

EXAM FEVER

Life Sciences 11 Workbook

- ANSWERS -

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1 Biodiversity, Change and Continuity

Biodiversity and Classification of Micro-organisms

A. Viruses

Question 1

1. Pathogen
2. Microorganism
3. Virology
4. Capsid
5. RNA
6. Bacteriophage
7. Retroviridae (retrovirus family)
8. Viruses
9. Antiretroviral treatment (ART)
10. Interferon (10)

Question 2

- | | |
|------|-------|
| 1. C | 6. C |
| 2. D | 7. C |
| 3. D | 8. B |
| 4. C | 9. A. |
| 5. C | 10. C |
- (10)

Question 3

1. AIDS (1)
2. Weight loss; TB; Pneumonia; Diarrhoea; sweating - any 3 (3)
3. Unprotected sex; multiple sex partners; sharing of hypodermic needles; stick wound injury - any 2 (2)
4. Post exposure prophylaxis – Month long treatment within 24hrs of contracting AIDS.
Anti retro viral therapy - Life long treatment administered to long term AIDS patients (2)
5. ART therapy (1)
6. Not to breast feed; maintain one sex partner; maintain a healthy diet; maintain ART (3)

Question 4

1. AIDS (1)
2. Weight loss; TB; Pneumonia; Diarrhoea; sweating - any 3 (3)
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B. Bacteria

Question 1

1. Unicellular
2. Prokaryote
3. Photosynthetic bacteria
4. Chemosynthetic bacteria
5. Bacillus
6. Cilia
7. Binary fission
8. Myobacterium tuberculosis
9. Monera
10. DNA (10)

Question 2

- | | |
|------|------|
| 1. D | 4. C |
| 2. D | 5. A |
| 3. B | |
- (10)

Question 3

1. Diagram of a bacillus bacterium as in page 4 of Grade11 SG. Include following labels:
ribosomes, cytoplasm, chromatin material, cell wall, cell membrane, slime capsule, cilia/ flagellum (8)

Question 4

1. TB (1)
2. Spread by droplets when infected person sneezes /coughs. (1)
3. Lungs/ kidneys/Brain /Spinal cord -any 3 (3)
4. Fever/Night sweats/Loss of appetite /chest pains/persistent cough/blood stained phlegm in coughs. any 4 (4)
5. Chest X-Ray/TB Skin test /Tissue culture (3)
6. Six months course of TB antibiotics (1)
7. TB becomes resistant to antibiotic (1)
8. MDR TB and XDR TB (2)
9. BCG vaccine (1)

Question 5

1. a) Autotrophic bacteria which are either photosynthetic (use sunlight) or chemosynthetic bacteria (use chemicals) to make food. (2)
b) Heterotrophic bacteria which cannot manufacture own food maybe saprophytic or parasitic. (2)
c) Decomposition bacteria use digestive enzymes to break down plant and animal matter to recycle nutrients in ecosystem. (2)
2. This symbiotic bacterium lives mutualistically in human gut. E. coli bacteria release vitamin B12, Vitamin E and vitamin K. This absorbed into host blood stream while gut provides partially digested food to bacterium. (3)
3. Cattle and buck eat a large amount of plant material. Mutualistic bacteria in their guts break down cellulose into simple sugars that is readily absorbed by animals; and bacteria benefit by getting nutrients from host. (3)
4. Using Bacteria in biotechnology produces beneficial products, making certain foods or chemicals.

Examples: Oil spill clean ups - chemosynthetic bacteria digest away oil spills; Chemical production – ethanol and acetone produced using modified bacteria; Food and drink production yogurt ,cheese, vinegar and wine involve use of fermentation bacteria; Metal extraction copper, gold, uranium using bacteria with bioleaching ability; Hormone production – insulin

(used in diabetes treatment) and human growth hormone (used to treat dwarfism) involve recombinant DNA technology and the plasmids of bacteria. (5)

5. Fermentation bacteria used to make amahewe and maas. Amahewe formed using bacteria, maize meal and flour. The bacteria ferment the mixture forming lactic acid, giving the drink a sour –sweet taste. Traditionally maas is formed from milk left to stand in clay pots. Present in the pots are bacteria that converts milk into maas. (3)

Question 6

1. TABLE OF DIFFERENCES BETWEEN VIRUSES AND BACTERIA (7)

VIRUSES	BACTERIA
Acellular	Unicellular
Always pathogenic	May be pathogenic, autotrophic
Nonliving structures capable of reproduction only	Organisms capable of many metabolic processes growth, movement, reproduction

2. Fresh food rich in moisture and nutrients is easily attacked by bacteria thus rots easily. Dehydrating foods and adding salt, removes water from food, thus preserving food and preventing saprophytic bacteria from decomposing food. (5)

C. Protists

Question 1

1. Assymmetrical
2. Pseudopodia/false feet
3. Plasma membrane
4. Endoplasm
5. Lysosome
6. Food vacuole/phagosome

7. Contractile vacuole
8. Eukaryote
9. Phagocytosis
10. Algae
11. Slime mould
12. Osmoregulation
13. Excretion
14. Intracelular
15. Binary fission

Question 2

1. C
2. D
3. B
4. A
5. C
6. B
7. B
8. A

Question 3

1. A-pseudopodium
B-contractile vacuole
C- food vacuole
D-nucleus
E- ectoplasm
F-cell membrane
G-lysosome
2. A- Movement/ ingestion of food
B- Osmoregulation
C-Nutrition
D-Cell Division/Controls activities of cell

