



KWAZULU-NATAL PROVINCE

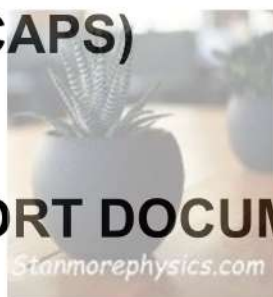
EDUCATION
REPUBLIC OF SOUTH AFRICA

CURRICULUM GRADE 10-12

DIRECTORATE

NCS (CAPS)

TEACHER SUPPORT DOCUMENT



GRADE 11

LIFE SCIENCES

JUST IN TIME

**APRIL
2026**

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Solutions

Topic: Biodiversity and of Micro-organisms

ACTIVITY 1

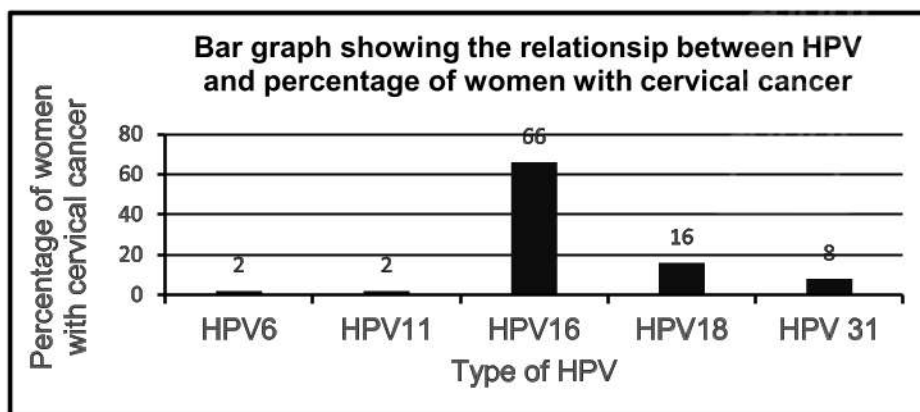
No.	Description	Biological Term
1.1.	A singled cell organism.	Unicellular✓
1.2.	An organism that does not have a true nucleus.	Prokaryotes✓
1.3.	Outer protein layer that encloses genetic material of a virus.	Capsid✓
1.4.	A virus that attacks bacteria.	Bacteriophage✓
1.5.	A lack of cellular structure in an organism.	Acellular✓
1.6.	An organism that causes diseases.	Pathogen✓
1.7.	Organism that has a trues nucleus	Eukaryotes✓
1.8.	Organisms that can be divided into two identical parts.	Symmetrical✓
1.9.	Grouping of organisms according to their similarities.	Classification✓
1.10.	Micro-organisms that only reproduce inside a host.	Virus✓
1.11	Whiplike structure used by bacteria for movement.	Flagellum✓
1.12	The bacterium type which is spherical.	Coccus✓
1.13	Substances used to stimulate the production of antibodies.	Vaccine✓
1.14	Mass of fungal threads.	Mycelium✓
1.15	Acquired immunity obtained through injection	Vaccination✓
1.16	A parasitic protozoan that causes malaria	Plasmodium✓
1.17	A relationship between two organisms where both benefit	Mutualism✓
1.18	An inborn ability to produce antibodies	Natural immunity✓
		(18 X 1) (18)

ACTIVITY 2

- 2.1 2.1.1 A - Capsid✓ (1)
B - Genetic Material/ DNA✓ (1)
2.1.2 They do not have cellular contents✓/cytoplasm✓ (1)
2.1.3 - Some bacteria cause diseases✓
- Viruses that infect bacteria will destroy pathogenic bacteria✓ (3)
- Diseases caused by bacteria may thus be prevented✓ (6)
- 2.2 2.2.1 Wear face masks✓
Social distancing✓
Prevent physical contact✓ Any (2)
(2)
(Mark first TWO only)
2.2.2 Virus is non-living/acellular✓ (1)
2.2.3 They have weakened immune system✓
Their antibodies cannot fight other infections✓ (2)
2.2.4 They stimulate the human immune system to produce antibodies✓ (1)
(6)

ACTIVITY 3

3. 3.1 HPV 6✓ (1)
3.2 -Acellular✓
-Non-living✓
-Reproduce inside a host✓
-Specific to the host✓ Any (3)
(3)
(Mark first 3 ONLY)
3.3 Have no cellular contents/ cytoplasm✓ (1)
They have no metabolic reactions.✓
3.4 66 – 16 ✓
= 50✓ (2)
3.5



(6)

Guideline for assessing the graph

CRITERIA	ELABORATION	MARK
Correct type of graph (T)	Bar graph drawn	1
Caption of graph (C)	Both variables included	1
Axes labels (L)	X- and Y axis correctly labelled with units	1
Scale for X- and Y-axis (S)	- Equal space and width of bars for X-axis and - Correct scale for Y-axis	1
Plotting of co-ordinates (P)	- 1 to 4 co-ordinates plotted correctly - All 5 co-ordinates plotted correctly	1 2

Histogram or line graph drawn

- Lose marks for type of graph and for scale

Transposed axes:

- Can get full credit if axes labels are also swapped and bars are horizontal
- If labels are *not* corresponding, then lose marks for labels and scale
- Check that the plotting is correct for the given labels

(13)

ACTIVITY 4

- 4
- 4.1 2018✓
- 4.2 $\frac{\text{Final value} - \text{Initial value}}{\text{Initial value}} \times 100$

$$\frac{6 - 2}{2} \times 100\%$$

$$= 200\%$$

- 4.3 The percentage of rabies increased between 2014 and 2015✓
Decreased in 2016✓
Increased again in 2017 and 2018✓
- 4.4 2017 and 2018✓

(1)

(3)

(3)

(1)

(8)

ACTIVITY 5

- 5
- 5.1 Cell membrane✓
- 5.2 For movement✓
- 5.3 - Unicellular✓
- Prokaryotic✓
- pathogenic✓
- 5.4 45mm/50 000✓
=0,00009 x 1 000
=0.9✓μm

Any 2 (2)

(2)

(6)



ACTIVITY 6

6

- 6.1 Bacteria✓ (1)
- 6.2 (a) C/F✓ - DNA✓ (2)
- (b) E✓ – Caspid✓ (2)
- 6.3 Asexual✓ reproduction (1)
- 6.4 Acellular✓
- Has no cytoplasm✓
- Has either DNA or RNA✓ Any 2 (2)
- (Mark first TWO only)**

(8)

ACTIVITY 7

7

- 7.1 Bacteria✓ (1)
- 7.2 Vomiting ✓
- Dehydration✓
- Diarrhoea✓
- 7.3 Antibiotics✓ (1)
- 7.4 40% x 8,5✓ billion (1)
- = 3,4✓ billion
- 7.5 More people seek medical treatment✓
- More money used to buy medication✓ (2)

Any 2 (2)

(1)

(1)

(2)

(8)



ACTIVITY 8

- 8.1 (a) Population of bacteria✓ (1)
- (b) Type of bacteria✓
- Type of agar medium✓
- Size of petri dishes✓
- Conditions of incubation✓ Any (2) (2)
- (Mark the first TWO ONLY)**
- 8.2 To ensure the reliability✓ of an investigation (1)
- 8.3 Act as a control✓
- To ensure that only vancomycin affect growth of bacteria✓ (2)

(6)

ACTIVITY 9

- 9 9.1 Protista✓ (1)
- 9.2 -Unicellular✓
-Eukaryotic ✓
-Heterotrophic✓
-Motile✓ Any 2 (2)
- (Mark the first TWO ONLY)**
- 9.3 Malaria✓ (1)
- 9.4 -Fatigue ✓
-Difficulty in breathing✓
-Fever✓
-Chills✓
-Diarrhoea ✓
-Headache ✓ (2)
- (Mark first TWO only)**
- 9.5 - Phytoplankton are producers in an ecosystem✓
Maintain balance of oxygen and carbon dioxide✓
-Slime moulds are decomposers✓
Play a role in nutrient cycling✓
-Parasitic moulds cause diseases✓
Population control✓
(Mark first TWO only) Any (2 X 2) (4)
(10)



ACTIVITY 10

- 10 10.1 Anopheles✓ (1)
- 10.2 (a) -High rainfall✓
-Inadequate medical facilities✓
-No money to buy insecticides✓
-Lack of awareness✓ Any 2 (2)
- (Mark first TWO only)**
- (b) -They may not have acquired immunity✓
-This increases chances of exposure to diseases✓ (Any 1) (1)
- 10.3 A person who is a carrier to a disease✓but experience no symptoms.✓ (2)
(6)

ACTIVITY 11

- 11 11.1 Plasmodium✓ (1)
- 11.2 Percentage growth of malaria increases from year 1 to year 2✓
Decreases on year 3✓
Increases from year 4 to year 7✓ (3)
- 11.3 5 and 6✓ (1)

11.4	Bacteria	Protist
	All unicellular	Unicellular and multicellular
	Prokaryotic	Eukaryotic

✓ + Any 4) (5)
(10)

ACTIVITY 12

- 12
- 12.1 Fungus✓ (1)
 - 12.2 A- Sporangium✓
B- Sporangiphore✓ (2)
 - 12.3 Hyphae ✓ (1)
 - 12.4 -Yeast is unicellular✓
-Bread mould is multicellular✓ (2)
 - 12.5 Makes bread✓/ beer
Sold to consumers✓ (2)
- (8)

ACTIVITY 13

- 13
- 13.1 Fungus✓ (1)
 - 13.2 (a) D✓ - Rhizoids✓ (2)
(b) C✓ - Stolon✓ (2)
(c) B✓ - Sporangiphores✓ (2)
- (7)



ACTIVITY 14

- 14
- 14.1 Temperature✓ (1)
 - 14.2 The investigation was done several times✓ (1)
 - 14.3 $\frac{75}{5}$ ✓
=15 times✓ (2)
- (4)

ACTIVITY 15

- 15
- 15.1 A weakened form of a pathogen✓ (1)
 - 15.2 -The body starts producing antibodies✓
-Offering protection against diseases✓ (2)
 - 15.3 Acquired immunity✓ (1)
 - 15.4 -Diseases causing bacteria destroyed✓
-By antibodies that exist in response to vaccination✓ (2)

- 15.5
- Improve sanitation✓
 - Improve quality of water sources✓
 - Maintain sewages✓
 - Educate people✓
 - Introduce penalties✓
- (Mark first THREE ONLY)**

Any (3) (3)

(9)

ACTIVITY 16

16

- 16.1 (a)
- Mutualistic relation✓
 - Both organisms gain✓ since,
 - E coli helps human with absorption of vital vitamins✓ and
 - Gain a place to live✓/nutrients✓

(4)

- (b)
- Mutualistic relation✓
 - They both gain✓
 - Since mycorrhizae gain nutrients✓ from a plant.
 - Plant gains extra surface for absorption of water✓

(4)

(8)



Solutions

Topic: Biodiversity of Plants and Reproduction

ACTIVITY 1

No.	Description	Biological Term
1.1	Plants without true roots, stems and leaves	Thallus✓
1.2	A group of plants that have seeds enclosed in an ovary.	Angiosperms✓
1.3	The collective name for a filament and an anther	Stamen✓
1.4	A diagram showing the evolutionary relationship between organisms	Phylogenetic tree✓
1.5	The protective cap that covers the sporangia in mosses	Calyptra✓
1.6	The transfer of pollen grains from the anther to the stigma of another plant's flower	Cross Pollination✓
1.7	Type of reproduction involving the fusion of gametes	Sexual reproduction✓
1.8	Dominant generation in the life cycle of ferns	Sporophyte generation✓
1.9	Reproduction which uses non-reproductive parts of a plant to produce new plants	Asexual reproduction✓
1.10	A reproductive structure found in gymnosperms and angiosperms only and consists of a plant embryo with a protective coat	Seed✓
1.11	The collective name for a stigma, style and ovary	Pistil✓
1.12	The seed-bearing plants	Spermatophytes✓
1.13	Female part of the flower consisting of a stigma, style and an ovary where ovules are produced	Pistil✓
1.14	A stem which grows horizontally	Rhizome✓
1.15	The spore-producing generation	Sporophyte✓
1.16	The gamete-producing generation	Gametophyte✓
1.17	A group of sporangia on the pinna of a fern frond	Sorus✓
		(17 X 1) (17)

