BIOLOGY MARKING SCHEME FORM 4

1. a) Hb S Hbs X HbSHbs;

	S Hb	Hbs
Hbs	S S Hb Hb	S s Hb Hb
Hbs	S s Hb Hb	S s Hb Hb

b) Phenotypic ratio

unaffected; sickle cell; sickle

Trait cell

anaemia

1 : 2 : 1

Normal: Mildly anaemic: Severely anaemic

1 : 2 : 1

Genotypic ratio

1HbSHbS: $2Hb^{S}Hb^{s}$: $1Hb^{s}Hb^{s}$

c) Haploid number;

Diploid number;

2. a) Protoctista;

(ii) Reason; single celled organism with a nucleus; has flagellum for lomotion.

b) Z - Chloroplast;

Function for carrying out photosynthesis

c) Binary fission;

Accept a sexual reproduction.

d) It is a source of variation;

- Causes hybrid vigour which leads to better yields and resistance;

e) An organism that do not have a true nucleus/lacks a nuclear membrane;

3. a) 12.5%;

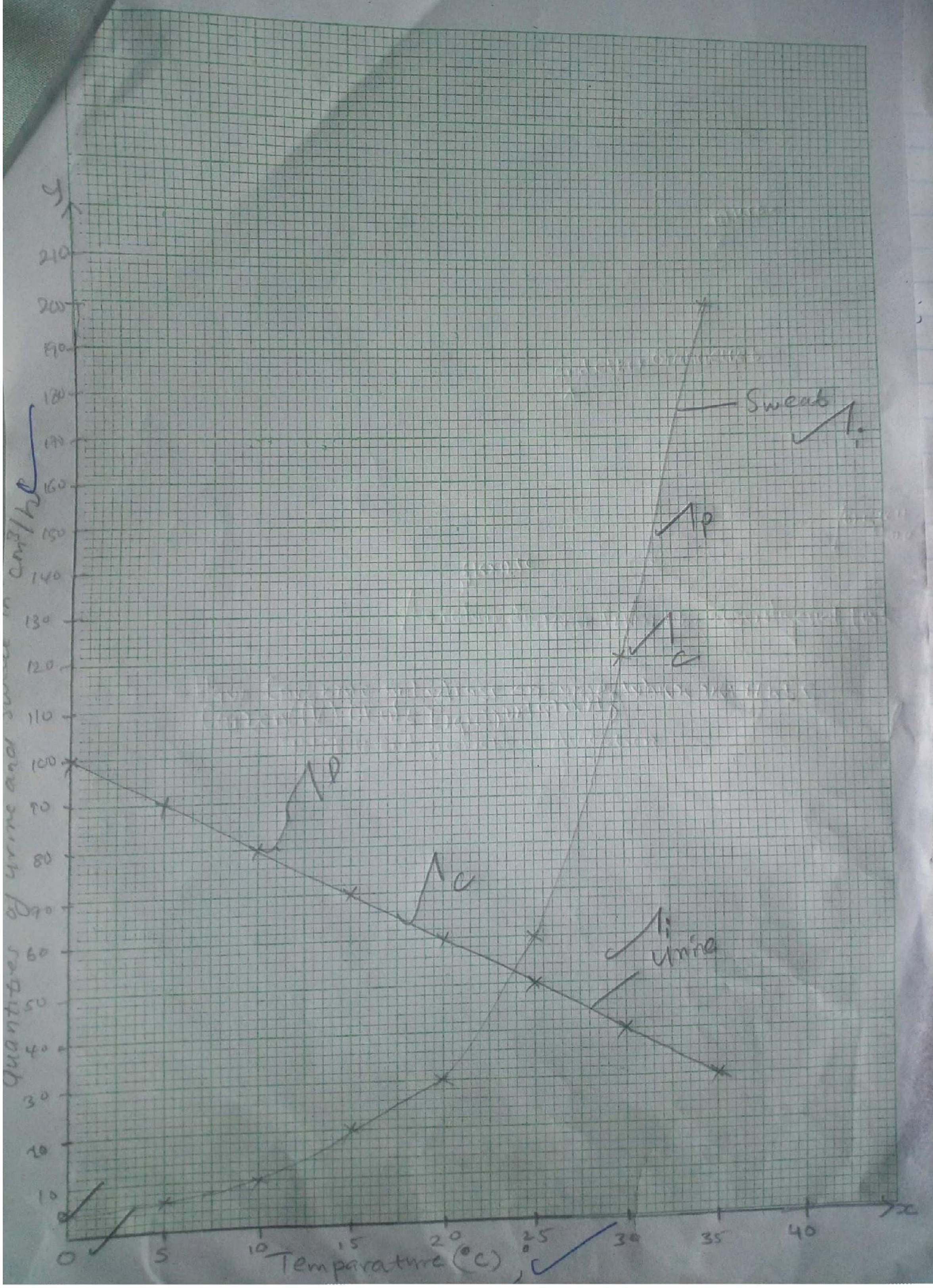
b) Isotonic solution;

