

2012 PROJECTIONS -001

231/2

BIOLOGY

PAPER 2

MARKING SCHEME

1. a) Keep the trachea lumen open/prevented the trachea from collapsing;

b) Tracheoles numerous in Nos; to increase SA for gaseous exchange. Have moist surface, to aid diffusion of gases. Have thin wall/epithelium; for easy diffusion of gases.

c) Insect - oxygen from atmosphere diffuse into the spiracle; Then trachea to the tracheoles; where it diffuse into the tissue/Not transported by fluid.

Mammals - Oxygen from atmosphere enters lungs, diffuses into blood to form oxyhaemoglobin; then to heart where it is pumped to body tissues;

2. a) Blood group O is a universal donor as it donates to all other blood groups;

Blood group AB is a universal recipient as they receive blood from blood from all other groups.

Blood group A can receive blood from blood group O and A only.

Blood group B can receive blood from blood group O and B only.

Blood group O does not receive blood from other blood groups except group O.

b) To avoid agglutination/clumping of red blood cells.(1 mark)

c) Blood does not have pathogens. The Rhesus factor matches; (2 marks)

3. (i) a) Tendril (1 mark)

b) Haptatrophism/thigmotrophism (1 mark)

(i) Provides support to climbing plants (1 mark)

c) When tendrils makes contact with a support; auxin hormones migrate to the

opposite side of the contact this cause faster growth on that side; this cause

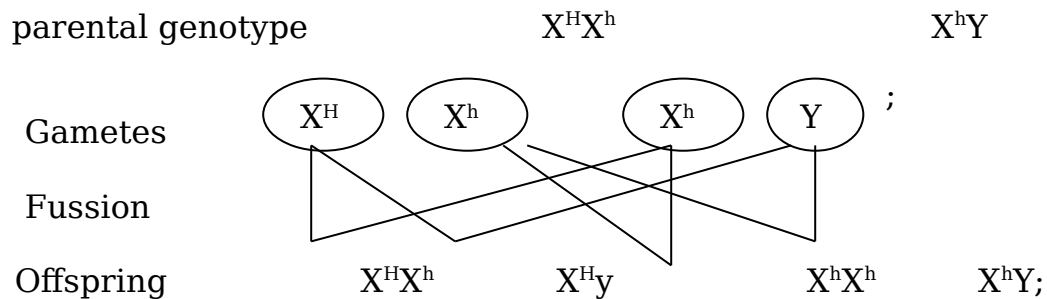
tendril To curl/coil around the support; (4 marks)

d) Auxin (1 mark)

4. a) (i) Man - X^hY ;

Woman – $X^H X^h$;

(ii) Parental phenotype carrier woman X Haemophilia
man



NB (Penalise for gametes if they are not circled & for fusion if crossing is not done)

b) $\frac{1}{4} \times \frac{1}{4} = \frac{1}{16}$ (2 marks)

c) Y chromosomes does not have the corresponding allele; for the gene that determine or cause haemophilia/Y chromosome is almost genetically empty.

- 5 a) Total dry mass; of living matter in an area at a particular time;
- b) Fixed energy which support living matter decrease at each successible trophic level; since energy is lost by respiration; undigested/unconverted material; hence less biomass supported at each.
- c) Energy from the sun trapped by green plants during photosynthesis; to produce chemical energy in form of carbohydrate; Green plants as producers are eaten by herbivores; herbivores eaten by carnivores I & II to obtain energy;

6. (a) Graph (NB) Reject if plotting is not visible.
 Plotting the 2 curves = 2 marks(p)
 Labelling curves = 2 marks(c)
 Labelled axes with units = 2 marks(l)
 Two linear scales = 2 marks

- b) The healing of the uterine wall. (1 mark)
- c) Production of oestrogen;
Development of the graafian follicle; (2 marks)
- d) Formation of the co-pus luteum; that is stimulated by luteinizing hormone; (2 marks)
- e) Ovulation occurred; (1 mark)
- f) Failure of fertilization to occur; making co-pus luteum to disintegrate; hence production of progesterone falls. (3 marks)
- g) (i) Production of ovum/egg cell;
Production of oestrogen (1 mark ANY one.)
- (ii) Inhibits production of follicle stimulating hormone maintains pregnancy.
Proliferation of the uterine wall (1 mk ANY one)
- (iii) Stimulating pituitary glands to produce luteinizing hormone.
Causes healing of the uterine wall after menstruation (1 mk) ANY one

7.

Adaptation of xerophytes

These are plants which are adapted to withstand harsh environmental conditions like – low supply of water, high day temperatures, windy conditions and low humidity; all these conditions lead into excessive water loss by transpiration; they are therefore adapted by;

Structural adaptations;

Their leaves are modified into spines/thorn like structures to reduce surface area exposed for transpiration; their stomata are sunken; and water vapour accumulate on the sunken depression; lowering water vapour concentration gradient; between the atmosphere and the sub-stomatal air spaces; this reduces the rate of transpiration;

Leaves have thick waxy cuticles; to reduce cuticular transpiration;

The number of stomata is reduced to minimal so that the roots reach and absorb water found in deeper layers in the soil;

They have parenchyma cells (in the stem and leaves); for storage of water when it is in adequate supply for use during drought, (the cactus whose leaves and stem appear succulent);

Some have hairy leaves; that trap water vapour in between them to lower the diffusion gradient hence reducing water loss;

Most xerophytes have sufficient roots; which grow extensively close to the soils surface; enabling them to absorb maximum amount of water after a short shower;

8.

It is muscular/has cardiac muscles; which are myogenic (does not need nervous stimulation) to pump blood;

It is supplied by vagus and sympathetic nerves; which controls to rate of heart beat depending on body's physiological requirements;

It has triscupid valves; and bicuspid valves between atrium and ventricles which prevent back flow of the blood into the right and left ventricles respectively;.

Presence of valvular tendons attached to the walls of ventricles and to the atria - ventricular walls; to prevent atria-ventricular valves from turning inside out due to changes in the pressure in the ventricles.

Heart is supplied by coronary artery; which supplies food and oxygen to the cardiac muscles for their pumping action; the coronary vein in the heart removes metabolic wastes;

The heart is enclosed by the pericardial membrane; that secretes a fluid which lubricates it reducing friction on the walls as it pumps; The heart is divided into two by the atria -ventricular septum; that prevent mixing of oxygenated blood and deoxygenated blood;

The left ventricles has a thick muscular wall; to pump blood at higher pressure to the distant body tissues;.

ii) White blood cells; - engulf; and destroy bacterial/pathogen; by producing antibodies; which neutralise bacterial toxins;

Blood platelets; - Cause clotting; on fresh wounds preventing entry of bacteria into tissues prevent loss of blood water; and mineral salts;.

2012 PROJECTIONS -002

BIOLOGY

231/2

PAPER 2

MARKING SCHEME

1. (i) - presence of cell wall
 - presence of chloroplast
 - presence of a sap vacuole that is centrally placed
- (ii) - chlorophyll; Traps light energy used for photosynthesis;
- (iii) - lack oxygen
 - active transport inhibited
 - respiration is inhibited since oxygen is not available
2. (i) ultra - filtration
- (ii) The pores in the glomerular capillaries are too small for plasma proteins to pass through

(iii) Most water in the glomerular filtrate is reabsorbed by the time urine is formed, whereas very little urea is reabsorbed / urea is not reabsorbed

(iv) Blood cells

(v) Selective reabsorption

Rej: reabsorption / absorption

(vi) Insulin was lacking

3. a) phototropism

b) Auxin, acc: indoleacetic acid / IAA

c) causes the auxin to localize in areas away from direct light / migration of auxin

d) the coleoptile will not show any response to light and growth will not occur

e) reflex action response takes a shorter time

f) -enables organism to escape adverse conditions

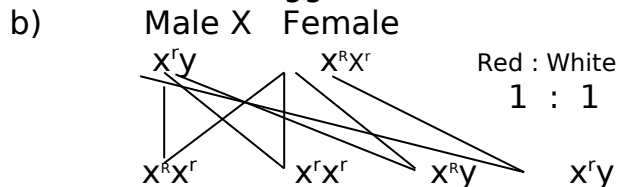
- enables organisms to obtain nutrients

4. a) (i) -keep sample flies to lay eggs

-leave the eggs for 9 days to hatch into adults

(ii) -leave the separate female flies to lay eggs

-if the laid eggs fail to hatch after 9 days, then they were unmated



5. a) P -Antipodal cells

Q -polar nuclei rej: polar nucleus

R - egg cell / functional egg cell

S - micropyle

b) -insect is more efficient

-it is certain / sure that pollination will take place

c) -Hangs outside the corolla; to trap pollen grains

- Feathery, for ease of trapping pollen grains (OWTTE)

Rej: if the feature is not accompanied by the reason

6. a) -correct labeling of axes 2mks

-scale(correct) 2mks

- plotting 1mk

- smooth curve 1mk

b) (i) number of bacteria are few; bacteria are adjusting to the environment; few bacteria are dividing;

(ii) There is high increase in population; more bacteria are dividing; due to suitable / favourable conditions; absence of much waste products; few cells are dying;

(iii) no population change, as number produced is equal to number dying

c) (i) Low temperatures inactive respiratory enzymes in bacteria cells.

(ii) Temperature is not conducive for division

- d)-food to be sufficient for the population
- social amenities / education to be provided / enough for the population
- a good health service provision

7. Ileum → hepatic portal vein → liver → hepatic vein → inferior vena cava → vena cava → right auricle → right ventricle → pulmonary artery → lungs → pulmonary vein → left auricle → left ventricle → aorta → abdominal aorta → femoral artery → femoral arterioles → capillaries → ultrafiltration → tissues fluid → muscle cell.

NB sequence of flow must be correct

8. a) Agrochemical from neighboring farms causes eutrophication e.g. pesticides

- poison the fish and plants life (living organism)
- siltation – reduce photosynthesis
 - clog gills of fish
 - causes turbidity
- industrial wastes e.g lead, mercury (heavy metals) hence poisoning
- is fixed in the food chain that gets its way to man
- untreated sewage – causes eutrophication
 - reduce oxygen in water
 - causes decomposition
 - causes diseases
 - increases turbidity reducing light penetration
- spilt oil from tankers or used oil from garage
 - limits supply of oxygen to aquatic life
 - covers stomata of plants
 - clogging gills and feathers of bird
- hot water – kills organism
 - reduces concentration of oxygen

b)-proper sanitation

- proper hygiene
- boiling drinking water
- avoid coming into contact with water bare footed
- draining stagnant water
- washing fruits with clean water
- proper cooking of food
- destroying the vectors
- proper storage of food / cover food

2012 PROJECTIONS -003

MARKING SCHEME

1. A - Left Auricle;
 B - Right Ventricle;
 C - Tricuspid valve; (3mks)

(b) - Prevents (Bicuspid) valve from turning inside out to ensure that blood flows in one

	direction;	(1mk)
(c)	E - Venacava	F - Aorta
	- Have valves	- Have no valves;
	- Have thin lumen	- Have narrow lumen;
more	- Have thin walls which are less	- Have thick walls which are
	muscular and inelastic	muscular and elastic; (1mk)

- (d) - Systematic circulation
 -Left auricle pumps blood into Left ventricle via Bicuspid valve;
 -Left ventricle pumps blood to all parts of the body except lungs through Aorta;

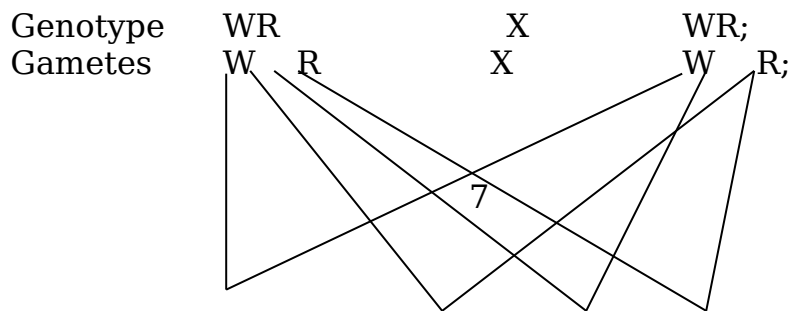
(2mks)

- (e) Coronary artery;

This paper consists of 6 printed pages

Please Turn Over

2. (a) Parents Male Female
 Phenotype Roan Roan



F2 WW WR WR RR; (4mks)

Rej. Other letters,

(b) Genotypic

Ratio

WW

1

WR

2

RR

1;

Phenotypic

Ratio

White

1

Roan

2

Red

1;

(2mks)

(c) Partial dominance/ in complete dominance;

(1mk)

(d) Determine unknown genotypes;

(1mk)

3. (a) A - Chloroplast;

E - Guard cell

(2mks)

(b) B - Transport water to photosynthetic cells

C - Translocation of food from photosynthetic site to all parts of the plant; (2mks)

(c) During the day the palisade cells carry out photosynthesis; releasing O₂ into the air

Space(D)

Some O₂ diffuse back to cells for respiration; and some diffuse out through the

stomata;

Cells carry out respiration and release CO₂; CO₂ diffuses into air spaces; some CO₂

diffuse out through the stomata; while some diffuse to palisade for photosynthesis;

(max 4mks)

4. Apical dominance - the inhibition

(a) Of lateral bud development by the terminal bud; (which when removed one or more

Lateral buds develop into branches.) (1)

(b) Hormone - Auxin; (1)

(c) Apical dominance causes an increase in the height of a plant; (1)

(d) Gibberellins-

- Stimulates cell elongation
- Increase cell division
- Initiates germination
- Promotes development.

Any 2

2

Abscisic acid

- Inhibits growth in plants
- Promotes falling of leaves and fruits (abscission)
- Causes dormancy in some seeds.
- Inhibits the development of lateral buds to side branches
- Induces closing of the stomata.

Any 3

5. (a) A - Malleus;
B - Incus;
C - Stapes;

(3mks)

- (b) Pliable to allow vibration movements (1mk)

- (c) Auditory canal directs sound waves into the ear drum; (1mk)

Ear drum then converts sound waves into vibrations; and transmits them to the ear

ossicle;

Ear ossicles - vibrate and transmit the vibrations to the cochlea via oval window;

(4mks)

6. (a) Scale (s) 1mk
 Axis (A) 1mk
 Identify (I) 1mk
 Curve (C) 2mks
 All points correct (P) 2mks
 7mks
 Temperature 0c $\frac{1}{2}$ A Time (Days) $\frac{1}{2}$ A
 0 10 20 30 40 0 1 2 3 4 5 6 7 8 9
 Set up 1 identify set up 2 identify $\frac{1}{2}$ $\frac{1}{2}$ S $\frac{1}{2}$ S P $\sqrt{P}$ $\sqrt{C}$ $\sqrt{C}$ $\sqrt{A}$ $\sqrt{\frac{1}{2}}$

6. (b) Day zero to day 2

Set up 1 – Temperature increased with time; seeds were germinating and respiring to produce

energy;

Set up 2 – Temperature remained constant within this period; since seeds were boiled. No

respiration occurred;

After day 5

Set up 1 – Temperature reduced slightly; After germination the seedlings respired

moderately;

Set up 2 – Temperature increased with time; decomposition led to increase in heat

production;

8mks

(c) Seeds in set up 3 were washed in antiseptic which killed the micro-organisms. No

decomposition occurred;

2mks

(d) Glucose + Oxygen $\longrightarrow$ water + carbon (iv) oxide + energy;

1mk

Rej. Chemical equation.

(e) Amount of oxygen consumed during breakdown of fat is more than the carbon (iv) oxide;

produced while in carbohydrate the amount of oxygen consumed equals carbon (iv)

oxide produced;

2mks

7. Abiotic factors.

Wind; on a windy day rate of transpiration increases since wind carries away water vapour leaving surrounding of leaves with low humidity;

- Wind disperse fruits, seeds/spore;
- Wind is an agent of pollination
- Strong winds break branches of trees and may uproot some trees;

Temperature; Enzymes work best at optimum temperature; hence influencing rate of photosynthesis/respiration; and other biological reactions.

Light; - green plants need light for photosynthesis;

- some plants need light for flowering;/ photoperiodism;
- some seeds (lettuce) require light for germination;
- light affects opening and closing of stomata; which affects transpiration; gaseous exchange and photosynthesis.

Humidity; when humidity is low the rate of transpiration increases due to less amount of

water vapour in the atmosphere; when the humidity is high the atmosphere becomes

saturated with water vapour reducing rate of transpiration;

pH; plants require optimum pH to grow well; acidic, alkaline or neutral

Salinity; - Plants with salt tolerant tissues; e.g. mangroves grow in saline areas.

- Plants in Estuaries adjust to salt fluctuations;
- Water; - for germination;
- for photosynthesis;
 - transport medium for synthesized food;
 - it is a solvent dissolving mineral salts for absorption and transport;
 - water increases turgidity of cells hence support;
 - water disperses fruits and seeds;
 - aquatic plants need water for pollination;
 - pteridophyta and bryophyta need water during fertilization;

Topography; - windward side receives enough rainfall and plants grow well; the leeward side

receives less rainfall resulting into plants with stunted growth; north facing slopes

in the southern hemisphere have more growth of plants.

Max 20mks

8. Mammalian skin.

Parts and functions.

Cornified layer; for protecting the skin; against mechanical damage and bacterial infection

Cornified layer; also protects the skin against water loss;

Granular layer; cells divide to give rise to cornified layer;

Malpighian layer; cells divide to give rise to granular layer;

It contains melanin which protects the skin against UV light;

Sebaceous gland; -produce oily secretion which is antiseptic; and protects the body against

micro-organisms Sebum makes skin supple; and waterproof. This protects the skin from

drying and desiccation;

Blood vessels; bring oxygen; and food; to the skin and also remove waste products; from the

skin. Blood vessels also control body temperature;

Nerve ending; enable mammals to detect changes in the external environment;

Sweat glands; produce sweat; and when sweat evaporates brings cooling of the body;

Sweat also removes waste products from the body;

Skin has hair or fur which also maintains body temperature'

Subcutaneous fat; in the dermis insulates the body against heat loss or gain;

2012 PROJECTIONS -004
MARKING SCHEME
BIOLOGY
PAPER 2

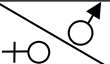
Question 1

- (a) Avoid competition / colonise new areas;
- (b) Overcrowding / inadequate light; lack of enough, mineral salts
- (c) Magnesium ; iron; nitrogen; (any two)

Question 2

- (a) (i) AB
- (ii)

1mk

	A	B	✓ 1
O	AO	BO	✓ 1
O	AO	BO	✓ 1

- (b)(i) Erythroblastosis foetalis / haemolytic disease of the new born.
- (ii) Blood transfusion / all blood of new born removed and replaced by screened blood;
- (c) Mother produces rhesus antibodies during the first pregnancy.;
 Second conception - large number of antibodies present in mother destroys foetal red blood cells;

Question 3

- (a) Oxygen

- (b) Presence of light; presence of chlorophyll; suitable temp/ optimum temperature;
- (c) Palisade cells; palisade mesophyll, spongy mesophyll
- (d) Photosynthesis

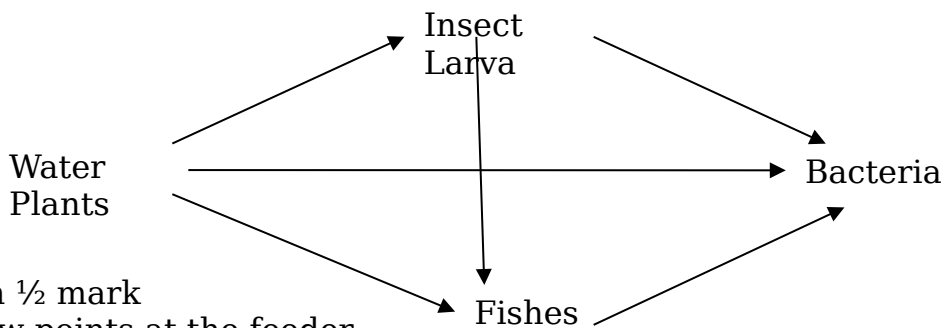
Question 4

(a) Where organism in various trophic levels don't exceed the carrying capacity.

