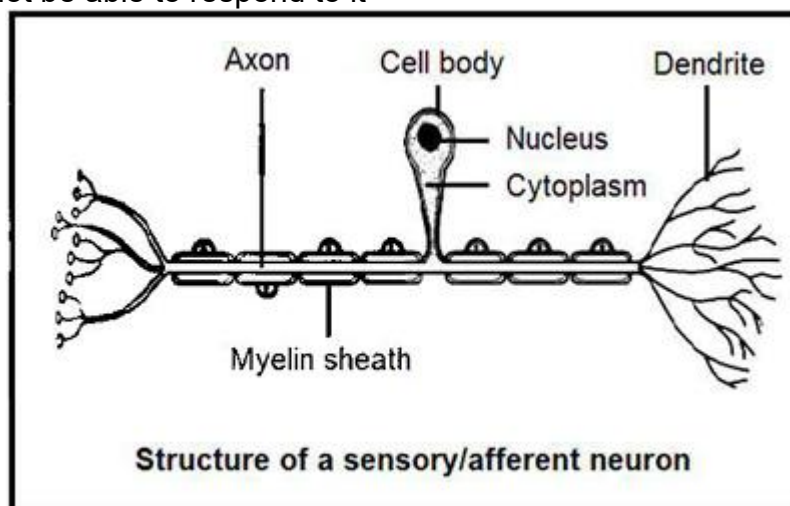
**(Mark first ONE only)**

20.4 Sensory neuron&gt;Connector/interneuron&gt;Motor neuron✓✓

20.5 - The person will be able to receive a stimulus✓

- but will not be able to respond to it✓

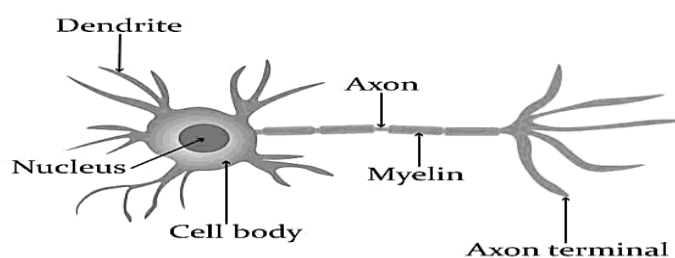
20.6



CRITERION	MARK ALLOCATION
Caption (C)	1
Correct diagram (D)	1
Any 3 correct labels (L)	3

### Activity 21

- 21.1 A **reflex action** is an automatic, rapid, and involuntary response ✓ to a stimulus that does not require conscious thought. ✓ It helps protect the body from harm ✓ by enabling quick reactions, such as pulling your hand away from something hot.
- 21.2 **If neuron C is damaged**, the reflex action will be impaired or completely lost because the signal will not reach the muscle to cause a response ✓✓
- 21.3 The disorder is called **Multiple Sclerosis (MS)**. ✓  
It is an autoimmune disease in which the immune system attacks the **myelin sheath**, leading to disrupted nerve signal transmission.
- 21.4



9

### Activity 22

- 22.1. (a) pupil ✓  
1 (b) Iris ✓
- 22.1. - it is a rapid ✓  
2 - involuntary response ✓  
- to light ✓
- 22.1. - Radial ✓ muscles  
3 - circular ✓ muscles
- (Mark first TWO only)**
- 22.1. - The pupil dilated ✓/enlarged so that  
4 - more light will enter the eye ✓  
- to improve vision ✓  
- in dim light ✓

11

- 22.2. (a) Vitreous humour ✓  
1 (b) Optic nerve ✓
- 22.2. • Transparent ✓ allows light to enter the eye and reach the retina ✓  
2 • Causes refraction /bend light ✓ toward the yellow spot /retina for clear vision ✓  
• Both are convex to allow for refraction ✓
- (Mark first ONE only)**
- 22.2. • Light stimulates the cones/photoreceptor in part G /retina/yellow  
3 spot ✓  
• To convert light to impulses ✓  
Impulses are transmitted via H/optic nerve ✓