Question 4

1. Plasmodium sp
2. Female mosquito
3. Anticoagulant
4. Liver
5. Asexual
6. Red blood cell
7. It bursts releasing more malaria
8. Within the salivary glands of mosquito
9. Fever/headache/Sweating/Flu-like symptoms/Nausea and vomiting

10. Yes
11. Yes
12. Drain stagnant water to prevent mosquitoes breeding and spread of malaria/Sleep under mosquito nets/
Use insecticides/ Use inset repellent/Install insect screens on open windows and doors/Use anti-malaria medication. any 5
13. Algal protista are producers – provide nutrients in food chain Algae maintain oxygen/carbon dioxide balance due to photosynthesis.
Certain algae used in food products such as tooth paste, jellies, ice-creams
Slime moulds decompose dead aquatic plant and animal matter – recycling nutrients in ecosystems
Certain plasmids are pathogens such as malaria
Diatoms have silica and used to make glass/beads/cosmetic product. any 5

D. Fungi

Question 1

1. Decomposers
2. Pathogen
3. Thallus
4. Mycelium
5. Hyphae
6. Sporangiophores
7. Stolons
8. Rhizoids
9. Aseptate
10. Sporangium
11. Substrate
12. Multinucleate
13. Rust
14. Penicillium notatum
15. Athlete's Foot

Question 2

1. C
2. D
3. A
4. C
5. C

Question 3

1. A – Spores
B – Sporangiphore
C – Rhizoid
D – Stolon
E – Columella (6)
2. A – Reproductive structures form new mycelium
B – Hold sporangium in favourable position for spore dispersal
C – Penetrate bread to anchor/absorb nutrients (6)

Question 4

1. Fungal disease (1)
2. Candida fungi (1)
3. Oral thrush – gargle with antifungal mouthwash, apply antifungal medication (2)
4. Keep skin dry and clean
Use antibiotics as directed by doctor
Proper healthy lifestyle to boost immune system
Diabetics to control blood sugar levels Any 3 (3)
5. Athlete's foot, Ringworm (2)

Question 6

1. Decomposers – reduce dead organisms to nutrients.
Some fungi (mushrooms, truffles) are edible and form part of the food chain.
Lichens are a symbiotic relationship of a fungus and alga and both benefit (3)
2. Foods (mushrooms, cheese, and bread) all involve fungi.
Decomposer fungi spoil stored food like maize/wheat...
Mould can develop on stored bags/clothing, causing damage. (5)
3. Penicillium used to produce the general antibiotic penicillin.
Pathogenic fungi cause diseases (3)

E. Immunity**Question 1**

- | | |
|----------------------|----------------------------|
| 1. Immunity | 6. Inactive vaccination |
| 2. Interferon | 7. Hydrochloric acid |
| 3. Activity acquired | 8. Hypersensitive response |
| 4. Antigen | 9. White blood cells |
| 5. Attenuated | 10. Interferon (10) |

Question 2

1. B
2. C
3. D
4. C
5. A (10)

Question 3

1. Natural Immunity – Built-in/inherent ability to produce antibodies and fight infection.
Acquired Immunity – Received from outside the body and can be passively or actively acquired. (4)
2. Passive; Active. (2)
3. Weak form of virus/bacterium injected and detected by white blood cells. White blood cells respond by producing antibodies
Antibodies destroy the weakened pathogen
If you are infected at a later stage, specific antigens are already recognized by white blood cells that can fight off infection. (5)
4. Barriers to entry
Phagocyte white blood cell
Protective proteins (3)
5. Skin and mucous membranes
Cilia and mucous
Sebum
Hydrochloric acid
Protective bacteria that live symbiotically internally (5)

Plant Biodiversity**1. Division Bryophyta****Question 1**

- | | |
|--------------------|----------------|
| 1. Thallus | 6. Sporophyte |
| 2. Vascular tissue | 7. Protonema |
| 3. Rhizoids | 8. Calyptra |
| 4. Photosynthesis | 9. Seta |
| 5. Gametophyte | 10. Water (10) |

Question 2

1. C
2. D
3. D
4. C (8)

Question 3

1. A – Calyptra
B – Sporangium/capsule
C – Seta
D – “leaf”/phyllides
E – axis/stem
F – rhizoid (6)
2. A – Covers and protects opening of capsule
B – Capsule that produces spores via meiosis
C – Supports capsule (3)

Question 4

1. Gametophyte (1)
2. Anchors moss to ground and absorbs water/minerals from substrate. (1)
3. Lacks cuticle, cannot restrict transpiration.
“Leaves” are only one cell layer thick and therefore must grow where all cells obtain moisture. (2)

2. Division Pterophyta

Question 1

- | | | |
|---------------|-----------------|------|
| 1. Frond | 6. Archegonium | |
| 2. Cuticle | 7. Adventitious | |
| 3. Rhizome | 8. Frond | |
| 4. Sporophyte | 9. Antheridium | |
| 5. Prothallus | 10. Prothallus | (10) |

Question 2

1. C
 2. D
 3. C
 4. A
- (8)

Question 3

1. A – Frond
B – Rhizome
C – Adventitious root
D – Pinna
E – Rachis
F – Fiddlehead/young frond
 2. C – Anchor plant/absorbs nutrients from soil
D – Photosynthesis
- (6)
(2)

Question 4

1. Sporophyte – fern exists for most of its life this generation
 2. Prothallus is thallus, gametophyte plant; undergoes sexual reproduction; antheridia use water to release sperms; sperms swim in a film of water into archegonium to fuse with ova; forming a diploid zygote.
 3. Dominant generation is sporophyte. This plant is not thallus. Has roots, rhizome and leaves with cuticles therefore can survive on land. Also spores do not need water for asexual reproduction spread in dry conditions.
- (3)
(5)
(4)

3. Division Spermatophyta

Question 1

- | | | |
|------------------|-----------------|------|
| 1. Spermatophyta | 6. Gymnospermae | |
| 2. Testa | 7. Devonian | |
| 3. Rhytidome | 8. Wind | |
| 4. Dwarf shoots | 9. Conifers | |
| 5. Endosperm | 10. Taproot | (10) |

Question 2

- | | | |
|------|------|-----|
| 1. B | 2. A | |
| 3. A | 4. C | (8) |

Question 3

Refer to diagram on page 21 of Grade11 notebook.
Include caption: Branches of *Pinus sp* and labels: needle shaped leaves, dwarf shoots, branches of unlimited growth.