(b) $500 + 1200 + 5000 + 10 = 6710\text{g}$ or 6.71kg

(c) (i) Water plants ✓ 1

(ii) Fishes; 1mk



Question 5

(a) (i) Yeast

(ii) Budding

(iii) Causes plant / animal diseases e.g. through ; athletes feet; causes food spoilage; used as food e.g. mushrooms; manufacture of antibiotics;

(b) (i) A group of organisms that can freely / naturally interbred; to give rise to a fertile offspring;

(ii) first name (generic) should start with a capital letter and the second name (specific) is written in small letters; two names should be underlined separately when handwritten / typed, when printed should be italicised;

Question 6

(a) Heat loss by conduction / convection from the body; the cooler blood under the skin enters the general circulation system; cooling the whole body;

(b) Vasoconstriction; less blood flow next to skin surface hence heat loss; sweating ceases; hence less heat lost; shivering; more heat generated; increased metabolic rate; more heat released;

Max. 3mks

Question 7

(a) Scale = $\frac{1}{2} \times 2 = 1$, Axis $\frac{1}{2} \times 2 = 1$

Smooth curve $\frac{1}{2} \times 2 = 1$, plot - 4 correctly plotted

(b)(i) Photosynthesis 1mk

(ii) Respiration 1mk

(c)(i) rate of CO_2 consumption increases from 6 hours – 12 hours. This is due to increase in light intensity. The rate remains constant between 12hrs and 14 hrs which is the period of optimum light intensity after which it decreases due to increase in light intensity .

3mks

(ii) Rate of CO_2 release decrease from 6hrs to 12 hrs because some of the CO_2 is used for photosynthesis; from 14 to 20 hrs the rate of CO_2 released increased because the rate of photosynthesis is decreasing as light intensity decreases after which the rate remains constant. Since no photosynthesis is taking place to consume the CO_2

3mks

(d)(i) 8hrs and 18hrs

1 x 1 = 1mk

(ii) Point at which rate of photosynthesis equals to the rate of respiration / rate of CO_2 consumption equals to the rate of CO_2 released.

2mks

(e) Increase in temperature increases the ratio of CO_2 consumption up to an optimum range as temperature activates enzymes

2x1=2mks

Question 8

Comparative anatomy / taxonomy;

Members of a phylum / group show similarities ; organisms have structures / organs performing the same function ; e.g. digestive system ; nervous system same function etc (any correct example 1mk)

The pentactyl limb / any correct example; these are called homologous organs / structures; homologous (same origin but have different function; Analogous structures / different structures performing the same function e.g. wings of insects, bat and birds; Analogous – different origin but performing same function;

Fossil records / Paleontology; remains of organisms preserved in naturally occurring materials for many years; show morphological changes of organisms over a long period of time; e.g. skull of man (leg of horse)

Comparative embryology; embryos of vertebrates have similar morphology; suggesting the organisms have a common origin / ancestry ;

Geographical distribution; continents present are thought to have been a large landmass; joined together; as a result of continental drift; isolation; occurred bringing about different patterns of evolution; e.g. lemurs in the Americas resemble the camel / any other correct example e.g. kangaroo in Australia Jaguar in S. America; camel in Africa;

Comparative serology / physiology ; antigen - antibody reactions / RH factor/ blood groups / haemoglobin structure reveal some phylogenetic relationship among organisms / common ancestry.

Question 8

- Has secretory glands / crypts of lieberkult which secretes enzymes (maltase / sucrose / peptidase / lipase to complete digestion of lipids / sugar / proteins.
- Goblet cells secrete mucus allows for smooth movement of food / protect wall of ileum from action of digestive enzymes
- Very long to provide large surface area for absorption
- Highly folded / coiled to slow movement of food to allow more time for digestion / absorption / increase surface area for absorption.
- Has numerous villi which increase surface area for absorption / microvillus which further increase surface area for absorption.
- Ileum wall / villi have thin epithelium which is only one cell thick to reduce distance over which digested food has to diffuse.
- Villi are highly vasculised / have a rich network of blood capillaries for rapid transport from small intestines / maintain a steep concentration gradient.
- Villi have lacteals for absorption of fatty acids and glycerol
- Cells of ileum wall have a large count of mitochondria to release energy that aid in active transport across the epithelium.

Max 20mks

2012 PROJECTIONS -005

231/2

(THEORY)

BIOLOGY

PAPER 2

MARKING SCHEME

1. a) A – Pinna

C - Rhizome

D - Rhizoid

b) Bears spores / spores form in it

c) i) Plantae

ii) - Eukaryotic and multicellular

- Body differentiated into leaves stem and roots

- Cells have cellulose / cell walls

- Majority have transport system

- Are autotrophic / have photosynthetic pigment / have chlorophyll

- Asexual or sexual reproduction

C

2. a) i) Man = X Y

C c

Woman = X X

ii) P. Phenotype

Colour blind

X

Carrier woman

P. Genotype

$\overset{C}{X} Y$

X

$\overset{C}{X} \overset{c}{X}$

✓

P. gametes

$\overset{C}{X}$

Y

X

$\overset{C}{X}$

$\overset{c}{X}$

✓

Cross

F1 generation

$\overset{C}{X} \overset{c}{X}$

$\overset{c}{X} \overset{c}{X}$

$\overset{C}{X} Y$

$\overset{c}{X} Y$

✓

b) i) $\frac{1}{4}$

ii) $\frac{1}{4}$

c) Males have a single 'X' chromosome which makes it 50% chance for the occurrence of colour blindness i.e. requires only one gene

3. a) Water

b) - Emulsifies fat / break fats into fat droplets

- Neutralizes acidic chyme from stomach

c) Trypsin

d) - Long

- Highly coiled

- Have villi

e) Appendix

f) Cellulase

4. a) Man - A

Lizard - B

b) Lizards have a body temperature that depends of the environmental temperature / warmed by the environmental temperature hence increase in environmental temperature increases the body temperature

c) Skin

d) - Sweating

- Reduction in metabolic activities

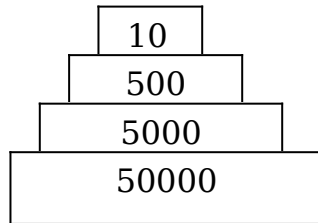
- Vasodilation

5. a) i) A situation where the available natural resources in an ecosystem can comfortably

support the population of organisms / an ecosystem.

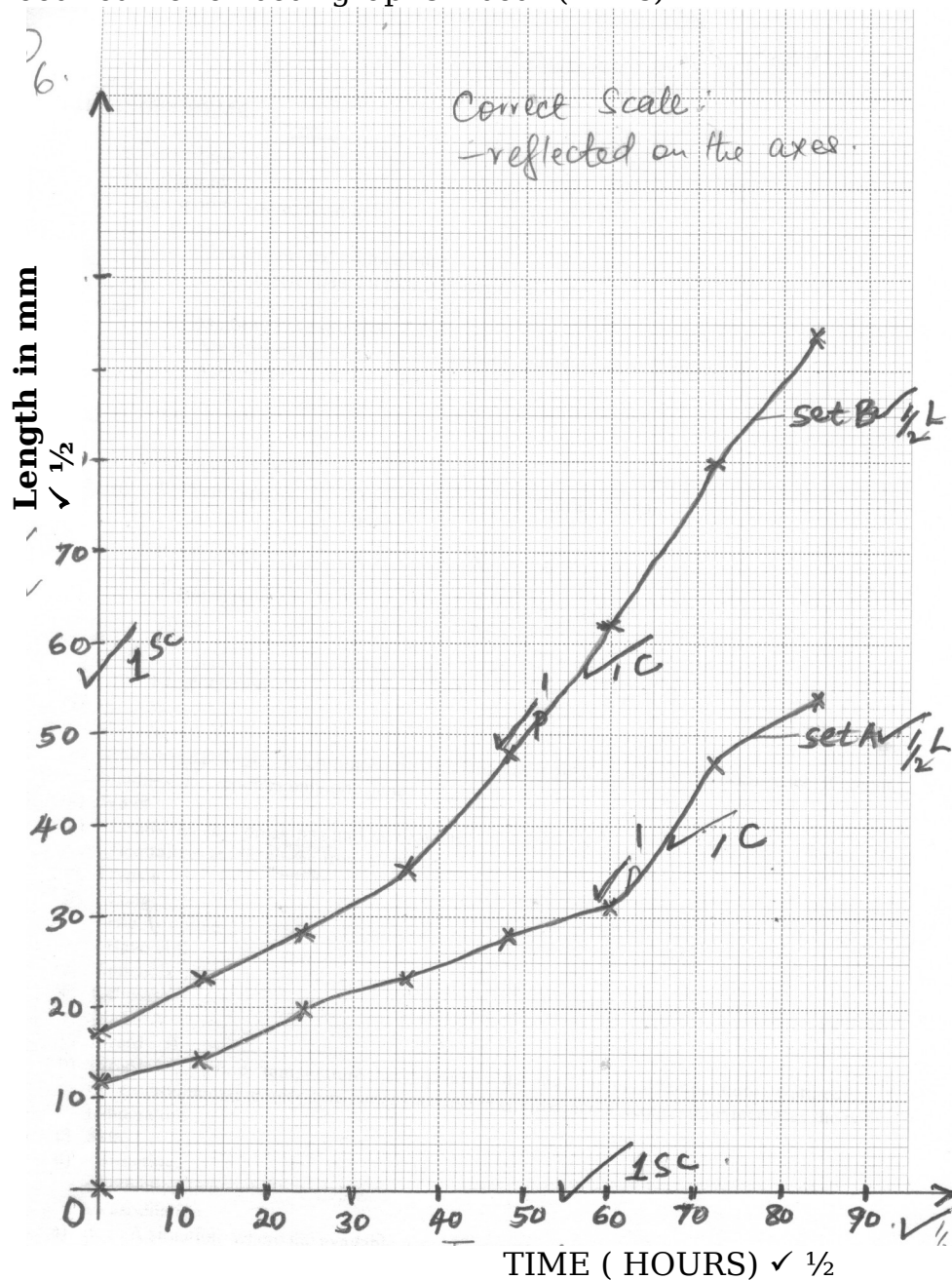
ii) $500 + 5000 + 50000 + 10 = 55510\text{gms}$

b)



- c) i) Bacteria
 ii) Kill nitrogen fixing bacteria and soil organisms

6. a) Labeling the axis $\frac{1}{2}$ mark each - both (1mk)
 Labeling each graph - $\frac{1}{2}$ mk each - both (1mk)
 Correct scale both axis - both (2mks)
 Plotting all points both graphs - both (2mks)
 Smooth curve for both graphs - both (2mks)

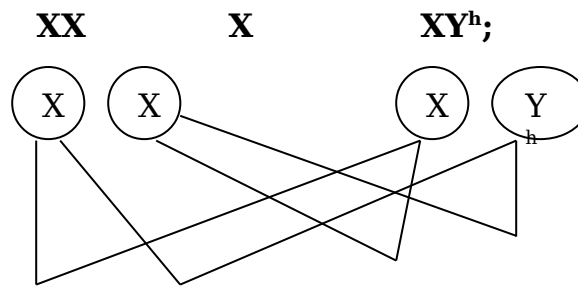


- b) A - 37 ± 1
 B - 67 ± 1
- c) There is faster growth in B than A. this is to enable plant to obtain light;
 d) The plant would become very weak, and finally die; they will exhaust all the food reserve in the cotyledon; since there is no photosynthesis due to lack of light;
 e) Oxygen supply; amount of water; amount of soil nutrients and temperature.
7. Pericardial membrane - secretes a lubricating fluid
 - encloses the heart
 - prevents over dilation of the heart
 Fat layer - prevents mechanical shock / cushions the heart
 Blood vessels - coronary artery supplies the heart muscles with oxygen and nutrients
 - coronary vein carries away CO_2 and waste products of metabolism
 Valves - prevent back flow of blood into the auricles
 Valve tendons - prevents valves from turning inside out when systolic pressure is high.
 Ventricles - are thick walled to pump blood out of the heart
 S.A.N (Sino-Atrial Node) - acts as a pace maker to set pace for heart to beat.
 Cardiac muscles - contract and relax without fatigue
 Vagus nerve - slows down the heartbeat
 Sympathetic - speeds up the heart beat (20mks)
8. Follicle stimulating hormone (FSH) - development of graafian follicle
 - stimulates ovary; to produce oestrogen
 Oestrogen; - repairs the uterine walls; at high levels; stimulates; pituitary gland; to produce
 luteinizing hormone; suppresses Follicle stimulating Hormone (FSH)
 Luteinizing hormone: - cause ovulation; cause development of corpus luteum ; (from graafian)
 - Corpus luteum produces progesterone
 Progesterone; - inhibits production of FSH; causes the development / thickening of uterine walls;
 maintains pregnancy; inhibits production of oestrogen;
 suppresses the production of luteinizing hormone from the pituitary gland stops ovulation (20mks)

2012 PROJECTIONS -006
231/2
BIOLOGY
PAPER 2
MARKING SCHEME.

1. a) P - Oesophagus ;
Q- Gall bladder ;
b) - Long to provide a large surface area for absorption and digestion;
- Coiled to slow down movement of food thus allowing more time for digestion and absorption ;
(2mks)
c) - Contains numerous bacteria which secrete enzyme cellulase ;
that digest cellulase to glucose;
(2mks)
d) Class :- Mammalia;
Reasons :- fur;
(2mks)

2. **Parental Genotype Gametes**



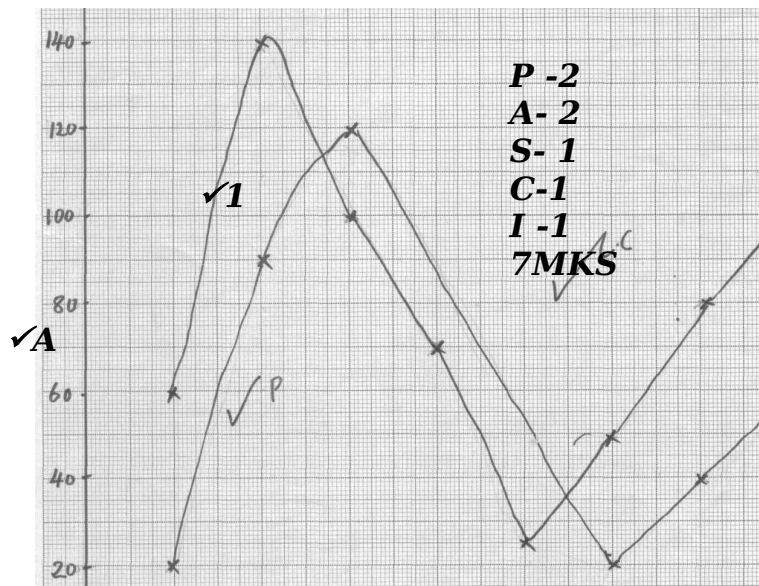
F₁

XX	XY^h	XX	XY^h
Normal	hairy	normal	hairy;
	pinna	pinna	

- b) The gene is located only on the Y chromosome// have no alleles on the X chromosome; and females are XX;
(2mks)
- c) Premature baldness ;
(1mk)
3. a) A - eye - piece lens;
B- Course adjustment knob;
(2mks)
b) E - Regulates the amount of light passing through condenser to illuminate the specimen;
F - Objective lens - Brings image into focus and magnifies it ;
(2mks)
c) Magnification = Magnification of eye - piece lens x magnification of objectives lens.
(1mk)
d) i) Allow light light pass making components of cell visible;
Colour various cells constituencies enabling them become visible.
ii) Fixation
- Harden the cytoplasm and preserve a tissue ; e.g dehydrating using alcohol .
(3mks)

4. a) - Remove water weeds;
- Add more water animals ;
(2mks)
- b) i) P.
- In sunlight, water plants photosynthesis; using the CO₂ thus less acidic; (2mks)
ii) Q Animals respired; thus releasing the CO₂ thus more acidic;
iii) R Animals released CO₂ which is used by plants during photosynthesis;
thus pH remains constant;
(2mks)
5. i) T - Bowman's capsule;
Y - Collecting tubule ;
(2mks)
ii) a) Antidiuretic hormone ;
(2mks)
Pituitary gland ;
(2mks)
b) Dilute urine formed ;
(1mk)
c) Glomerular filtrate // capsular fluid ;
(1mk)
d) - Narrower efferent arteriole
- Highj pressure from pumping action of heart.
- Narrow glomeruli capillaries
- Tiny pores in capsular wall // endothelium of glomeruli; **Any**
(2mks)

2



6. a) 0 1 2 4 6 8 10 12 14 16
Time(hours) ✓A
- b) 5 hrs and 24 min $\pm$ 6 min ;
11 hrs $\pm$ 6 min
- c) Paramecium Aurelia - predator ;

©

21

✓ 1/2 ✓ 1/2

Paramecium

Yeast - prey;

(1mk)

d) $6 - 4 = 2$ hours;

- When population prey// yeast increases is followed by increase in predator ;

Acc converse

(2mks)

e) i) 2 and 6 hours

- More cells are dividing ; due to suitable environment // favourable condition ; few are dying; hence high increase in number ; (3mks)

(ii) 6 and 12 hours

- Acculation of toxic wastes; that kill paramecium ; Depletion of nutrients leading to death ; over- crowding ; leading to competition for food // space; (3mks)

f) Population will remain the same ; temperature not conducive; (2mks)

7. 1. **Cerebrum** ; - Which controls learning intelligence // reasoning // thought //

memory / speech / vision // hearing / smell // taste

- **Also controls voluntary movement s// movement of lips // limb // neck etc;**

Hypothalamus; - Which controls body temperature ability to sleep and wake - uip // appetite // osmo regulation / secretion of hormones;

Pituitary gland; - Secretes hormones like ADH / F.S.H .. L.H // prolactin // oxytocin;

Thalamus ; -Which is a relay centre that integrates sensory impulses from eyes // ear // skin ; and sends the impulse to sensory cortex of cerebrum;

Acc contains receptors for pain and pleasure.