ACTIVITY 2

2. 2.1 A - Bryophyta✓/bryophytes✓/moss plant ✓
B - Pteridophyta✓pteridophytes✓/ fern plant✓ (2)
- 2.2 (a) A✓and B✓ (2)
(b) C✓and D✓ (2)
- 2.3 - Pollen grains are carried by wind or pollinator from male to female cone✓
- After pollination a pollen tube✓ is developed
- This allows male gamete to be carried directly to the egg cell✓in the ovule (3)
- 2.4 - No true root, stem or leaves/ have rhizoids✓
- No conducting tissue✓
- No stomata✓
- No cuticle✓ Any (3) (3)
- (Mark first THREE only)
- 2.5 - Flowers enable angiosperms to attract pollinators✓
- thus increasing success of pollination✓/ fertilisation (2)
- 2.6

Bryophytes	Pteridophytes
- Thallus✓	- True roots, stems and leaves✓
- No vascular tissues✓	-Vascular tissues✓

T✓ (5)
(19)

ACTIVITY 3

3. 3.1 Plantae ✓ (1)
- 3.2 (a) A✓ - Bryophytes✓ (2)
(b) B ✓- Pteridophytes✓ (2)
- 3.3 - Flowers ✓
- Fruits ✓ (Any 1) (1)
- 3.4 Phloem✓ (1)
(7)

ACTIVITY 4

- 4 4.1 (a) Ovary✓ (1)
- (b) Style✓ (1)
- (c) Stigma✓ (1)
- 4.2 Stamen✓ (1)
- 4.3 C✓ - Ovule✓ (2)
- 4.4 - Attract pollinators✓ (2)
- Contain/ protect reproductive organs✓ (2)
- (8)**

ACTIVITY 5

- 5 5.1 To determine the effect of petals on insect pollination✓✓ in apple flowers (2)
- 5.2 (a) (Presence or absence of) petals✓ (1)
- (b) Pollination✓ (1)
- 5.3 - Flowers were taken from the same species✓ (2)
- Plants were exposed to pollinating agent for the same amount of time✓ (2)
- 5.4 (a) Pollinators are attracted by the petals✓
and therefore, visit the flowers with petals more✓ (2)
- (b) Self-pollination occurred✓ (2)
- Some pollen tube did not reach the ovary✓ (2)
- 5.5 The greater the number of petals the greater the chance/amount of fertilisation✓✓ (2)
- (12)**

ACTIVITY 6

6. 6.1 20✓% (1)
- 6.2 - No/Few pollen tubes grew✓ (2)
- Since the high concentration of sugar solution caused plasmolysis in the pollen grains✓ (2)
- 6.3 To carry the male gamete towards the female gamete✓ (1)
- (4)**

Solutions

Topic: Biodiversity of Animals

ACTIVITY 1

No.	Description	Biological Term
1.1	Body wall consisting of two germ layers	Diploblastic✓
1.2	A gut with only one opening, used for both ingestion	Blind gut✓
1.3	The arrangement of body parts such that an organism can be divided into identical parts vertically along any radius	Radial symmetry✓
1.4	Body wall consisting of three germ layers	Triploblastic✓
1.5	The arrangement of body parts such that an organism can be divided into identical parts in only one way through the mid-longitudinal line	Bilateral symmetry✓
1.6	Type of symmetry relating to organisms that have an irregular shape and can thus not be divided into two identical parts	Asymmetry✓
1.7	A true body cavity that is lined on both sides by mesoderm	Coelomate✓
1.8	Blood system in which the blood is always confined to the blood vessels	Closed blood system✓
1.9	A body cavity that is lined by mesoderm on one side only	Pseudocoelom✓
1.10	Blood system in which the blood is always confined to the blood vessels	Closed blood system✓
1.11	Concentration of sense organs at the anterior end of an animal leading to the formation of a head	Cephalisation✓
1.12	The germ layer in animals that gives rise to muscles and other internal organs	Mesoderm✓
1.13	Embryonic layer that gives rise to the digestive tract and associated organs	Endoderm✓
1.14	Type of blood system that has blood vessels and haemocoels	Open blood system✓
1.15	Removal of solid waste from the gut	Egestion✓
1.16	The gut that runs through organism with two openings, the mouth and anus	Through gut✓
1.17	Animals that remain attached to the substrate for their entire life cycle	Sessile✓
1.18	Shedding of the skeleton in arthropods to allow growth	Moulting✓
1.19	Removal of solid waste from the gut	Egestion✓
		(19 X1) (19)

ACTIVITY 2

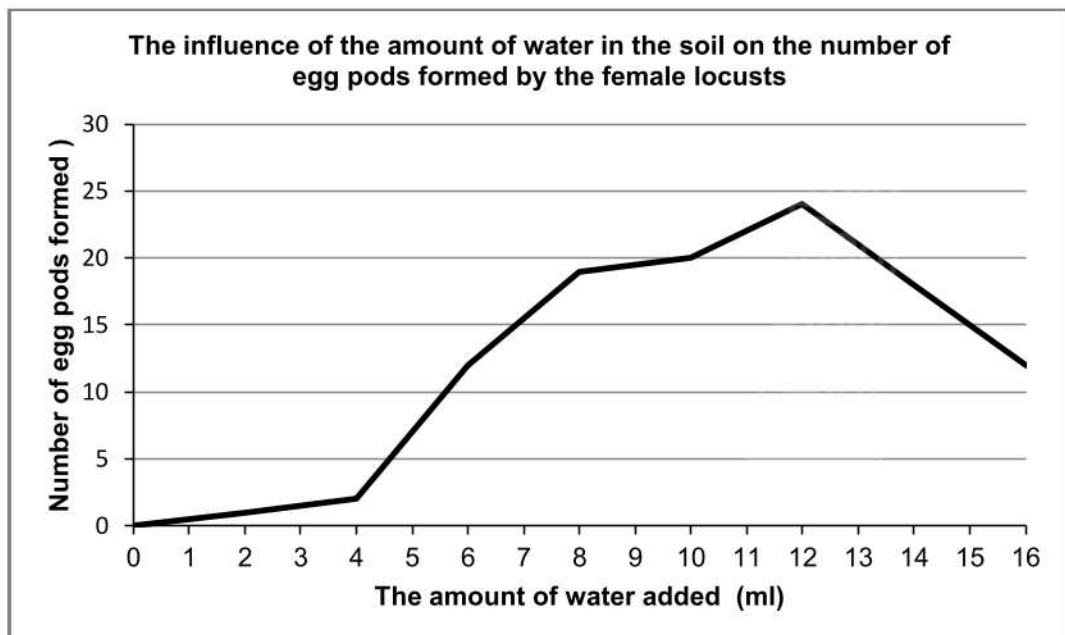
- 2 2.1 Cnidaria✓ (1)
 2.2 Radial✓ symmetry (1)
 2.3 It can catch prey ✓/ sense danger from all directions✓ because they are sessile/ sedentary ✓ (3)
 2.4 - Chordata✓ (3)
 - Arthropoda✓ (3)
 - Annelida✓ (8)

ACTIVITY 3

- 3 3.1 (a) Number of egg pods formed✓ (1)
 (b) Amount of water✓ (1)
 3.2 -Same person counting the egg pods✓
 -Counting egg pods at the same time✓
 -Same age/size of the locusts✓
 -Same size of the troughs✓
 -Same type of soil✓
 -Same diet of the locusts✓
(Mark first THREE only)
 3.3 $\frac{\text{Final value} - \text{Initial value}}{\text{Initial value}} \times 100$
 $= \frac{(20 - 12)}{12} \times 100$
 $= 67\%$



Any 3 (3)





CRITERIA	ELABORATION	MARK
Correct type of graph (T)	Line graph drawn	1
Caption of graph (C)	Both variables included	1
Axes labels (L)	Correct label and unit in X- and Y- axis	1
Scale for X- and Y- axis (S)	Equal spacing between intervals for each axis	1
Plotting of points (P)	1 to 8 points plotted correctly All 9 points plotted correctly	1 2

(6)
(14)

ACTIVITY 4

- 4
- Insects are pollinating agents✓resulting in reproduction of plants✓
 - Earthworms and insects are decomposers✓and recycle nutrients✓
 - Earthworms and insects aerate soil✓and make oxygen available✓to plant roots

Any (3 x 2) (6)



ACTIVITY 5

- 5
- 5.1 (a) Gut✓ (1)
- (b) Ectoderm✓ (1)
- 5.2 Animalia✓ (1)
- 5.3 Body plan C✓ (1)
- 5.4 Triploblastic✓ (1)
- 5.5 - Allows for cephalisation✓ (2)
- making detection of prey and danger much easier✓ (2)
- 5.6 Exoskeleton✓ (1)
- 5.7 - It restricts animal growth✓ (2)
- Skeleton needs to be regularly shed/moulting must occur and animals become vulnerable to predators✓ (2)
- 5.8 - The shrimp is bilaterally symmetrical✓ (3)
- With cephalisation✓ (3)
- Allowing for more efficient forward movement✓ (3)
- 5.9 - Provides space✓ for development of internal organs✓ (4)
- Contains fluid✓ which acts as hydrostatic skeleton✓ (4)
- The fluid cushions internal organs✓ protecting them from injury✓ (4)
- Separates gut wall from body wall✓ enabling to function independently✓ (4)
- (Mark first TWO only) Any (2 x 2) (4)

(17)

ACTIVITY 6

- 6
- 6.1 Phylogenetic tree✓/Cladogram (1)
 - 6.2 Cnidaria✓ (1)
 - 6.3 (a) Porifera✓ (1)
 - (b) - Annelida ✓
 - Arthropoda✓
 - (Mark first ONE only)**
 - 6.4 They share a most recent common ancestor✓ (1)
 - 6.5 Annelida✓/ Arthropoda/ Chordata Any (1) (1)
 - (Mark first ONE only)**
- (7)**

ACTIVITY 7

- 7
- The hydra is diploblastic✓
 - The endoderm lines a cavity called a coelenteron✓ which acts as a blind gut✓
 - Water in the coelenteron✓ acts as a hydrostatic skeleton✓
 - Hydra has no blood system✓ since food diffuses directly into all cells✓
 - The hydra has a single digestive opening✓ which serves as a mouth and an anus✓
 - The opening can only be one since the other end is attached✓
 - The position of the tentacles allow for food to be captured and inserted into the mouth✓
- Any 8 **(8)**

ACTIVITY 8

- 8
- 8.1 - B✓ (2)
 - A✓
 - 8.2 Annelids✓, molluscs✓, arthropods✓, chordates✓ Any 3 (3)
 - (Mark first THREE correct only)**
 - 8.3 B✓ (1)
 - 8.4 Porifera✓ (1)
 - 8.5 (a) X- coelom✓ (1)
 - (b) Y- ectoderm✓ (1)
 - 8.6 - Provides room for organ development✓ allowing for more complex organisms✓
 - Provides a hydrostatic skeleton✓ to provide support✓
 - Separates gut wall from the body✓ to allow for more efficient digestion of food✓
 - Increases respiration and nutrition✓ by allowing nutrients to dissolve✓
- Any (2 X 2) (4)
- (11)**

Solutions

Topic: Photosynthesis

Activity 1

No.	Description	Biological Term
1.1	The green, light-trapping pigment in photosynthesis found in plant leaves.	Chlorophyll ✓
1.2	Site of reactions of the light independent phase in the chloroplast.	Stroma ✓
1.3	The organic molecules that act as catalysts and control the chemical reactions during photosynthesis.	Enzyme ✓
1.4	The organelle in which photosynthesis takes place	Chloroplast ✓
1.5	Gas given off by green plants during photosynthesis	Oxygen ✓
1.6	Organisms that cannot photosynthesize and obtain food from other organisms	Heterotrophic ✓
1.7	Part of the chloroplast that contains chlorophyll	Thylakoids ✓
1.8	Green plants that produce their own food through photosynthesis	Autotrophic ✓
1.9	Stored form of glucose in plants	Starch ✓
1.10	The splitting of water molecules into hydrogen and oxygen in the presence of light.	Hydrolysis ✓
		(10 x 1) (10)