- To the cerebrum✓ to be interpreted

22.2.  
4

<b><u>Table showing structural differences in the eye for near and far vision.</u></b>	
<b>Object closer than 6 m</b>	<b>Object further than 6 m</b>
Ciliary muscle contracts ✓	Ciliary muscle relaxed ✓
Suspensory ligaments become slack/slacken ✓	Suspensory ligaments tighten/become taut ✓
Lens more convex ✓	Lens less convex ✓
T ✓ table including column headings	
<b>Mark first TWO only</b>	

13

### Activity 23

23.1 (a) D✓ and E✓

(b) B✓, C✓ and I✓

**(Mark first TWO only)**

23.2 (a) controls the amount of light that enters the eye✓

(b) - absorbs excess light✓

- supplies the eye with nutrients and oxygen✓

(c) – equalizes air pressure between the middle and outer ear✓

23.3 (a) – contains cristae✓

- which are stimulated by the change in direction and speed✓

- and convert the stimulus into an impulse✓

(b) – Eardrum vibrates✓

- Causing ossicles to vibrate and amplify vibrations✓

- This causes vibrations of the oval window✓

- Setting pressure waves on the endolymph✓

- which stimulates the organ of Corti ✓in the cochlea

- Organ of Corti converts the stimulus into an impulse✓

15

### Activity 24

24.1 C✓ - Yellow spot✓ / fovea centralis

24.2 Light has to pass through **D**, the cornea **E**✓, the pupil✓ and **B**, the lens✓ before reaching **A**, the retina.

**(The learner must give the name and letter for each structure to get the mark)**

24.3 **Pupillary mechanism**✓\*

- Circular muscle ✓of the iris relax✓

- Radial muscle✓ of the iris contract✓

- Pupil size increases✓ /dilate

- More light enters the eye✓

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## Activity 25

- 25.1 (a) A – Iris✓  
Controls the size of the pupil✓ /amount of light entering the eye  
**DO NOT ACCEPT:** gives the eye colour
- (b) E – Optic nerve ✓  
Carries impulses to the cerebrum✓
- 25.2 **Prescription** lenses✓ (glasses or contact lenses) laser  
Surgery(treatment)/cornea transplant
- 25.3 **FLows Diagram Should Not Be Credited**
- The circular muscles (of the iris) contract✓
  - The radial muscles relax✓
  - The pupil constricts✓
  - The amount of light entering the eye is decreased ✓/less light enters the eye

9

## Activity 26

- 26.1 C✓ – Iris✓
- 26.2 **\*Pupillary mechanism**✓
- circular muscles contract✓
  - the radial muscles relax✓
  - the pupil constricts✓
  - less light enters the eye✓
- 26.3 Transparent – to permit light to pass through✓  
OR  
It is convex – for the minor refraction of light rays✓
- 26.4
- maintains the shape of the cornea✓
  - supplies the lens and cornea with food and oxygen✓
  - plays a minor role in their refraction of light ✓
- (Mark first TWO only)**
- 26.5 1✓
- 26.6 The lens is less convex✓
- 26.7
- the ciliary muscle contract✓
  - the ciliary body moves nearer to the lens✓
  - suspensory ligaments slacken✓/tension decreases
  - and tension on the lens is released✓
  - the elastic lens becomes more convex✓

18

## Activity 27

- 27.1 -The **choroid** is a **thin, darkly pigmented layer** located **behind the retina** and is **rich in blood vessels**, supplying nutrients and oxygen to the eye.✓✓  
-The **iris** is a **colored, muscular structure** at the **front of the eye** with **circular and radial muscles** that control the **size of the pupil** to regulate light entry. ✓✓
- 27.2 -In **dim light**, the **radial muscles** ✓of the iris **contract**, ✓ and the **circular muscles relax**✓, causing the **pupil to dilate**. ✓ -This **increases the pupil size**, allowing **more light to enter the eye** for better vision in low-light

- conditions. ✓
- 27.3 -Biconvex lenses are designed to **converge light rays**✓, typically used to **correct farsightedness (hyperopia)** ✓. -A person with **normal vision** doesn't need this extra convergence. -When wearing **biconvex lenses**, the light rays from the nearby book **converge too early**✓, forming an image **in front of the retina**, ✓ not directly on it. -This results in a **blurred image**. ✓