(5)

Question 4

1. Variety of dispersal methods- spread widely afar; Long periods of dormancy due to testa; Stored food in endosperm allows for rapid embryo growth independent of environmental conditions; More complex structure thus survive longer than spores.
 2. Taproot system-anchors plant and allows for water absorption
 3. Mycorrhiza- assists in water and mineral absorption
 4. Rhytidome protects the stem
 5. Has vascular tissue/xylem and phloem
 6. Reduces transpiration due to needle shaped leaves
 7. Thick cuticle on leaves reduce transpiration
 8. Gametes protected by cones
 9. Winged seeds allow for wind adaptation
 10. Testa on seed protects and prevents dehydration
 11. Endosperm within seeds provides nutrition for developing embryo.
- (4)
(5)
(4)
(5)
(5)
(5)
(5)
(5)
(5)
(5)
(10)

4. Subdivision Angiospermae

Question 1

- | | | |
|------------------|----------------------|------|
| 1. Anther | 6. Mesozoic | |
| 2. Pedicel | 7. Calyx | |
| 3. Pollination | 8. Spermatophyte | |
| 4. Fertilisation | 9. Androecium | |
| 5. Sepals | 10. Self-pollination | (10) |

Question 2

1. B
 2. D
 3. C
 4. B
- (8)

Question 3

Refer to the diagram on page 22 of Grade11 notebook.
Include caption: L/S typical dicotylenous flower
Labels: petal, sepal, calyx, corolla, stamen, anther, stamen, filament, androecium, gynoecium, stigma, style, ovary, pedicel.

(12)

Question 4

Seeds of endangered plants can protected from extinction; Genes of original wild type of food plants can be conserved; Optimum environmental conditions at seed banks keep seeds dormant for longer; Seed banks provide seeds that can be re-germinated at a future date.

(4)

Question 5

Vascular plants;
Not thallus plants;
Can grow into tall trees;
Produce flowers, seeds and fruit;
Pollination does not totally dependent on water;
Very reduced gametophyte plants;
Sporophyte plant is dominant
Any5

(5)

Question 5

Grains/seeds of cereal grasses e.g. oats/rice/maize are rich sources of carbohydrates. Provide energy and form staple diet of many.

Pulses/seeds of legumes e.g. peas/beans/lentils are a rich in protein which are needed for growth and repair

Nuts e.g. almonds/pecan/walnut and seeds e.g. sunflower/flax/grape seed rich in fats and oils are valuable for insulation and provide many fat soluble vitamins (6)

Question 6

	Bryophytes	Pterophytes	Gymnosperms	Angiosperms
Dominant Generation	Gametophyte	Sporophyte	Sporophyte	Sporophyte
Cuticle	Absent	Present	Present	Present
Rhizoids	Present	Present	Absent	Absent
Rhizome	Absent	Absent	Present	Maybe present
Root hairs	Absent	Absent	Absent	Present
Vascular tissue	Absent	Present	Present	Present
Dependence on water for Fertilisation	Yes	Yes	No	No
Spores produced	Yes	Yes	No	No
Seeds produced	No	No	Yes	Yes

(20)

5. Reproduction in Plants

Question 1

1. Asexual
2. Anther
3. Cross pollination
4. Ovum
5. Ants (5)

Question 2

1. D
2. B
3. C (6)

Question 3

Self pollination- Ripe pollen of an anther transferred to the stigma of the same flower.

Cross pollination- Ripe pollen of an anther transferred to the stigma of the another flower of the same species. (4)

Question 4

Light pollen/reduced calyx and corolla/feathery sigma/dangling anthers/scentless/no nectar any 3 (3)

Question 5

5.1. Vegetative reproduction- non sexual reproduction involving vegetative parts of a plant such as tubers/bulbs/corms (2)

5.2 Only one plant needed; rapidly develops into new plant/no need for pollinating agents; desirable characteristics can be selected and propagated into new plants any 3 (3)

Animal Biodiversity

Question 1

1. Radial
2. Diploblastic
3. Coelom
4. Through gut
5. Open blood system
6. Cephalisation (6)

Question 2

1. Ectoderm
2. Coelom
3. Endoderm
4. Gut
5. Mesoderm (5)
2. A- Earthworm/Insect/Man
- B-Hydra
- C-Taenia (3)
3. A Triploblastic; coelomate (3)

Porifera

Question 1

1. D
2. C
3. B
4. C (8)

Question 4

1. A- osculum
- B- flagellum
- C- spongocoel
- D- pores (4)
2. A- entry and exit of water-bring in nutrients and washing out waste
- C- provides hydrates support (2)
3. Asymmetrical (1)
4. Sponges lack a concentration of sense organs anteriorly as the sponge lacks tissues and organs (2)

Cnidaria

Question 1

1. Cnidaria
2. Hypostome
3. coelenteron/enteron
4. Nemaoblasts
5. Mesoglea

(5)