- Olfactory lobes ; Controls sense of smell ;

- Ventricles ; which contain cerebrospinal fluid which supplies food nutrients and oxygen; to tissues of brain // remove metabolic waste from brain tissues ; fluid acts as shock absorber for the brain;

- Optical lobes ; control movement of the eye ;

- Cerebellum ; controls body balance // movement // posture ;

- Medulla oblongata ; controls involuntary movement sneezing vomiting / blood circulation // breathing movement;

- Ventricles // meninges ; for protection;

- Arachnoid layer ; secretes cerebrospinal fluid for oxygen // absorbs shock // nutrients;

8. a) Pollen grains stick to the stigma surface; surface of the stigma produces a

chemical substances ; which stimulates the pollen grain to produce a pollen tube // germinate;

- The pollen tube grows down (into the tissues of the style (from which it derives nutrients;
 - The generative nucleus divides to give rise to two male nuclei; and embryo sac has eight nuclei; 2 synergids ; egg cell ; two polar nuclei ; three antipodal cells;
 - When the pollen tube reaches the micropyle the vegetative nucleus // pollen tube nucleus in the pollen tube degenerates// disintegrates ; one male nucleus fuses with egg cell ovum ; and forms a zygote; which develops into embryo;
 - The other male nucleus fuses with two polar nuclei ; to form triploid nucleus;which develops into endosperm; the process involves double fertilizations;
- b) Changes in flower after fertilization
- Integuments of ovule - seed coat / testa
 - Zygote - embryo ;
 - Triploid nucleus - endosperm ;
 - Ovary wall - pericarp;
 - Ovary - fruit;
 - Ovule - seed
 - Any other part // style / petal / calyx / stamen // corolla //
- stigma - dry // falls off;

5mks

2012 PROJECTIONS -007

231/2

BIOLOGY

PAPER 2

MARKING SCHEME

1. a) B - Nerve endings; Acc. Nerve fibre/ nerve cell
R - Cornified layer; (2mks)
- b) C - Secretes sebum which makes the skin supple/flexible/waterproof/
is antiseptic;
Accept; which kills bacteria (1mk)
P - Gives rise to new epidermis/malpighian layer/has melanin which
protects the skin
from ultraviolet rays; (1mk)
Rej. Sunrays / light rays
- c) Presence of adipose tissue which acts as an insulating layer;
Presence of blood vessels which constrict so as to enhance blood
flow to deeper layers;
Presence of hairs- when it is cold the hairs are raised trapping more
air which acts as an
insulator;
(Mark 1st two only (2mks)
- d) - Can cause skin cancer ✓ because the skin is affected by ultraviolet
radiation
- Reduce melanin hence reducing pigmentation

2. a) Strong air currents / winds;
High temperatures;
Low humidity/dry conditions any 2 pts = 2mks
Light / Bright light;
b) Absence of leaves/stomata absent; (2mks)
Transpiration is reduced/ little transpiration;
c) Habitat for A: Arid/dry/desert/semi-desert; (2mks)
Reason: Low rate of water loss/ little water lost
Habitat for B: Areas of adequate water / high rainfall/ plenty of water;
Reason: High rate of water loss / more water lost / A lot of water loss; (2mks)
3. a) Hawks;
b) Green plants → Grasshoppers → Lizards →
Snakes Hawks;
Green plants → Mice(pygmy-possum) → Cane toads →
Snakes Hawks;
(The arrow points the eater).
c) Quaternary consumers;
d) Capture some fish, mark and release; them (without harming them).
Record as first marked (FM);
After 24 hours, collect as many organisms as possible in the same area. Record the number collected as second capture (SC);
Record the number of those previously marked as marked recapture (MR);
$$P = \frac{FM \times SC}{MR}$$
 Max 4 mks
4. a) A (mature) embryo sac; Rej. Embryo alone
b) A - Antipodal cells;
B - Polar nuclei;
C - Synergids;
c) B - Polar nuclei fuses with one male nucleus to form a primary triploid;
C - Egg cell fuses with another male nucleus to form a primary diploid;
d) Protandry - Is where the stamens ripen earlier than the stigma;
e) Protogyny - Is where the stigma matures earlier than the stamens;
5. a) Aa; Aa; / both are Aa (2mks)

b)

insulin hormone;

Also increased rate of respiration reduced the level of glucose.

c) 90mg / 100m/s;

d) Person B has a defect in the pancrease;

Person B did not produce enough insulin to control the blood sugar

level;

e) By administration of insulin - hormone;

f) Ensure optimum levels of metabolism; High level will increase the

osmotic pressure; and

thus affect metabolism;

Low levels reduce energy supply in the body tissues and affect

metabolism; 3 pts = 3mks

g) Glucose is used for respiration;

Glucose was lost in urine;

7. **Mouth**

Mechanical digestion where food is chewed and broken into small pieces.

Food is mixed with saliva which has salivary amylase, salivary amylase breaks down some starch into maltose;

The bolus is then swallowed through the oesophagus/gullet to the stomach. In the stomach, the presence of the bolus in the stomach stimulates the gastric glands to secrete gastric juice; which contains dilute hydrochloric acid; Pepsin and rennin; Dilute Hcl creates an acidic medium for trypsin enzyme; also kills; germs present in the food bolus.

In the duodenum; the pancrease; produces pancreatic juice; which contains pancreatic amylase; pancreatic lipase; and Trypsin enzymes; Pancreatic amylase breaks down the remaining starch to maltose, pancreatic lipase breaks down the lipids into fatty acids and glycerol; The liver produces bile; that contains bile salts; which emulsify; fats into small fatty droplets;

Bile salts also creates an alkaline medium for enzymatic action. In the ileum secretory cells secrete intestinal juice; that contains maltase; sucrase lactase, peptidase and lipase;

Maltase breaks down maltose to glucose and lipase breaks down fats and oils to fatty acids and glycerol.

Glucose is absorbed in the ileum; to the blood stream; fatty acids and glycerol are absorbed by the lacteals.

8. a) Secondary thickening is facilitated by meristematic cells; known as cambium; which are

located between phloem and xylem in vascular bundles of plants;

The cambium divides radially; to form a ring (cylinder) of cambium tissue with the xylem inside the ring; and the phloem outside the

ring; cells of the cambium ring divide to form secondary phloem

outside; interfascicular cambium (between vascular bundles) divided to form secondary parenchyma; thereby increasing the growth of

meducary rays; much more xylem is formed than phloem; thus pushing phloem and cambium outwards; The rate of secondary

growth is dependent on the season/rainy resulting in annular rings;

cork. Cambium/phellogen divides to form new cork./ bark tissue; to accommodate increased growth on outside and secondary cortex on the inside; (14mks)

- b) - Choose/ identify a young leaf which is folded; use the same leaf throughout; measure the total length of the whole leaf; (acc measurement of any part of the leaf / record / length) Repeat the procedure at regular interval; until no change occurs in length/ until it gets constant length; The average rate of growth is equal to total increase in length divided by the period taken to achieve final length; (6mks)

2012 PROJECTIONS -008

BIOLOGY MARKING SCHEME 231/2

MARKING SCHEME

SECTION A (40MARKS)

1. (a) Gene located on the sex chromosomes and are transmitted along with those determining sex;✓
(2mks)

Reject trait/characteristics for genes.

- (b) Baldness/premature baldness
(2mks)

Tuft of hairs sprouting from pinna/nose/ears;

- (c) Parental phenotype: Red eyed female X White eyed male

Genotype: $X^R X^R$ $\times$ $X^r Y$;✓ The cross must be shown and

Genotype are correct to score

be
to score
mark for correct fusion

Gene X^R X^R X^r Y ; ✓ All the gametes must
Correct
; ✓ Award a

Fusionet
es

→ F1 $X^R X^r$ $X^R Y$ $X^R X^r$ $X^R Y$;✓ All the four
genotype must be

Correct to
score

If phenotype is indicated instead of genotype deny marks for genotype

Phenotype ratio = 2 Red eyed female: 2 Red eyed male. 1 Red eyed female: 1 Red eyed male

Or

If a punnet square is used award marks as follows

Parental phenotype: Red eyed female X White eyed male

Genotype: $X^R X^R$ x $X^r Y$;√ If the cross is not indicated award no

Gametes: X^R X^R X^r Y

Mark.

♀ X ^R		Gamete	
		X^R	Y
X^R	$X^R X^R$ ✓	$X^R X^r$	For
Y	$X^R Y$	$X^r Y$ ✓	F1

Phenotypic ratio: 2 Red eyed female: 2 Red eyed male. 1 Red eyed female: 1 Red eyed male ; 1:1; ✓

2. a)

Donor

	Ab	Ba	ABo	Oab
Ab	✓	X;	X	✓
Ba	X	✓;	X	✓
ABo	✓	✓	✓;	✓
Oab	X	X	X;	✓

b) Open circulatory; 1

c) (i) Hepatic portal vein; 2

(ii) Vena cava;

d) Left ventricular pumps blood a longer distance to all parts of the body; thicker walls exerts greater pressure; 2

3. a) Community - consist of all plants and animals in a habitat interacting with each other / All organisms of different species in an habitat;✓

Population refers to members of the same species in an ecosystem✓

b) - use of capture and recapture method; ✓

- capture the grasshoppers; ✓

- Count and mark; ✓

- Use permanent ink to mark; ✓

- record and release; and allow time to mix with entire population; ✓

- recapture and count the marked and unmarked; ✓

- Total population is equal to members of marked and unmarked grasshoppers in first sample; ÷ number of grasshoppers in second sample that were recaptured;

$$(P = \frac{FM \times SC}{MR};) \quad \frac{1}{2} \times 10$$

= 5 MARKS

4. a) (i) P- Will bent/ grow towards light; ✓
 Q- Will remain straight / no growth / little growth; ✓
 R- Will remain straight / grows straight / grows upwards; ✓
 3mks
 (ii) In P -growth substances (hormones) / Auxins / IAA are produced by the stem tips; ✓ they move (downwards and get distributed) to the side away from the side of light / to the darker side; ✓ which they cause rapid (more) growth / (more) cell division / (more) cell elongation that results in bending; ✓
 In Q- The source of auxin (tip of stem) has been removed; (1mk)
 In R- The auxins cannot be affected by light because the tip has been covered; ✓ (1mk)

Total

5marks

- b) It will bend towards the light / grows towards light by bending; ✓
 c) All the seedlings will grow straight / upwards; ✓

Or

P and Q grows straight / or upwards

Q- No growth;

5. a) pelvic girdle; 1
 b) (i) femur;
 (ii) obturator foramen 2
 c) Cardiac muscle / heart muscles;
 Smooth muscle / involuntary muscle / visceral muscle; 3
 Skeletal muscle / voluntary muscle;
 d) (i) Hip and socket rotates 360° / allow movement in all plane while hinge rotate 180° / allow movement in one plane only;
2
 (ii) Patella;

SECTION B (40 MARKS)

6. On the graph
 Award for the
 -Plotting - correctly plotted points ✓ P
 - Curves - smooth curves ✓ C
 - Scales - Y axis ✓ S
 - X axis ✓ S
 - labeling of axes
 -Time in minutes ✓ A
 - Number of yeast cells ✓ A
 Total 6marks
 (i) sigmoid; ✓
 (ii) 92/93; ✓ check on the graph

(iii) 31.5 minutes; ✓

c) $\frac{110 - 78}{4} = 8.0;$

d) (i) Lag phase / slow growth phase;

Reason – number of cells dividing are few therefore little growth;
- cells have not adjusted to the environment;

(ii) Exponential / rapid growth is due to

- increase in number of dividing cells;
- cells have adjusted to the new environment;
- nutrients / food is enough and cells are not competing for resources;
- rate of cell increase is higher than the rate of cells death;

(iii) Decelerating phase;

Reason for slow growth

- most cells are fully grown and differentiated;
- fewer cells are still dividing;

e) Four factors which could cause human population growth to assume the curve between 10 and 30.

- Low death rate / low mortality; ✓
- High birth rate / high fertility; ✓
- Improve health services; ✓
- Enough food / availability of food; ✓
- Absence of war, political stability / peace; ✓
- Improved standard of living; ✓

Mark the first four

7. (a) Define digestion

It is break down of complex insoluble; ✓ food substance into simple soluble food substances; ✓

(b)

Describe the digestion of ugali;

- Digestion of ugali begins in the mouth; ✓ ugali is chewed by the teeth to increase large surface area ✓ for action of salivary amylase / ptyalin; ✓ The food mixes with saliva produced by salivary glands; ✓
- Saliva contains mucus and enzyme ptyalin. Mucus moistens, softens and lubricates the food; ✓ ptyalin speeds up the conversion of starch to maltose; ✓ ugali is made into bolus in the mouth; ✓
- The bolus moves along the oesophagus and peristalsis / by contraction and relaxation of circular and longitudinal muscles into the stomach; ✓
- The digestion continues until ugali become acidic since the stomach does not contain carbohydrase / carbohydrate digesting enzymes no digestion of ugali takes place here. ✓
- Ugali now moves into duodenum by peristalsis in form of acidic chyme; ✓ where it mixes with the bile from the liver and pancreatic juice from the pancreases; ✓ bile being alkaline neutralizes the stomach acid; ✓ and provides a suitable alkaline medium for the enzymes to act on carbohydrates; ✓
- Pancreatic juice contains three enzymes out of the which enzyme amylase speeds conversion of starch to maltose; ✓

- When food reaches the ileum; it mixes with intestinal juice which contains several enzymes. Maltase – speeds up conversion of maltose to glucose;✓
- Lactase which speeds up conversion of lactose to glucose✓ and galactose; sucrase which speeds up conversion of sucrose into fructose and glucose;
- Absorption- glucose, the end product of all carbohydrates diffuses through the epithelium of villi and capillary walls and enters into blood stream and is carried to the liver via hepatic portal veins;✓
- Assimilation- in the liver excess glucose is converted into glycogen and stored;
- The rest of the glucose is carried by the blood tissues where is oxidized during tissue respiration to release energy;✓

21max

18mks

Total 20mks

8. -Temperature;

High temperature faster rate of transpiration; high temperature increases the capacity of atmosphere to hold water and moisture; also heat increase internal temperature of the leaf hence water evaporation;

4 accept converse

- Atmospheric pressure;

Low atmospheric pressure, high rate of transpiration 2

- Humidity;

Low humidity higher rate of transpiration; low humidity increases the saturation deficit; hence water moves from leaves to drier atmosphere;

4

-Wind;

When it is windy the rate of transpiration is higher; wind sweeps away vapour that has accumulated at the surface of leaf; in creasing saturation deficit; hence faster rate of transpiration

5

- Light intensity;

High light intensity faster rate of transpiration high light intensity increase photosynthesis rate hence stomata opens; 4

- Amount of water in soil;

More water in the soil increases the rate of transpiration; it wets the xylem (ensure xylem is wet throughout); 3

Max 20

2012 PROJECTIONS -009

231/2

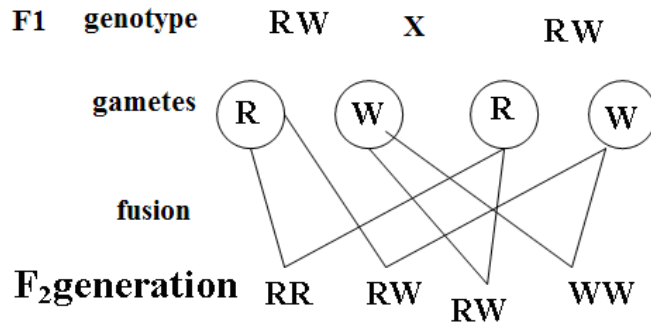
BIOLOGY

PAPER 2

MARKING SCHEME

THEORY

- 1) a) i) RR; WW;
ii) RW;
b)



- c) 1 Red, 2 Pink, 1 White/
there are three colours 1 red 2 pink and 1 white, pink appearing due to incomplete dominance/ co- dominance / equal dominance; Reject if colours are not mentioned.
2. a) Diffusion
b) i) Reducing sugars;
ii) Diastase converts starch to reducing sugar; so present in the visking tubing then due to small sized molecules of reducing sugar and semi permeability of visking tubing; the molecules moved across the semi permeable membrane to the beaker; so present both in the visking tubing and the beaker. (Rej. second mark: - If size and semi permeability are not indicated.)
- c) i) Proteins; Rej. Amino acids.
ii) The molecules of proteins are large / big so cannot pass through the pores of the semi - permeable membrane Visking tubing
- b) Turgid; acc turgidity;
3. a)

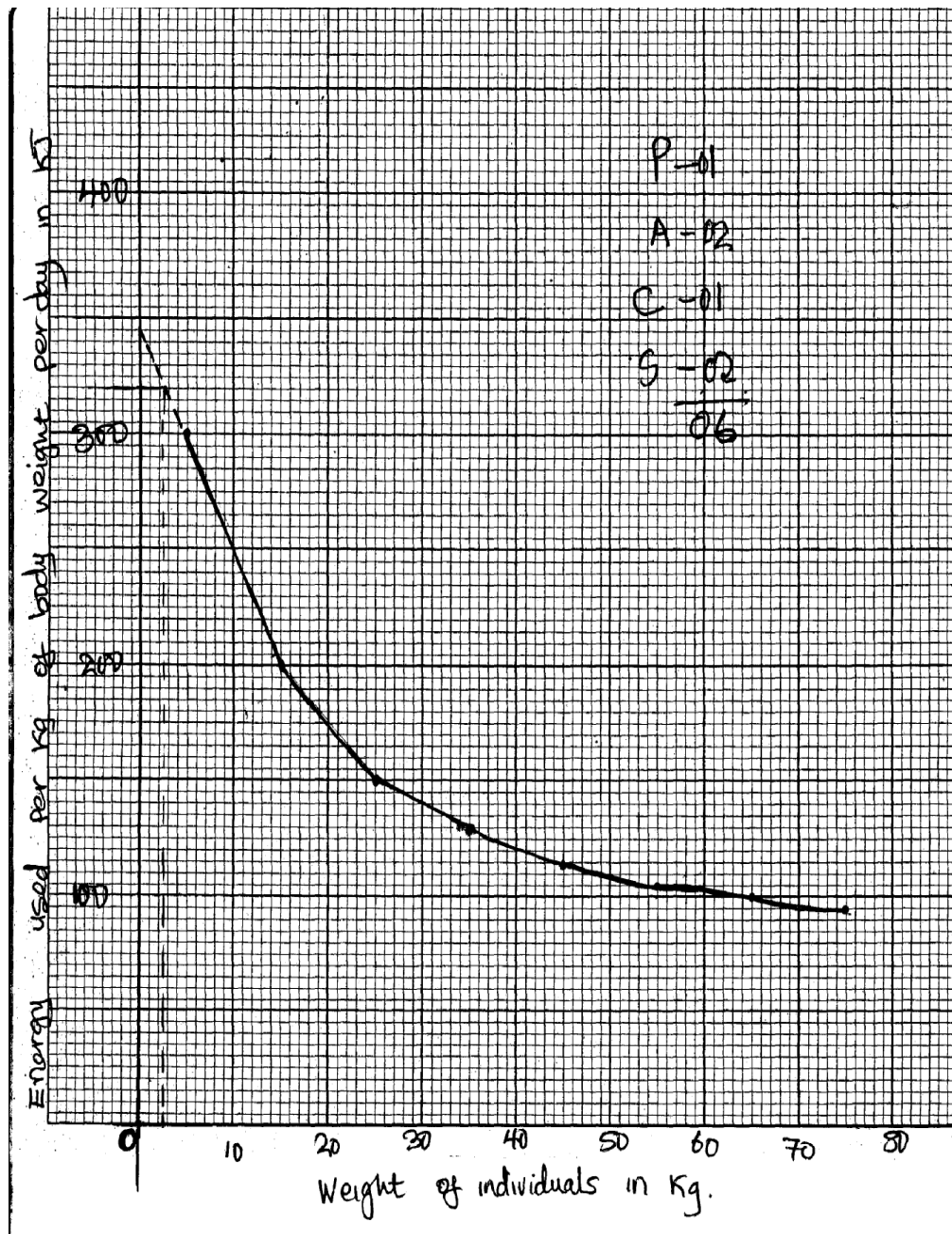
Natural Immunity	Acquired immunity
Inherited / transmitted from parent to the offspring	Developed after suffering from a disease / through vaccination.

Rej. If the setting apart of the terms is not done.

- b) Allergy - Drastic reaction of the body seen in a few individuals towards foreign substances that are normally harmless to the rest of the population / hypersensitive reaction of the body to harmless substances;
- c) i) Platelets / Thrombocytes;
ii) Calcium ions;
iii) Fibrin clot; Rej. Clot alone.