Activity 2

2

- 2.1 (a) Chloroplast✓ (1)
 (b) Photosynthesis✓ (1)
- 2.2 B✓ - Stroma✓ (2)
- 2.3 - Light Phase/Light Dependent Phase*✓
 - Chlorophyll molecules absorb radiant energy from the sun✓
 - This energy is used to split water into hydrogen and oxygen✓
 - Some energy is used to form ATP (energy-carrier)✓
 - Energised hydrogen atoms are released and used in the dark phase✓
 - Oxygen is released into the atmosphere✓
- *Compulsory mark + Any 3 (4)
- 2.4 - Provision of energy for all living organisms✓
 - Maintaining the correct balance of O₂ and CO₂ in the atmosphere✓
 - Releasing oxygen as a by-product✓ (2)
- (Mark first TWO ONLY)**
- (10)**

Activity 3

3

- 3.1 chloroplast✓ (1)
- 3.2 (a) granum ✓ / grana (1)
- (b) double membrane✓/outer membrane (1)
- 3.3 (a) h^+ atoms/ high energy hydrogen atoms✓ (1)
- (b) glucose✓
- 3.4 - source of h atoms✓
- and oxygen atoms✓
- h atoms to form carbohydrates✓
- oxygen atom to form oxygen as a gas✓ (4)
- 3.5 - other requirements for photosynthesis✓
- maybe in short supply✓

or

large increase in carbon dioxide makes the ph acidic✓ (2)

enzyme controlling the process is damaged✓ any 1 x 2 (14)

Activity 4

4

- 4.1 - light intensity✓
- environmental temperature✓
- carbon dioxide concentration✓ (2)
- (mark the first two only)**



- 4.2 - excess carbon dioxide will combine with water to form carbonic acid✓
- which causes the ph to decrease✓
- the enzymes of photosynthesis will become denatured✓
- causing the rate of photosynthesis to decrease✓
- or
- when the optimum amount of carbon dioxide is present photosynthesis will occur most rapidly✓
- if the carbon dioxide concentration is higher than the optimum amount, then photosynthesis will remain constant✓
- this is because the light independent phase✓ cannot take place more quickly than what it does at the optimum level of carbon dioxide concentration✓ (4)
- 4.3 - less chance of pests✓/ better control of pests / less water lost through evaporation.
- which increases crop yield✓ (2)
- (08)**

Activity 5

5

- 5.1 the light intensity✓ (1)
- 5.2 by counting the number of bubbles released per minute✓✓ (2)
- 5.3 oxygen✓ (1)
- 5.4
- temperature✓
 - the voltage of the bulb✓ / current
 - the amount of carbon dioxide✓
 - person counting the bubbles✓
 - plant species✓
 - the surface tension of water✓
 - the purity of water used✓ any (2)
- (mark the first two only)**
- 5.5 to increase the concentration of carbon dioxide in the water✓ (1)
- 5.6
- the glowing splint✓ burst into flame / glows brighter
 - which indicates that oxygen has been given off✓ by the plant. (2)

5.7 (a) $28 - 8 = 20$ ✓

$$\frac{20}{8} \times 100\% = 250\% \text{✓} \quad (3)$$

- (b)
- it enables farmer to adjust the light to its optimal level*✓
 - to increase the rate of photosynthesis✓
 - by increasing the rate of photosynthesis, the farmer can increase agricultural yield to its maximum✓

*compulsory mark + any 1 (2)

(14)

Activity 6

6

- 6.1 Chloroplast✓ (2)
- 6.2
- Grana contain chlorophyll✓
 - to trap sunlight✓
 - Has lamellae/thylakoids✓
 - that present a large surface area for absorption of sunlight✓
 - Double membrane is (selectively) permeable✓
 - allowing water and carbon dioxide to enter easily✓
 - Stroma contains enzymes/ribosomes✓
 - for photosynthesis ✓
 - Starch granule✓
 - for storage of starch✓ Any (2 x 2) (4)

(Mark the First TWO only)

- 6.3 (a) - Burning of coal ✓
 - Petroleum products ✓ (2)
(Mark first TWO only)
- (b) carbohydrates ✓ (1)
- 6.4 $\frac{4}{0.04}$ } ✓ = 100 ✓ (2)
(10)

Activity 7

7

- 7.1 Carbon dioxide concentration ✓ (in arbitrary units) (1)
- 7.2 - Duplicating the experiment with all variables kept the same ✓
 - Not including the pondweed and pond snail/independent variables ✓ (2)
- 7.3 - The amount of CO₂ released during cellular respiration ✓
 - is utilised by the pondweed during photosynthesis ✓ (2)
- 7.4 - Photosynthesis could no longer take place ✓
 - as no light was available ✓ (2)
- 7.5 - The environment was anoxic/lacked sufficient O₂ ✓*
 - For cellular respiration to occur ✓
 - The water became too acidic to support aquatic life ✓
(✓* plus any other ✓) (2)
- 7.6 - Photosynthesis and cellular respiration are complementary processes ✓ regulating CO₂ concentration in the environment. ✓

OR

-Photosynthesis removes carbon dioxide ✓ and produces oxygen. ✓

OR

-When there is no light, photosynthesis stops ✓ and carbon dioxide increases due to respiration. ✓

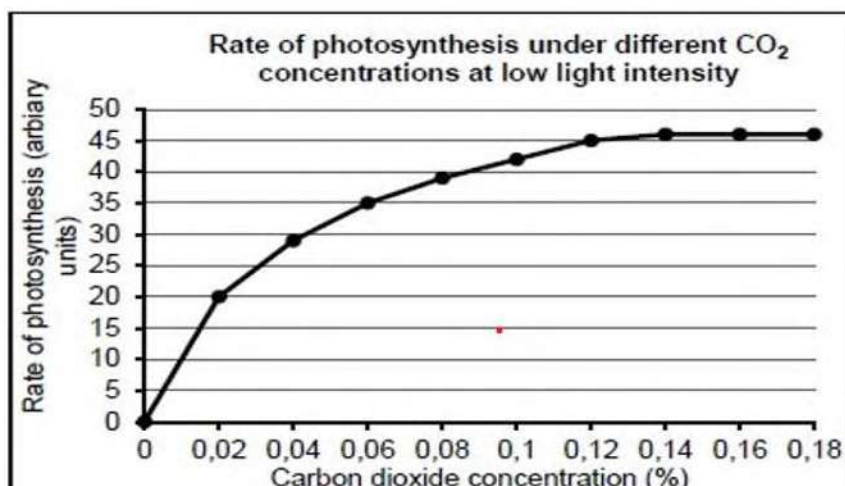
(2)
(11)

Activity 8

8

- 8.1 Rate of photosynthesis ✓ (1)
- 8.2 0.14% ✓ ✓ (2)
- 8.3 - Amount of water ✓
 - Temperature ✓
 - Light ✓ (Any 2) (2)
(Mark the first TWO only)

8.4



Criterion	Elaboration	Mark
Type of graph (T)	Bar graph drawn	1
Caption (C)	Includes both variables	1
Scale (S)	Appropriate scale for X and Y axis	1
Labelling of axis (L)	Correct labels and units of X and Y axis	1
Drawing of bars (P)	All bars drawn correctly - 2 marks	2
	1-5 bars drawn correctly - 1 marks	

(7)
(12)

Solutions

Topic: Cellular respiration

Activity 1

No.	Description	Biological Term
1.1	The organelle in which respiration takes place	Mitochondria✓
1.2	The type of anaerobic respiration that occurs in yeast cells	Alcoholic fermentation✓
1.3	The process during which glucose is converted into pyruvic acid	Glycolysis✓
1.4	The gas which is essential for the Krebs cycle to occur	Oxygen✓
1.5	The acid that accumulates in the muscles of humans during continuous strenuous physical activity	Lactic Acid✓
1.6	General energy carrier molecule in cells	ATP✓
1.7	A 6-carbon molecule that is broken down during cellular respiration to provide energy in living cells	Glucose✓
1.8	A micro-organism used in manufacturing beer and bread	Yeast✓
1.9	The phase of cellular respiration during which most ATP is formed	Oxidative phosphorylation✓
1.10	The type of respiration that occurs in the presence of oxygen	Aerobic respiration✓
		10x1 (10)

Activity 2

2

- 2.1 (a) Outer membrane✓ (1)
 (b) Oxygen✓ (1)
 (c) Pyruvic acid✓ (1)
- 2.2 (a) C ✓ Matrix ✓ (2)
 (b) D ✓ Cristae ✓ (2)
- 2.3 (a) Glycolysis ✓ (1)
 (b) Krebs cycle ✓ (1)
- 2.4 - Carbon dioxide ✓
 - Water ✓
 - Energy/ATP ✓
- Any (2)
- (Mark first TWO only)**

**(11)**

Activity 3

3

- 3.1 (a) A ✓ - Outer membrane✓ (2)
 (b) DNA✓ and Ribosome✓ (2)
 (c) Inner membrane is highly folded to form cristae✓ that increase the surface area for attachment of enzymes✓ (2)
 3.2 Glycolysis✓ (1)
(7)

Activity 4

4

- 4.1 Glucose + oxygen✓ → carbon dioxide + water + energy✓ (ATP) (2)
 4.2 - Glucose is broken down✓
 - into two pyruvic acid molecules✓
 - which are converted into lactic acid✓ (3)
 4.3 - The lactic acid is converted back into pyruvic acid ✓
 - Enough oxygen is supplied to the cell✓
 - for aerobic respiration to occur✓ (3)
 4.4 $12s \div 60s \times 8 \text{ litres} = 1,6 \text{ litres}$ (2)
(10)

Activity 5

5

- 5.1 - Glucose is broken down ✓
 -To form 2 pyruvic acid✓
 - Energy-rich hydrogen atoms (H⁺) are released✓
 - Some energy released is used to form 2 ATP molecules✓
 - Process is controlled by enzyme✓
 Any 4 (4)

5.2

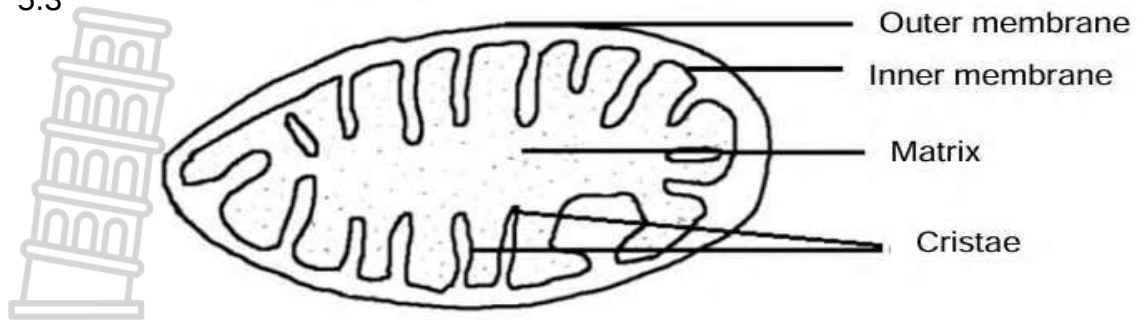
T✓*

Aerobic respiration	Anaerobic respiration
-38 / more ATP produced✓	-2 / less ATP produced✓
-CO ₂ and water are produced✓	-lactic acid is produced✓

(1* compulsory mark for the table + 4)

(5)

5.3



Structure of mitochondrion

Criteria for marking the diagram

Criteria	Mark allocation
Caption (C)	1
Labels (L)	3

(4)

(13)

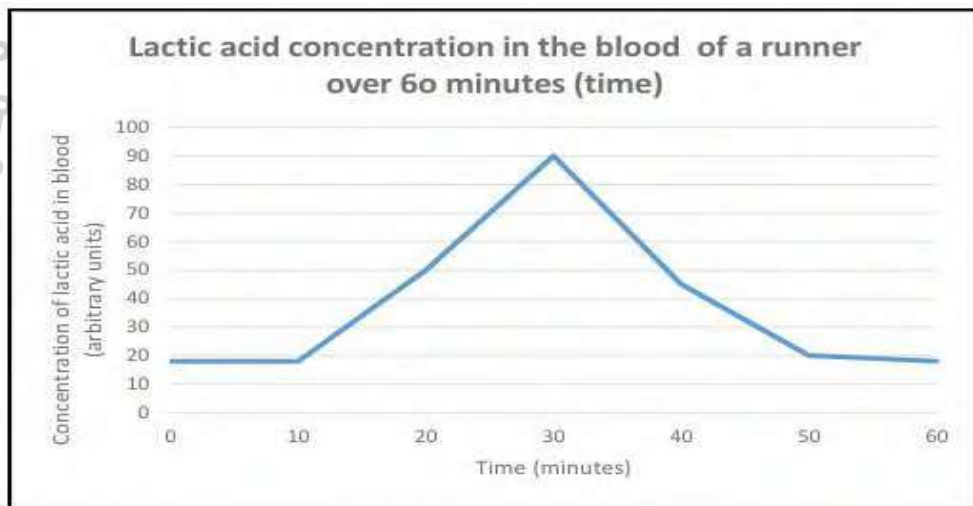
Activity 6

6

- 6.1 Anaerobic ✓ (1)
- 6.2 10 minutes ✓ (1)
- 6.3 % Decrease $(90 - 50 = 70)$ ✓ $70 \div 90 \times 100 = 77.7\%$ ✓ (3)