Question 2

1. A-tentacles
B-mouth
D-ectoderm
H-basal disc
2. A- capture prey / locomotion
G- hydrostatic skeleton/ site of extra cellular digestion

(4)

(2)

Question 3

- a) radial
- b) sense organs are located all around allowing it sense pray/detect predators from all directions
- c) diploblastic – body wall has 2 germ walls i.e. ectoderm and endoderm only / lacks mesoderm

(1)

(3)

(3)

Platyhelminthes

Question 1

1. Bisexual /hermaphrodite
2. Pig
3. Gravid
4. Scolex
5. Bilateral

(5)

Question 2

1. D
2. D
3. D
4. D
5. C

(10)

Annelida

Question 1

1. Closed
2. Clitellum
3. through gut
4. Chaetae
5. Hydrostatic

(5)

Question 2

1. Annelida
2. Bilateral
3. Forward moving, cephalized
4. Cephalised; through gut; coelomate

(1)

(1)

(4)

(3)

Arthropoda

Question 1

1. Exoskeleton
2. Haemocoels
3. Antennae
4. through gut
5. Abdomen

(5)

Question 2

1. C
2. D
3. B
4. B

(8)

Chordata

Question 1

1. Highly cephalised
2. Endoskeleton
3. Closed blood system
4. Internal fertilisation
5. Viviparous

(5)

Question 2

LHS - bottom going up
Porifera;
Platyhelminthes;
Annelida;
Arthropoda;

RHS - top going down
Chordate;
Cnidaria

(6)

2 Life Processes in Plants and Animals

Energy Transformations

A: Photosynthesis

Question 1

1. Glucose/starch
2. Oxygen
3. Iodine solution
4. Variegated
5. Chloroplast (5)

Question 2

Photosynthesis; radiant energy; chloroplasts; carbon dioxide; water; leaves; oxygen. (6)

Question 3

Mark scheme for drawing of chloroplast.

- 5 marks for correct labels
- 1 mark for caption.
- 1 mark for quality of drawing (7)

Question 4

1. A. Grana B. Stroma (2)
2. Process whereby radiant energy is used to split water into hydrogen and oxygen. (2)
3. 25°C (1)
4. The enzymes controlling photosynthesis become denatured. (3)
5. a. decreases the rate of photosynthesis (1)
b. increases the rate of photosynthesis up to the optimum temperature. (1)
6. - excess carbon dioxide combines with water to form carbonic acid.
- this creates acidic conditions which denature the enzymes that control photosynthesis. (4)
7. Structure built for the growing of plants in a controlled environment. (2)

8. Prevents birds, pests and other animals from getting to plants.
Amount of water and nutrients available to the plant can be controlled.
Environment factors/conditions such as carbon dioxide levels, light and temperature can be controlled. (6)
9. Energy rich substances that are formed are a source of food for animals.
Reduces carbon dioxide level in the atmosphere.
Releases oxygen which is used by animals for cellular respiration. (any 2) (4)

Question 5

1. To determine the effect of light intensity on the rate of photosynthesis. (2)
2. Approximately 15 bubbles (1)
3. Approximately 280cm (1)
4. Place a glowing splinter at the mouth of the test tube. If the splinter ignites then the gas is oxygen. (4)
5. Temperature; carbon dioxide concentration. (2)
6. As the distance between the lamp and the plant increases, the rate of bubbles produced by the plant decreases. (4)
7. It indicates the rate at which photosynthesis occurs. (2)

Question 6

1. Allows photosynthesis to occur and starch to accumulate in the leaf. (2)
2. Stop all metabolic functions.
Soften the tissues. (2)
3. Whitish (1)
4. To extract chlorophyll from leaf. (2)
5. Turn off the flame when boiling the leaf in alcohol. (2)
6. Palisade mesophyll; spongy mesophyll; guard cell (3)
7. Blue-black (1)
8. Leaf contains starch. (2)

Question 7

1. Removing all traces of starch from the plant. (2)
2. Place plant in dark cupboard for 48 hours. (2)
3. Area exposed to light tested positive for starch.
Area not exposed to light tested negative for starch. (4)
4. Light is essential for photosynthesis. (2)
5. Presence of starch under the foil will affect the final result. (2)
6. The leaf was not completely destarched. (2)

Question 8

1. It has areas with chlorophyll and areas without chlorophyll. (2)
2. Areas with chlorophyll tested positive for starch.
Areas without chlorophyll tested negative for starch (2)
3. Areas with chlorophyll - experiment
Areas without chlorophyll – control (2)
4. Chlorophyll is essential for photosynthesis. (2)

Question 9

1. To determine whether carbon dioxide is essential for photosynthesis. (2)
2. Soda lime; caustic soda (2)
3. Prevents the entry and exit of carbon dioxide. (2)
4. To allow photosynthesis to occur. (2)
5. Brown (1)
6. Blue-black (1)
7. Carbon dioxide is essential for photosynthesis. (2)

Question 10

- To show the effect of light on the rate of photosynthesis under different CO₂ conditions. (2)
- Mark scheme for line graph
 - Correct type of graph
 - Correct scale on x-axis
 - Correct scale on y-axis
 - Title for x-axis
 - Title for y-axis
 - Caption
 - Appropriate key for both graphs
 - Plotting
 - > 80-100% correct plots - 5 marks
 - > 60-80% correct plots - 4 marks
 - > 40-60 %correct plots - 3 marks
 - > 20-40% - correct plots - 2 marks
- Temperature, Humidity (12)
- As light intensity increases the rate of photosynthesis at 0.03% carbon dioxide is low
As light intensity increases the rate of photosynthesis at 0.13% carbon dioxide is high
Or
Rate of photosynthesis is greater at 0,13% CO₂ than at 0,03% CO₂ (4)