10

### Activity 28

- 28.1 Right side✓
- 28.2 Decreased pupil size✓  
Dropping eyelids✓  
Decreased sweating✓  
**(Mark first ONE only)**
- 28.3 Cerebrum✓
- 28.4 Automatic nervous system✓
- 28.5 As pupil is too small it cannot dilate✓ enough to let more light in there is a greater risk of having an accident at night, because it will be difficult to see in the dark/dim light✓

28.6	<b>Adrenalin</b>	<b>Parasympathetic nervous system</b>
	Increase heart rate✓	Decrease heart rate✓
	Constricts blood vessels in the skin/vasoconstriction✓	Dilates blood vessels in skin/vasodilation✓
	Dilates pupils✓	Constricts pupils✓
	Increases blood pressure✓	Decreases blood pressure✓
	Widens bronchioles✓	Narrows bronchioles✓
	Decreases peristalsis✓	Increases peristalsis✓
	Causes relaxation of the bladder wall✓	Causes contraction of the bladder wall✓

### (Mark first TWO only)

- 28.7 Accommodation✓\*
- Ciliary muscles contract✓
  - Suspensory ligaments slacken✓
  - Tension on the lens decreases✓
  - Lens become more convex✓
  - Increasing the refractive power of the lens✓
  - Forming a (clear) image on the retina✓

15

### Activity 29

- 29.1 Accommodation✓
- 29.2 B✓ and D✓  
**(Mark first ONE only)**
- 29.3 - Circular muscles relax✓  
- radial muscles contract✓  
- the pupil size increases✓  
- more light enters the eye✓
- 29.4 B✓
- 29.5 Astigmatism✓

- 29.6 - wearing glasses with a corrective lenses or lens ✓  
 - laser surgery✓  
**(Mark first ONE only)**

10

### Activity 30

- 30.1 Iris✓  
 30.2 Helps to maintain the shape of the eye✓  
 Plays a role in refraction of light  
 Allows the transmission of light✓  
 Prevents desiccation✓ of structures in the eye  
 Holds the retina in position✓  
 Nourishment ✓ of the eye  
 Prevents mechanical injury✓ in the eye

### Any

**(Mark first TWO only)**

- 30.3 - Area B contains (a high concentration of) photoreceptors✓/  
 cones  
 - Area C contains no photoreceptors✓/ no rods & cones  
 30.4 Astigmatism  
 30.5 - Because the lens will become cloudy✓/opaque  
 no/less light will enter the eye✓  
 - causing no sight v/weak sight  
 30.6 The ciliary muscle contracts✓  
 The ciliary body moves closer to the lens✓  
 The suspensory ligaments slacken  
 Tension on the lens decreases✓  
 The lens becomes more convex/✓rounded  
 Light rays are refracted more✓  
 To focus the light on the retina

15

### Activity 31

- 31.1 A – Ossicles✓  
 F – auditory canal✓  
 31.2 D – Eustachian tube✓  
 Equalizes pressure on either side of the tympanic membrane/eardrum  
 31.3  $G > F > E > A > C > B$ ✓✓ **(2 marks or nothing)**  
 31.4 - sound waves strike the tympanic membrane✓ /eardrum  
 - causing it to vibrate✓  
 - transferring vibrations to ossicles✓  
 31.5 - pressure waves will not be generated✓ in cochlea  
 - the organ of Corti will not be stimulated✓  
 - pressure waves will not be generated ✓in cochlea  
 - No stimulus will be converted to an impulse✓  
 - Impulse will not be interpreted in the cerebrum✓  
 - and the sound will be distorted✓\*/will be unclear **(COMPULSORY MARK)**  
 - causing less✓/no hearing

12

### Activity 32

- 32.1 (a) C ✓  
(b) A ✓  
(c) B ✓
- 32.2 The Eustachian tube ✓ allows air to move into and out of the middle ear ✓
- 32.3 - Cristae ✓  
- in the ampullae/semi-circular canals are stimulated ✓  
- by a change in the speed and direction of the body/head ✓  
- the stimulus is converted into an impulse ✓  
- the impulses are sent via the auditory nerve ✓  
- to the cerebellum ✓  
- the cerebellum then sends impulses to the skeletal muscles ✓ to restore the balance. ✓