c) Sugar solution was hypotonic to the cell sap; so cells absorbed water by osmosis; from the solution, through a semi permeable membrane. The cells swell and increased in diameter;

d) Plant a rigid cellulose cell wall; while animal has a flexible membrane only;

e)

Diffusion	
- Involves movement of particles/molecules of liquid or gas - It occurs through air or membrane - Not affected by pH changes	- Involve movements of solvent/water molecules - It takes place through a semi permeable membrane; - Rate affected by pH changes


Quantities of urine and sweat in cm³/hr
Temparature (°C)
Sweat
Urine
y
x
0
5
10
15
20
25
30
35
40
100
200
210

4. - Trypsin;

a) Pepsin;

Rej; Trypsinogen/pepsinogen

b) The ileum is long providing a large surface area for absorption;

- Narrow to bring digested food into close contact with the walls of ileum for easier absorption;
- Highly coiled inorder to slow down the movement of food that allows more time for digestion and absorption;
- Presence of a thin epithecal layer/of one cell thick cells through which digested food diffuses;/to reduce distance covered by digested food.
- Presence of a dense network of blood capillaries in villi to maintain a steep diffusion gradient enhancing diffusion;/transport end products of digestion.
- Presence of lacteals in villi into which fatty acids and glycerols enter as lipids.
- Inner walls have mucus glands/goblet cells that secrete mucus; for lubrication;/and protection against digestive enzymes

c) Proteins that contains a non-protein compound/molecule;

5. a) A - red blood cells;/Erythrocyte

B - white blood cell;/ Leucocytes

C - an antigen;/bacteria/virus/fungi

b) Red blood cells are many for the efficient transport of oxygen;

c) Phagocytosis; it leads to destruction of disease-causing micro-organisms in blood.

d) - Have hemoglobin that has high affinity for oxygen

- Do not have a nuclear and other organelles which increases the surface area for packaging of hemoglobin;
- Biconcave shape to increase surface area for packaging of hemoglobin that increases oxygen carrying capacity;
- They are small flexible and are able to squeeze through narrow capillaries;

(Any two)

- Have carbonic anhydrase enzyme which increase carbon (iv) oxide transportation;

6. b) $24^{o}c + 0.5$;

c) Sweat production increases with increase in temperature high temperature increases the evaporation rate and hence more sweat converted to vapour; This uses latent heat of evaporation from body hence cooling.

d) An increase in temperature deceases the amount of urine produced; this is due to sweating that raises the osmotic pressure of blood; A lot of water is then reabsorbed into the blood from the kidney tubules, resulting in production of little concentrated urine;

e)Hair - when hot erector pili muscles relax; hair lies flat on skin surface reducing insulation/encourages heat loss.