B: Animal Nutrition**Question 1**

- | | |
|----------------|----------------------|
| 1. Peristalsis | 6. Emulsification |
| 2. Roughage | 7. Deamination |
| 3. Anorexia | 8. Large intestine |
| 4. Mastication | 9. Oesophagus |
| 5. Villi | 10. Pyloric splinter |

Question 2

- D
 - B
 - B
 - B
 - C
- (5x2=10)

Question 3

- A: Oesophagus
 B: Stomach
 C: Gall bladder
 D: Duodenum
 E: Liver
 F: Pancreas
 G: Hepato-pancreatic duct (7)
- Insulin - converts excess glucose into glycogen.
- promotes absorption of glucose into body cells. (any 1)
- Glucagon – converts glycogen into glucose. (6)
- Makes and secretes bile.
Converts glucose to glycogen and fat.
Deaminates excess amino acids into urea.
Detoxifies harmful substances.
Stores minerals eg. Fe, Cu
Stores vitamins A, B12, D, E, K (any 5) (5)
- Pancreatic juice (1)
- Bile
·Neutralizes acidic chyme
·Emulsifies fats (3)
- F (1)

Question 4

- Kwashiorkor. Diet rich in carbohydrates but lacking in protein. (3)
- Swollen abdomen
- Stick-like arms and legs
- Retarded growth
- Sores on skin
- Swollen face (any 3) (3)
- One which contains all the essential food groups in sufficient quantities. (2)
- Cardiovascular diseases, hypertension, certain cancers, gall bladder diseases (3)

Question 5

- Labels clockwise from right.
 - goblet cell
 - Brunners gland
 - venule
 - lymph vessel
 - arteriole
 - lacteal
 - capillaries (7)
- Single layer of epithelial cells facilitate diffusion.
Lacteal for transport of absorbed fats.
Capillaries for transport of absorbed nutrients.
Epithelial cells has many mitochondria which produces energy for active absorption of water.
Goblet cells secretes mucus which acts as lubricant and protects lining of intestine. (any 4)(4)
- a. amino acids
 b. monosaccharide
 c. fatty acids and glycerol (3)
- Stimulates peristalsis and movement of faeces.
Prevents constipation .
Softens faeces (any 2) (2)

Question 6

- Oesophagus (1)
- Peristalsis (1)
- a. Saliva
 b. Gastric juice
 c. Intestinal juice (3)
- R (1)
- Small intestine (1)
- Increases surface area for the digestion and absorption of food. (2)
- Defaecation - removal of undigested food and waste from the large colon through anus.
Excretion - removal of metabolic wastes through lungs and kidneys. (4)
- Contains bacteria which breakdown undigested food.
Absorbs water from faeces. (2)

C: Cellular Respiration

Question 1

1. ATP
2. Mitochondria
3. Glycolysis
4. Oxygen
5. Anaerobic
6. Chemical potential energy
7. Cristae
8. Lactic acid fermentation
9. Oxidative phosphorylation
10. Enzymes (10)

Question 2

1. Mitochondrion (1)
2. A. Photosynthesis
B. Cellular respiration (2)
3. 2 – Oxygen
3 – Carbon dioxide
4 – Oxygen
6 – Carbon dioxide (4)
a. Glucose (1)
b. Ethanol + carbon dioxide + ATP (3)

Question 3

1. water
Glass tube
thistle funnel
germinating seeds
clear lime water (5)
2. They are actively respiring. (2)
3. Clear limewater turns milky in the presence of carbon dioxide. (2)
4. Kills any bacteria and fungi that may be present and prevents them from respiring. (2)
5. Set up the investigation exactly the same way except replace the germinating seeds with seeds that have been boiled and then sterilised. (3)
6. Carbon dioxide is given off by respiring seeds. (2)

Question 4

1. Absorbs carbon dioxide. (2)
2. To allow gases to enter and exit the seeds. /To prevent the seeds from being immersed in the KOH. the seeds (2)
3. Level increased from A to B. (3)
4. -Carbon dioxide is absorbed by potassium hydroxide.
- The only reactive gas present is oxygen.
- Oxygen is taken up by germinating seeds.
- This decreases the volume of oxygen in the test tube.
- This draws the liquid from point A to B in the U-shaped tube. (4)

Question 5

1. Both have glucose as their reactant.
Both produce energy in the form of ATP. (2)
2. Humans: Lactic acid is produced, no carbon dioxide is produced.
Yeast: Alcohol is produced, carbon dioxide is produced (2)
3. Respiration that occurs in the absence of O_2 . (2)
4. During strenuous exercise./ When adequate O_2 does not reach the muscle cells. (2)

D: Gaseous Exchange

Question 1

1. Pleura
2. Oxy-haemoglobin
3. Squamous epithelial
4. Cartilage
5. Pulmonary veins (5)

Question 2

- Both A and B
Both A and B
B only
Both A and B
B only (5)

Question 3

1. Clockwise right to left.
· Epiglottis
· Trachea
· Bronchus
· Alveoli/air sac
· Rib
· larynx (7)
2. Prevents food from entering the trachea during swallowing. (2)
3. Inter-costal muscles; diaphragm (1)
4. Allows for the expansion and contraction of oesophagus when the bolus moves down the oesophagus. (3)
5. (5)

INHALATION	EXHALATION
Diaphragm contracts and flattens, increasing the volume of the thorax from top to bottom.	Diaphragm relaxes and is raised, decreasing the volume of the thorax from top to bottom.
Internal intercostals muscles contract, causing the ribs to be lifted upwards and outwards. The volume of the thoracic cavity increases sideways.	External intercostals muscles relax, causing the rib cage to be lowered and become smaller. The volume of the thoracic cavity decreases sideways.
Inter-pleural pressure decreases, causing a decrease in the pressure in the lungs.	Inter-pleural pressure increases, causing an increase in the pressure in the lungs.
Atmospheric pressure is now greater than the pressure within the lungs, air rushes into the lungs via the nostrils.	Pressure within the lungs is now greater than atmospheric pressure, air is forced out of the lungs via the nostrils.