Any 5  
10

### Activity 33

- 33.1 (a) Tympanic membrane ✓  
(b) Cochlea/organ of Corti ✓  
(c) Eustachian tube ✓  
(d) Auditory canal ✓
- 33.2
  - The AirPods block the auditory canal ✓ and prevent the sound waves from the environment from reaching the tympanic membrane ✓
  - The sound from the AirPods is too loud ✓ and the environment noise is too quiet/soft by comparison, so it is not detected ✓
- (Each point must have a linked cause and effect statement.)**
- 33.3 (a) Fred ✓  
(b) (Fred's) volume is 92 dB ✓ / over 80 dB  
Which is more than the safe level ✓ of 80 dB

11

### Activity 34

- 34.1 (a) D ✓ – Oval window ✓  
(b) B ✓ – cochlea ✓
- 34.2 - change in speed/ direction of head ✓  
- stimulates the cristae ✓  
- stimulus is converted to an impulse ✓  
- Impulse is transmitted to the cerebrum ✓  
- via the auditory nerve ✓  
- The cerebellum sends impulses to voluntary / skeletal muscles ✓ to maintain balance
- 34.3 - Long coiled structure ✓  
Increased surface area to detect pressure vibrations of endolymph ✓ / enhances the ability to detect low frequency sound
- OR**
- Presence of mechanoreceptors / organ of Corti ✓  
To convert pressure vibrations into a nerve impulse ✓
- OR**
- Contains fluid ✓ / perilymph and endolymph  
Medium through which pressure vibrations are generated and moves

through✓

10

### Activity 35

35.1 (a) Cochlea✓

35.2 (b) Semi-circular canals✓

- The pinna directs sound waves✓
- Into the auditory canal✓
- The auditory canal transmits sound waves to the tympanic membrane✓
- The tympanic membrane transmits vibrations to the ossicles ✓ as vibrations
- The ossicles transmit amplified vibrations ✓
- to the oval window✓
- which vibrates✓ and set pressure waves in the inner ear

8

### Activity 36

36.1 B – ossicles✓

C – Oval window✓

36.2 A ✓ tympanic membrane✓ / **Tympanum/Eardrum**

36.3 Absorbs excess (pressure waves) ✓ from the inner ear/ prevents echo

36.4 - The person will suffer from hearing loss✓\* / be deaf because  
- pressure will not be equalized on either side of the tympanic membrane✓  
- no/less vibrations in the middle ear✓ / ossicles

36.5 - tympanic membrane/Part A vibrates and transmits the vibrations to the ossicles in the middle ear  
- the ossicles amplify the vibrations to the oval window  
- pressure waves will form in the cochlea/inner ear  
- receptors in the Organ of the Corti/hair cells are stimulated

14

### Activity 37

37.1 Auditory nerve✓

37.2 Organ of Corti✓

37.3 (a) E ✓ - Oval window / Fenestra ovalis✓

(b) D✓ - Round window / Fenestra rotunda✓

(c) A✓ - Semicircular canals✓

8

### Activity 38

38.1 (a) Auditory nerve✓ / cochlea nerve

(b) cochlea ✓

(c) Oval window✓ / fenestra ovalis

38.2 Equalizes pressure on both sides of the eardrum tympanum/ tympanic membrane✓

38.3 - use of grommets✓  
- antibiotics✓

38.4 - the sound vibrations are transmitted from the large tympanic membrane✓/A



- to the smaller oval window✓
  - through the ossicles ✓/ B
  - which are arranged from largest to smallest✓
  - this concentrates the vibrations thus amplifying them
  - 38.5 - A change in speed/direction of movement
  - stimulates the cristae✓
  - the stimulus is converted into an impulse✓
  - the impulse is transmitted to the cerebellum✓
  - via the auditory nerve✓ / vestibular nerve
  - the cerebellum sends impulses to the skeletal muscles ✓to restore balance
- 14**