6.4



Rubric for marking graph

Correct type of graph (T)	1 mark
Correct caption (with the two variables) (C)	1 mark
Correct X and Y axis labels with units (A)	1 mark
Correct scale on both X and Y axis (S)	1 mark
Plotting (P)	1-4 correct points: 1 mark
	All 7 points correct: 2 marks

(6)

6.5

Anaerobic respiration	Aerobic Respiration
- Breaks down glucose in the absence of oxygen✓	- Breaks down glucose in the presence of oxygen✓
- Takes place in the cytosol only✓	- Takes place in the cytosol and in the mitochondria✓
- Produces less energy✓	- Produces more energy✓
- Glucose is broken down into alcohol or lactic acid and CO ₂ ✓	- Glucose is completely broken down into water and CO ₂ ✓
- The alcohol/lactic acid formed accumulates & becomes poisonous✓	- The CO ₂ and water produced can be excreted✓

Mark the first ONE only

(2)

(13)

Activity 7

7

- 7.1 (a) The brew temperature is only slight higher than the room temperature ✓✓ (2)
- (b) The brew temperature changes only very slightly within narrow limits over time ✓✓ (2)
- 7.2 - the decrease in pH was the results of an increase in CO_2 ✓, - which was converted to an acid ✓ (2)
- 7.3 12hours ✓ (1)
- 7.4 During the process of fermentation/ brewing, the yeast produces energy in the form of heat ✓ within the brew container, thus increasing the temperature ✓ (2)
- (9)**

Activity 8

8

- 8.1 To prevent any CO_2 from entering or leaving the test tube ✓ so that the results cannot be influenced. ✓ (2)
- 8.2 - will be Purple ✓ The leaf photosynthesises and the CO_2 are -absorbed which leads to low CO_2 concentration ✓
-B will be yellow ✓ due to the insects that respire and release CO_2 thus -more CO_2 will be present in the test tube ✓ (4)

8.3

✓ Table

Photosynthesis	Respiration
Occurs in the plant cells ✓	Occurs in all living cells ✓
Occurs only in the presence of light ✓	Occurs day and night ✓
Uses carbon dioxide and water ✓	Uses oxygen and glucose ✓
Oxygen is released as a product ✓	Carbo dioxide is released as product ✓
Food/Glucose is manufactured ✓	Food/ Glucose is broken down ✓
Occurs in a chloroplast ✓	Occurs in the Mitochondria ✓

(7)

(13)

Activity 9

9

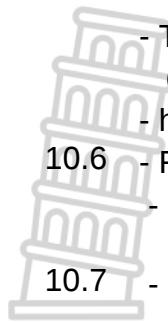
- 9.1 (a) 20 ✓ Brix (1)
 (b) 7% ✓ (1)
 9.2 Carbon dioxide ✓ (1)
 9.3 - During fermentation process, the lactic acid bacteria creates an acid medium ✓ (produce lactic acid while breaking down sugar)
 - favourable for the multiplication/ breeding of yeast cells ✓
 - The yeast produces vitamins and increase other nutritional components such as amino acids ✓
 - for the growth of lactic acid bacteria ✓ (4 x 1) (4)
 9.4 $17 - 7 = 10$ ✓ $10 / 17 \times 100 = 58,82$ ✓% (3)
 9.5 The completion of fermentation is indicated by the levelling of the sugar concentration ✓ (Brix level) (1)
 9.6 - The micro-organisms/lactic acid bacteria and yeast derive energy ✓
 - from the decomposition of sugar ✓ in the banana juice and sorghum mix
 - As fermentation progresses, more sugar will be broken down ✓ and this will lead to the decrease in the sugar content (3)
(14)

Activity 10

10

- 10.1 Carbon dioxide ✓ (1)
 10.2 The clear lime water turns milky white in the presence of carbon dioxide ✓ (1)
 10.3 - Germinating seeds are actively growing plant parts ✓
 - therefore, the rate of respiration is higher ✓ than in any other parts of the plant
 - since more energy is ✓ required for the active growth process (Any 2) (2)
 10.4 - No cellular respiration takes place in the dead seeds ✓
 - as a result, no carbon dioxide is released ✓ therefore, clear lime water remains clear ✓ (Any 2) (2)
 10.5 - There are spaces between the fibres of the cotton plug ✓ / gases can diffuse through cotton wool - allows the downward movement of carbon dioxide ✓

OR



- The rubber block does not allow the downward movement of carbon dioxide ✓ (2)
 - hence no result would be obtained ✓
 - 10.6 - Repeat the experiment several times ✓
 - use more seeds✓ / increase sample size (Any 1) (1)
 - 10.7 - Some of the cells in the seeds may contain chloroplasts✓ and therefore
 - they perform photosynthesis ✓
 - and disrupt the end result ✓ (Any 1) (1)
 - 10.8 - Temperature ✓
 - Light ✓ (2)
- (12)**



Solutions

Topic: Animal Nutrition

Activity 1

No.	Description	Biological Term
1.1	The round ball of food pushed down the oesophagus during swallowing	Bolus ✓
1.2	An automatic wave of muscle contraction and relaxation that moves food in one direction through the digestive tract	Peristalsis ✓
1.3	A protein that acts as a catalyst to regulate or speed up most biochemical reactions in living cells	Enzymes ✓
1.4	Specialized cells in the pancreas that secrete insulin and glucagon	Islets of Langerhans ✓
1.5	The ability of an organism to maintain a constant internal environment within narrow limits regardless of the changes in the internal or external environment	Homeostasis ✓
1.6	A disorder characterised by high glucose levels resulting in increased fatigue, dehydration and lack of energy	Diabetes Mellitus ✓
1.7	The physical and chemical breakdown of food into its simplest form	Digestion ✓
1.8	Ductless glands which secrete their secretions directly into the bloodstream	Endocrine ✓
1.9	Tiny finger-like projections lining the wall of the small intestine and increasing the surface area for food absorption	Villus/Villi ✓
1.10	The group of animals that feed on both plant and animal matter	Omnivore ✓
1.11	The removal of undigested food from the body	Egestion ✓
1.12	A process in nutrition whereby absorbed nutrients are taken up by the cells	Assimilation ✓
1.13	The process whereby the products of digestion are diffuse into the bloodstream	Absorption ✓
1.14	The part of the soft palate which closes the opening to the nasal cavity when swallowing	Epiglottis ✓
1.15	The arrangement, type, and number of the teeth in an organism's mouth	Dentition ✓
1.16	A fluid produced by the liver and stored in the gall bladder that aids the digestion of lipids in the small intestine	Bile ✓
		16x1 (16)

Activity 2

2

2.1

- (a) Stomach ✓ (1)
- (b) Anus ✓ (1)
- (c) Large intestine ✓ (1)
- (d) Gall bladder ✓ (1)
- (e) Salivary gland ✓ (1)

2.2

- (a) C ✓ - Pancreas ✓ (2)
- (b) A ✓ - Mouth ✓ (2)
- (c) H ✓ - Oesophagus ✓ (2)

- 2.3
- Part **D**/ the small intestine is very long ✓ to ensure that food remains in the alimentary canal for a long time for maximum absorption. ✓
 - The millions of villi/microvilli ✓ in the small intestine/ part **D** increase surface area for maximum absorption ✓
 - The lacteal and capillaries ✓ transport absorbed food away quickly ✓
 - The columnar epithelial cells ✓ have a high concentration of mitochondria ✓ to provide energy for active absorption of food ✓
- (Any 2 X 2) (4)

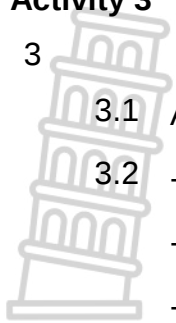
(Mark the first TWO only)

- 2.4 Part **C**/ pancreas is regarded as an exocrine gland because it secretes pancreatic juice containing digestive enzymes into ducts. ✓ It also secretes hormones / insulin and glucagon into the blood vessels making it an endocrine gland ✓ (2)
- 2.5 Part **G**/ Gall bladder stores bile ✓ which aids in the emulsification of fats ✓ (2)

(19)

Activity 3

3



3.1 A ✓ (1)

3.2 - Large pointed canines✓
- Molars and premolars are also pointed✓
- Small diastema✓ (2)

3.3 (a) 8 ✓- Incisors✓ (2)

(b) 32✓ (1)

(c) They do not have canines✓ which are used for tearing meat✓ (2)

(8)

Activity 4

4

4.1 Villus ✓ (1)

4.2 Small intestine ✓ (1)

4.3 (a) Goblet cell ✓ (1)

(b) Lacteal ✓ (1)

4.4 - produces mucus ✓ (2)

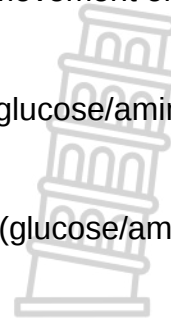
- to keep the intestinal walls moist✓/ assist in movement of food over villus

4.5 - Y contains high concentration of nutrients✓(glucose/amino acids) (2)

- X contains a low concentration of nutrients✓(glucose/amino acids)

4.6 - Villi is a finger-like projection ✓which provides large surface area for maximum absorption✓

- transport system/ lacteal & capillary network is present✓, to





- transport absorbed nutrients away from the intestine✓
 - Single layer of columnar epithelium lines the villus✓, providing a thin surface for diffusion of nutrients ✓
 - Columnar epithelium have microvilli✓, increasing surface area (4) for absorption✓ Any (2 X 2)
- (Mark the first TWO only)**

(12)

Activity 5

5

- 5.1 Identify the:
- (a) Rate of digestion✓ (1)
 - (b) By determining bowel transit time✓ (1)

- 5.2 - to ensure that foods already in the colon✓
- are digested before the investigation✓

OR

- to ensure that there is no food in the colon✓
- before the investigation✓ (2)

- 5.3 - Participants were all teenage boys✓
- All boys have no health conditions✓
- All boys fasted 8 hours before the investigation✓
- Same plate size food given✓
- Each drank 500ml of water✓
- All did not engage in physical activities after the meals✓ (3)

(Mark the first THREE only)

- 5.4 Average bowel transit time was calculated in each group✓ (1)
- 5.5 $\frac{196}{28} = 7$ times✓ (3)
- 5.6 - Investigation will not be valid✓

- Physical activities needs more energy✓/ rate of digestion will be (2)



Increased

5.7 - Cheese has highest rate of digestion✓✓

OR

- Fruits have lowest rate of digestion✓✓

(2)

(15)

Activity 6

6

6.1 - Adding 100 ml of skim milk to 30g of cereal increases the nutritional value of the meal✓✓

OR

- The value of all the nutrients and energy increases✓, except dietary fibre because milk does not contain fibre✓ (2)

6.2 $572 - 430✓ = 142✓\text{kJ}$ (2)