Question 4

1. a. 36%
b. 33% (2)
2. 45% (1)
3. Decreased by 5% (2)
4. Non-smokers (1)
5. Decreased between 1980 and 1990, increased between 1990 and 2000. (4)
6. There is an increase in the number of career /working women, use smoking as a 'stress reliever'
More women have joined the social circle leading to addiction to smoking and alcohol consumption.
More women frequent clubs and bars where smoking is rife.
Greater peer group pressure. (any 2) (2)

Question 5

1. a. Trachea and bronchi
b. Lungs
c. Rib cage and thoracic cavity
d. diaphragm (4)
2. The balloons inflate.
· the pressure within the bell jar decreases.
· the atmospheric pressure is now greater than the pressure in the bell jar.
· air rushes into balloon via the Y-shaped tube. (5)
3. Bell jar, which represents the ribs in humans, is inflexible whereas in humans the ribs and muscles are flexible.
There is large space between the balloons and the bell jar but very small space exists between lungs and thoracic cage in humans. Balloons are small whereas the lungs are large and occupy the entire thoracic cavity. (any 2) (2)

Question 6

1. B: Carbon dioxide
D: Air rich in Oxygen
E: Oxygen (3)
2. Inhalation (1)
3. Pulmonary artery (1)
4. Haemoglobin (1)
5. Single layer of squamous epithelial for easy diffusion of gases.
Lined with thin fluid layer which allows for gases to dissolve before diffusing into the blood.
Cup shaped pouch provides a large surface area for diffusion. (3)

Question 7

1. Tar, nicotine (2)
2. Tar – damages lung tissue, causes cancer
Nicotine – paralyses the cilia and this allows harmful dust and smoke particles to accumulate in the air sacs. (4)
3. Mark scheme for bar graph:
·Scale for x-axis
·Scale for y-axis
·Title for x-axis
·Title for y-axis
·Caption
·Plotting
 > 5-6 correct – 3 marks
 > 3-4 correct – 2 marks
 > 1-2 correct – 1 mark (8)
4. Smoking is banned in public places.
Special designated smoking areas must be provided in bars and restaurants.
Cigarettes cannot be sold to people under the age of 18.
Advertisements for smoking have been banned.
Tobacco companies are not allowed to sponsor sporting events. (5)

E: Excretion**Question 1**

1. Renal capsules
2. Excretion
3. Renal artery
4. Ureter
5. Nephrons
6. Hilum
7. Papilla
8. Renal
9. Medulla
10. Sweat (10)

Question 2

1. Labels clockwise from right to left.
aorta
adrenal gland
ureter
bladder
urethra
renal artery
renal vein
inferior vena cava (9)
2. Ureters (2)
3. Aorta (1)
4. Urea, uric acid, ammonia (3)
5. Aldosterone (1)

Question 3

1. Protects the kidney. (2)
2. Malpighian Body
Proximal Convoluted tubule
Distal convoluted tubule (any 2) (2)
3. Pyramid (1)
4. Bladder (1)

Question 4

1. A: Glomerulus
B: Proximal convoluted tubule
C: Afferent vessel
D: Efferent vessel (4)
2. amino acids, glucose (2)
3. Glomerular filtration (10)
4. The efferent arteriole is narrower than the afferent arteriole allowing a pressure system to develop which is essential for filtration.

The Bowman's capsule is cup-shaped allowing more close contact with the blood capillaries of the glomerulus for filtration.

A single layer of endothelial cells of the capillary wall and a single layer of podocytes of the Bowman's capsule form a thin surface for filtration

Large surface area of the capillary network of the glomerulus increases the efficiency of filtration. (4)

Question 5

1. Glucose; amino acids (2)
2. Uric acid, creatinine, ammonia (any 2) (2)
3. Patient may be diabetic. (2)
4. The amount of urea in urine will increase. (2)
5. a. ADH (1)
b. Pituitary gland (1)
6. high temperature
Back and side pain
Frequent urination
Pain while urinating
Blood or pus in the urine (5)

Question 6

1. Drinking water results in increased urination. (2)
2. To show that the volume of urine collected every $\frac{1}{2}$ hour will be different after a person drinks a litre of water. (2)
3. 50cm³ (1)
4. Volume of urine collected every $\frac{1}{2}$ hour increased after drinking water. (2)
5. 3 hours (1)

6. Mark scheme for drawing of a bar graph.
·Correct scale on the x-axis
·Correct scale on the y-axis
·Title for x- axis
·Title for y- axis
·Caption
·8-10 correct plots : 3 marks
·5-7 correct plots : 2 marks
·2-4 correct plots : 1 mark (8)

Question 7

1. To enable only waste material (e.g. urea, uric acid) to diffuse into dialysis fluid. (2)
2. Increases surface area so more waste material can exit blood and enter dialysis fluid. (2)
3. Blood will clot and this could affect the blood flow to the brain and heart. (1)
4. 37°C – represents the body temperature of human body. (3)
5. osmoregulation, salt regulation, regulation of blood pH (2)
6. Dialysis fluid out. (1)
7. Form a blockage (air lock) and prevents the free flow of blood. (2)
8. 2-4 times a week (1)
9. - Persons working life is not interrupted.
- Treatments on the dialysis machine are expensive.
- Patient does not have to visit the hospital regularly. (3)