### Activity 39

- 39.1 a) Auditory nerve✓
- b) Cochlea✓
- 39.2 a) Absorbs (excess) pressure waves✓ from the inner ear/prevents echo
- b) Equalises pressure on either side of the tympanic membrane✓
- 39.3 - The person will suffer from hearing loss✓\*/ be deaf because
- no/less vibrations will be transmitted to the oval window✓ and
- no/less pressure waves will form in the cochlea✓/inner ear
- therefore, there will be less/ no stimulation of the organ of Corti✓/hair cells
- less/no impulse will reach the cerebrum✓
- 39.4 - cristae✓
- are stimulated by a change in speed/direction of (movement) of the head✓
- Maculae✓
- are stimulated by a change in the position of the head✓
- to generate an impulse✓
- which is transmitted by the auditory nerve✓
- to the cerebellum✓ for interpretation

**14**

### Activity 40

- 40.1 (a) Tympanic membrane✓
- (b) Cochlea✓
- 40.2 (a) A✓
- (b) B✓
- 40.3 (a) Organ of Corti✓
- (b) Auditory nerve✓

**6**

### Activity 41

- 41.1 (a) Semi-circular canals✓
- (b) Round Window✓
- 41.2 (a) D✓ Eustachian✓n tube✓
- (b) C✓ Cochlea
- 41.3 (a) F✓
- (b) A✓

**8**

### Activity 42

- 42.1 A ✓ F✓
- 42.2 B✓ — Capillaries/blood vessel✓

- 42.3 C✓ – Sweat gland✓  
 (a) ADH/Antidiuretic hormone✓  
 (b) Kidney✓

8

### Activity 43

- 43.1 (a) Aldosterone and adrenalin✓  
 (b) Testosterone✓  
 43.2 Pituitary gland✓\*/hypophysis is stimulated✓

To secrete less TSH into the blood✓

Low TSH levels stimulates the thyroid gland✓to secrete less thyroxin✓

Thyroxin levels decrease✓/normal

\*✓Compulsory mark and FOUR other points

8

### Activity 44

- 44.1 Pituitary/ hypothysis✓  
 44.2 Growth hormone  
 44.3 a) C-Pancreas✓  
 b) D-Testes✓  
 c) B-Thyroid gland✓

8

### Activity 45

- 45.1 (a) thyroid gland✓  
 (b) Adrenal gland✓  
 (c) pancreas gland✓  
 45.2 (a) TSH/ Thyroid stimulating hormone✓  
 (b) Pituitary gland /hypophysis✓  
 (c) (Negative feedback mechanism) ✓  
 45.3 Adrenalin✓  
 45.4 Glucagon✓

8

### Activity 46

- 46.1 Maintenance of a constant internal environment within the body✓✓  
 46.2 (a) ADH✓  
 (b) Kidney✓  
 46.3 - receptor cells in the carotid artery✓ in the neck are stimulated  
 - to send nerve impulses to the medulla oblongata✓  
 - medulla oblongata stimulates breathing muscles and heart✓  
 - breathing muscles contract more actively✓  
 - increasing the depth and rate of breathing✓  
 - the heart beats faster✓  
 - more carbon dioxide is exhaled✓  
 - the Carbon dioxide level returns back to normal✓  
 46.4 46.4.1 Adrenalin✓  
 46.4.2 It converts glycogen into glucose ✓

- 46.4.3 –Adrenalin causes the blood vessels to dilate✓ since  
 -the muscles require more blood✓  
 -with more oxygen and glucose✓  
 -for increased cellular respiration✓ / increase breakdown of glucose  
 -to supply additional energy✓
- 46.5 – the thyroid gland becomes more active ✓  
 -more thyroxin is secreted✓  
 -which increases metabolism✓/ cellular respiration  
 -more heat is generated on a cold day✓