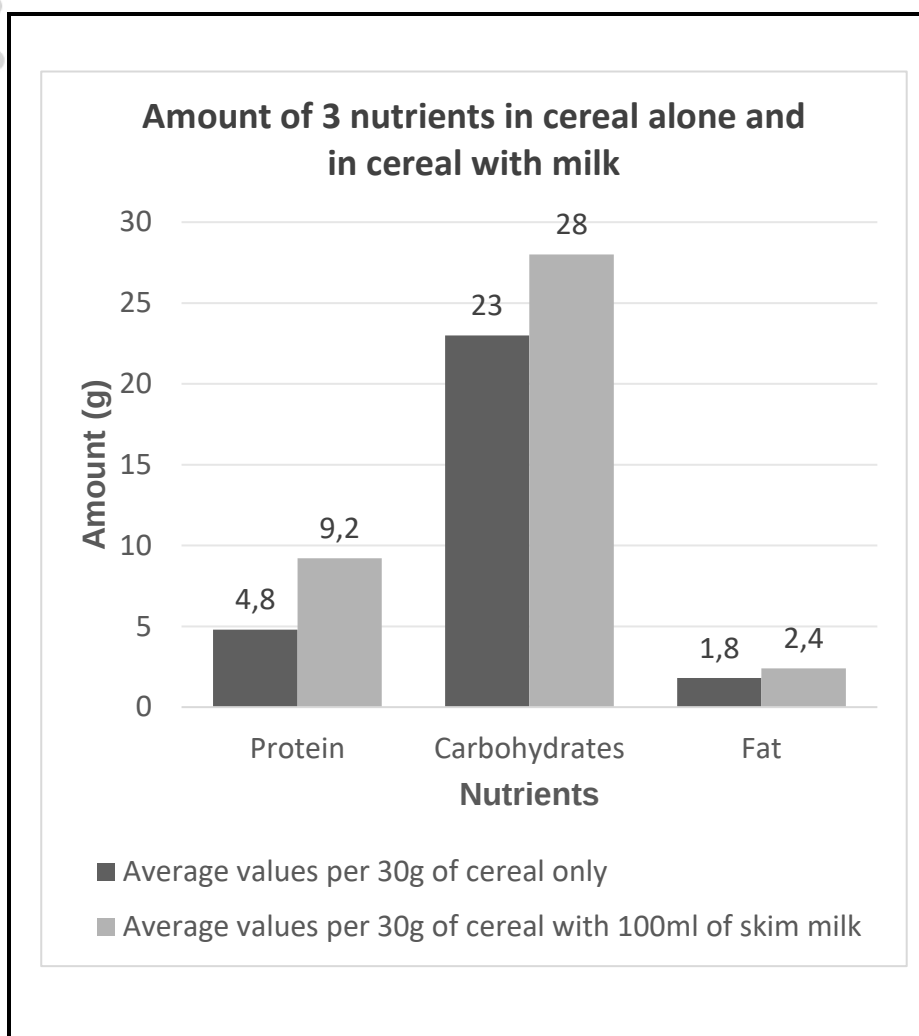
6.3 - Adds bulk to the faeces ✓

- Enhances peristalsis✓

- Stretches colon walls to ensure defecation✓

- Absorbs water to keep faeces moist✓/Prevents faeces from becoming dry and hard✓ (Any 2) (2)





(6)

Criterion	Elaboration	Mark
Type of graph (T)	Bar graph drawn	1
Caption (C)	Includes both variables	1
Scale (S)	Appropriate scale for X and Y axis	1
Labelling of axis (L)	Correct labels and units of X and Y axis	1
Drawing of bars (P)	All bars drawn correctly - 2 marks	2
	1-5 bars drawn correctly - 1 marks	

(12)

Activity 7

7

7.1 Ice cream ✓

(1)

7.2 - Carbohydrates✓

(2)

- Fats✓

7.3 $\frac{5\ 000}{15\ 000} \times 100 = 33\%$ ✓

(3)

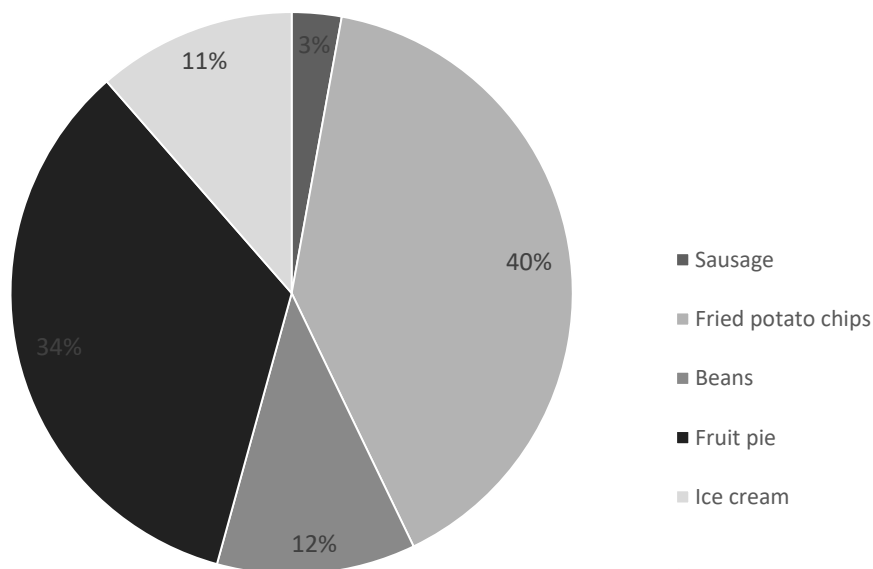
7.4 - The learner would become obese/ overweight✓

- due to excess nutrients✓/ energy if not doing any exercises.

(2)

7.5

Pie chart showing carbohydrates obtained from different food types eaten by a Grade 11 learner



Criterion	Mark allocation
Type of graph (T)	1
Caption (C)	1
Calculations (CA)	All correct: 2 marks
	1-3 correct: 1 mark
Accuracy of pie sizes (P)	All correct: 2 marks
	1-3 correct: 1 mark

(6)

(14)

Activity 8

8

- 8.1 Pancreas ✓ (1)
- 8.2 The glucose is the source of energy ✓ as it is oxidised (broken down) during cellular respiration (1)
- 8.3
- When a person develops insulin resistance,
 - the body cells become incapable of using insulin effectively ✓ / unable to absorb sufficient amounts of glucose ✓
 - this leads to an increase in the level of glucose in the blood ✓
 - which stimulates the pancreas to secrete extra insulin ✓
 - to enable the cells to absorb sufficient amounts of glucose ✓
 - over a period of time, the pancreas's ability to secrete extra insulin begins to decrease ✓
 - which leads to the development of type 2 diabetes (Any 4) (4)
- 8.4
- The glucose level in the blood increases above the normal levels
 - the pancreas is stimulated ✓
 - to secrete insulin ✓ in the blood
 - Insulin travels in the blood to the liver ✓
 - where it stimulates the conversion of excess glucose to glycogen ✓ which is then stored
 - The glucose level in the blood now decreases ✓ and returns to normal (Any 4) (4)
- (10)

Activity 9

9

- 9.1 Blood glucose level increases ✓ (1)
- 9.2 100 (mg/dl) ✓ (1)
- 9.3

Eating fewer large meals	Eating many small meals
Insulin peaks are higher ✓	Insulin peaks are lower ✓
Insulin is released less often ✓	Insulin is released more often ✓

✓ Table (5)

- 9.4
- A diabetic may not produce sufficient insulin ✓
 - when eating many smaller meals, less glucose ✓ enters the blood
 - less insulin ✓ is needed
 - to return blood glucose to normal ✓

OR



- A diabetic may not produce sufficient insulin✓
- when eating fewer larger meals, more glucose✓ enters the blood
- more insulin✓ is needed
- to return blood glucose to normal✓

(4)
(11)

Activity 10

10

10.1

- (a) Palate ✓ (1)
- (b) Peristalsis ✓ (1)
- (c) Circular ✓ and longitudinal ✓ muscles (2)

- 10.2 - During swallowing, the bolus is pushed down into the pharynx✓ and
- this stimulates the closure of the glottis by epiglottis clocking the flow
of food into part D✓ (2)

- 10.3 - The incomplete portion of the C-shaped cartilages of the trachea is
in contact with the oesophagus✓
- this allows the oesophagus to stretch and bulge into the trachea
preventing the oesophagus from becoming blocked✓/prevents
choking (2)

- 10.4 - The bacterial infection causes inflammation of the vocal cords✓
- therefore, vocal cords will not be able to vibrate freely✓ and
- no sound can be produced✓ (Any 2 x 1) (2)

- 10.5 - Oxygen will not reach the lungs ✓
- Oxygen concentration drops in the blood ✓
- Oxygen will not be made available for cellular respiration ✓
- The energy production stops ✓
- therefore, all vital organs will stop functioning ✓

OR

- CO₂ will not be removed /exhaled from the lungs ✓
 - CO₂ concentration in the blood remains high ✓
 - Blood pH drops/ blood becomes very acidic ✓
 - Enzymes becomes functionless ✓
 - therefore, all vital metabolic processes will stop ✓ (Any 4 x 1) (4)
- (14)



Activity 11

11

11.1 - Digestion ✓*

- Proteases ✓

(2)

11.2 Stomach✓

(1)

11.3 Assimilation✓

(1)

11.4 Egestion✓*

- Undigested materials and waste products are transported through the colon✓ where most water and mineral salts are absorbed✓

- Undigested material is temporarily stored in the rectum ✓until it is excreted through the anus ✓

(* COMPULSORY + Any other two)

(3)

11.5 (a) Breaking of larger food pieces into smaller pieces ✓making it easier to swallow increases the surface area of the food so that digestive enzymes can work more effectively.✓

(2)

(b) - Bread contains starch.✓

(2)

- During chewing, an enzyme in saliva called amylase breaks down starch✓into sugar (maltose),✓which tastes sweet.

(11)

Activity 12

12

12.1

(a) Liver ✓

(1)

(b) Pancreas ✓

(1)

(c) Insulin ✓

(1)

12.2 Diabetes mellitus✓

(1)

12.3 - Do not have ducts✓

- secretes hormones✓/insulin and glucagon

- directly into the blood□✓

(3)

12.4 - It is stimulated to convert glycogen back into glucose✓

(2)

- It is stimulated to convert excess glucose into glycogen ✓

(9)

Solutions

Topic: Gaseous Exchange

Activity 1

No.	Description	Biological Term
1.1	Process of taking air into and expelling it from the lungs	Breathing ✓
1.2	The control centre that is activated when carbon dioxide levels increase in the blood	Medulla Oblongata ✓
1.3	The maximum number of individual an environment can support in a specific season.	Haemoglobin ✓
1.4	The tissue lining the inner walls of an alveolus	Squamous epithelium ✓
1.5	Double membrane surrounding the lungs	Pleura ✓
1.6	Type of tissue that lines the nasal passages	Ciliated columnar ✓
1.7	The cartilaginous, leaf-shaped structure which covers the opening of the trachea	Epiglottis ✓
1.8	The tissue making up the rings that surround the trachea	Cartilage ✓
1.9	The part of brain that controls the breathing rate	Medulla oblongata ✓
1.10	The structure of respiratory system that contracts and flattens altering the volume of the chest cavity and is important in the breathing.	Intercostal muscles
		10x1 (10)

Activity 2

2

- 2.1 (a) Inhalation ✓ (1)
- (b) Exhalation ✓ (1)
- (c) Diaphragm ✓ (1)
- 2.2 (a) Lifted ✓ (1)
- (b) Lowered ✓ (1)
- (5)**

Activity 3

3

- 3.1 (a) Trachea ✓ (1)
- (b) Alveolus ✓ (1)
- 3.2 - Diaphragm ✓ relaxes and become arched ✓ / Diaphragm relaxes pushing air/ CO₂
- External intercostal muscles ✓ relaxes to lower the rib cage ✓

- This decreases the volume of the thoracic cavity✓
 (Mark first FOUR only Any (4)
 3.3 - surface area available for gaseous exchange is reduced✓/ blockage
 of air-passage by tumours
 - leading to less/no oxygen entering the blood✓
 - less /no oxygen reaching tissues /heart muscles✓
 - More carbon dioxide being trapped✓/not exhaled which dissolve in
 water forming carbonic acid✓ resulting in heart failure✓
 (Mark first THREE only Any (3)
 (9)

Activity 4

- 4
 4.1 (a) Oxygen ✓ (1)
 (b) Diffusion ✓ (1)
 4.2 (a) A ✓ – (Pulmonary) arteriole ✓ (2)
 (b) D ✓ – Erythrocyte ✓ / Red blood cell (2)
 (c) B ✓ – (Pulmonary) venule ✓ (2)
 4.3 (a) Squamous ✓ epithelium (1)
 (b) Endothelium ✓ (1)
 (10)