- d) i) High temperature in the atmosphere causes temperature of the leaf to rise, thus increasing the vapour pressure in the intercellular air spaces, this causes increase in transpiration rate;
 ii) Low humidity in the atmosphere / dry air, results to higher vapour in the intercellular space than the air surrounding the leaf, hence increases diffusion gradient hence higher transpiration rate;
 iii) Low atmospheric pressure; causes an increase in evaporation from a wet surface /less opposing pressure to evaporating molecules thus higher rate of transpiration.
 Rej. If the student has not quantified the factor eg. High temperature, low atmospheric pressure low humidity.
 Rej. Where no explanation is given e.g high temperature, low temperature, the higher the transpiration rate.
4. a) E - malpighian layer;
 F- Nerve endings; Rej. Specific names.
 b) Structure H - Sweat from it evaporates leading to cooling the body;
 Removal of excretory products; Removal of urea / water/excess mineral salts;
 Mark any correct one.
 Structure I: Makes the hair water repellant / Waterproof;
 Makes the skin soft /supple / water proof/ water repellant;
 Has antiseptic / antibiotic properties / kills bacteria;
 Acc. Any correct one.
 Rej. Oily alone (sebum is oil)
 Rej. Moist - makes skin moist.
- c) i) H - Sweat glands - become more active thus secrete more sweat that evaporates, bringing about cooling of the body;
 ii) G - Erector pill muscle, relaxes thus lowering the hair, no / little air is trapped and thus heat is lost.
 c) Acts as a storage organ for fats;
 - Sensitive to high/low temp/ sensitivity to pain / pressure;
 - Synthesis of Vit. D when Exposed to sunlight;
 - Mechanical barrier / Protection against entry of pathogens;
 - Screens the ultra violet light due to presence of melanin pigment. Mark 1st two. Only.
- 5) a) i) Anterior end - Scapular / clavicle;
 ii) Posterior end - Radius and ulna; the two must be mentioned to get a mark.
 b) Distal end - Gliding joint; Rej. Wrist / Movable
 Proximal end - Hinge joint; Rej. Elbow / movable.
 c) E (offers S.A) for attachment of tendons / muscles;
 Prevents overstretching of the arm/ acts as a stopper;
 mark 1st one only.
 d) Name - Ligament
 - Function bone to bone connection; The two answers must be correct to earn a mark.

- e) P (biceps) contracts while Q (triceps) relaxes; Rej. If naming is incorrect.
- f) Calcium phosphate Rej. Calcium, calcium ions.



- b) i) 75 ± 2.5 KJ/ day;
 ii) 10 ± 2.5 KJ/ day Rej. If units are not shown.
- c) Individuals with smaller size have a larger surface area to volume ratio than those with larger size hence losses more energy per unit body weight / smaller size individuals lose heat faster than bigger size individuals;
 Rej. If S.A to volume ratio is not connected to heat loss.
- d) i) 320 kJ/day;
 ii) Age: Young people are actively growing hence require more energy than older people;
 Occupation:

Manual workers require more energy than sedentary workers;

Sex:

Males are more muscular hence require more energy than females;

Rej. Masculine = Used mainly for gender.

- e) i) There will be less energy required;
- ii) Are ectothermic / Gain heat from the environment/ are less active;

f) Lipids;
Carbohydrates;

g) Proteins;

h) i) $\frac{\text{Volume of CO}_2 \text{ produced}}{\text{Volume of O}_2 \text{ consumed}} = \frac{102}{145} = 0.703$;

ii) Fats; Rej., Lipids and oils

iii) Need a lot of the oxygen for oxidation.

iv) Need to be mobilized from their storage areas and transported to site of oxidation.

7. Domestic effluents; sewage / faeces / urine'

- Nitrogenous wastes / Urea / Uric acid/ Ammonia;

- Garbage; detergent; pollute water.

- Pollution from domestic affluent- controlled by treating domestic wastes /

- Using biotechnology;

- Banning use of phosphate - based detergent;

- use of plastic pipes - instead of lead pipes.

- Recycling garbage;

- Industrial waste; radioactive wastes;

- Industrial wastes have heavy metals which include lead/ zinc / copper/

Chromium mercury; Treating industrial wastes; Carrying out environmental assessment before establishing industries;

- Hot water; cooling hot water;

- Oil spills; controlled by cleaning oil spills/ Biotechnology; Penalising industrial / Industries / companies causing pollutions;

- Agrochemicals; such inorganic fertilizers; herbicides/Insecticides/ Pesticides / Fungicides;

- Pollution due to agrochemicals - controlled by mechanical control of weeds; biological control of weeds / pests; use of biodegradable organic fertilizer / herbicides/ insecticides/ organic farming/

Educating farmers on correct amount of agrochemicals;

- Sitting; soil erosion; controlled by appropriate farming practices / contour farming/ reforestation/ building gabions/ terracing;

Total 27

Max 20

8. - Conjunctiva is thin / transparent/ tough; to allow light to pass through /

protect the eye;

- Sclerotic layer is made up of (collagen) fibres / fibrous; it maintains shape

of eyeball/ protects the eye;

- Cornea is transparent / curved; thus refracts light rays/ allows light to pass through;
- Choroid (is a layer of a tissue) has black / dark pigments; prevent internal reflections of light in the eye; / Contains blood vessels; that supply oxygen / nutrients/ (removes the metabolic) waste from the eye
- Retina has rods / cones; for low vision / for colour/ bright light;
- Yellow spot / Fovea centralis / Fovea – has highest concentration of cones; for accurate/visual acuity;
- Blind spot has no cones and rods; place where optic nerve leaves /enters the eye;
- optic nerve has sensory nerve fibres/ neurons; for transmission of impulse to the brain (for interpretation)
- Lens is biconvex / made up of elastic/ transparent material; adjust to focus far or near objects/ allows light rays to pass through / for refraction of light rays;
- Ciliary body is made up of muscle fibres/ glandular; which contracts / relax to change shape/ curvatures of the lens / to produce aqueous humour;
- Suspensory ligaments are inelastic; hold the lens in position / attach it to ciliary body;
- Iris (is the coloured part of the eye(It has radial and circular muscles; which control size of the pupil;
- Pupils (is the small) – hole at the centre of the iris; through which light passes into the eye;
- Aqueous humour is fluid / transparent / clear; through which oxygen / nutrient pass “to” cornea / lens/ maintains shape of the eyeball/ refracts light rays / allows light to pass through; acc transparency to refraction.
- Vitreous humour is a fluid / transparent / clear; which maintains shape of the eye / refracts light/ allows light to pass through;

TOTAL 30 MARK
MAX 20 MARKS.

BIOLOGY PAPER TWO MARKING SCHEME.

2012 PROJECTIONS -010

1. a) i. Phloem/phloem tissue: **1mk**

ii. Sieve tubes have cross-walls called sieve plates that are perforated: to allow the flow of synthesized food material from one sieve tube to the next: **1mk**

Presence of cytoplasmic strands/ protein strands that allow the streaming / flow of synthesized food material along them during translocation; **1mk**

Presence of companion cells next to the sieve tubes, which have numerous mitochondria to produce energy for translocation; **1mk**

b) In the soil water exists as a thin film in the soil particles /soil solution✓

The concentration of the cell sap of the root hair is greater than that of the surrounding solution in the soil; ✓ 4mks

total 8mks

The water molecules from the soil solution are drawn into the cell sap of the root hair cells: through the cell wall; ✓ and semi-permeable cell membrane; ✓ by osmosis; thus dilute the root hair cell sap causing it to become less concentrated than that of the adjacent cortex cell of the root; ✓ water enter the cortex cell by osmosis; then pumped across the endodermis into the root xylem; ✓

2. a) Pisces ;

1mk

b) T -gill rakers -- are used filtering food particles from the water before it flows over the gills; thus protect the gill filaments from mechanical damage /injury; 2mks

c) Operculum;

1mk

d) Gill filament are numerous to provide large surface area for gaseous exchange; gill filaments have thin walls /one cell thick /epithelium wall to reduce the distance over which the gases diffuse; Gill filaments have moist surface/ covered by mucus to facilitate faster diffusion of respiratory gases; Gill filaments are highly vascularised / have dense network of blood capillaries to facilitate transport of respiratory gases to and from the gills.

4mks

Total 8mks

3. a) Is a type of nutrition where organisms especially green plants and some bacteria manufacture their own food; from simple inorganic materials with the help of sunlight/chemical reactions;

2mks

b) Light stage. Light trapped by chlorophyll pigments is used to split water molecules chemically (in the granum) to produce hydrogen ions, and oxygen; some of the light Energy is used to produce ATP molecules;

2mks

c) i. Palisade mesophyll layer have cells with numerous chloroplasts; to provide large surface for maximum photosynthesis; palisade mesophyll cells are numerous to provide large surface area for photosynthesis;

Any two 2mks

Palisade mesophyll cells are found next to the upper epidermis; for maximum absorption of sunlight for photosynthesis; any two

ii. Spongy mesophyll layer has cells that have irregular shape and loosely packed to provide large intercellular air spaces for free circulation of carbon (IV) oxide to reach the photosynthesis cells; chloroplasts that provide a site for photosynthesis.

Any one give 3 mks

d) Carbon (IV) oxide reacts with hydrogen ions/ atoms in the presence of ATP/ energy to form simple sugars; 1mk total 8mks

4. a) Fertilization in higher plants –involves one male nucleus fusing with a functional; egg to form a zygote; while the other male nucleus fuses with the polar nuclei to form a triploid cell;

In animals, fertilization involves the fusion of the male nucleus and female ovum nucleus to form a zygote.

2mks

- b) i. Oestrogen

Promotes / causes /initiate the healing /repair of the endometrium/ uterine'

Stimulates the pituitary gland to secrete Luteinising hormone 2mks

- ii. Luteinising hormone (LH)

–causes ovulation;

–Stimulates the Graafian follicle remains to change into the corpus

lutevis;

–stimulates/causes corpus luteum to secrete progesterone any two

2mks

–causes/stimulates the maturation of the Graafian follicle

c) Provide site for exchange of nutrients and waste products between the material blood and the faetal blood system; secretes/ produces progesterone hormone; placenta attaches the foetus to the mothers' uterus; mark the fist two.

total marks

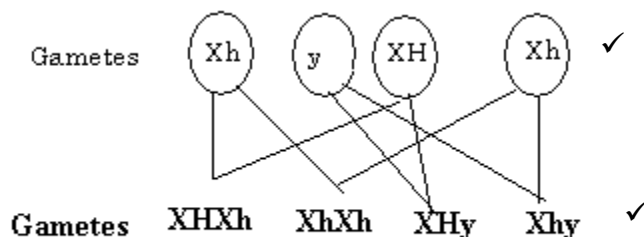
8mks

5. a) Mutation is a sudden / spontaneous change; in the genetic make up of an organism; 2mks

b) Bacteria that survive the drug will undergo mutation; to produce bacteria which are resistance to the prevailing condition / drug;

2mks

- c) Genotype Xhy x XHXh✓



rej= X_H or X_HX_H
Accept X^Hy n X^H
 X^h

3mks

- d) Phenotypic ratio: 1 male normal
1 male haemophiliac
1 female haemophiliac
1 female carrier

1male normal: 1male haemophiliac :1 female haemophiliac: 1 female carrier:
1mk

Total

marks =8mks

SECTION B

6. a) labeling axis = 2mks

Scale mark = $2/2 = 1$ mk
 Plotting = 2mks
 Identification = $2/2 = 1$ mk
 Smooth curve = $2/2 = 1$ mk
 Total = 7 mrks

b) Concentration of glucose in blood of

x at 25th minute = $130 + 0.5$:

y at 25th minute = $162 + 0.5$:

2mks

c) individual x, sugar level increase in the blood due to its absorption at the gut; ✓ until 30 minutes; ✓ after 30 minutes the level of sugar decreased in x as the liver was converting excess to glucose by the help of insulin; to glycogen; ✓

Individual y the concentration of the sugar level does increase after 30 minutes since the body has no mechanism of regulating it/ the body is not able to control its body sugar. ✓

4mks

d) The individual x has the ability to homeostatically control the sugar level in the blood; the individual y has no ability of controlling the sugar level homoestatically;

2mks

e) i. Glucagons;

1mk

ii. the hormone (is released by the pancreas when the sugar level is below the norm)l. Glucagon stimulate the liver cells to convert stored glycogen into glucose which is released into the blood;

2mks

f) i. Blood sugar is used in the cells for respiration process to release/ produce ATP/ energy for the cells;

1mk

ii. Diabetes mellitus;

1mk

Total marks

20mks

7. a) Xerophytes

Xerophytes have roots that grow deep to absorb water far below;

Some xerophytes have shallow roots that spread widely / extensively in order to trap water from any little shower of rain;

Xerophytes have fleshy / succulent /juicy stems / roots for storage of water;

Some xerophytes have photosynthetic stems that take the place of leaves; to reduce the surface area for transpiration;

Some xerophytes have leaves that are needle like / reduced to spines; to reduce surface area thus reducing loss of water by transpiration;

Some xerophytes have fewer number of stomata located only on the lower surface of the leaves to reduce transpiration rate;

The stomata are also small in size to reduce loss of water by transpiration;

Some xerophytes have sunken stomata which allow water vapour to saturate in the pits / depression; thus reducing water loss of transpiration;

Xerophytes have thick waxy cuticle that is water proof; thus preventing excessive loss of water;

Some xerophytes have a very short life cycle thus grow fast to use the little rain within a very short time;

Some xerophytes have thorns on their stems / branches / midribs / leaves to protect the plant from predator / browsers / herbivorous animals;

Some xerophytes roll their leaves to reduce surface area exposed thus reducing rate of water loss by transpiration;

Some xerophytes have reversed stomatal rhythm where they open their stomata at night and close during the day to reduce water loss of transpiration;

b) hydrophytes

Hydrophytes have large number of stomata on the upper surface / epidermis to increase transpiration rate;

They have broad leaves to increase the surface area for floating / buoyancy;

Hydrophytes have long fibrous roots to increase surface area for floating / absorption of mineral / salts;

Hydrophytes have aerenchyma tissues that have large intercellular air spaces for storage of air to be used for gaseous exchange;

They have aerenchyma tissues that also help the plant to float in water / buoyancy; hydrophytes have poorly developed supporting tissues because water provides the necessary support;

They have poorly developed conducting tissues / xylem and phloem since the plant get water by diffusion;

Leaves of submerged hydrophytes are deeply dissected into thread-like straws to provide large surface area for absorption of light;

Submerged hydrophytes have no cuticle and epidermal cells to enable them absorb water;

8. The ear has the pinna which is funnel shaped to collect / direct sound waves into the ear; The ear has the external auditory canal to passage through which sound waves passes to reach the ear drum / tympanic membrane;

The ear-drum / tympanic membrane is thin and tight to convert sound waves into (sound) vibration to the ear ossicles;

The ear ossicles are three tiny bonny structure that vibrate when striked; by the ear-drum; the ear ossicles transmit sound vibration to the oval window; and amplified sound vibration (and the oval window);

The inner ear has the cochlea; which is long and spiral / coiled increasing surface area for attachment of many sensory cells that detect sound vibrations; the sensory cells in the cochlea together with the basilar membrane form the organ of corti;

Sensory cells in the cochlea / the organ of corti, are stimulated by the vibration received from the oval window; and the perilymph and endolymph flinds; impulses are generated and transmitted to the brain via the auditory nerve fibres; for interpretation

The inner ear has three semi-circular canals arranged in planes at right angles to each other; to be able to detect changes in the position of the body in any of the planes;

The semi-circular canal has a swelling at its base called the ampulla; ampulla has sensory cells which detect any changes in the head displacement;

The inner ear has the intriculus sacculus has a gelatinous cupila; which has otolith attached to the sensory celled; Any movement of body causes the otolith to change position thus exerting pressure on the sensory cells which causes the generation of impulses ; impulses are transmitted to the brain for interpretation along the auditory nerve fibres; the position of the body (in relation to gravity) is restore

**BIOLOGY
PAPER 2
2010**

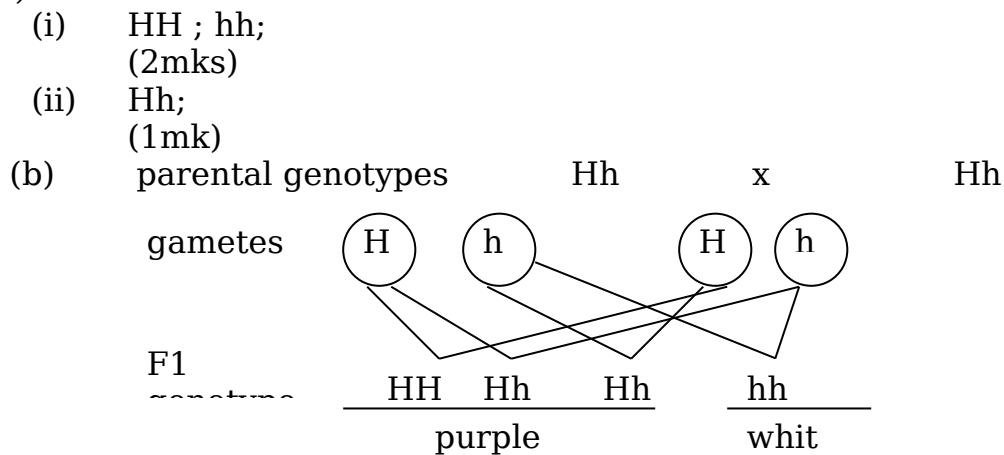
2012 PROJECTIONS -011

MARKING SCHEME

1. a)ATP / Adenosine triphosphate
(1mk)
b) V - Oxygen
W - Carbon (IV) Oxide reject: symbols
(2mks)

- c) Condensation;
(1mk)
- d) stroma; reject chloroplast
(1mk)
- e) cellulose; Lipids / fats and oils;
two (2mks) any
- protein / amino acids;
- f) - Thin to reduce distance for diffusion of gases / easy penetration of light
- chlorophyll to trap light energy (reject trap light) any two
correct (2mks)
- Broad and flat lamina to offer large surface area for exchange of
gases / maximum absorption of sunlight.
- Network of veins contains xylem which supplies the photosynthetic
tissues with water and minerals salts / contain phloem which transport
soluble food to other parts of the plant.

2. (a)



(c) The gene for purple flower is dominant over the gene for white flower / the gene for white flower is recessive;
(1mk)

3. (a) Tendril

(1mk)

(b) (i) Thigmotropism

(1mk)

(ii) - Offer mechanical support for the plant;

- plants is lifted in order to maximize the absorption of light /
sunlight

(c) Auxins; migrate to the parts of the tendril, the part touching structure
T has less concentration of auxins;

Auxins cause faster growth / faster cell elongation (not faster cell division
alone) on the outer part of the tendril than the part touching structure T;
hence the tendril grows round the structure T

(3mks)

4. (a) (i) Red blood cells / erythrocytes

(1mk)

(ii) -Transport of oxygen from the lungs to the respiring tissues
- Transport of Carbondioxide from the respiring tissues to the lungs; (2mks)

(b) -Have no nucleus but sunken centre leaving room for more haemoglobin to be packed in the cell to allow more Oxygen to be carried;
- Too tiny about 5 m per m³ to be able to squeeze through the narrow capillaries;

- Large in number and bi concave shape to increase surface area for gaseous exchange;

any two (2mks)

(c) plasmodium

(1mk)

(d)-sternum

- vertebrae

- ribs

any

two (2mks)

(e) (i) 25 mm + or - 1;
(1mk)

(ii) 1 mm = 1000 μ m
25 mm = (25x1000) μ m.
= 25000 μ m;

(2mks) NB Units must be shown

to earn mark.