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### Activity 47

- 47.1 (a) Kidney✓  
 (b) Endocrine system✓
- 47.2 - it increases hormones✓  
 - directly into the blood/and it is ductless✓
- (Mark first TWO only)**
- 47.3 - low salts levels are detected by receptor cells✓ in the kidney  
 - Adrenal glands are stimulated✓ to secrete  
 - More aldosterone✓  
 - Which stimulates the renal tubules✓  
 - To be more permeable to salt✓  
 - This increases the reabsorption of salt✓ and  
 - The salt levels in the blood increase✓/return back to normal
- 47.4 - The secretion of ADH✓  
 - Will increase✓  
 - Which will increase the permeability✓  
 - Of the renal tubules✓ in **X**  
 - So that more water is reabsorbed ✓from filtrate

14

### Activity 48

- 48.1 Deepening of the voice✓/larynx enlarges  
 Broadening of the chest✓/shoulders  
 More muscular physique✓  
 Penis/testes/sex organs enlarge✓
- (Mark first TWO only)**
- 48.2 To determine the relationship between the density of beard growth and the concentration/level of testosterone. ✓✓

**OR**

To determine the effect of testosterone levels on beard density✓✓

**(Must include “to” and both variables).**

- 48.3 All males should have the same:
- age✓
  - diet✓
  - health/level of activity✓
  - race✓
  - environment✓

**(Mark first THREE only)**

- 48.4  $0,5 + 0,53 + 0,52 + ),51 + 0,53$ ✓ divide 5 OR  $0,261$  divide by 5

=0,522✓ ug ✓ (accept 0,52 or 0,5)

- 48.5 REJECTED✓, A greater density of beard growth was not shown to correspond with an increased testosterone level✓. Even when density of hair growth was more, testosterone levels remained similar

12

### Activity 49

- 49.1 (a) A-Liver✓  
B – Pancreas✓  
(b) Insulin✓
- 49.2 A regulatory substance in the body that stimulates cells to bring about change✓✓. A protein/chemical messenger in the body.
- 49.3 - excess glucose cannot be converted to glycogen✓  
- in the liver✓/organ A  
- thus, the glucose level in the blood remains above normal✓/blood glucose levels are high  
- the person has diabetes✓
- 49.4 Thyroxin✓  
Adrenalin✓  
Glucagon✓

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### Activity 50

- 50.1 Impairment of mental/physical performance✓/may pose a serious risk to health
- 50.2 0,4-0.49 L,h✓
- 50.3 - the hypothalamus/osmoreceptors is/are stimulated✓  
- and sends impulses to the pituitary gland✓/hypophysis  
- to secrete more ADH✓  
- ADH increases the permeability of the renal tubules✓  
- of the kidney✓  
- more water is reabsorbed into surrounding blood vessels✓.  
- the water level in the blood increases to normal✓ levels.  
- less urine is produced✓/urine becomes more concentrated /less water is lost through urine
- 50.4 - sweating increases✓ causing the  
- body temperatures to decrease✓.  
- This is because more evaporation of sweat✓, causes  
- more cooling of the skin surface, blood beneath skin surface✓
- 50.5 - make shifts shorter/at cooler times of the day/morning and night✓.  
- provide clothing/shade that helps to keep workers cooler. ✓  
- Supply sufficient (cold) water/fluids for workers✓

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### Activity 51

- 51.1 (a) Diabetes✓ mellitus  
(b) – The pancreas of this person produces low levels of insulin✓/cells are insulin resistant  
- blood glucose is not converted to glycogen✓/glucose is not absorbed into the cells

51.2 13-4✓  
=9✓

51.3 - glucagon✓  
- Adrenalin✓

7

### Activity 52

52.1 F✓ - Growth hormone (GH)/somatotropin✓

52.2 B ✓ - Pancreas✓

52.3 A ✓ - Ovary✓

52.4 E ✓ - Thyroid gland✓

52.5 C ✓ - Testosterone✓

10

### Activity 53

53.1 A- Glucagon✓

B- Insulin✓

53.2 (a) Pancreas✓

(b) Islets of Langerhans✓

- 53.3
- Negative feedback reaction✓
  - The glucose concentration in the blood drops below normal✓
  - The alpha cells/islets of Langerhans/pancreas detect the drop and secretes glucagon✓
  - In the blood✓
  - Which is transported to the liver✓ /muscle cells
  - Glucagon stimulates the conversion of glycogen to glucose✓
  - The glucose concentration in the blood returns to normal✓