3 Environmental Studies

Population Studies

Population Size

Question 1

- Individuals of the same species, occupying the same habitat and able to interbreed
- Always/ever changing
- Movement of organisms into an area/habitat
- Movement of organisms out of an area/habitat
- Maximum individuals an area can support (10)

Question 2

- Natality; immigration (4)
- Mortality; emigration

Question 3

- 3.1. Density dependent factors- intensity of the factor is affected by size of the population
Density independent factors - factors that affect a population irrespective of population size (4)
- 3.2. a) Competition for food; space; disease
b) Natural disasters e.g.floods; drought (4)

Question 4

- Line graph title; Time(days) on x-axis; Number of bacteria on y-axis; correct scale; correct joining of 3 points. (7)
- Geometric/exponential (1)
 - 1-2days: Lag phase; 3-5 days: Geometric phase (2)
 - Bacteria still getting used to environment; insufficient adults to reproduce; conditions not yet optimum (3)
 - Space-more bacteria means less space; competition increased
Food – more bacteria means greater competition for nutrients competition increased (6)

Question 5

- Line graph title; Time (years) on x-axis; Population size (millions) on y-axis; correct scale; correct joining of 3 points; scale included. (6)
- 1000 million
 - between 2010 and 8000 million
 - 1850 to 1950
 - around 1980 (4)
- Planning for infrastructure e.g. roads; hospitals; education
Correct utilization of a country's resources (2)

Question 6

- Logistic (1)
- Population size (1)
- Lag/Establishment phase
 - Exponential/Geometric phase
 - Stationary phase
 - Death phase (4)
- Organisms well adapted to area; abundance of food/resources; reduced or no competition occurs (2)
- Population has reached carrying capacity; resources limited; environment cannot support more individuals. (3)
- Disease; lack of resources; environmental degradation (3)

Question 7

- Lag/Establishment phase- rabbits still getting used to environment; insufficient adults to reproduce; conditions not yet optimum (3)
- Exponential/Geometric phase – rabbits are well adapted to area; abundance of food/resources; area lacked predators; reduced or no competition occurs. (any 2) (2)
- Carrying capacity exceeded; environmental degradation occurs; lack of resources (2)
- 120 rabbits. population goes as high as 200 in 1993 yet settles around 120 in 1997 and 1998 (2)
- drought; disease (2)

Question 8

- Census. The difference between the births and deaths per thousand per year calculated e.g. (42 – 17) thousand births per year is 25 thousand births per year. (See India in table) (4)
- India (1)
 - Density Independent
monsoon/earthquakes/droughts
Density dependent- disease/lack of food (5)
- Argentina (1)
- Sweden (1)
 - 96years (1)
- China more developed than Argentina; greater availability of country's resource to all; large population – greater number of births each year. (4)

Question 9

- $M=50; C=40; R=8; N = \frac{C \times M}{R} \quad N = \frac{40 \times 50}{8}$
 $N = 250 \text{ fish}$ (5)
- Repeat procedure; use same dam and net (3)
- Tag must last for entire investigation; tag must not interfere with animals life style; technique to be done during non-breeding season; allow sufficient time between marking and recapture; repeat investigation (5)

Question 10

$$M=15; C=150; R=10; N = \frac{C \times M}{R} \quad N = \frac{15 \times 150}{10}$$

$$N = 225 \text{ blesbok} \quad (5)$$

Question 11

- Estimated population = $\frac{\text{Total area} \times \text{Av in sample}}{\text{Sample area}}$
 $= \frac{120 \text{ m}^2 \times 13}{4 \text{ m}^2}$
 $= 30 \times 13$
 $= 390$ (12)
- Choose plats/quadrats randomly; repeat the investigation (2)

Interactions in the Environment

Question 1

1. predator
 2. intraspecific
 3. interspecific
 4. resource partitioning
 5. mutualism
 6. commensalism
 7. parasitism
- (7)

Question 2

When 2 organisms of different species compete for a limited resource, one outcompetes the other and it remains in the area while the other moves away/dies off.

(3)

Question 3

1. predation (1)
2. jackal (1)
3. about 50 (1)
4. Rabbit population dramatically declines as jackals prey on rabbits (2)
5. Density dependent (1)

Question 4

- a. endoparasite
 - b. ectoparasite
 - c. suckers
 - d. bilharzia
 - e. flock
 - f. division of labour
 - g. primary succession
 - h. pioneer
 - i. succession
 - j. secondary succession
- (10)

Question 5

1. Mutualism - both organisms benefit: Fungi provides structure/water and houses the alga; alga undergoes photosynthesis to make food for itself and Fungus (5)
2. Commensalism - only 1 organism benefits; other neither harmed nor benefitted: Remora fish stays near shark and gets scraps of food as well as physical protection against other predators. Shark is not harmed nor benefitted (5)
3. Resource partitioning - Single tree/resource is shared by 3 different species as each feeds on/utilizes a different part of the tree. Thus direct competition is avoided. (3)

Workbook 11 - Answers

Human Population

Question 1

1. Table heading; column headings; include following aspects in comparison- birthrate; life expectancy; mortality; shape of graph (5)
2. Fewer births; adults living longer due to better lifestyle as well / choose to have few or no children (3)
3. Sweden (1)
4. Developing (1)
5. Allows for future planning in terms of job creation/impact on environment/infrastructure planning such as health / education (5)
6. Improved agriculture resulted in greater crop yields/ reduction in people starving
Improved sanitation; improved water supply; efficient sewage disposal lead to decrease in disease/deaths
Industrialisation lead to greater efficiency in transport/ manufacture of goods thus reducing injury and deaths in human population (6)