Actual size = $\frac{\text{Diameter of the cell (electromicrograph)}}{\text{Total magnification}}$

= $\frac{25000}{1000}$

= 25 μ m

(2mks)

5. (a) Root hair

(1mk)

(b) (i) -support

-transportation of water through the plant

(2mks)

(ii) - they are elongated

- they have lignified walls

- they are non-living

- they are very narrow

any two

(2mks)

(iii) - elongated and narrow to increase capillarity

- lignified walls to offer support and prevent water from leaking out of the xylem vessels

- non - living making it hollow to allow efficient transportation of water and mineral salts

any correct two (2mks)

6. a) (i) At 60 minutes the mean is 1.38
At 180 minutes the mean is 1.06

(2mks)

(ii) Title 1mk

Correct scale 1mk

Smooth curve (free hand) 1mk

Correct plotting point 1mk

Axis 2 mks

(iii) 1.34 - 1.35 mg / ml of blood (reject lack of units) 1mk

(iv) To obtain accurate results (1mk)

b) Difference in Age; sex; size; (3mks)

c) There was a general decline in the glucose concentration, in the blood due to reduction of insulin which promote

- its breakdown to release energy

- conversion of excess into glycogen for storage (in the liver and muscle tissues)

- conversion into fats storage; (in the adipose tissue / around major body organs)

d) fatty acids / glycerol ; amino acids;

(2mks)

7. -The ear performs two major functions, Hearing; and detecting changes in the position of the body;

- the ear is divided into three sections the outer ear; middle ear; the inner ear;

- pinna collects and concentrates sound waves into the external auditory meatus; which conveys them to the eardrum / tympanic membrane

- the external meatus has hair and wax; to trap solid particles / dust that would damage the ear drum;

- the ear drum vibrates as the sound waves strike it;; the sound waves are converted into sound vibrations; which are then transmitted to the ear ossicles (malleus, incus and stapes); the stapes passes the vibrations to the oval window which vibrates; passing the vibrations to the perilymph of inner ear;

- from the perilymph the vibrations are passed up to the reissner's; which passes them to the endolymph of the middle canal of the cochlea;

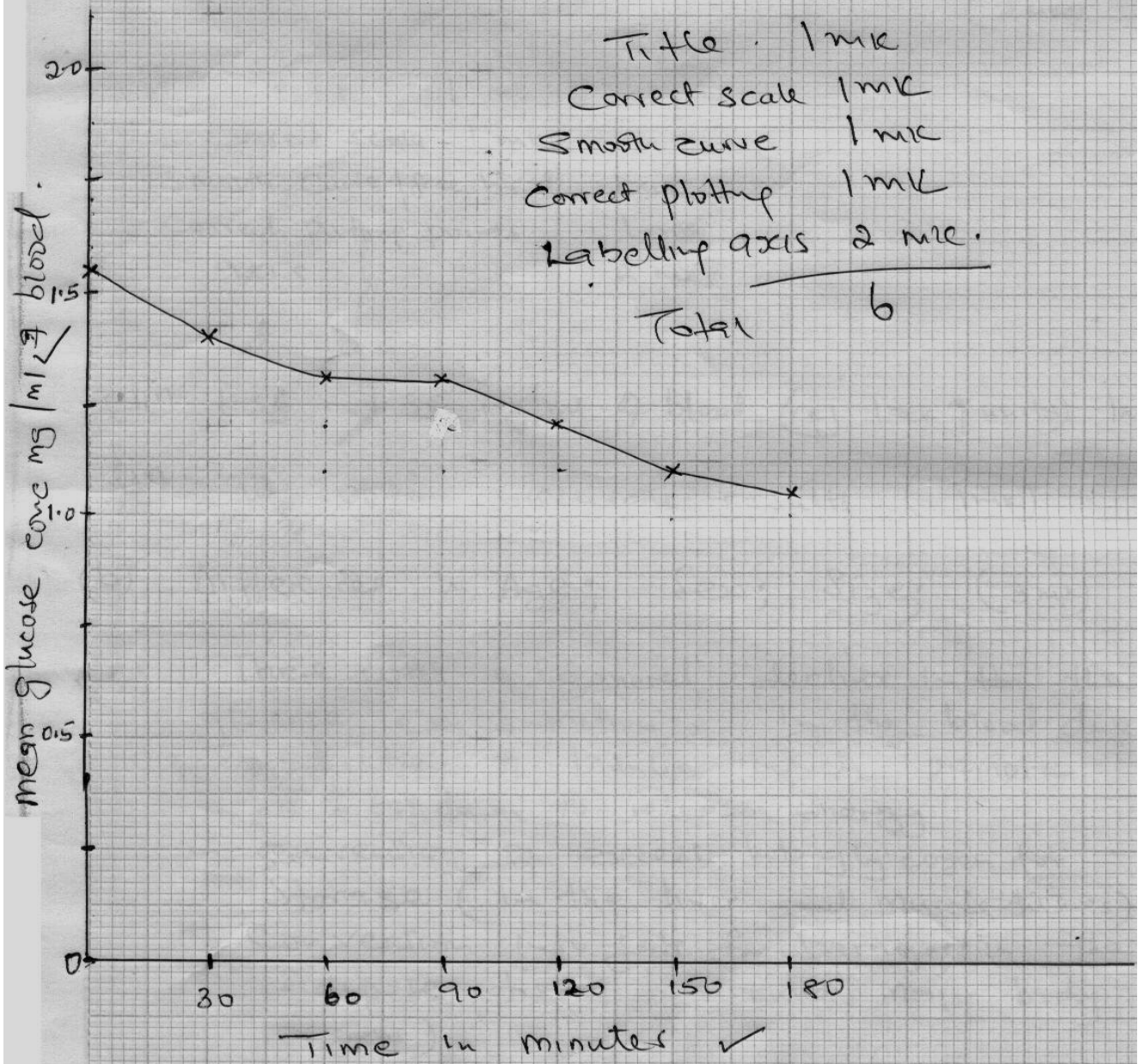
- the basilar membrane and tectoral membrane pick up the vibration from endolymph; and transmit them to the organ of corti; the sensory hair cells; in the organ of corti are thus stimulated by the vibration, hence they trigger off nerve impulses; which are transmitted to the brain via the auditory nerve fibre; for interpretation; the organ of corti discriminates sound according to their frequencies and the intensity of stimulation of sensory hair cells determines the pitch / loudness of sound. (max (20 mks)

8. a) Length , mass/ weight (dry), volume
(3mks)

b) Limitation in measuring growth (6mks)

- difficulty in choosing the right growth parameter✓
 - the use of a single growth parameter does not take into account growth in other directions✓
 - volume cannot be used for those organisms with irregular shape✓
 - mass of an organism is usually affected by variation in the fluid content of the organism✓
 - use of dry mass involved killing the organism
 - the use of mass or size may be inaccurate because✓ different parts of an organism at different times✓
 - irregularities in the growth of an organism due to fluctuation in the environment / diet✓
- (c) Structural adaptation of the insect tracheal system
- Spiracle; ✓ are openings through which gases (O_2 and CO_2) enter or exit the tracheal system ✓
 - Valves; ✓ ✓ on the spiracle control the opening and closing of spiracle; ✓
 - Hairs on the spiracle; ✓ traps dust / foreign particles and prevent entry into the tracheal system; ✓
 - Trachea is mechanically strengthened with rings of cartilage; ✓ to prevent collapse / keep trachea open✓
 - Air sacs; ✓ to act as air reservoirs air storage especially for very active insects✓
 - Trachea highly branched into tracheole: ✓ to increase the surface area for gaseous exchange✓
 - Tracheoles are thin walled'✓ to reduce diffusion distance for gases / rapid exchange of gases✓
 - Tracheoles contain a fluid; ✓ which absorbs oxygen thus facilitating diffusion into the tissues; ✓ (16mks) (14 max)

Graph Showing the mean of glucose conc
against time in rabbits.



2012 PROJECTIONS -012

231/2

BIOLOGY

PAPER 2

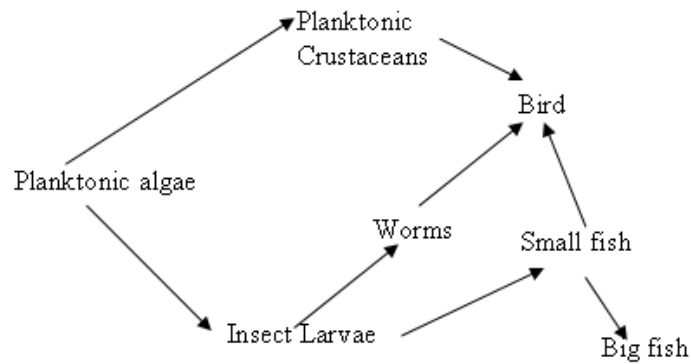
MARKING SCHEME

1. a) Study of cell functions;
 b) i) Iodine solution; RJ iodine alone
 ii) Diffusion ;
 iii) Iodine molecules moved by diffusion across the walls of the visking
tubling; react
 with starch to form Blue Black; solution ;
 iv) - Gaseous exchange in plants;
 - Movement of manufactured food materials of photosynthesis from
leaves to other
 parts of the plant;
 - Absorption of mineral salts from the soil by plant root hairs.
2. a) Sensory neurone; - cell body of the Axon
 b) Relay Neurone ; - Cell body in between the axon
 c) Motor Neurone ; - cell body at the end of the Axon.
 d) - When the impulse reaches the synaptic knob, the vesicles are stimulated
and releases the
 Acetyl ycholine which makes the membrane permeable; and acetylcholine
diffuses
 across the synaptic cleft to the post synaptic membrane which becomes
depolarized; and sodium ions
flow to the post synaptic membrane causing an action potential;
3. a) 1 $X^a Y$
 2 $X^A X^A$
 7 $X^A Y$
 9 $X^A X^a$

 b) Male cannot have heterozygous condition since the condition is caused by
X - linked
 gene. The gene is not linked to Y chromosome;
 c) Male have XY chromosomes and need only a single recessive gene to have
a condition
 unlike the female who have XX and therefore need two recessive genes to
be colour blind
 since it is caused by a recessive gene ;
4. a) i) Rate of reaction of the enzyme increases; because the substrate
concentration is
 increasing;
 ii) The rate of reaction is not changing
 Increasing;/because all the active sites of the enzymes are occupied
by the
 substrate;
 b) Increase the concentration of the enzyme;

- c) - Temperature;
- pH;
- Cofactors;

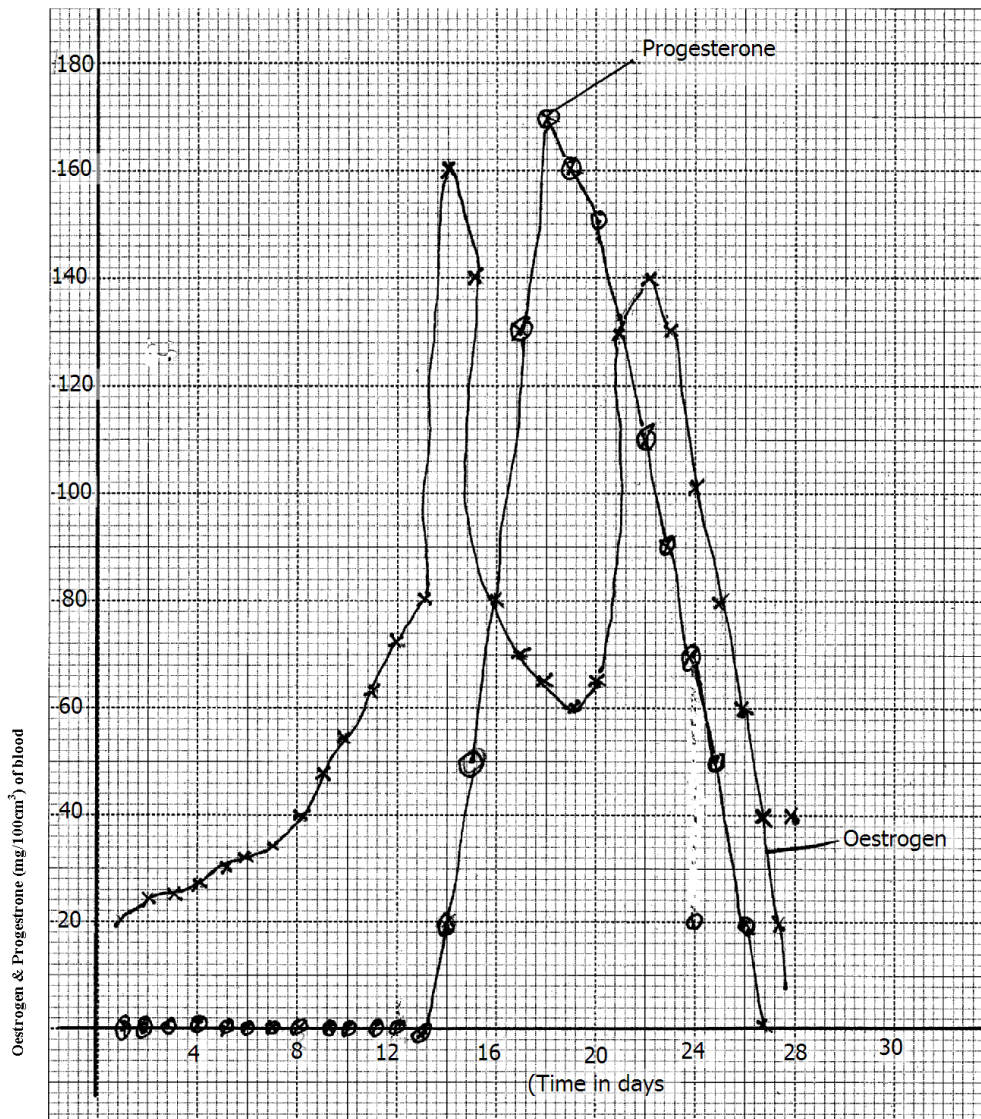
5. a)



- b) i) Planktonic Algae → Planktonic crustaceans → Bird;
- ii) Planktonic Algae → Insect larvae → Small fish → Big fish;

c) - To compensate for that energy which is lost during transfer from the producer to the consumer in order to sustain the next trophic level;

6. a)

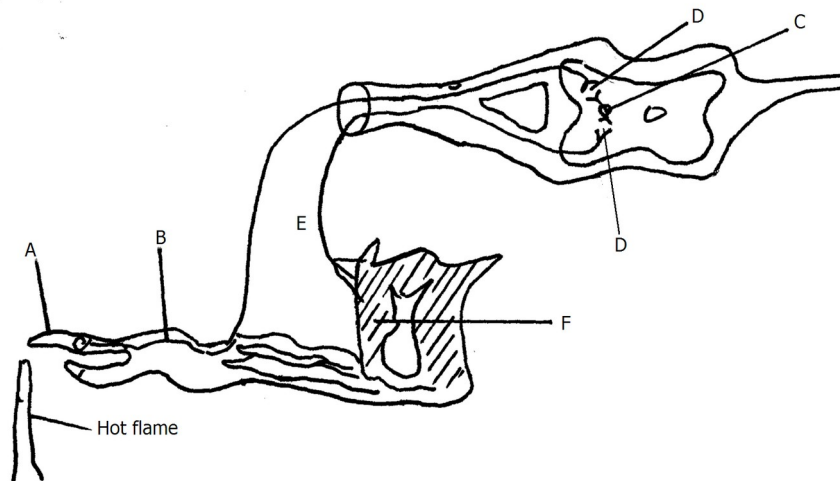


L 01
P 02 for Each curve
C ✓ 02
S 01

- b) Menstruation days 1 - 5
- c) Healing and repair of the uterus
- d) Causes/ stimulates thickening and increased blood supply to the endometrium in preparation of implantation of blastocyst in the uterus;
- e) Ovulation taking place; Due to hormonal imbalance There is rise in temperature;
- f) The corpus luteum disintegrates hence progesterone is produced;
- g) i) Ovary - Produces ova;
- Produces female sex hormones;
- ii) Progesterone - Stimulates thickening of the endometrium
- Stimulates increased blood supply to endometrium
- iii) Oestrogen - Healing and repair of the endometrium

- Stimulates pituitary gland to produce LH

7. a0 - Is a rapid automatic response to a certain stimulus



- A - sense organ (Receptor)
B - Sensory neurone
C - Relay neurone
D - Synapse
E - Motor neurone
F - Effector organ

- b) When the finger touches a very hot object; pain receptors; in the skin of the finger are stimulated;
Nerve impulses are triggered off; and transmitted through the sensory neurone; to grey matter of the spinal cord;

The impulse is then transmitted to the relay neurone; through the synapse; then to the motor neurone; through another synapse;

Through the ventral root, the impulse is transmitted to the effector organ (bicep of the arm); which contracts; and the forearm is withdrawn; and thus the finger is raised from the hot object;

8. a) Digestion is the process by which food substances are broken down mechanically and chemically into simple substances which can be absorbed into the blood stream;
b) **Starch digestion**
Begins in the mouth by chewing the food into small particles to increase surface Area for enzymatic action; The enzyme salivary amylase/ ptyalin breaks starch to maltose; Due to favourable pH condition (slightly alkaline) in saliva;

No starch digestion in the stomach since the pH is acidic due to presence of Hydrochloric acid; Continued in the duodenum since the pH is slightly alkaline (optimum); (for starch digestion) pancreatic amylase; breaks starch into maltose; in the ileum the enzyme maltase; completes the digestion of starch where maltose; is broken down to glucose;

Protein digestion

Starts in the stomach due to acidic conditions because of the presence of hydrochloric acid; Enzyme Rennin coagulates milk proteins being acted by pepsin; pepsin breaks proteins to polypeptides; In the Duodenum enzymes trypsin / chymotrypsin breaks down proteins and polypeptides to small peptides;

In the ileum; enzyme peptidase; breaks down peptides into Amino Acids;

231 / 2

Paper 2

Biology theory

2012 PROJECTIONS -013

Kenya Certificate of Education (K.C.S.E)

MARKING SCHEME

Q1. a) Process by which cells work✓

b) (i) Iodine solution; ✓ rj. Iodine alone

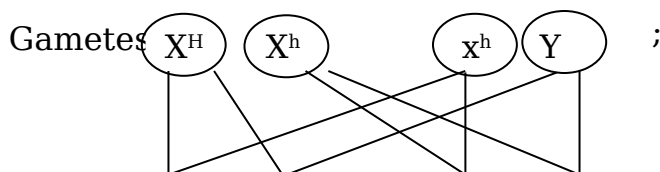
(ii) Diffusion✓

(ii) Iodine molecules, moved by diffusion, across the semi permeable membrane, due to their small sizes; ✓ of the visking tubing; ✓ react with starch to form a blue black colour. ✓

(iv) Mouth; ✓ duodenum✓

Q2. a)

Parental genotypes $X^H X^h$ X $x X^h Y$;



4marks

Parental genotypes $X^H X^h$ $X^H Y$ $x^h x$ $X^h y$; OR

♀ \ ♂	x^h	Y ✓
X^H	$X^H x^h$	$X^H Y$ ✓
x^h	$x^h x^h$	$x^h Y$ ✓

b) $\frac{1}{2}$ / 50%

c) Genes / alleles located on the sex chromosomes and transmitted together with them

d) - Colour blindness;

©

- Hairy pinna/ nose;
- (Premature) baldness;

FIRST TWO

Q3. a) Aquatic/ fresh water;✓

b) (i) Phytoplanktons✓

(ii) Hawks✓

c) (i) Phytoplanktons → Zooplanktons → Frogs → Snakes → Hawks. ✓
Rj. arrow not indicated

(ii) -Snake would decrease due to less food✓

- Zooplanktons would increase due to less predators✓

d) - Oil clogs fish gills

- Oil cuts off dissolved oxygen in water leading to suffocation✓

Accept any one right

Q4. a) W- Sebaceous gland

X- Erector pili muscles

b) Y (malpighian layer) - Produces melanin which protects the body against the body against u.v light / determines the skin colour.

Z- (sweat gland) - Secretes sweat which evaporates to bring about cooling.

- Sweat which removes excretory products / excess salts / water/sweat is antiseptic /kill bacteria.

c) -Vasoconstriction; hence less blood flows to the skin surface; reducing heat loss.