Activity 5

- 5
 5.1 - The body's ability to maintain a stable internal environment ✓ (2)
 - despite changes in the external environment ✓✓
 5.2 (a) Chemoreceptors of the carotid artery (1)
 (b) Intercostal muscles, ✓ diaphragm ✓ (respiratory muscles ✓),
 heart ✓ (2)
 5.3 - The blood becomes increasingly acidic ✓/cell death (2)
 - Less aerobic respiration can take place ✓ /no ATP created (2)
 (7)

Activity 6

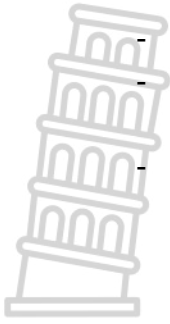
6

- 6.1 Diffusion ✓ (1)
- 6.2 - Mucus layer present inside the alveolus ✓ *
- Allowing for O₂ and CO₂ to be dissolved as diffusion occurs ✓
- Alveolus is only one squamous epithelium layer thick ✓* Promoting easy diffusion into/out of the wall of the alveolus ✓
- Blood capillary is only one cell layer thick ✓* Promoting easy diffusion into/out the wall of the alveolus ✓
- Richly supplied with blood vessel(s) ✓ *
- Allowing for efficient gaseous exchange (of CO₂ and O₂) to occur
(**ANY TWO** ✓* **with corresponding reasoning** ✓ (2 x 2) (4)
- 6.3 - As oxyhaemoglobin ✓
- Dissolved within blood plasma ✓ (2)
- 6.4 - Blood would move into the lung/alveoli ✓
- Limiting/preventing efficient gaseous exchange ✓
- Pressure would no longer be effectively regulated/ Lung will collapse ✓ Impeding the processes of inhalation and exhalation as pressure is required to pull air into the lung/force air out ✓
- Lung tissue/alveoli/ bronchioles would be damaged
- ✓Limiting/preventing gas pathways through the lung ✓
- (5)
- (12)**

Activity 7

7

- 7.1 Carbon dioxide ✓ (1)
- 7.2 - Bicarbonate ions ✓
- In solution in the blood plasma ✓
- Carbaminohemoglobin ✓ (Any 2x1) (2)
- (Mark first TWO only)**
- 7.3 Pulmonary vein ✓ (1)
- 7.4 The direction of arrow indicates the outward flow of blood ✓ (1)
- 7.5 - The red blood cells/ erythrocytes contain haemoglobin ✓ for the transportation of oxygen to the tissues and carbon dioxide from the tissues. ✓
- Red blood cells/erythrocytes are biconcave discs ✓ to increase the surface area for the maximum absorption of oxygen ✓
- (Mark first TWO only)** (2 X 2) (4)
- 7.6 - The heater warms the air and removes the moisture from the air ✓/ humidity in the room



- The person sleeping in the room will continuously inhale dry air ✓
- causing the lungs (the moist lining of alveoli) to become dry ✓ and
- this prevents diffusion of gases between the atmospheric air and the blood in the alveolar capillaries ✓
- the low concentration of oxygen / high concentration of carbon dioxide in the blood stops metabolic processes in the cell/tissues causing possible death ✓

Any 3

(3)
(12)

Activity 8

8

- 8.1 Oxygen has been used by body cells for cellular respiration ✓

(Mark the first ONE only)

(1)

- 8.2 $4\% - 0,04\% \checkmark = 3,96\% \checkmark$

(2)

- 8.3
- Receptors in the carotid artery are stimulated ✓ and
 - impulses are sent to the medulla oblongata ✓
 - stimulating the heart to beat faster ✓
 - The breathing muscles (intercostal muscles and diaphragm) contract more actively ✓
 - more carbon dioxide is taken to the lungs ✓
 - And the rate/ depth of breathing increases ✓
 - More carbon dioxide is exhaled ✓
 - The carbon dioxide level in the blood decreases ✓ / returns to normal

(Any)

(5)
(8)

Activity 9

9

9.1

- (a) Diaphragm ✓
- (b) Intercostal muscles ✓ / external and internal intercostal muscles

(1)

(1)

9.2 Diagram 2 ✓

(1)

- 9.3
- The diaphragm is relaxed and therefore restores its original dome shape ✓
 - Size of thoracic/chest cavity is substantially reduced ✓
 - Size of the lungs became smaller ✓

(Mark first TWO only)

(Any 2 x (2))

1)

- 9.4 A ✓ & B ✓

(2)

- 9.5 (a) - The accumulation of fluids and mucus in the alveoli drastically reduces the rate of gaseous exchange ✓



- This causes an increase in the carbon dioxide level and drop in the oxygen level in the blood ✓
 - The high level of carbon dioxide stimulates medulla oblongata ✓
 - to send impulses to breathing muscles ✓ and heart muscles ✓
 - causing an increase in the rate and depth of breathing and rate of heart beat ✓
 - in an attempt to restore carbon dioxide/oxygen balance in the blood ✓ (Any 4 x 1) (4)
 - (b) - Reduced rate of gaseous exchange ✓ due to pneumonia
 - leads to a steady drop in oxygen in the blood ✓
 - hence active pumping of oxygen is required to raise the level of oxygen in the blood ✓
 - to maintain the optimal rate of cellular metabolism ✓ (e.g., cellular respiration)
 - to generate energy for the proper functioning of vital organs to maintain life ✓ (Any 4 x 1) (4)
- (15)**

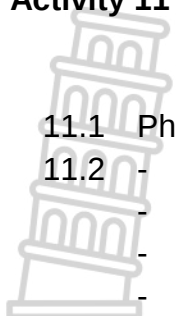
Activity 10

- 10.1 (a) Wearing of a facemask ✓ (1)
- (b) Carbon dioxide level in the blood ✓ (1)
- 10.3 150 volunteers were used ✓ (1)
- (Mark first ONE only)**
- 10.2 - To act as a control ✓/baseline
- To see if it is the facemask that affects the carbon dioxide levels and not the physical activity ✓ (Any 1) (1)
- 10.3 - Receptors in the carotid artery are stimulated ✓ and
- impulses are sent to the medulla oblongata ✓
 - The medulla oblongata stimulates the heart ✓
 - to beat faster ✓ causing
 - more carbon dioxide to be taken to the lungs ✓
 - The breathing muscles/intercostal muscles and diaphragm
 - contract more actively ✓ and
 - the rate/ depth of breathing increases ✓
 - More carbon dioxide is exhaled ✓
 - The carbon dioxide level in the blood decreases ✓/returns to normal (Any 5) (5)
- (9)**



Activity 11

11

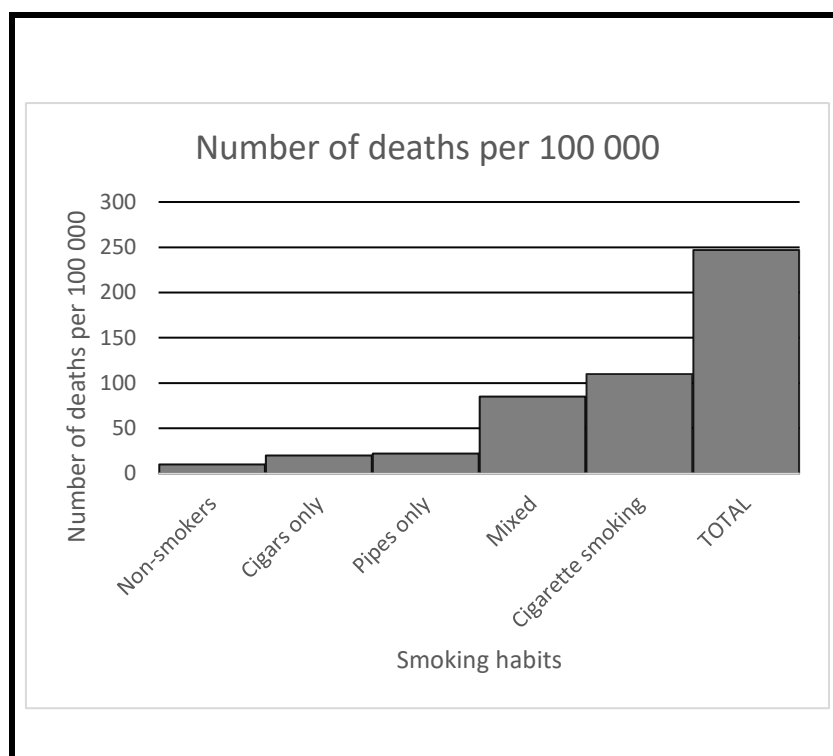
- 
- 11.1 Physical activity ✓ (1)
- 11.2 - Asked learners permission ✓
 - Decide on the type of physical activities ✓
 - Decide how to measure the heart rate and breathing rate ✓
 - Decide on how to record the result of the investigation ✓
 - Decide the venue ✓
(Mark first TWO only) (Any) (2)
- 11.3 - Learners are same age ✓
 - Learners walked same distance ✓ / 5 km
(Mark first ONE only) (Any) (1)
- 11.4 The learners breathing rate increases ✓ (1)
- 11.5 Enables more carbon dioxide to be removed out of the body quickly ✓✓/exhaled (2)
- 11.6 $120 - 71 = 49$ beats per minute ✓ (2)
- 11.7 Physical activities increase heart rate and breathing rate ✓✓ (2)
- (11)**



Activity 12

12

12.1



(06)



Solutions

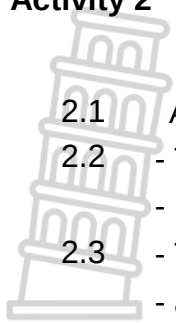
Topic: Excretion

Activity 1

No.	Description	Biological Term
1.1	Part that stores urine temporarily.	Bladder ✓
1.2	Blood vessel that transport blood containing metabolic waste products directly into the kidney.	Renal artery ✓
1.3	The removal of metabolic waste products from living organisms	Excretion ✓
1.4	The structural and functional unit of the human kidney	Nephron ✓
1.5	A network of capillary blood vessels inside Bowman's capsule.	Glomerulus ✓
1.6	Tube that transports urine from the bladder to outside.	Urethra ✓
1.7	Blood vessel that carries purified deoxygenated blood away from the kidney.	Renal vein ✓
1.8	The control of water content and salt balances in the blood and tissue fluid.	Osmoregulation ✓
1.9	The hormone secreted by the adrenal gland to regulate the salt concentration of the blood.	Aldosterone ✓
1.10	The hormone secreted by the pituitary gland to regulate water levels in the blood.	ADH ✓
1.11	The functional and structural unit of the human kidney	Nephron
1.12	The control of water content and salt balances in the blood and tissue fluid	Homeostasis
1.13	Specialised cells with filtration slits found lining Bowman's capsule.	Podocytes
1.14	A network of capillary blood vessels inside Bowman's capsule.	Glomerulus/Capillary
1.15	Tube that transports urine from the bladder to outside the body.	Urethra
1.16	The blood vessel that carries oxygenated blood filled with waste to the kidney.	Renal artery
1.17	Tube that transports metabolic waste from the kidney to the bladder.	Ureter
1.18	Glands that secrete hormones	Endocrine gland
1.19	Control centre for water in the blood	Hypothalamus
1.20	Control centre for salt	Adrenal gland
		10x1 (20)

Activity 2

2



- 2.1 A condition characterised by excess sodium in the blood ✓ (1)
- 2.2 - Too much water loss ✓ (2)
- High intake of salt ✓ / sodium (2)
- 2.3 - The high concentration of sodium ✓ creates
- a steeper concentration gradient ✓
- which leads to the passive absorption of water ✓
- from the collecting tubule into the surrounding tissue fluid ✓
- surrounding the cells at the medulla region (Any 3 x 1) (3)
- 2.4 - The lower level of sodium in the blood stimulates
the adrenal gland ✓ to secrete and release
- more aldosterone into the blood ✓
- which causes the reabsorption of more sodium by the capillaries ✓
- at the distal and collecting tubules ✓ / less sodium ions are
excreted
- from the kidneys ✓
- Sodium ions are reabsorbed until its level in the blood returns to
normal ✓ (Any 4 x 1) (4)
- 2.5 - The diarrhoea and vomiting leads to excessive loss of water and
salts ✓
- drops the level of water in the blood ✓ / causes dehydration that
- stimulates the hypothalamus ✓ / pituitary gland to release
more ADH into the blood. (Any 2 x 1) (2)
- (12)**