Human Impact on the Environment

Question 1

- | | |
|---------------------|------------------------------|
| a. greenhouse gases | i. wetland |
| b. global warming | j. aquifer |
| c. carbon footprint | k. eutrophication |
| d. methane | l. thermal pollution |
| e. zone | m. indigenous |
| f. desertification | n. afforestation/monoculture |
| g. afforestation | o. poaching |
| h. desertification | p. recycling |
- (16)

Question 2

1. Avoid water entering one's eyes/mouth
Wear protective gear such as gloves (2)
2. *E. coli* resides in the human gut where 37°C is normal body temperature. (2)

3. River A / C : water remains red indicating it is clear of *E. coli* and unpolluted
River B: water changes from red to yellow indicating it has *E. coli* and is thus polluted (6)
4. People defaecate directly into river; polluted water from further upstream enters local river (2)
5. Provide proper sanitation for people near rivers
Educate people of using river as a toilet and of *E. coli*
Engage the community to maintain cleanliness of community and river. (3)

Question 3

1. a. 100 km
b. 40 km
c. 80 km
d. 10
e. 10 (5)
2. City is highly polluted as there are under 20 lichens and moths within 20 km of city centre. (2)
1. Dark moths are better adapted in cities as the dark colour camouflages them readily. (2)
2. No (1)
3. Large number of lichens and white moths, yet number of black moths has decreased indicating less carbon emissions associated with cities.

Question 4

1. Africa (1)
2. % Forest cover = $\frac{\text{Forest cover (ha)} \times 100}{\text{Land area (ha)}}$
= $\frac{547\,793 \times 100}{3\,084\,746}$
= 17.76% (3)
3. Clear area for roads/ supply wood for timber products/ wood provides fuel (3)
4. Loss of biodiversity/ loss of habitat for forest animals/ increased global warming (2)
5. Plant more trees either as individuals/government/ corporate. Use technology to produce other goods so that reliance on timber is diminished (2)

Question 5

- Carbon dioxide; methane; nitrous oxide; ozone; CFC's; inert gases such as H₂ / Ne/ Ar/Xe/Kr. (5)
- They trap heat in earth's atmosphere; preventing heat from escaping into space, thus warming up the planet sufficiently for life to exist. Yet now the levels of the gases excessive and must be decreased (3)
- Change in weather patterns; increased intensity and number of climatic disaster such as cyclones/ hailstorms.
Change in food production due to climate change
Reduction in availability of water.
Reduction in biodiversity
Rising sea level due to melting of polar caps
Threats to human health (5)
- Buy local products; decrease use of electricity; recycle so as to reduce need to manufacture more goods (3)
- Cause sun burn/eye damage/skin cancer/ premature wrinkling
Slows down photosynthesis
Prevents seeds germinating
Can destroy DNA leading to mutations/cancer. any 3 (3)

Question 6

- Include table heading; column headings with units (% waste and type of litter); values correctly indicated as per graph (5)
- To re- use / find new use for an item already used. (2)
 - Decrease amount of waste that lands in landfill sites
Conserves natural resources (2)
- Waste that can rot easily and is derived from living organisms such as egg shells, paper (1)

Question 7

- Annual emission from Other Countries X
= 24 706 - (5673+3733+1477+1106+364)
= 12 353 (3)
- Greenhouse gases continued to rise despite the Kyoto Protocol.
Global warming was not stopped (2)
 - USA is the biggest producer of green house gases. All countries share a common atmosphere; USA was selfish and shortsighted in delaying entire process. (2)
- SA is a developing country; SA imports a large number of goods; Large middle class produce a lot of greenhouse gases. Poor public transport system force overuse of private transport. (3)
- Pie chart must be drawn. Include heading; and calculation table; column headings with units (% CO₂ emission and country); values correctly indicated as per table; correct key for each country; accurate conversion of % into degrees of circle; accurate indication on pie graph. (15)

Question 8

- Water storage; hydroelectric schemes for electricity production. (2)
- SA has limited water resource; erratic rainfall; destruction of agricultural land; affects fish migration; increases spread of malaria / bilharzias (5)

Question 9

- about 95 MWh/kg
 - about 70 MWh/kg
 - about 10 MWh/kg
 - Amount energy to make both paper and aluminum from scrap
= (10 + 30) MWh/kg
= 40MWh/kg (3)
- Helps to conserve limited resources; saves energy as new goods not manufactured/transported/provides employment/encourages creativity (3)
 - paper (1)

Question 10

- Wetland habitats support unique organisms; act as purification sites that trap pollutants; prevents pathogens and diseases such as dysentery or diarrhoea from spreading (3)
- Draining of wetlands; dam building; urban development; agriculture (3)

Question 11

- Large game like black rhino/elephant thrive in thickets – ideal for ecotourism
Bees inhabit thickets and beekeeping is a viable source of income
Planting of the thicket tree, Spekboom needs a lot of labour thus employing more people (3)
- Loss of biodiversity as land is cleared and only on species planted; overuse of pesticides causes leaching/ run of f into rivers/nutrient depleted from large tracts of land (2)
- Mechanical clearing;chemical removal;biological methods;use of aliens in commercial products (4)
- Harmful,soluble,chemical by products from decaying waste seep into the soil and enter into waterways / rivers (2)
- Methane (1)
- Converting it into electricity (1)