- No sweating; Heat produced through metabolism / shivering; is retained in the body;

6 max (4mks)

Q5. a) (i) Absorbs Oxygen✓

(ii) To find out if light is necessary for germination✓

b) (i) -At 4°C temp below optimum enzymes are inactive hence little germination✓

- At 60°C high temp. is low above optimum denatures enzymes / killed cells /

protoplasm hence no germination ✓

- At 35°C optimum temperatures/(w.t.t.e) hence highest % germination✓

(ii) Some seeds not viable✓

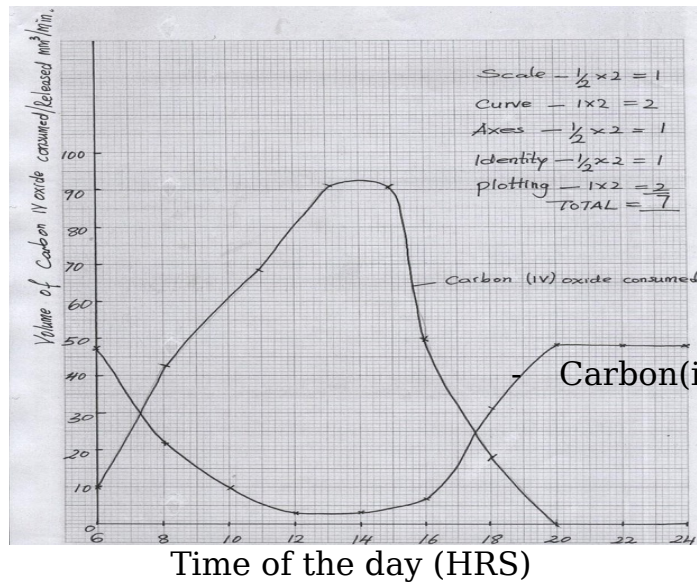
c) Water - Activates enzymes hence allowing them hydrolyse food. ✓

- Medium for chemical reaction ✓

- Soften testa. ✓

3mks (max.2mks)

Q6. a)



- b) (i) Photosynthesis,
(ii) Respiration;
(1mk) (1mk)
- c) (i) Rate of carbon (iv) oxide consumption increases from 6 hours to 12 hours; due to increase in light intensity; The rate remains higher between 12 and 14 hours which is the period of optimum light intensity; after which rate of consumption decreases due to decrease in light intensity;
4points max.3mks
- (ii) Rate of carbon (iv) oxide released decreased from 6 hours to 12 hours; Some were used up for photosynthesis; from 14 hours to 20 hours the rate of carbon (iv) oxide released increased due to decrease in rate of photosynthesis / reduced light from ; rate remains constant from 20 hours since photosynthesis is not taking place / no use of carbon (iv) oxide; 4 points max. 3marks
- d) (i) Point at which rate of photosynthesis equal rate of respiration / amount of carbon (iv) oxide used is same as amount of carbon (iv) oxide released.
(1mk)
- (ii) 7.2; 17.5; hours (2marks)
- e) Increase in temperature increase the rate of carbon (iv) oxide consumption / up to optimum point); Further increase reduce rate of carbon (iv) oxide consumption as enzymes are denatured;
(2marks)

Q7. Evidence of evolution

Comparative anatomy / taxonomy

Members of the phylum / group / show similarities; organisms have similar structures / similar organs performing same functions e.g. digestive system, urinary system, nervous system/ appendix/ coccyx/ vesceval/ heart/the pentadactyl limb, / any correct example. These are called homologous structures same in origin different functions e.g wings of insects, bats and birds;- Divergent evolution; Analogous structures- different in origin same functions; leading to convergent evolution 8mks. Max. (5mks)

Fossils records / Palaentology

These are remains of organisms preserved in naturally occurring materials; for many years; shows morphological changes of organisms over a long period of time; e.g skull of man/leg of horse;

(4mks)

Comparative embryology

Embryos of vertebrates which are morphologically similar; suggesting organisms have a common origin / ancestry;

(3mks)

Geographical distribution

Present continents are thought to have been a large land mass; as a result of continental drift; Isolation occurred; bringing different patterns of evolution; e.g Thus in Africa .This resulted into formation of new species;

(5mks)

Comparative serology;

Antigen- Antibody reactions / rhesus factor / blood group/ haemoglobin structure occur in oyster reveal some (phylogenetic) relationship among organism / common ancestry.

(3mks)

Total

(20 mrks)

Q8.Dispersed by wind

- Seeds / fruits are light in weight / small in size; to be carried easily away;
- Some have wing like structures; to increase surface area for them to remain buoyant / float in the air;

- Some have perforations; and hang on a slender stalk; when swayed the seeds are scattered away;

Water dispersed

- Fruits / seeds have fibrous mesocarp; with a lot of air spaces for buoyancy;
- Fruits / seeds have impermeable seed coat / mesocarp to avoid soaking;

Animal dispersed

- Fruits / seeds have hooks; to stick on to animal body and carried away
- Some fruits seeds are freshly; scented; brightly coloured; to attract animals which may carry them away.
- Some seeds / fruits have hard / indigestible seed coats; and are released in animal droppings away fro parent plants;

Self dispersal / explosive mechanism

- Some when dry split open along lines of weakness and scatter the seeds away;

(23pts max.20mks)

2012 PROJECTIONS -014

BIOLOGY

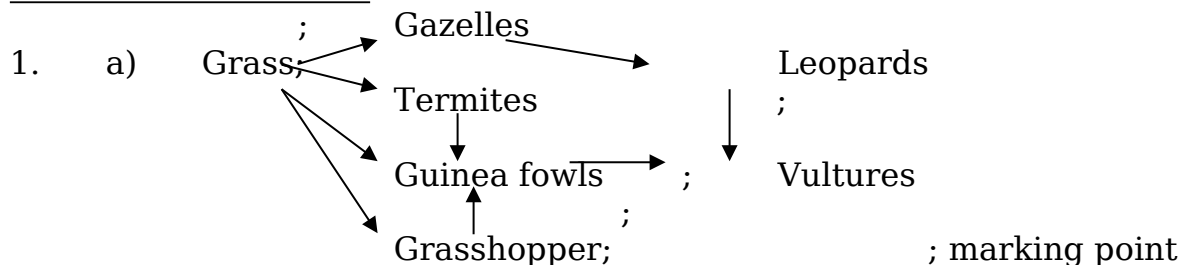
PAPER 2

231/2

MARKING SCHEME

BIOLOGY 231/2

MARKING SCHEME



Award one mark for each trophic level where there is an arrow and ;(prod, pry, sec, tert & quart).

- b)
- Grass → Gazelles → Leopards → Vulture ;
- Grass → Termites → Guinea Fowls → Vulture;
- Grass → Grasshopper → Guinea fowls → Vulture;

- c) for
- Population of leopards decreases due to competition (interspecific) food.
 - Population of gazelles will decrease due to more predation; by lions and leopards.
 - Population of vultures will increase due to more food; from left overs.

(Mark any two)

2. M - Chitinous ring; Reject rings alone.
N - Tracheole;

- b) M - Prevents from collapsing/keep trachea open;

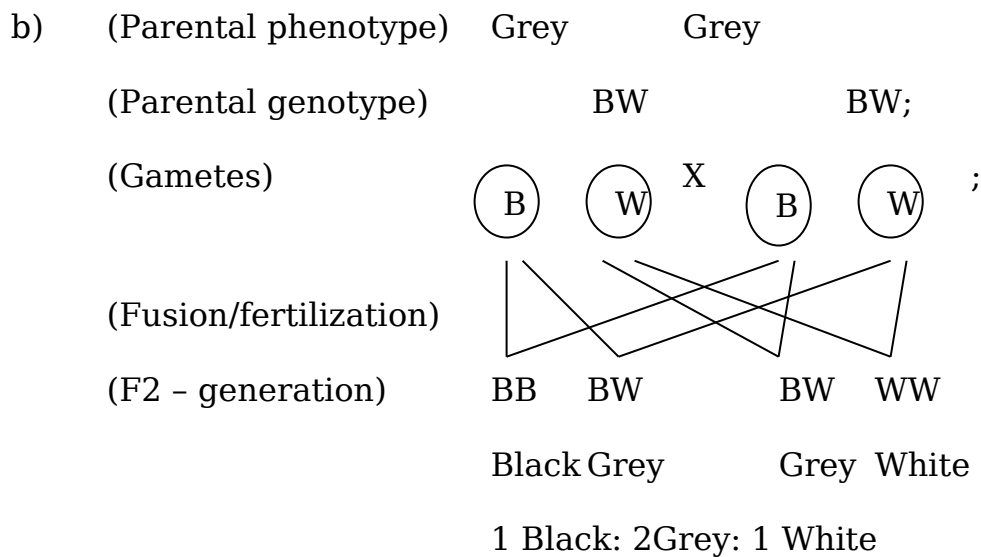
- c) From muscle tissue; to tracheole; to trachea; and out through spiracles.
(Mark any three)

- d) M - Cartilaginous rings; (of trachea)
N - alveoli/alveolus;

3. a) CO₂ is necessary for photosynthesis;
b) To destarch; the leaf.
c) To allow photosynthesis; to take place
d) To absorb CO₂;
e) i) J - Blue black colour/colouration
L - No colour change/iodine colour remains brown.
ii) No CO₂;

No light;

4. a) The genes for white and black (coat) are codominant/incomplete dominant/partial dominant.



Or use of punnet square

	Grey	Grey
	BW	BW; ;
 /M	 /F	
B	BB	BW
W	BW	WW; ;

- c) Blood - group;
- d) Colours blindness/Red green colour blindness;
5. a) positively hydrotaxes;
- b) prevents dehydration;
- c) open;

- d) - Tip of tendril produces auxin hormone;
- Contact with object causes migration of auxin to the opposite side;
- Side with more auxin promotes more cell growth/elongation than side without auxin;
- Tendril grows round the object;
- 6. b) i) Blood glucose level raises rapidly/very fast; due to absorption of glucose; (in the ileum)
- ii) Blood sugar level declines; (gradually due to) secretion of insulin hormone by pancreas; that stimulate liver cells to convert glucose into glycogen/respiration/oxidation of glucose/conversion of glucose into fat;
- c) i) Failure of the pancreas to secrete enough insulin hormone;
- ii) Diabetes mellitus;
- iii) Test for reducing sugars;
- d) A - Glucose has been reabsorbed; as the proximal convoluted tubule/nephron;
- e) Pancreas produces glucose hormone; glucagon stimulates liver (cells) to convert glucogen to glucose;
- 7. Describe the function of the various parts of the mammalian skin.

Epidermis which has three layers; which are:-

- Cornified layer that protects against dessication; and mechanical damages;
- Granular layer with living cells that give rise to cornified layer;
- Malpighian layer which actively divides to give rise to granular layer cells. Has melanin which screens against U.V light cells that produce melanin synthesis Vitamin D.

Has dermis layer which consists of many structures as follows:-

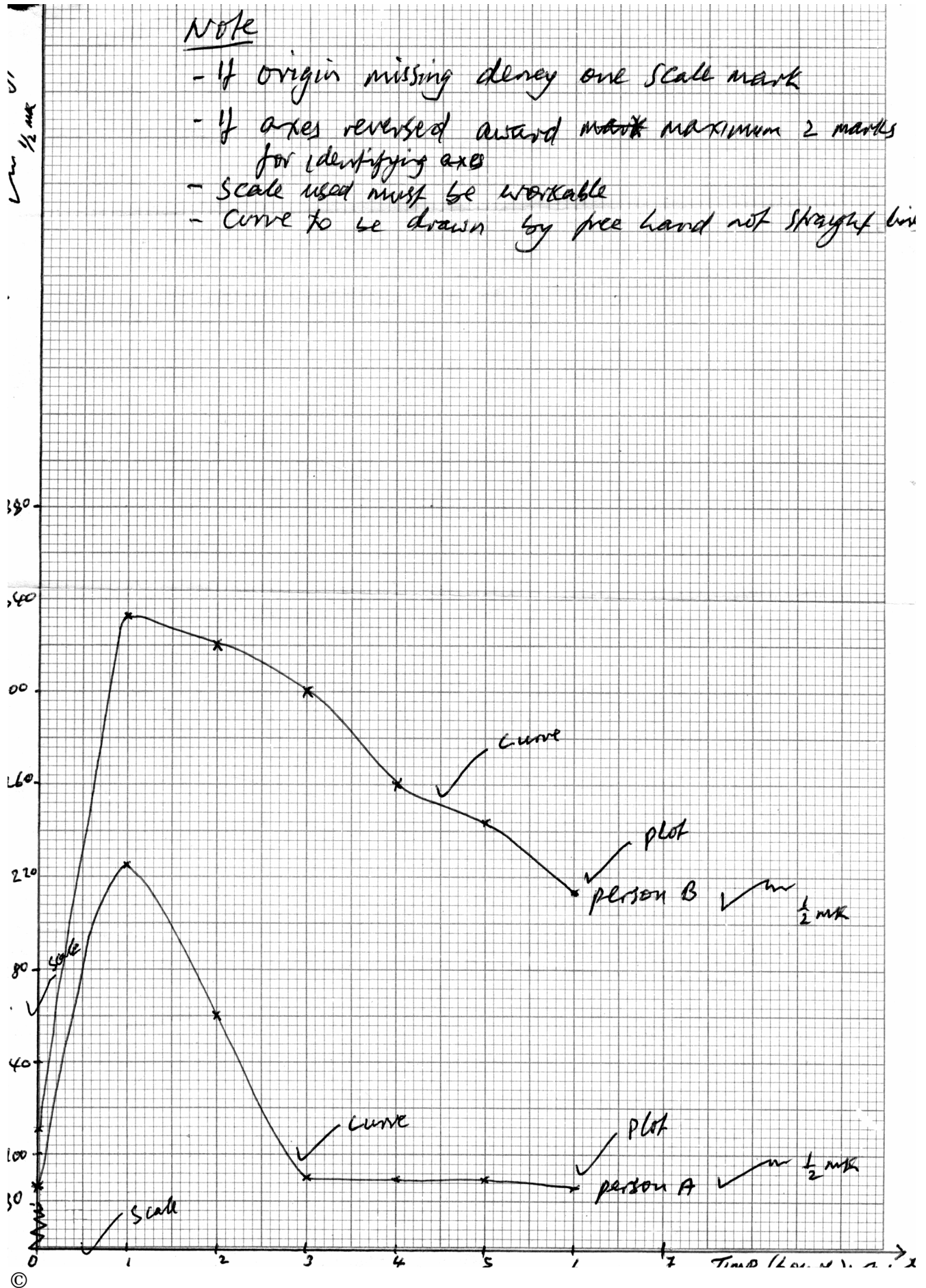
- Blood capillaries that supply food and oxygen; and remove excretory products;
- Arteries that vasolidate; and vasoconstrict; to regulate the temperatures.
- Has sweat glands that produce sweat which consists of water and salts; Sodium Chloride, urea and lactic acid' acting as an excretory organ;
- Sweat produced evaporates to cool the body.
- Has hair follicles which have hair; which insulates against heat.
- Through heat regulation by lying and rising the hair, skin acts as a temperature regulator;
- It has nerve endings which are sensitive to various stimuli; the skin therefore acting as a sensory organ.
- Sebaceous glands which produce secretions containing oily substances are water repellant; antiseptic; and cracking of skin.
- Subcutaneous fat which insulates the body against heat loss.

8. Palaentology/fossil records;

- Fossils are past material remains of ancestral of organisms accidentally preserved in some naturally occurring materials e.g. sedimentary rocks. They provide a direct evidence of gradual change from one type of organism to another;
- Their age is determined by radioactive Carbon 14 dating; used to construct evolutionary history of development of a certain – organism; e.g. human skull, horse limbs e.t.c
- Comparative anatomy
Members of a phylum or group shows similarities in structures or organs performing similar functions; Homologous structure/divergent evolution; same embryonic origin but performing different functions; arose by divergent evolution e.g. pentadactyl limb of vertebrates.
- Analogous structure/convergent evolution; structures with different embryonic origins but evolved to perform similar functions due to exploitation of different ecological niches; They evoked by convergent evolution e.g. wings of birds and those of insects.
- Comparative embryology
Study of embryos in their early stages of development e.g. those of vertebrates look similar; the more the similarity the more the evolutionary relationship.
- Cell biology;
Structure and functioning of cells from almost all kinds of organisms are basically similar. All Eukaryotic cells contain same cell organelles; such as mitochondria lysosome; ER e.t.c. indicating a common ancestry.
- Geographically distribution;
Initially there was one land – mass (pangae); split and parts drifted away forming the present continents; After the split members of some species occupying originally similar regions were isolated by barriers and evolved along their own line for instance illamas in S. America, Leopards and Cheetahs in Africa.
(Max 21)

Note

- If origin missing deny one scale mark
- If axes reversed award ~~mark~~ maximum 2 marks for identifying axes
- Scale used must be workable
- Curve to be drawn by free hand not straight line

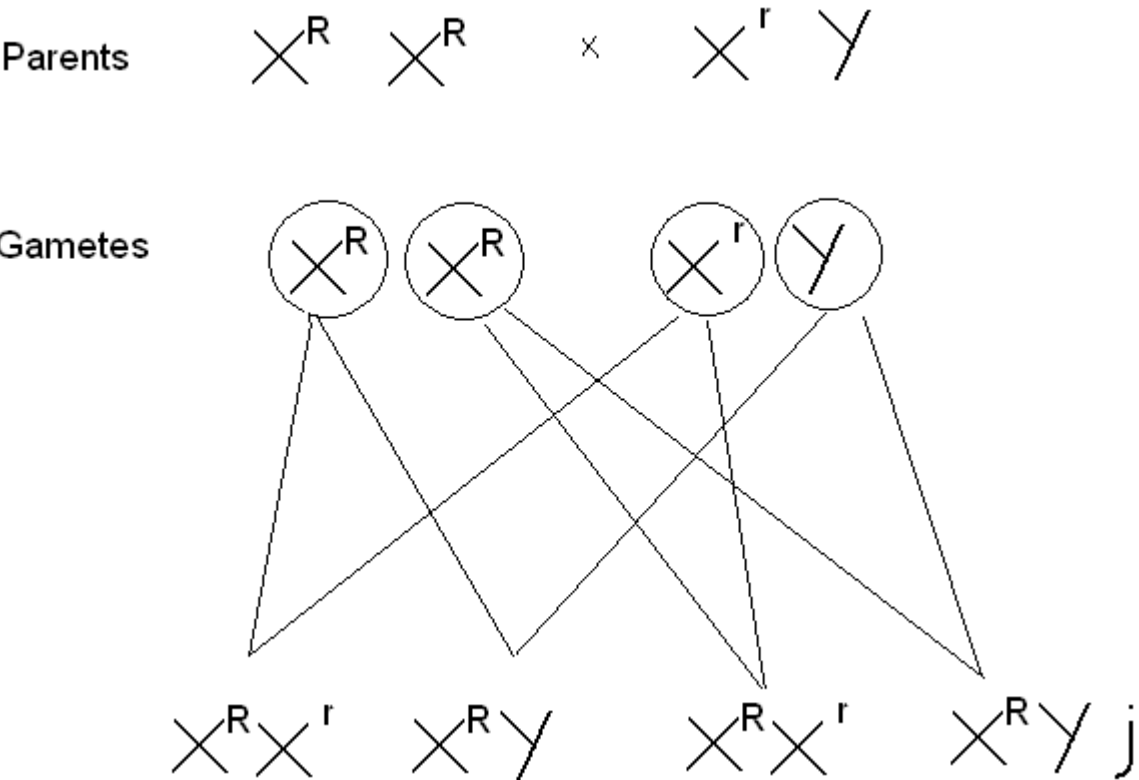


2012 PROJECTIONS -015

231/2
 BIOLOGY
 PAPER 2
 MARKING SCHEME

1. The Genes are located on the sex chromosomes; they are transmitted along with those determining sex.

- (b) Colour blindness; accept hairy ears/pinnae/nose and baldness
 Haemophilia; reject breeders disease for haemophilia
 Reject ebola-breeders disease.