- When cold erector pili muscles contract; causes hair to stand and trap air which acts as an insulator; sweat glands - when hot releases more sweat; sweat evaporates taking away latent heat of vaporization hence cooling;
- When cold sweat glands releases less sweat; hence less evaporation hence less heat loss.

- Blood vessels - when hot blood vessels vasodilate; more blood flows near skin surface increasing heat loss by radiation.
- When cold, blood vessels constrict; less blood flows near skin surface reducing heat loss by radiation.
- The skin has subcutaneous fat which insulate the body against heat loss.

7. -Simple reflex action e.g. withdrawal of finger from a sharp object/hot object; its an automatic response to a specific stimulus; when the finger touches sharp object/hot object the palm receptors/thermo receptors in the skin are stimulants and trigger off a nerve impulse; the nerve impulses is transmitted via the senses neuron; to the grey matter of the spinal cord/CNS/brain; the impulse is then transmitted via synapse; to the relay neurone; and then through another synapse to the motor neurone and then through another synapses to the motor neurone; the impulse is then transmitted to the effector muscles in the hand; ace-efferent neurone for motor neurone
- Afferent neurone for sense neurone
- Intermediate/associative/corrector/interauncial neurone for relay. The effectors' muscles/biceps contract and the finger is withdrawn from the hot object/sharp object; conditioned reflex action - salivation in a dog/human being (ace, any other relevant examples) student in response to sound; it is an automatic response evoked from an animal by unrelated stimulus; substituted for the one which normally elicits the response; it develops from a past experience; and involves modification of behaviour/involves learning it weakens with time; and must be reinforced by repeating the related stimulus; the dog/student salivates when the bell (for meals) rings because they have learnt to associate the ringing of the bell at meal time with food; every time it rings (accept use of other relevant examples) they are offered food.

8. Pollution of air is caused by
- Sulphur based chemicals e.g. sulphur dioxide gas, H_2S, C_2 HCL, from food processing industries increases the risks of respiratory diseases, affects gaseous exchange structures, causes acid rain and damages plant leaves.
- Refrigeration, air conditioning industries, produce CFCs that deplete the Ozone layer causing genetic mutations.
- Aerosols used in agricultural practices e.g. in pesticides, herbicides, insecticides etc. pollute the air and cause respiratory diseases since they corrode epithelium of respiratory diseases since they corrode epithelium of respiratory organ thereby allowing bacteria to easily enter. The chemicals are residuals and persistent (not easily) broken down/non-biodegradable.
- Smokes and fumes from motor vehicles, industries, burning fuels/oil/coal produce carbon monoxide which affect oxygen carriage in blood. Fumes also settle on leaves and stop photosynthesis.
- Production of large quantities of CO_2 from combustion industries causes green house effect, temperature inversion as a result of heating in lower layers of atmosphere.
- Radioactive emission, carbon cycles, from nuclear reactors/mines/x-rays machines/atomic bomb plants, produce radiations that causes genetic mutation/cancer/death.
- Noise/sounds produced by heavy machinery, heavy vehicles, aircrafts affect hearing causing hearing impairment in animals.
- Dust from industrial production of cement causes irritation of respiratory systems and eyes. Dust also settle on plant leaves limiting photosynthesis.
- Deforestation/cutting of trees/vegetation interfere with concentration of gases in the environment leading to grey house effect.
- Forest fires and charcoal burning produces carbon monoxide which affects respiratory system.

- Sewage treatment works release unpleasant gases like H_2S, NH_3 into the environment casing acid rains, respiratory diseases.
- Quarrying activities produce dust and noise which block stomata thereby reducing photosynthesis.
-Combustion of leaded petroleum interferes with mental development in children, damages organs like lungs and causes cancer.
- Cigarettes smoking/manufacturing releases nicotine in the air and interferes with foetal development.
- Nitrogen IV oxide from Nitric acid manufacturing industries is carcinogenic, causes acid rain and respiratory diseases.