Activity 3

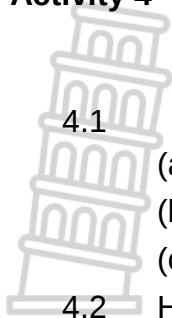
3

- 3.1 (a) Malpighian body ✓ (1)
- (b) Podocyte cell ✓ / Bowman's capsule (1)
- 3.2 Glomerular filtration ✓ / Ultra-filtration (1)
- 3.3 F ✓ - Bowman's capsule ✓ (2)
- 3.4 - Allows blood to be under high pressure ✓
- for substances to be forced out of the glomerulus ✓ (2)
- (7)**



Activity 4

4



4.1

- (a) **B✓** (1)
- (b) **D✓** (1)
- (c) **C✓** (1)

4.2

Higher concentration (%) of urea is excreted by the kidney from structure **D** into structure **B** ✓✓

OR

all the glucose and amino acids is reabsorbed into structure **D** after filtration by the kidney

OR

there are not proteins that are filtered by the kidney from structure **A** into structure **B** any 1 x 2 (2)

4.3

- No ✓
- since no glucose is excreted ✓ by the kidney/ all the glucose is reabsorbed ✓ any 2 (2)

4.4

- glucose, amino acids and proteins ✓
 - because they are not present in structure **B** ✓ / glucose and amino acids are all reabsorbed back into the blood in structure **C** (2)
- (9)**

Activity 5

5

- 5.1 - Urea is added to the filtrate from the blood in the second capillary network ✓ (2)
- during tubular excretion ✓

5.2

Percentage of salt re-absorbed =

$$= \frac{500\text{g} - 15\text{g} \checkmark}{500\text{g}} \times 100 \checkmark$$

OR

$$\frac{485 \checkmark}{500\text{g}} \times 100 \checkmark$$

$$= 97\% \checkmark$$

(3)

5.3

All the glucose was re-absorbed into the blood at the proximal convoluted tubule ✓ (1)

5.4

ADH ✓

- When the water levels in the blood drop below normal:





Activity 6

6

6.1

- more ADH is secreted causing the walls of the collecting tubules to be more permeable to water ✓ (2)
- (8)

(a) ADH ✓ (1)

(a) Aldosterone ✓ (1)

6.2 - Higher levels of ADH ✓ increases the permeability of the renal tubules ✓ (2)

- more water is reabsorbed into the surrounding blood capillaries ✓

6.3 Diagram 3 ✓ (1)

6.4 - salt level in the blood is high ✓ (4)

- the adrenal gland ✓ secrete less aldosterone ✓

- the renal tubules become less permeable ✓

- less salt is reabsorbed ✓

- salt level will go back to normal ✓ (4)

(8)

Activity 7

7

7.1 - Glomerulus ✓ /capillary network (3)

- Proximal convoluted tubule ✓

- Collecting duct ✓

7.2 (a) B ✓ – proximal convoluted tubule ✓ /C – distal convoluted tubule. Any 1 x 2 (2)

(b) A ✓ – capillary network ✓ /glomerulus. (2)

(c) B ✓ – proximal convoluted tubule ✓ /C – distal convoluted tubule. Any 1 x 2 (2)

7.4

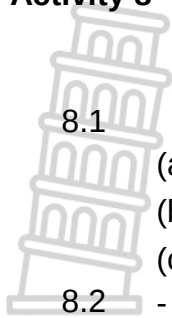
Blood in A	Blood in F
- Has high concentration of urea or uric acid ✓	- Has low concentration of urea ✓
- Contain high concentration of glucose ✓ / amino acids	- No glucose ✓ /amino acids present

Table ✓ + (2 x 2) (5)

(14)

Activity 8

8



8.1

- (a) A ✓ (1)
- (b) C ✓ (1)
- (c) D ✓ (1)

8.2

- increased concentration of solutes in the blood ✓ causing blockage in the glomerulus ✓ .
- ultra-filtration cannot occur ✓ Any 2 (2)

8.3

- drinking a lot of water ✓
 - reduce intake of solutes ✓ /salt and sugar
 - avoid drug abuse ✓ /such as painkillers. Any 2 (2)
- (8)**

Activity 9

9

9.1

- (a) Kidney ✓ (1)
- (b) Bladder ✓ (1)

9.2

- A carries high concentration of metabolic waste ✓
- D carries low concentration of metabolic waste ✓ (2)

9.3

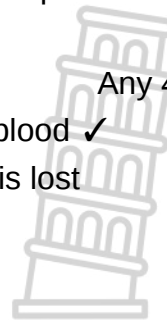
- A ✓ (1)

9.4

- more aldosterone ✓
- is secreted by the adrenal gland ✓
- permeability of the tubules increases ✓
- more salt is reabsorbed in the surrounding blood capillaries ✓
- salt level in blood increases ✓
- returns to balance ✓ Any 4 (4)

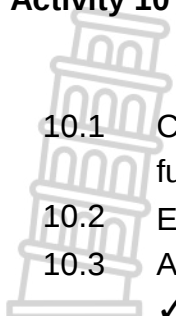
9.5

- an athlete experiences lower water levels in the blood ✓
 - as a result of excessive sweating ✓ /more water is lost
 - the hypothalamus is stimulated ✓
 - the pituitary gland secrete more ADH ✓
 - ADH makes the tubules to be more permeable ✓
 - more water is reabsorbed into surrounding blood vessels ✓
 - water levels increases and returns to normal ✓ Any 5 (5)
- (14)**



Activity 10

10

- 
- 10.1 Condition whereby the kidney is damaged such that they no longer function properly. ✓ (1)
- 10.2 Excretion ✓ (1)
- 10.3 Allows smaller particles in the blood to filter through the membrane ✓, while larger particles not allowed ✓ (2)
- 10.4 - to pump blood into the dialysis machine ✓ (1)
- 10.5 - blood is pumped at higher pressure into the dialysis membrane ✓
- Dialysis membrane enables separation of molecules by size ✓, the smaller molecules diffusing through ✓
- filtered blood then returns back into the human body ✓ Any 3 (3)
- 10.6 - glomerular filtration ✓
- tubular reabsorption ✓. Any 2 (2)
- (10)**



Solutions

Topic: Population ecology

Activity 1

No.	Description	Biological Term
1.1	An organism that captures and kills another organism for food	Predator ✓
1.2	A direct method whereby all individuals in a human population are counted	Census ✓
1.3	A group of organisms of same species living in same habitat at the same time.	Population ✓
1.4	A community interaction where the competing species coexist in the same habitat since they use the resources in slightly different.	Resource partitioning ✓
1.5	Plant and animal species that remain stable in their environment	Climax species ✓
1.6	Factors that will exert an influence on a population regardless of its size	Density-independent factors ✓
1.7	A process of initial colonisation of land in a previously disturbed area	Primary succession ✓
1.8	Temporary movement of organisms into or out of an area due to seasonal changes in resources.	Migration ✓
1.9	The type of competition between members of different species.	Interspecific competition ✓
1.10	Co-existence of different species living in the same habitat by using resources differently.	Resource partitioning ✓
1.11	The maximum number of individuals that an area can support	Carrying capacity ✓
1.12	A symbiotic relationship in which both species benefit from the association	Mutualism
		12x1 (12)

Activity 2

- 2
- 2.1 Logistic✓/S-shaped (1)
- 2.2 (a) Equilibrium✓/ stationary phase (1)
- (b) carrying capacity✓ (1)
- 2.3 - The population is sexually immature✓
- They are getting used to the environment ✓
- They are still looking for mates✓✓ Any 2 x 2 (2)
- 2.4 - disease✓
- competition ✓ /lack for/of food
- competition✓ /lack for/of water



- competition✓ /lack for/of space
- predation✓
- parasitism✓
- natality✓
- immigration✓

Any 2 x 2 (2)

(2)

(9)

Activity 3

3 3.1 Simple sampling✓/ Quadrat method (1)

3.2 They should represent the whole area✓ (2)

3.3 Average number of dandelions:
(22+3+7+4+15+0+3+0+12+3+0+14+4+7+2) ✓ / 15 = 6,4✓

Total number of dandelions:

6,4 x 2 500 m² ✓

1 m² ✓

= 16 000 ✓ dandelion weeds (5)

3.4 To increase reliability✓ (1)

3.5 - To know how much weedkiller/herbicide to use✓

- To know how long it would take him to pull out all the weeds✓

Any 1 x 1 (1)

(Mark first ONE only)

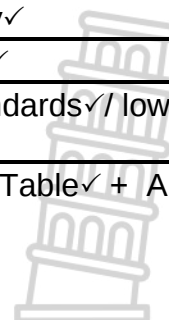
(10)

Activity 4

4

Developed country	Developed country
Good medical care✓	Good medical care✓
Developing country✓	Developing country✓
Poor medical care✓	Poor medical care✓
High economic standards✓/ high standard of living	Low economic standards✓/ low standard of living

Table✓ + Any (2 x 2) (5)



Activity 5

- 5 5.1 South Africa✓ (1)
- 5.2 - has highest youth unemployment rate✓ (2)
- due to high population in young age✓
- 5.3 $\frac{20 - 15}{15} \times 100$ ✓ **OR** $\frac{20000 - 15\ 000}{15\ 000} \times 100$ ✓
- = 33,33✓ % = 33,33✓ % (3)
- (6)**

Activity 6

- 6 6.1 Predator-prey✓ (1)
- 6.2 (a) - they hunt in packs✓ (2)
- to increase the chances of successful hunting✓
- (b) - to prevent overgrazing of the land✓ /land degradation (2)
- which can result in reduced carrying capacity✓
- 6.3 - Commensalism✓ (2)
- Parasitism✓ (2)
- (Mark first TWO only)** (7)

Activity 7

- 7 7.1 (a) To determine the changes in the population size of impala in a nature reserve over time✓✓ (2)
- (b) Population size of impala✓ / number of impala (1)
- 7.2 - Mark and recapture method was used every year✓
- Procedure was always done in April✓
- Impalas were given 3 weeks to mix in their environment✓ before 2nd sample was taken
- Population is determined using same Petersen index✓ (1)
- (Mark first ONE only)**
- 7.3 Logistic✓ growth form (1)
- 7.4 Lag✓ / establishment phase (1)
- 7.5 - Population growth is slow✓ (2)
- Impala still acclimatising to the area✓ (2)
- (8)**

Activity 8

- 8
- 8.1 (a) Hare✓ (1)
(b) Lynx✓ (1)
- 8.2 92 000✓ (1)
- 8.3 1860✓ and 1890✓ (2)
- 8.4 (a) Exponential✓/geometric phase (1)
(b) Death✓/extinction phase (1)
- 8.5 - Disease✓ (2)
- Competition✓ (9)

Activity 9

- 9
- 9.1 Age-gender✓ pyramid (1)
- 9.2 (a) 1980✓ (1)
(b) 2020✓ (1)
- 9.3 - There is a higher survival rate in adults in 2020 compared to 1980✓
- which indicates better health care services✓ /facilities (2)
- 9.4 $1\,424\,929\,781 \times \frac{51.2}{100}$ ✓
= 729 564 048✓ males (2)
- 9.5 (a) - The percentages of the pre-reproductive ages decreased✓ from 1980 to 2020 due to fewer births✓
- The percentages of the working-age group increased✓ from 1980 to 2020 due to improved economic activity✓ /more people employed Any 2 x 2 (4)
(Mark first TWO only)
- (b) - Educate people about family planning✓ / contraceptives
- Incentives/ tax-rebates for people with fewer family members
- Remove/ limit child support grant✓ Any 2 x 1 (2)
- (13)**

Activity 10

- 10
- 10.1 (a) Intraspecific✓ competition (1)
(b) Interspecific✓ competition (1)
- 10.2 - Parasitism✓ Exists when one organism benefits from the relationship while the host is harmed. ✓
- Commensalism✓ Exists when one organism benefits from the relationship while the other organism is neither harmed nor does it benefit. ✓ Any 2 x 2 (4)
- (6)**

Activity 11

- 11 11.1 - they can tackle prey too fast for them✓
 - they can capture prey too large for them✓ (2)
- 11.2 Predator-prey✓ relationship (1)
- 11.3 - large numbers mean that an individual is less likely to be caught by predator✓ / prey have a better opportunity to escape✓
 -as there are many eyes to spot a predator✓/as running in herds may reduce the ability of a predator to focus on one individual to attack✓ (2)
- 11.4 - running in herds intimidates the predator✓ thus, making the prey less endangered✓/vulnerable if the prey numbers increase the predator numbers will increase✓ (3)
- (8)**

