**Term 1 – 2023-OPENER EXAM**

**BIOLOGY (231/2)**

**FORM FOUR (4)**

**Time:**

**MARKING SCHEME**

SECTION A

1. a)i) M – Co-factor/Co-enzyme;

ii) N – Inhibitor;

b) Enzyme-Substrate complex will be activated/Reaction will proceed/Substrate binds to enzyme’s active site/Substrate will be broken down to products; OWTTE

c)i) Since they are protein in nature;

ii) Reactions are reversible; They are Substrate-specific; Protein in nature/Denatured by temperature beyond optimum/extreme pH; Mark 1st 2

d)i) Enzyme-Thrombokinase/Thromboplastin;

ii) M – Vitamin-K; Calcium Ions;

1. a) Investigate the effect of temperature/boiling on osmosis;

b) The sucrose solution is hypertonic/more concentrated than the cell sap of potato cells (and the Distilled water in the depression); a concentration gradient is formed and water molecules move from the distilled water into the potato cells by osmosis; (leading to now water in the depression in the potato)

c) Maintains osmotic pressure of the cells/osmoregulation; Facilitate entry and exit of water into/out of the cell cytoplasm;

d)i) Semi-permeability;

ii) Sensitive to changes in temperature/denatured (destroyed) by high temperature beyond optimum;

e) Active transport requires energy; requires carrier molecules; Occurs against concentration gradient; Mark 1st one

1. a) Epigeal

b) Cotyledon are carried above the ground; Elongated hypocotyl;

c) Dry weight reduces; stored food are hydrolysed to supply energy for cell division/germination/growth/development/formation of new tissues;

d) To push through the soil so as to prevent damage to delicate bud by soil particles as it emerges above the ground;

e) Photosynthesis occurs; thus food is stored/formation of new tissues/growth due to high rate of cell division;

1. a)i) Two daughter cells are formed at stage J;

ii) Constriction along the equator to form two daughter cells at stage J;

b) Stage: metaphase;

Reason: Chromosomes are aligned along the equator of the cell;

c) Separation of the daughter chromatids;

d)

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| --- | --- | --- |
| **Feature** | **Meiosis** | **Mitosis** |
| Number of Daughter Cells | 4 | 2; |
| Crossing over | Occurs | Does not occur; |
| Nucleus of Daughter cells | Haploid | Diploid: |

1. a)i) Number of cells**: 7 cells**;

ii) Diameter: **65millimeters;**

bi) Diameter of one cell = (65mm ÷ 7 cells)/1cell;

= 9.29mm;

= 9.29 x 1000micrometers

= 9290micrometers;

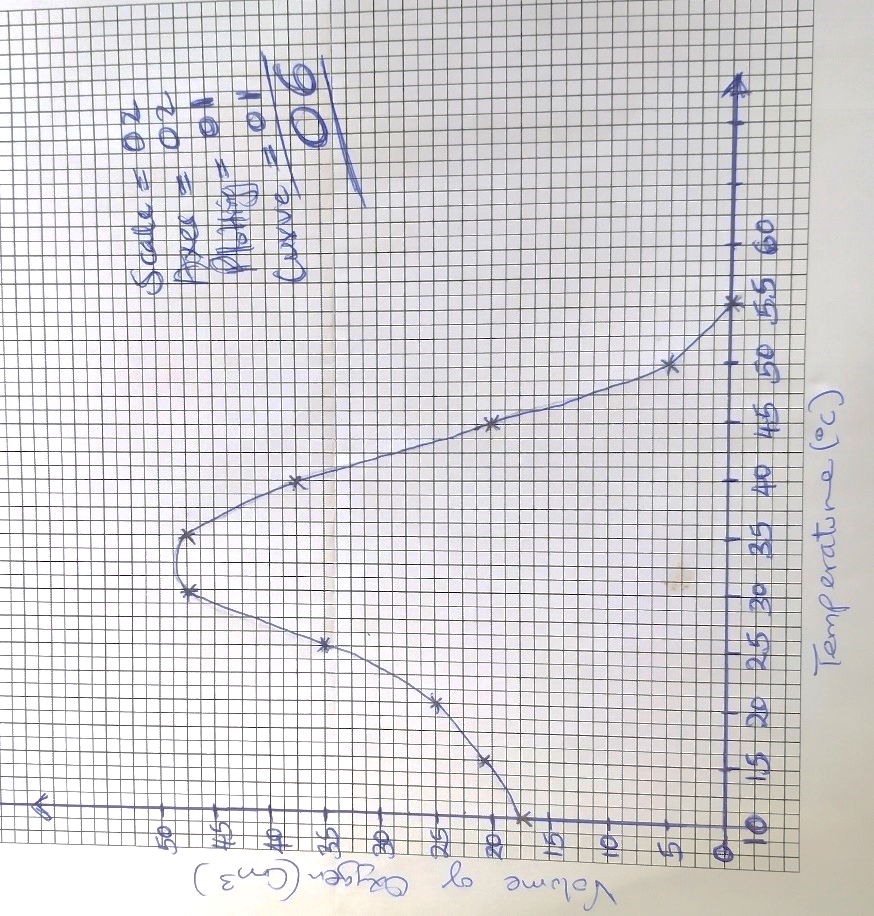
ii) Actual diameter = Image length ÷ Magnification