Ratio: 1 red eyed/males: 1 red eyed female;
 Punnet square

♀ ♂	$\times^R$	$\times^R$
	$\times^r$	$\times^r$
$\times^R$	$\times^R \times^r$	$\times^R \times^r$
Y	$\times^R Y$	$\times^R Y$

j for parental genotype

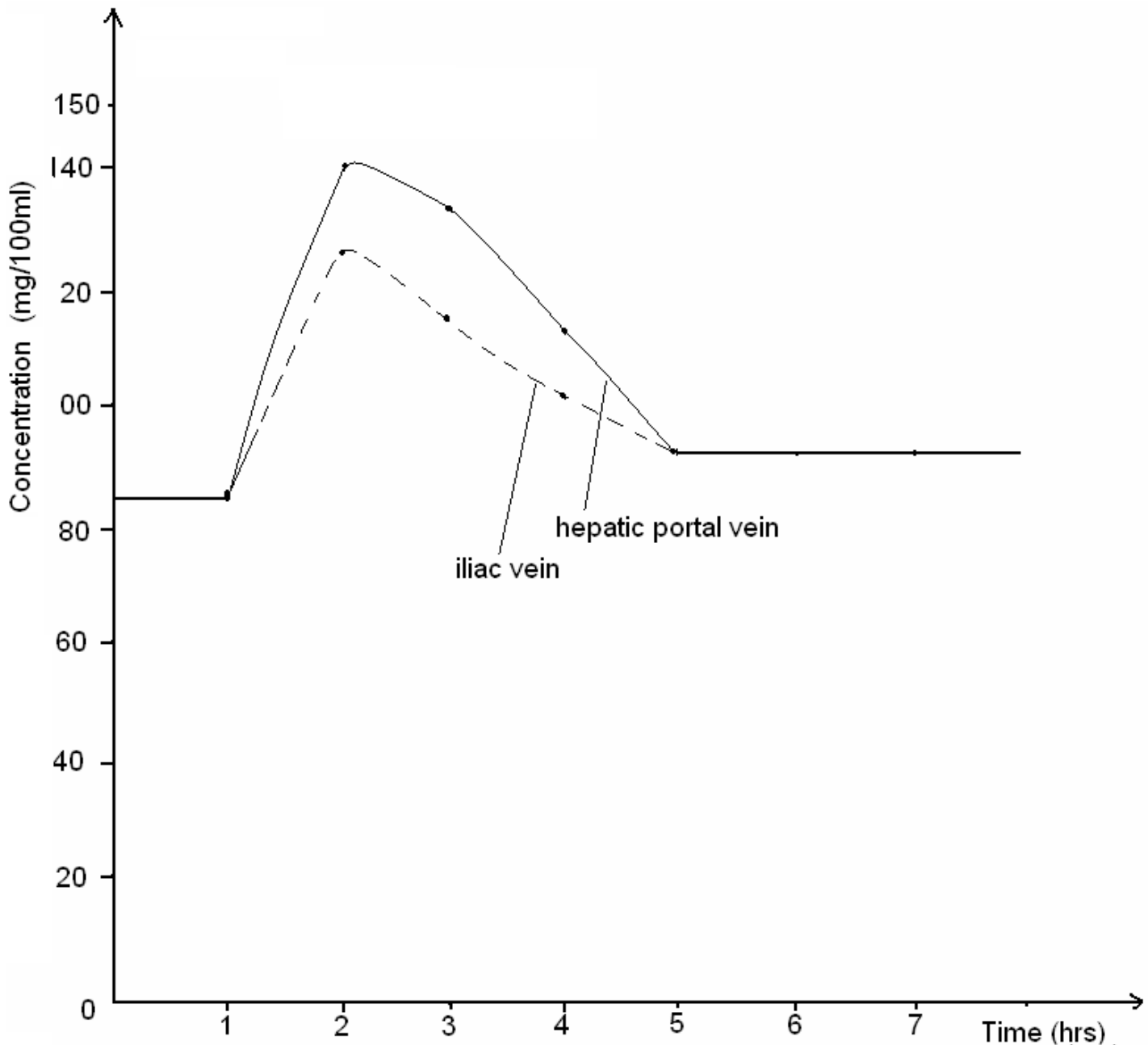
2. (a) chorion
 - (b) (i) arteries; veins
 - (ii) More food nutrients more oxygen in veins;; less food nutrients more excretory production in the arteries.
 - (c) Highly vascularised/large surface area
Presence of secretory cells;
 - (d) cushions/absorbs shock
3. 3(a) (i) Thigmotropism
 - (ii) Contact with support; causes migration of auxins to outer side; causing faster growth/cell elongation on the side away from contact surface; (causing tendrils to curls around support)
 - (b) Escape injurious stimuli/seek favourable habitat
 - (c) - induce root growth in the stem cuttings; (accept induce adventitious roots in the stem cuttings)
 - selective weed killers
 - Encourage sprouting of side branches
 - Breaking seed dormancy
 - Induces parthenocarpy
 - Promote flowering
 - Accelerates ripening of fruits
 - Induces/encourages fruit fall/abscission

Any 3 correct 1 mk each

4. (a) Photosynthesis
 - (b) Carnivorous; reject carnivores
 - (c) Marine ecosystems/aquatic; terrestrial; rej. Water and land
 - (d) Algae - zooplanktons - small fish - birds P - large birds
 - (e) (i) Bacteria; (accept nitrifying bacteria) fungi;
(ii) Decomposition
5. (a) (i) Diffusion; because its uptake occurs according to the concentration gradient.
(ii) active transport; because its uptake occurs against concentration gradient;
 - (b) Iodine; its uptake depends on energy derived from ATP;
 - (c) This is because the fresh water fish would lose water molecules to the marine habitat since the marine environment is hypertonic;
6. (a) identification of axis (2 marks)
Scale (1 mark)
Curves (2 marks)

Plotting (2 marks)
(7 mks)

- (b) (i) 0 – 1 hour
Constant/low/below normal levels in blood; no/little digested foods/glucose from the intestines/gut/alimentary canal/absorption;
- (ii) 1 -2 hrs
Sharp increase in concentration of glucose in blood; more absorption of glucose; after digestion of the meal.
- (iii) 2-4 hrs
Glucose concentration declining/decreasing; less glucose being absorbed; more glucose being converted to glycogen in the liver/tissue/used for (tissue) respiration;
- (iv) 5 – 7 hrs
Concentration of glucose stabilizes/constant; this is the normal glucose level concentration in the blood.
- (c) The concentration of glucose in the iliac vein is lower than in the hepatic portal vein; because it hasn't been stored in the liver to be used in respiration; most of it in the hepatic portal vein was stored/used up by the liver/other tissues/respiration



(d) Proteins take longer to digest

7 (a) prevents mixing of maternal and foetal blood;

- protects the foetus against microorganisms;
- Prevents some chemicals/hormones passing to the foetus;
- Protects foetal blood vessels from damage by high blood pressure of maternal blood.
- Allows exchange of gases
- Allows supply of nutrients and water to the foetus;
- Removes metabolic wastes from the foetus to be excreted through maternal blood
- Produces progesterone and oestrogen.

Total 8 marks

Max 7 marks

- (b) Follicle stimulating hormone; produced by pituitary gland; causes development of graafian follicle; in the ovary; it also stimulates the ovary to produce hormone oestrogen ; oestrogen causes healing and repair of uterine wall after menstruation; oestrogen also stimulates pituitary gland to secrete lutenizing hormone (LH).

LH causes ovulation; and stimulates conversion of Graafian follicle into a corpus luteum; it also stimulates corpus luteum to secrete hormone progesterone; progesterone causes thickening of uterine wall;

If fertilization occurs, it inhibits production of FSH; it also inhibits production of LH and stops ovulation.

If the implantation does not occur, the level of progesterone falls; due to disintegration of corpus luteum causing menstruation.

Total - 18 marks

Max. 13 marks

7. It is the addition of substance into the water that may cause harm to organisms and are destructive to the ecosystem.

Causes of water pollution are industrial effluents.

- Industrial effluents that may be toxic chemicals which kill the aquatic organisms; it can be controlled by treating the effluents before discharging them;
- Hot water reduces the concentration of oxygen, killing the animals; it is controlled by placing hot water;
- Oil spillage from oil tankers that reduces oxygen in water, penetration of light and clog feathers of marine birds; it can be controlled by regular servicing of oil tankers;

Domestic effluents;

- untreated sewage that causes water borne diseases; it can be controlled by treating sewage before being discharged;
- detergents that causes eutrophication causing reduced oxygen concentration; it is controlled by banning phosphate based detergents;

Agricultural effluents;

- pesticides and herbicides that have heavy metal that they may accumulate along the food chain killing the higher animals; it is controlled by use of biological control pests;
- inorganic fertilizers that have nitrates and sulphates that causes eutrophication; is controlled by use of organic fertilizers;
- silting due to soil erosion reduces penetration of light to the plants and clog respiratory surfaces of animals; it is controlled by proper farming methods;

2012 PROJECTIONS -016

231/2

BIOLOGY

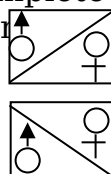
PAPER 2

MARKING SCHEME

1. a) Parental phenotype - Sick cell trait x Normal man
 Parental Genotypes HbS Hbs X HbA HbA ;
 Gametes Hbs Hbs X HbA HbA ;

HbA	HbA	HbA
Hbs	HbA Hbs	HbA Hbs

- NB i) All squares must be complete
 ii) Gamete square should be



Genotypic ratio $2\text{HbAHbA} : 2\text{HbAHbs}$

Reject ratio $2 : 2$

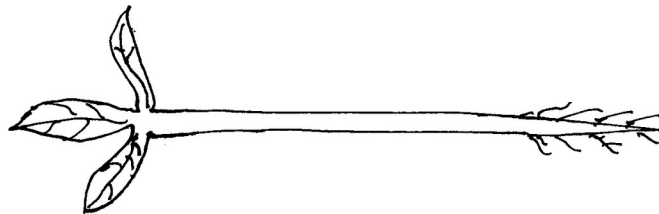
NB - Ratio should be to simplest term.

= Check on letter S (capital) and S (small)

- b) Individuals with sickle cell trait are more resistant to malaria; hence aspect of natural selection; for survival advantage;

2. a) i) Solution X - hypertonic;
 Solution Y - hypotonic;
 b) Process A - Crenation;
 Process B - Haemolysis;
 c) Osmoregulation;
 d) R.B.C gains excess water by osmosis; from hypotonic solution; swell and burst due to

3. a) weak plasma membrane;
i) Made up of large molecules which cannot pass through capillary walls;
ii) Reabsorbed back into the blood capillaries (reject absorbed)
- b) - Urea;
- Uric acids;
Excess salts;
- c) Increase S.A for reabsorption of valuable substances; (reject absorption)
- d) i) Anti-diuretic hormone (reject ADH alone)
ii) Aldosterone
- e) - Nephritis
- Kidney stones; (any one correct)
- Diabetes insipidus;
3. a) Total number of donors = 100
Number of Rh -ve = 15
 $\therefore \frac{15}{100} \times 100 = 15\%$;
- b) i) Blood group O is universal donor/ can donate blood to all groups/
high frequency of blood group O so that transussion can occur within the group.
ii) Blood group AB is universal recipient/ can receive from all groups.
Low frequency so that the high dependency / parasitic phenomenon is reduced in
the population;
- c) i) Rhesus positive blood has rhesus antigen while rhesus negative lack
rhesus antigen on the surface of Red blood cells;
ii) Blood groups O and B are rhesus negative other blood groups
incompatible since they have antigens which correspond with recipients antibodies
hence agglutination
5. a) Klinostart;
b) i) Still horizontal with an increased length;



- ii) Each side of the shoot and root is exposed to gravitational stimulus
for such a short time that they do not have time to respond; all sides have
almost equal auxin concentration;
- c) - Shoots -ve Geotropic;/ bending upwards
- Roots +ve Geotropic; / bending downwards;
- d) - Enables the roots to seek water and mineral salt;

- Enables the roots to anchor into the soil
- 6. b) i) 0.15% volume of air;
 ii) Concentration of CO₂ at which the rate of photosynthesis is at its maximum;
 c) Rate of photosynthesis is increasing with increase in carbon (iv) oxide
 d) CO₂ conc. Has ceased to be the limiting factor/ other factors are limiting the process.
 e)
 f) i) O₂ molecules
 Hydrogen atoms
 ATP;
 ii) Glucose;
 Amino acids;
 Fatty acids;
 g)
- 7. a) - The evolution of homologous structures i.e structures of same embryonic origin but have
 become modified in the course of evolution to exploit a different ecological niches hence
 become structurally different; eg. Pentadactyl limb structure in vertebrates;
 - The evolution of analogous structures i.e structures of different embryonic origin but
 have become modified in the course of evolution to exploit a similar ecological niche
 hence became structurally similar; (accept either of the two)
 b)

- (b) The following are the evidences that support the theory of evolution
Fossil records, geographical distribution, comparative embryology, comparative anatomy, cell biology, comparative serology.

(a) **Fossil records / Fossils / Palaeontology**

- Fossils are remains of ancestral organisms that were accidentally preserved in naturally occurring materials such as sedimentary rocks, plant resins etc. over a long period of time/millions of years.
- Fossils give direct evidence of the type of plant or animal that existed during a certain geological era.
- This is because fossils show morphological changes of the organisms over the millions of years.
- The evolution of the skull of man from Homo habilis (earliest species of man) to Homo sapiens (present species of man) has been documented through the fossil records.
- The exact age of fossils can be determined using radioactive carbon dating techniques.

(b) **Geographical distribution**

- Is based on the theory that before the continental drift occurred the present continents consisted of one single large land mass joined together.
- When animals evolved they migrated from the centre of the land mass to different parts of the land mass.
- Later when the continental drift i.e. the breaking away and falling apart of the continents occurred, it caused the animals with common ancestry to become isolated by physical barriers e.g. mountains, deserts, oceans etc and hence the animals evolved into different species after a long period.

Examples

- (i) Illamas of the Amazon forest and the camels of Africa and Asia both show resemblance of a common ancestry.
- (ii) The tiger of the Asian jungle resembles the leopard and the cheetah of Africa.
- (iii) Kangaroos in Australia and the Jaquars in South America show a common ancestry. ; (at least one example given)

(c) **Comparative embryology**

A comparison of embryos of common vertebrates such as fish, chicken, lizard, mammal etc shows morphological similarities in their early stages of development. This shows that they have a common origin/ancestor.

(d) **Comparative anatomy**

Members of a phylum or closely related group show similarities in their body structures or organs performing the same body functions e.g. digestive system, urinary system, nervous system etc. Such structures show that these groups of organisms may have had a common origin/ancestor. Comparative anatomy is

8 (a) Describe how mammalian heart is adapted to performing its function.

Response.

- Has myogenic cardiac heart muscles that contract and relax rhythmically without fatigue.
- The heart muscles have striations and purkinje tissues that spread the wave of excitation over the surface area of the heart.
- The heart is served with the arteries that take blood away from the heart and veins that take blood towards the heart.
- The heart has a thick muscle called septum which separates the right side from the left side of the heart chambers to prevent the mixing of deoxygenated and oxygenated blood.
- The heart has cuspid valves which prevent the back flow of blood into the auricles during systole.
- The two valves are tricuspid valve found in the right side of the heart and bicuspid valve found in the left side of the heart.
- The heart contains four chambers that hold the blood. The upper chambers are the auricles whereas the lower chambers are the ventricles.
- The auricles have a thin layer of walls because they receive blood flowing at a low pressure.
- The ventricles have thick walls because they contract to generate enough pressure to pump blood out of the heart.
- The left ventricle wall is more muscular than the right ventricle wall because it pumps blood over a longer distance. Hence it has a thicker wall to generate enough pressure for pumping. The right ventricle pumps blood only to the lungs hence the wall is less muscular.
- The heart has semilunar valves in the pulmonary artery and aorta to prevent the backflow of blood into the ventricles during diastole.
- The tricuspid and bicuspid valves are supported by tendons which prevent them from turning inside out.
- The heart has pericardium membrane which prevents overdilation of the heart and also secretes pericardial fluid which reduces friction during the pumping action of the heart.
- The heart has coronary artery which transports mineral salts, oxygen and other nutrients to the heart and has coronary vein which transports carbon dioxide and other metabolic wastes out of the heart.
- The heart muscles have numerous mitochondria to release energy for muscular contraction especially in the left ventricle wall.
- The heart has sino-atrial node (SAN) which initiates the rhythmical contraction of the cardiac muscles and sets the pace for contraction (i.e. SAN is the pacemaker).
- Presence of the atrio-ventricular node (AVN) and purkinje tissue, which spreads the contractions in the walls of the ventricles.
- Presence of the vagus nerve that slows down the rate of the heartbeat.
- Presence of sympathetic nerve that accelerates the rate of the heartbeat.

(21 marks) - max 20 marks

2012 PROJECTIONS -017

231/2

BIOLOGY

PAPER 2

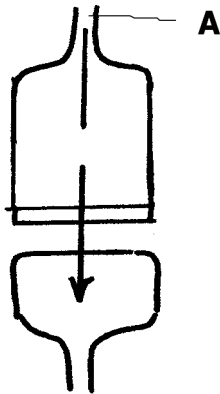
MARKING SCHEME

- 1.a) i) Vibro cholere Rej. Bacteria, Vibro only
b) i) Drinking contaminated waters / eating contaminated food ;
- Dirty food vedors;
- Eating using dirty hands ; (any two)
ii) - Proper hygiene ; / proper sewage disposal ; cleanliness ; boiling water before drinking .
2. a) X - Pulmonary / semi lunar valve prevent backward flow of blood into right ventricle during relaxation;
W - Tricuspid valve - prevent backward flow of blood into right auricle when the muscle of the Right Ventricle contract.
Q- Biscupid valve - prevent backward flow of blood into left auricle when wall of left ventricle contract .Reject collect function of identity is wrong.
b)i) Cardiac muscle;
ii) M is more muscular / thicker than N ; M exerts more pressure since it pumps blood longer distance to all body parts ; while N exerts less pressure since it pumps blood short distance / to the lungs for oxygenation ;
c) A, lower pressure, B, high pressure;
A more carbon II oxide and less oxygen, B less Carbon IV oxice and more Oxygen.
d) Can contract and Relax without experiencing fatigue ; (Rej. If b(i) is wrong)
3. a)i) Cause cell division and cell elongation ; uniform application of IAA on all sides promote uniform growth / elongation in all sides while application on right side causes more elongation on right side resulting to curvature to the left.
ii) The tip ; in three (iii) the Coleoptiles tip grows towards the light but when the tips is removed in IV) no response is recorded;
b) IAA shift to the darkened part of coleoptile / away from ;light ; causing more cell Division and elongation / growth thus the curvature to the right ;
c) Phototropism ; Rej tropism alone
4. a) Distilled water hypotonic to the cell sap, cells absorbed water by osmosis; hence turgor pressure increased leading to curling; cortical cells curl more because they absorb more water than Epidemal cells ;

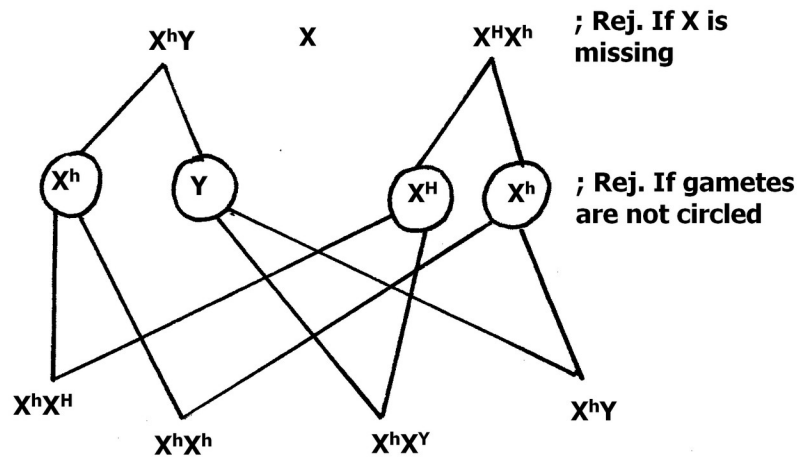
- ii) Salt solution hypertonic to the cell sap, water drawn from the cells by osmosis ; cell become plasmolysed with cortical cells loosing more water and the strip become straightened.
- b) Osmosis
- c) Cortical cells have higher turgor pressure than epidermal cells hence current outwards;

5. ionic
- a) Electric change / wave of electrical disturbance arising from change in concentration across the membrane of an axon / dendrites / dendrone.
 - b) Neural junction / synapse ;
 - c) A - dendrite ;
B - Mitochondrion ; Rej mitochondria
C- Synaptic cleft / synapse;
 - d) acetylcholine

e)



- 6.
- a)
 - i) Albunism ; rej; albino
 - ii) Sickle cell anaemia;
 - (iii) Anchondroplasia ; Mark / accept the 1st 2nd.
 - b)
 - i) $X^h y$;
 $X^H X^h$;
 - ii) Parental phenotype - Haemophilic male X Carrier female
" Genotype - $X^h Y$ x $X^H X^h$; Rej if x is missing



1 carrier female :/ haemophiliac female :/ 1 normal male :/ haemophiliac male

Rej: if genotypes only.