Activity 12

- 12 12.1 $P = \frac{FXS}{M}$
 $= \frac{50 \times 75}{15}$ ✓
 $= 250$ ✓ snails (3)
- 12.2 Mark-recapture✓ method (1)
- (4)**

Activity 13

- 13 13.1 The fertility rate decreased from 1980 to year 2000✓ and then increased in year 2010✓ (2)
- 13.2
- | Developed countries | Developing countries |
|-------------------------|------------------------|
| Longer life expectancy✓ | Lower life expectancy✓ |
- Table✓ + Any 2 x 1 (3)
- (5)**

Activity 14

- 14 14.1 (a) Reduces variation in population ✓ and species might not survive ✓ if environmental conditions changes (2)
- (b) The workers become specialised ✓ / adapted to carry out its role most efficiently ✓ (2)
- (4)**

Solutions

Topic: Human impact

Activity 1

No.	Description	Biological Term
1.1	The access, by all people at all times, to adequate, safe and nutritious food	Food security ✓
1.2	A layer in the stratosphere that filters out harmful UV light from the sun	Ozone layer ✓
1.3	Water-bearing rock from which water is obtained using bore-holes	Aquifer ✓
1.4	The use of living organisms to regulate the numbers of a pest species	Biological control ✓
1.5	A plant species introduced into an environment from another country	Alien/ exotic ✓
1.6	A layer in the atmosphere that is damaged by chlorofluorocarbons (CFCs)	Ozone layer ✓
		6 x1 (6)

Activity 2

2	- Higher temperatures occur✓ - Heat waves occur✓ - The distribution of rainfall changes✓ - Leading to increased rainfall in some areas✓/experience floods - While other areas experience decreased rainfall✓/experience drought - Storms are more severe ✓/frequent	Any 5 x 1 (5)
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Activity 3

- 3 3.1 Yield of wheat✓

3.2 - Same size of plot✓

 - Same crop✓ /wheat

 - Same source of water✓

(Mark first TWO only)

3.3 - Increase the size of the plots✓

 - Use more than one plot for each type of fertilizer✓

3.4 - It increases the nutrient content of the water✓ /eutrophication occurs

 - This causes an increase in algal growth✓

 - The algae block out the light✓

 - reducing photosynthesis✓

 - Plants and animals depending on them die✓

(1)

(2)

Any 1 (1)





3.5

- increasing decomposition✓
- leading to a depletion of oxygen✓
- Depletes nutrients from the soil✓
- Decreases quality of topsoil✓
- Leads to decreased yield✓
- Increases pests✓
- Leads to soil erosion✓
- Decreases biodiversity✓

Any 4 (4)

(Mark first ONE only)

Any 1 (1)

(9)

Activity 4

- 4 4.1 Thermal pollution lowers the oxygen content✓ /causes algal bloom/increased number of bacteria in the water which reduces✓ the quality of the water. (2)
- 4.2 - The hot water can be stored until it is cooled down✓ before it is released into the river.
- After cooling down the hot water, it can be re-used to cool down the plant again. ✓
- Use fans/other technology to cool down the machinery✓ Any 1 (1)
- 4.3 The warm water may cause fish to die✓ /move away which will cause a loss of income ✓ to the fishermen (2)
- 4.4 The biodiversity increased✓ because no thermal pollution occurred✓ (2)
- (7)

Activity 5

- 5 5.1 $100 - (17+14+45+6) \checkmark /82\%$ (2)
- =18✓%
- 5.2 Transport✓ (1)
- 5.3 - Increased number of houses built✓ /increased population
- More houses received electricity connectivity✓
- More street lamps provided by municipality✓
- A very cold winter✓ Any 2 (2)
- (MARK FIRST TWO ONLY)
- 5.4 - It creates more CO₂✓ which is released into the atmosphere
- CO₂ traps more heat within the atmosphere✓
- causing the 'enhanced greenhouse effect'✓
- which causes a rise in the average global temperature✓





- 5.5
- This is known as global warming✓ Any 4 (4)
 - Invest in alternative forms of fuels✓ /energy generation/solar/
wind/nuclear that will limit dependence on fossil fuels✓
 - Improve public transport system✓ to reduce the number of cars on the roads✓
 - Invest in research and development of new technologies✓ /any example to decrease CO₂ output✓
 - Introduce legislation✓ to penalise offending industries✓ /to allow incentives to industries that adhere to legalisation to reduce CO₂ emissions
 - Educating people on strategies to reduce CO₂ output✓ Any 2 x 2 (4)
- (MARK FIRST TWO ONLY)**
- (13)**

Activity 6

- 6
- 6.1 - Food security refers to the availability and access✓
- to adequate, safe and nutritious food✓
- to people at all the time✓ Any 2 (2)
- 6.2 - More food will need to be produced✓
- thus, utilising more energy needed to produce✓ / package
- as well as energy needed to dispose of food✓
- this contributes to the increase in carbon dioxide emissions✓
- which eventually lead to global warming✓ Any 3 (3)
- 6.3 - Changes in weather patterns✓ / such as an increase in rainfall in some areas and drought in others
- An increase in the number and intensity of extreme weather events✓ / for example: cyclones, high winds and hail storms
- Changes in food production due to temperature changes✓
- Reduction in availability of water supplies✓ due to droughts
- Increase in evaporation from water surfaces✓ such as oceans, lakes, dams and rivers due to high temperatures
- Changes in the composition and location of forests✓ due to changes in weather patterns
- Reduction in biodiversity✓
- Rise in sea levels✓ / due to polar ice melting, flooding low lying coastal towns
- Threats to human health✓ due to changes in weather patterns/ flooding/drought Any 2 (2)
- (Mark first TWO only)**
- 6.4 - Buy only what is needed in sufficient quantities✓
- Give to others what is not used instead of throwing away✓



- Educate about efficient farming methods✓
- Educate about ways to preserve food✓
- Improve storage facilities✓

(Mark first FOUR only)

Any 2 (2)

(9)

Activity 7

7

7.1

A species that does NOT occur naturally in a country✓ outcompeting the natural species of the country✓ (2)

7.2

- An excessive growth of water hyacinths on the surface of the water will block out the light✓ /deprive submerged plants of sunlight/limits photosynthesis
- disrupting food chains/webs✓
- Alien plants outcompete the indigenous species✓
- this may lead to some of the indigenous species becoming eliminated thus disrupting food chains✓/webs
- Alien plants have a greater demand on natural resources✓
- resulting in a depletion of natural resources for the indigenous species✓

Any 2 x 2 (4)

(MARK FIRST TWO ONLY)

(6)

Activity 8

8

8.1 Western Cape✓

(1)

8.2 2792✓ tons ✓

(2)

- 8.3
- Pollution and contamination of water sources. ✓
 - Toxic discharge affects aquatic flora and fauna. ✓
 - Decomposing waste gives off bad odours. ✓
 - Medical waste is aesthetically unattractive. ✓
 - It also causes eutrophication. ✓
 - Decrease of oxygen ✓

(Mark first three) (3)

8.4 Plastics take a long time to biodegrade ✓ approximately 50 years, marine animals can die when they become entangled in plastic bags and nets ✓ /if swallowed it can become stuck in an animal's stomach✓ and prevent it from feeling hungry. ✓

Any 1 (1)

8.5 Biodegradable waste is waste that can be broken down✓ (decomposed) by natural processes in a relatively short time. ✓

(2)

8.6 Reduce ✓, reuse ✓, recycle ✓

(2)

(11)

Activity 9

9

9.1 Poaching ✓ (1)

9.2 - Deforestation ✓

- Urbanisation ✓

- Mining ✓

- Agriculture ✓

- Veld fires ✓

- Building ✓

- Pollution ✓

- Introduction of alien species ✓

(1)

(MARK FIRST ONE ONLY)

9.3 - Increasing human population ✓

- Increasing unemployment ✓ / poverty

- Increased prices of bush-meat ✓ / greed

- Increased demand ✓

- Poor protection of wildlife ✓

(2)

(MARK FIRST TWO ONLY)

9.4 - Disturbs the ecosystem ✓

- because food chains are affected ✓

- leading to the extinction of some species ✓ in the ecosystem

- and will eventually lead to loss of biodiversity ✓ (Any 3)

(3)

9.5 - Very old animals have passed the reproductive stage in their lives ✓
/old animals are at the end of lifespan

- therefore may not significantly influence the size of the population

- Weak animals have a short lifespan ✓

- and will not contribute to the survival of the population ✓

- Killing old and weak animals may prevent a population from
exceeding carrying capacity ✓

- Genes causing weakness will be removed from the gene pool ✓ Any 3

(3)

(10)

Activity 10

10

10.1 (a) Sludge worms ✓

(1)

(b) Leeches ✓

(1)

10.2 - The size/volume of the water samples must be the same ✓

- The samples must be taken at the same depth ✓

- Samples must be taken at the same time in all three areas ✓

- Use sterile containers ✓

Any 2

(2)

10.3 Amount of oxygen ✓ / amount of waste ✓

- organisms present ✓

(2)

10.4 After the point of entry of sewage, the amount of oxygen ✓ and waste
decreases. ✓ When waste has reached low levels again, the amount of
oxygen starts increasing again. ✓

(3)

- 10.5 - Unpolluted water ✓/less waste at X
 - therefore more plants/algae will be present ✓
 - producing more oxygen through photosynthesis ✓ Any 2
- OR**
- Unpolluted water ✓ /less waste at X
 - therefore fewer aerobic bacteria will be present ✓ -hence using less oxygen ✓ (2)
- 10.6 - Local government must provide proper sanitation ✓
 - Sewage must be purified before it enters the river ✓
 - Education to make people aware of proper sewage disposal measures ✓
 - Treat sewage in sewage treatment works so it can be recycled ✓
 - Ensure that all sewage treatment works are properly working and maintained ✓
 - Pit latrines, septic tanks or flushing toilets must be supplied in all areas ✓ Any 2 (2)
- (13)**

Activity 11

- 111
- 11.1 - Poor infrastructure ✓
 - Climate change ✓
 - Wastage ✓
 - Pollution of water sources ✓ Any 2 (2)
- 11.2 - The need of water for irrigation will be reduced ✓ (1)
- 11.3 - Decreased production ✓
 - will lead to loss of profit ✓ (2)
- 11.4 - More revenue for fixing poor infrastructure ✓/building dams
 - Less water wastage ✓ by individuals and companies (2)
- (7)**

Activity 12

- 12
- 12.1 B ✓, To determine if sewage had any effect on oxygen level, ✓ one with sewage and one without sewage, the first one serves as a control. ✓ (3)
- 12.2 - The loss of blue colour shows low levels of oxygen. ✓
 - Because bacteria and other decomposers ✓
 - Are abundant in the water because of the sewage ✓
 - and therefore use up the oxygen. ✓ (Mark first 3) (3)
- 12.3 - By collecting more samples of water before and after sewage outflow pipe ✓ and testing their oxygen levels. ✓
 - By increasing the number of days ✓ for collection of water samples. ✓
 - By repeating the investigation ✓ (4)

- 12.4 Sewage is potentially harmful✓ so protective gloves prevent sewage getting into the skin. ✓ (2)
(12)

Activity 13

13

- 13.1 Arsenic✓ (1)
13.2 The factory could have put measures in place to prevent the metals from going into the water✓/factory could have disposed of arsenic in another way
(Mark first TWO only) Any 2 (2)
13.3 Cadmium✓ (1)
13.4 None ✓of the metals poses a health danger, because all the concentrations are lower✓ than the concentration that humans can tolerate

OR

Heavy metals accumulate in the body over time✓ and may therefore exceed✓ the levels of tolerance (2)
(6)

Activity 14

14

- 14.1 Number of germinating seeds ✓ (1)
14.2 - Repeat the investigation a few times✓/use more seeds and
- calculate the average✓
- Use the same species✓/size of germinating seeds because other
- species may respond differently✓
- Ensure enough time✓ for the germination of the seeds (6)
- Some seeds may need longer time✓
14.3 - asthma✓
- bronchitis✓
- allergies✓
- emphysema✓
- lung cancer✓
- coughing✓
- shortness of breath✓
Any 2 (1)
(8)