= 9290 micrometers ÷ x1500;

= 6.1933micrometers;

SECTION B

1. a)



b) i) Low Oxygen production; Since low temperatures inactivated the photosynthetic enzymes; causing low rate of photosynthesis;

ii) Declining Oxygen production; Since temperature beyond optimum denature/destroy enzymes; causing low rate of photosynthesis;

c) i) 32.5 ± 0.5 oC;

ii) 30cm3;

d) Water + Carbon (IV) Oxide Glucose + Oxygen;

e) Optimum light intensity; Rainfall/More water; Optimum Carbon (IV) Oxide concentration; Mark 1st 3

f) Increase primary productivity/Growth rate thus more food/plant material; more herbivores migrate to the ecosystem that attract more carnivores; which reproduce (leading to high diversity);

1. a)
2. Fit vehicles with catalytic converters in their exhaust pipes to reduce emission of polluting gases
3. Use lead free fuels in motor vehicles
4. Develop and use renewable energy sources such as solar and wind energy
5. Use of biological methods to control pests, diseases and weeds
6. Ban smoking in public
7. Use CFC free aerosols

b)

1. It has valves which prevent the back flow of blood.
2. Cuspid valves have tendons that prevent the valves from turning inside out during systole/when ventricles contract.
3. The ventricles have thicker walls to generate high pressure to pump blood.
4. The wall of left ventricle thicker than the right ventricle to pump blood over longer distance;
5. It has cardiac muscles which contract and relax continuously without fatigue;
6. The cardiac muscles are myogenic i.e. contract and relax without nervous stimulation;
7. Cardiac muscles are interconnected to form a network of fibres to rapidly and uniformly spread the waves of contractions throughout the heart wall;
8. The cardiac muscles have numerous mitochondria to generate energy for efficient muscular contraction;
9. It has sino atrial node (SAN) that acts as pace maker/Generates waves of contraction;
10. It has atrioventricular node (AVN) which relay contraction waves from sino atrial node (SAN) to the purkine tissue;
11. Has purkine tissue to relay waves from the atrioventricular node (AVN) to the ventricular myocardium/All parts of the heart;
12. It has coronary artery that supply heart tissue with blood in order to nourish the heart/ supply nutrients and oxygen to the heart muscles.
13. It has coronary vein to remove Carbon (IV) oxide and metabolic wastes from heart tissues;
14. It is divided into 4 chambers for the atria to receive blood and the ventricles to pump blood out of the blood;
15. It has a septum to prevent the mixing of low Oxygen/High Carbon (IV) Oxide concentration and that of high Oxygen/Low Carbon (IV) Oxide concentration for efficient Oxygen supply to tissues;
16. It is enclosed by pericardium to prevent over dilation/ overstretching of the heart/keep the heart in position.
17. The pericardium secretes pericardial fluid to reduce friction /lubricate the heart;
18. Heart is covered with thick adipose/fat tissue to absorb shock;
19. Has vena cava and pulmonary vein to supply blood to the heart;
20. Has aorta and pulmonary artery to transport blood away from the heart;
21. Has Pericardium that prevents over-dilation of the heart during diastole;
22. a) i) **Heart:** Heartbeat/rate/frequency increases; this increases blood pressure; and more blood is pumped to the muscles; at a faster rate; supplying more Oxygen; and nutrients; for continued Oxidation of food/respiration; to give more energy to sustain (vigorous) contraction and relaxation of muscles (during physical activity); the high pressure also ensure faster transport of Metabolic/Nitrogenous wastes/Lactic acid/Carbon (IV) Oxide to excretory organs for their elimination; such wastes if allowed to accumulate, intoxicate/poison cells;

ii) **Kidney:** Kidney help maintain blood plasma pH**;** and Osmotic pressure (of body fluids); by eliminating excess Hydrogen ions that accumulate due to production of lactic acid/Carbon (IV) Oxide during exercise; to maintain Osmotic pressure of blood; the kidneys conserve Sodium/Na+ ions; and reabsorb more water molecules; leading to reduction of volume of Urine produced; More Urea/Nitrogenous wastes are also filtered out by the kidney into the urine;

b)

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| Class **Monocotyledonae** | Class **Dicotyledonae** |
| One cotyledon | Two cotyledons; |
| Parallel venation in leaves | Net venation in leaves; |
| In most monocots, leaf petiole is modified to form a leaf sheath | Leaf petioles are not modified into sheath/Have leaf stalk; |
| Lack pith in stem | Have pith in the stem; |
| Most lack lateral meristems / vascular cambium hence no secondary/ lateral growth | lateral meristems/ vascular cambium common, resulting in secondary growth; |
| Flower parts in multiples of 3 | Flower parts in multiples of 4 or 5; |
| Fibrous root system | Tap root system; |
| In root, vascular bundles are arranged in a ring with phloem and xylem alternating | In the root, xylem is centrally placed and star-shaped, with phloem alternating with the arms of the xylem ; |
| Vascular bundles scattered in stem cortex | Vascular bundles arranged in a ring near the outer edge of the stem; |