7. a)i) Plasma proteins molecules too large ; to pass through the capillary walls of the glomerula hence left in blood;
 ii) Glucose and amino acids selectively reabsorbed ; along the kidney tubules completely;
 b) i) Nitrogenous wastes, mineral salts and water; any two.
 ii) Osmoregulation , / conservation of glucose and amino acids ; any one.
 c) i) High pressure ;
 ii) Blood reaching the renal artery being at high pressure due to pumping of heart; narrow glomerular capillaries cause pressure build up due to blood flow; / afferent renal artery has a wider lumen ; than the efferent renal artery lumen. Rej if c (i) is wrong.
 d) Excess amino acids are deaminated in the liver to form urea ; Amino acids break into a nitrogen component and carboxyl group; The amino group combine with carbon IV Oxide to form urea;
 e) i) C :
 Ammonia is very toxic and require a lot of water to dilute hence the mammal releasing a lot of dilute urine ;
 ii) D;
 Shortage of water in Desert, mammal excrete little amount of urine to conserve water;
 iii) Long loop of henle in D than in A / shorter loop of henle in A than in D ; more glomerular in A than in D ;
 iv) ADH make the walls of the tubule permeable to water resulting to little amount of concentrated urine ;
 (The reverse is true)
8. a) **Characteristics of meristematic tissues**
 Retain the ability to divide mitotically and remain undifferentiated cells are thin walled ; with large nucleus ; and cytoplasm; The cells have high density of mitonchondria ;

b)i) **Apical meristems;**

Found near the root and shoot apex; They are responsible of increase in length of shoot and root / primary growth ; At the apex are the zones of cell division; cell elongation ; and cell Differentiation ;

ii) **Vascular cambium ;**

Found between the xylem and phloem of woody plants; cells divide to give rise to secondary xylem and phloem; resulting to increase in birth / Diametre ; secondary parenchyma ; is formed between adjacent vascular bundles resulting to secondary growth ;

iii) **Cork Cambium ;**

Located beneath the Epidermis; Divides to form secondary cortex ; and corky cells ; (to the inside and outside respectively Preventing rupturing of the stem and root when vascular cambium increase in firth

iv) **Intercally meristem;**

Found at internodes and base of leaf sheath ; in presses, are responsible for increase in length of leaf and nodes;

(Max 16 points)

9. **Comparative anatomy;**

Comparisons of structures of different organism show resemblances in structure ; and functions ; e .g Digestive systems; Homologous structures ; like pentadactyl limb; invertebrates are similar but perform different functions ; showing common ancestry ; analogous structures; are morphologically different but perform similar functions ; showing convergent in Evolution ;

Comparative embryology;

Embryos of vertebrates have great similarity showing common ancestry ; e.g the long thin and other body system;

Cell biology ; Comparative serology;

Cells from different organism have similarity in structure ; and functioning ; closely related animals have similar plasma proteins ; suggesting common origin;

Geographical distribution ;

Organisms originated from a common dispersal centre ; when the continents were joined ; continental drift occurred isolating the organisms bring different patterns of evolution due to adaptations ; e.g the Galapagos finches

Taxonomy ;

Classification based on Evolution relationship show great similarity in organism of the same Taxa ; e.g phylum having less common features while species have the highest common features.

2012 PROJECTIONS -0018**231/2****BIOLOGY****PAPER 2****MARKING SCHEME**

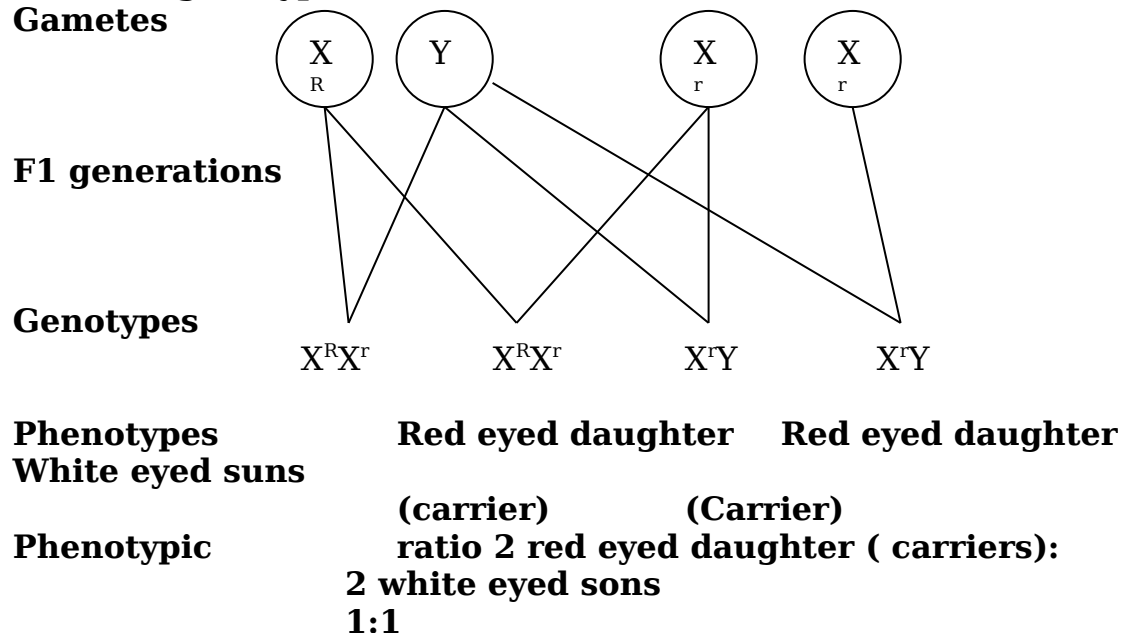
1. a) Sperm cell / spermatozoon;
 b) A - A crosome;
 B- Nucleus
 C- Mitochondria
 c) Propels the sperm forward
 d) Length of one cell = $\frac{\text{diameter of field of view,}}{\text{No.of cell across the diameter of field of view.}}$
 $\frac{1.25\text{mm;}}{6}$
 $1 \text{ mm} = 1000\mu\text{m}$
 0.208m
 $= 208\mu\text{m}$
2. a) Q - cortex
 X - Pholem
 Y - Xylem
 b) Secondary growth / thickening
 c)i) They are hollow and narrow to facilitate cappilarity.
 ii) have no cross was, water is therefore able to rise continuously.
 iii) Have lignified walls,which enables them to withstand high pressures without collapsing and enable the vessels serve a supportive function.
 iv) Have pits which are perforations on the walls. This ensures lateral movement of substances.
 d)
- | Arteries | Veins |
|--|---|
| - Arteries have thick elastic and muscular walls
- Arteries have no valves except at the bases of large arteries leaving the heart.
- Arteries have narrow lumen | - Veins have thin and less muscular walls.
- Veins have valves present at intervals throughout their length.
- Veins have wide lumen. |
3. a)i) Proximal convoluted tubule.
 ii) - Water in the descending limb of the loop of henle moves by osmosis into the blood capillaries.
 - Sodium chloride is actively pumped from ascending limb of loop of henle into blood capillaries;
 b) - Glucose
 - Amino acids.

- c) Excess amino acids are deaminated; The amino group (NH_2) combines with hydrogen ions to form Ammonia (NH_3). Ammonia combines with CO_2 to form urea.
- d)
 - Long loop of henle
 - Small bowman's capsule
 - Few glomeruli

4. a) The inheritance of genes on sex chromosomes together with genes that determine sex.

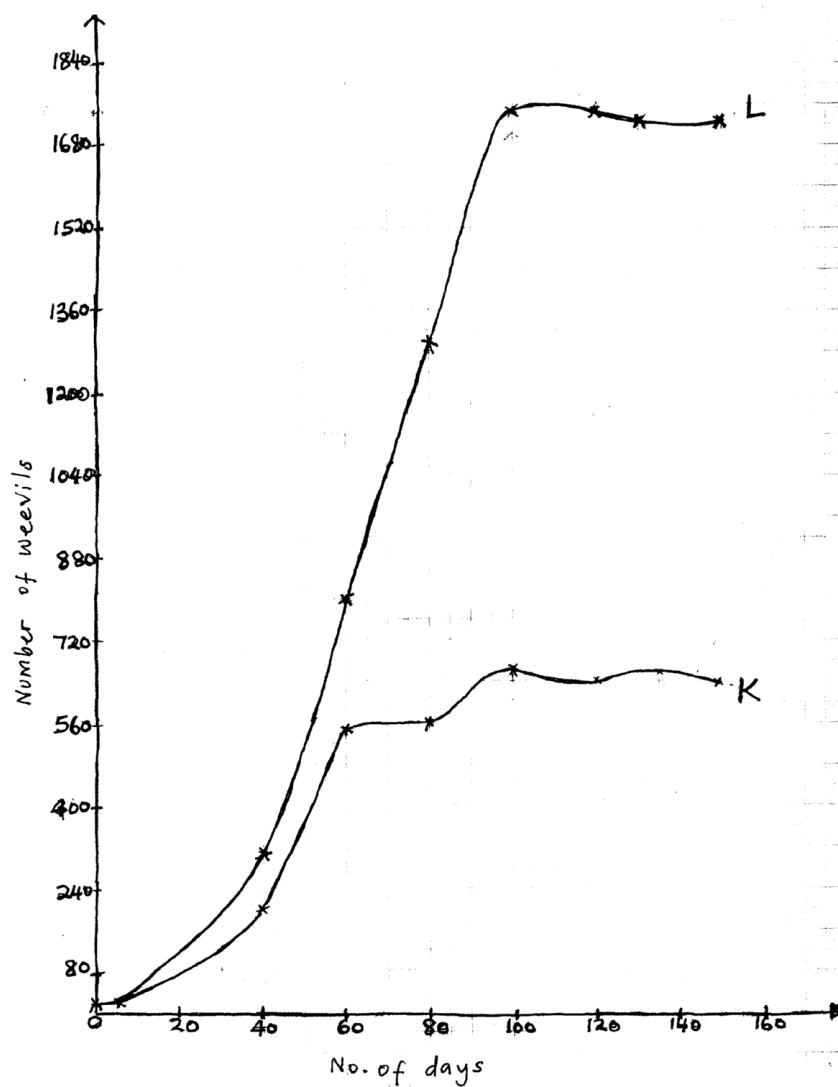
- b) Haemophilia
 - o Colour blindness
 - o Premature baldness
 - o Tuft of hair in ear pinna / nose

c) Parental phenotypes Red eyed male White eyed female
Parental genotypes **XRY** **Xr Xr**
Gametes



- 5. a)i) Modifications that occur to structures with a common embryonic origin to enable organism with such structures to exploit different environments.
- ii) Occurs when structures with different embryonic origin functions (to enable organisms exploit the same environment).
- iii) Sudden spontaneous changes in the genetic make up / genotype of an organism.
- b)
 - Large brain capacity leading to high intellectual ability.
 - A grasping hand
 - Forward facing eyes
 - Ability to speak
 - An upright posture that free the hand from locomotion to be used for other purposes.
- c)
 - Not all organisms were fossilized hence missing links
 - Distortion of fossils by earth movements eg earthquake.

6 a)



Axes	-	2
Curve	-	2
Identification	-	2
Scale	-	2

- b) K- 555
L - 1020
- c) i) 86th Day
100 - 120

- d) Increase in population ; because there is adequate food ; the number of reproducing individuals is increasing ; wastes products have not accumulated to toxic levels;
- e) - Diseases
- Lack of food
- Death rate equal to birth rate.
- Scrotal sac protects and house the testes;

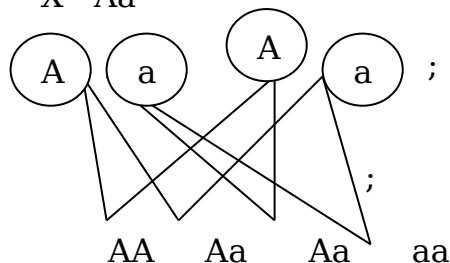
7. - The testes found outside the body; to provide a cooler environment for sperm production;

- Seminiferous tubules consist of actively dividing cell; which give rise to sperms;
 - Epididymis which is highly coiled; to store sperms;
 - Sperm duct / vas deferens ; connect the epididymis to the urethra;
 - Seminal vesicle; provides an alkaline fluid which contains nutrients for spermatozoa.
 - Prostate gland ;alkaline secretion to neutralize the vaginal; fluids, also activates the sperms;
 - Cowper's gland; neutralizes the acidity along the urethra;
 - Urethra used for the expulsion of urine to the exterior.
 - Penis made up of spongy tissue; muscles and blood vessels filled with blood to enable vessels filled with blood to enable it penetrate during coitus;
8. - Broad / wide / flat lamina; to provide large S.A; for absorption of CO₂/sunlight;
- Thin; to ensure short distance for CO₂ to reach photosynthetic cells/palisade/mesophyll;
- Guard cells/ presence of stomata; for efficient diffusion of CO₂ into leaf/ oxygen out of leaf/ gaseous exchange/ water vapour/ transpiration
- Transparent cuticle/epidermal cells; for penetration of light; into palisade cells/ photosynthetic cells.
- Palisade cells contain many chloroplasts; to trap light (for photosynthesis);
- Chloroplasts have chlorophyll; for trapping light energy;
- Leaves have veins; Xylem to conduct water to photosynthetic cells; and phloem to translocate the photosynthates to other parts of the plant;
- Air spaces in spongy mesophyll; for gases to circulate/diffuse easily/ for CO₂ to diffuse into palisade cells;
- Mosaic arrangement of leaves; enables all leaves to trap sunlight;
- Palisade cells are next to upper epidermis for maximum light absorption (by chloroplasts)

MAKING SCHEME OF BIOLOGY PAPER TWO 2012 PROJECTIONS -020

1. a) Aa Aa / Both aa Aa;

b) Aa X Aa



Normal pigmented children AA; Aa;
Albino child aa;

c) $\frac{1}{4}$ or 25%;

2. a) i) A - Hypogeal
B - Epigeal;

ii) A - Cotyledon / seed coat left underground after germination;
B - Cotyledon carried above the soil after germination.

b) i) Contains stored food used by plant during germinating
ii) Turns green and start manufacturing food for the plant;

c) Man-Takes place continuously over many years and then stops;
Insects- Growth is intermittent and takes place only after & ecdysis, stops and process repeated;

3. a) Movement of molecules / particles; from a region of high concentration to a region of low concentration;

b) i) The higher the diffusion gradient between two points the faster the rate of diffusion;
Accept the converse.

ii) The higher the surface area to volume ratio the faster the rate of diffusion;
Accept the converse.

iii) Increase in temperature increases the rate of diffusion; Accept the converse

c) - Energy is used;
-Molecules / substances move against concentration gradient;
- Uses carrier molecules;

4 a) R - Sieve pores;
S - Cytoplasmic strands / filaments;
Cell T - Companion cell;

b) Translocation / transport manufactured food;

c) Contain many mitochondria; that are sites for respiration producing energy;
Needed in
active transport of manufactured food;

d) Thickened; with lignin; Accept thick walls lignified;

5. a) Emergence of present organisms from pre-existing forms ; gradually over a long

period of time ;

b) Divergent evolution

Basic structural form is modified to serve different functions;, Vertebrate forelimbs /

pentadactyle limb/ beak structure in birds / feet of bird;

Convergent evolution

Different structures are modified to perform similar function; e.g. wings of birds and insects/ eyes of human and octopus;

c) fossil records; cell biology ; Geography distribution;

Comparative anatomy;

Comparative embryology;

Comparative serology;

Any two

6. b) A 120 ± 3 ; (mg/1000cm³)

B 140 ± 3 ; (mg/1000cm³)

c) Person A is capable of regulating glucose; while person B is likely to be diabetic /

Unable to control blood sugar level / does not have insulin;

d) A – Insulin is released by pancreas;

Excess glucose is converted to glycogen in liver;

B – insulin is not released; thus decline is due to glucose being released in urine;

Total 4 mks

Maximum 3 mks

e) Adenosine triphosphate / AT.P;

f) Deaminated; resulting in formation of ammonia; Ammonia combines with carbon (IV)

oxide to form urea (and water) : Urea is passed out through urine;

Carbohydrate group

is oxidized / stored as glycogen;

7. **Wind;**

In windy conditions the rate of transpiration increases; wind dispenses fruits / seed / spores; Wind is an agent of pollination;

Temperature;

Changes in temperature affect the rate of photosynthesis / other biochemical reactions; increase in temperature increases the rate of transpiration;

Light

Plants need light for photosynthesis;
Some plants need light for flowering;
Some seeds (lettuce) require light for germination;

Humidity;

When humidity is low the rate of transpiration increases; accept converse

PH

Each plant requires a specific PH to grow well;

Salinity;

Plants with salt tolerant tissues; grow in saline areas
Plants in estuaries adjust to salt fluctuations;

Topography;

North facing slopes in temperate land have more plants than south facing slopes; Plants on lee ward side have stunted plants; (And wind ward has normal growth for plants)

Rainfall / Water;

- Fewer plants in deserts where rainfall is lees;
- Water is required for seed germination;
- Is a raw material for photosynthesis;
- Dissolves mineral salts / solvent;
- Provides frigidity for support;
- Medium for transport;
- Dispersal of fruit / seeds / spores;

Pressure;

Variation in atmospheric pressure affects availability of CO_2 ; which affects photosynthesis; and low pressure increase rate of transpiration; and affect amount of O_2 ; for respiration;

Mineral salts;

- Affect distribution of plants in the soil;
- Plants thrive best volume the elements are present;
- Plants living in soil deficient in a particular element must have special methods of obtaining it;

8. a) -Pollen grains stick to the stigma surface;
-The surface of the stigma produces a chemical substance; which stimulate the pollen grain to produce a pollen tube / germinate; The pollen tube grows down the style (from which it drives nutrients). The nucleus divides into two male nuclei; and the embryo sac contains eight nuclei; 2 synergids; egg cell/ovum; two polar nuclei; three antipodal cells;
-When pollen tube reaches the micropyle the vegetative nucleus degenerates / disintegrates; one male nucleus fuses with the egg cell and forms the zygote; the other male nucleus fuses with the two polar nuclei; The process involves double fertilization;
- b) Integument forms seed coat / testa;
Triploid nucleus forms endosperm;
Ovary wall forms pericarp;
Ovary forms fruit;
Ovule forms seeds;
Style dries up / falls off / corolla dries up / falls off;
Calyx may dry up / filament or filaments dry up / fall off;