10

### Activity 54

54.1 (a) Insulin✓

(b) Blood sugar level starts decreasing✓

- 54.2
- Maintenance of a constant internal environment within the body✓
  - Regardless of changes in the internal or external environment✓

54.3 **Question removed**

9

### Activity 55

55.1 Hypothalamus✓

- 55.2
- The body temperature decreases✓ because
  - Blood vessels of the skin dilate✓/vasodilation
  - More blood flows to the surface of the skin✓
  - More heat is lost from the surface of the skin✓
  - More blood flows to the sweat glands✓
  - To release more sweat✓/to become more active
  - Evaporation of sweat cools the skin✓

55.3 Increase in cellular respiration✓ in muscles produces more energy✓ as heat

8

### Activity 56

- 56.1 Cold environmental conditions✓  
56.2 - Blood vessels dilate✓/blood vessels become wider/vasodilation occurs  
- more blood flows to the surface of the skin✓  
- more heat is lost from the skin✓  
56.3 - as the environmental temperature increases above body temperature  
- increased sweating will occur✓  
- as the sweating is evaporated✓  
- it allows the body temperature to decrease✓ /more cooling of the skin will occur  
56.4  $36-30$  divided by  $30$ ✓ x  $100$ ✓  
=26,67% (accept 26,7 or 27%)

10

### Activity 57

- 57.1 November✓  
57.2 - The concentration of abscisic acid increases✓  
- To stimulate the abscission✓/falling of leaves  
- To prepare the tree for dormancy✓  
57.3 - Less sunlight✓/less water/cold conditions therefore  
- Decreased photosynthesis✓/reduced transpiration/lower energy demand/  
low growth  
57.4 Auxins promote the development of roots✓  
a) - it brings about (general) root growth✓  
Causing their downward ✓growth/positive geotropism  
b) in the stem, the auxins stimulate growth✓ on the lower side causing the stem  
to grow/bend upwards✓  
- in the root, the auxins inhibit growth✓ on the lower side causing the root to  
grow /bend downwards✓

13

### Activity 58

- 58.1 Phototropism✓  
58.2 Auxins✓  
58.3 A✓ and B✓  
58.4 - because the stem is exposed to unilateral light✓/light from one side only  
- Auxins/the hormone are/is destroyed by the light✓/move away from light.  
- causing the auxins/hormone concentration to be high on the dark side✓  
away from the light  
- therefore, cells are stimulated to elongate/grow on the dark side✓ away  
from the light  
- the auxin/hormone concentration is low on the side receiving light✓  
Therefore, cells are not stimulated to elongate/grow on this side✓ facing the  
light  
-therefore, the plant bends/grows towards light  
58.5 - as auxins are removed✓  
- there will be more lateral branches✓/lateral branches are longer  
- they can carry more fruit✓/higher yields  
- therefore, more income from sales ✓

**Activity 59**

- 59.1 (a) (Presence/absence of) auxins✓  
 (b) Growth of lateral branches✓
- 59.2 - To ensure that the results are caused only by the presence of auxins✓ which  
 - Increases the validity✓ of the investigation
- 59.3 - It acts as a control✓  
 - To show that the results of Plant D✓  
 - Are caused by the (presence of) auxins✓  
 - And not the agar jelly✓
- 59.4 The presence of auxins slows down the growth of lateral branches✓✓  
 OR  
 The absence of auxins stimulated the growth of lateral branches✓✓

9

**Activity 60**

- 60.1 (a)- shoot will grow straight upwards✓  
 - auxins in the agar gel diffused evenly downwards✓  
 - causing equal growth on both sides of the shoot/cell elongation✓  
 - no lateral branches will develop✓
- (b)- No upwards growth✓  
 - since there are no auxins✓  
 - lateral branches develop✓
- 60.2 -same type of plant✓  
 - same age of plant✓  
 - measure length at the same time✓  
 - same environmental conditions ✓ (any example)  
 - same type of agar✓
- 60.3 - repeat the investigation✓  
 - use more than one plant shoot✓/increases the sample size

8

**Activity 61**

- 61.1 Geotropism✓
- 61.2 Auxins✓
- 61.3 - Due to gravity✓  
 - there is a higher concentration of auxins on the lower side of the stem  
 - which stimulates growth✓  
 - therefore, growth will occur mainly on the lower side✓  
 - causing the stem to grow/bend upwards✓
- 61.4 - exposes the flowers more favorable✓  
 - for pollination✓/seed dispersal

9

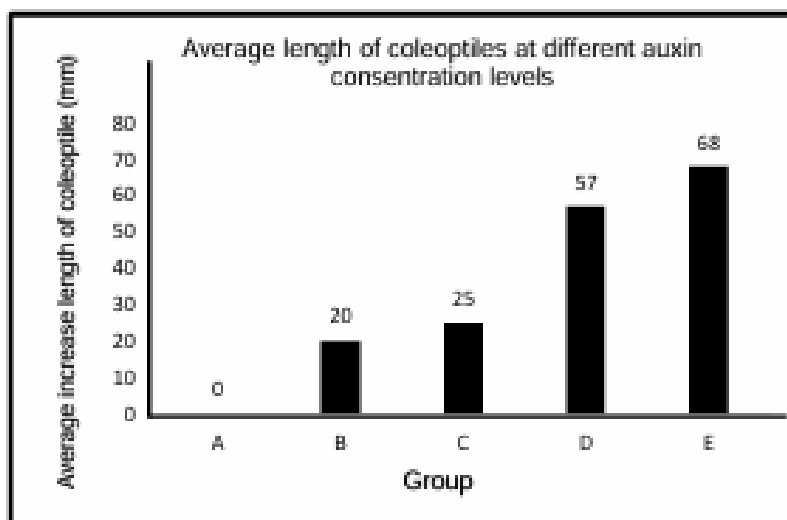
**Activity 62**

- 62.1 (Different) Concentration of auxin✓
- 62.2 It is a control group

- To ensure that the results are caused by (different concentrations of) auxins✓
- 62.3 Same length of the coleoptiles✓  
Same species of bean plants✓  
Same time for growth (4days) ✓  
All the tips of the coleoptiles were removed✓  
Injections at cur surface✓  
**(Mark the first TWO only)**
- 62.4 When the concentration of auxin increases, the (average) length of coleoptiles increases✓✓

**OR**

- When the concentration of auxin decreases, the (average) length of coleoptiles decreases✓✓
- 62.5



**Criteria for marking graph:**

Criteria	Mark allocation
Bar graph is drawn (T)	(1)
Caption of the graph includes both variables (C)	(1)
Correct labels on X-axis and Y-axis and with correct unit on Y-axis (L)	(1)
Correct scale for X-axis and Y-axis and bars with equal width with equal spaces for X-axis (S)	(1)
Plotting correctly done for: (P)	
1–4 coleoptile lengths	(1)
All 5 coleoptile lengths	(2)

13

### Activity 63

- 63.1 To determine the effect of abscisic acid on plant dormancy✓
- 63.2 (a) Absciscic acid✓  
(b) plant dormancy✓  
(c) -constant temperature of 28✓  
- constant humidity of 30✓  
- 8 pear trees in each group✓



- 63.3 Falling of leaves/fruits from the trees✓  
63.4 -promotes the ageing of leaves✓  
-induces flowering in some plants✓

7

#### **Activity 64**

- 64.1 Auxins✓  
64.2 To cancel the effect of unilateral light on plumule growth✓/to show that the light has no effect on the upward bending of plumule/to exclude a phototropic response  
64.3 When a plumule is placed horizontally:  
- Auxins are attracted by gravity✓  
- There is a high concentration of auxins on the lower side of the plumule✓  
- Which stimulates growth/cell elongation/cell division on the lower side✓  
- There is a low concentration of auxins on the upper side of the plumule✓  
- Which inhibits growth/cell elongation/ cell division on the upper sides✓  
- The lower side of the plumule grows faster✓/uneven growth occurs causing the plumule to grow/ bend upwards  
- The plumule grows away from gravity✓ / the plumule is negatively geotropic  
64.4 The germinating seed is attached to the disc of rotating clinostat✓

6

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[2] B. Decker, *A Guide to Software* (2012).

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