**553/1**

**BIOLOGY**

**THEORY**

**Paper 1**

**AUGUST, 2019**

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**JINJA JOINT EXAMINATIONS BOARD**

**Uganda Certificate of Education**

**MOCK EXAMINATIONS – AUGUST, 2019**

**PROPOSED MARKING GUIDE**

**SECTION A (30 MARKS)**



**D**



**B**



**C**



**A**



**D**



**B**



**A**



**D**



**C**



**B**



**C**



**B**



**D**



**C**



**D**



**B**



**D**



**D**



**A**

**D**



**A**



**B**



**C**



**B**



**A**



**D**



**C**



**D**



**B**



**A**

**SECTION B (40 MARKS)**

1. (a) *See Graph*
2. Record, in the table below, the volume of blood flowing per minute to each of the organs when the body is at rest and when the body is undergoing strenuous exercise. (6marks)

|  |  |  |
| --- | --- | --- |
|  | Volume of blood/dm3min-1 | |
| At rest | During strenuous exercise |
| Heart muscle  Skeletal muscle  Kidneys  Gut and liver  Skin  Brain | *0.2****;***  *2.2****;***  *1.1****;***  *1.4****;***  *0.5****;***  *0.7****;*** | *0.7****;***  *12.0****;***  *0.6****;***  *0.6****;***  *1.9****;***  *0.7****;*** |

**½ mark @**

1. What is the total volume of blood per minute being pumped by the left ventricle to all of these organs when the body is;

at rest ***0.2 + 2.2 + 1.1 + 1.4 + 0.5 + 0.7 =;***

***6.1dm3min-1;***

undergoing strenuous exercise?

***0.7 + 12.0 + 0.6 + 0.6 + 0.9 + 0.7 =;***

***16.5dm3min-1;***

**4 marks**

1. If the pulse rate when the body is at rest is 70 per minute, what volume of blood is pumped out by the left ventricle at each heart beat? (2marks)

***70 x 6.1 =;***

***427dm3;***

1. If the pulse rate during strenuous exercise is 160 per minute, what volume of blood is pumped out by the left ventricle at each heart beat? (2marks)

***160 x 16.5 =;***

***2640dm3;***

1. Explain the changes in the rate of blood flow to the following organs as a result of undergoing strenuous exercise. (8marks)

Heart muscle***: The heart rate increases from about 80 beats min-1 to 140 beats min-1;This demands more oxygen and glucose supplied by blood to heart muscle;***

Skeletal muscle***: The skeletal muscles are contracting vigorously; and require more glucose and oxygen;***

Kidney***: The blood flow decreases; owing to the demands of heart and skeletal muscle;***

Gut and liver***: The blood flow decreases; owing to the demands of heart and skeletal muscle;***

1. An experiment was set up as shown below to investigate a certain biological process. The set up was exposed in the light.

(See set up)

1. State the biological process being investigated in this experiment. (1mark)

***The necessity of carbon dioxide in photosynthesis;***

1. State the function of sodium hydroxide;
2. On the path of the incoming air. (1mark)

***To absorb carbon dioxide from the air entering the bell jar;***

1. Inside the bell jar.

***To absorb carbon dioxide from the air inside the bell jar;***

1. Why were the pots covered with polythene bag? (1mark)

***To stop the carbon dioxide released by microorganisms in the soil from inter-fearingwith the investigation;***

1. What was the need of watering the potted plant at the beginning of the experiment? (1mark)

***To prevent water supply from being a limiting factor during the study;***

1. State four other factors that affect the rate of photosynthesis. (4marks)
2. ***Water;***
3. ***Light;***
4. ***Temperature;***
5. ***Amount of chlorophyll;***
6. In which set up would the leaf test positive for starch? (1mark)

***Set up 1;***

1. In an experiment set up, a seedling was placed horizontally as shown below. Study the diagram and use it to answer the questions that follow:

(See diagram)

1. Name the parts labelled A and B. (1mark)

***A: Radicle; ½mark @***

***B: Plumule;***

1. If the seedling is left for three days, describe the shape and positions of A and B in terms of auxin concentrations. (7marks)

***A bends downwards (the radicle) while the plumule (B) bends upwards;***

***This is because when the seedling is held horizontally, the auxins migrate to the lower side of the seedling due to gravity;***

***High auxin concentration inhibits growth in the root; while low concentration stimulates growth;***

***The upper side of the root therefore elongates faster than the lower side and the root bends down wards;***

***In the shoot, due to high auxin concentration on the lower side, the lower side elongates faster than the upper side;***

***With the result that the shoot bends up wards;***

1. Name the tropic response shown by A and B as a result of your description in (b) above. (2marks)
2. A: ***Positively geotropic;***
3. B: ***Negatively geotropic;***

**SECTION C**

1. **The human eye has the following structural components, which have certain characteristics adapting them for their roles to the eye and generally adapting it to its major function as follows:**

**The eye has the:**

* ***Cornea, which is transparent and curved to allow passage of light and refract light into the eyes;***
* ***Sclera, a tough outer fibrous coating to protect the declicate inner parts;***
* ***Conjuctiva, a thin transparent membrane which protects the delicate inner parts;***
* ***Aqueous and vitreous humour, which are transparent fluids that refract light onto the retina and give shape to and nourish the eye;***
* ***Iris, a thin sheet of muscles, opaque and contractile that control the amount of light entering the eye;***
* ***Lens, which is transparent and biconvex, refract and focuses light on the retina;***
* ***Ciliary body, has muscles to change shape of lens to focus on an object, but also secrete humour;***
* ***Suspensory ligaments, these are fibrous and hold the eye in position;***
* ***Retina, has rods and cones which contain rhodopsim and iodopsin respectively to perceive low and high intensity light and colour vision;***
* ***Optic nerve, has neurons to transmit impulses from retina to the brain;***
* ***Choroid layer, this has blood vessels for supply of nutrients and is opaque to reduce light reflection and absorb stray light;***
* ***Eye lids, tough with contractile muscles and fibrous eye lashes to protect the eye;***
* ***Eye muscles, are contractile to rotate the eye within the eye ball;***
* ***Tear glands, secrete solution (tears) to keep eyes moist, wash away dust and have antiseptic properties;***
* ***Fovea, has high concentration of cones for accurate vision;With all the above, that is how the human eye is adapted for sight;***

***1 mark @ = 15 marks***

1. ***(a) Calyx; and corolla; ½ mark@ = 1 mark***

***(b) (i) Self-pollination refers to the transfer of pollen grains from the anther to the stigma of the same flower/the transfer of pollen grains from the anther to the stigma of another flower but on the same plant, where as cross pollination refers to the transfer of pollen grains from the anther to the stigma of different flowers but of the same species; 1 mark***

***(ii). Protandry refers to a situation where the stamens ripen first and shed their pollen before the stigma is mature while protogyny refers to maturity of carpels before the stamens; 1 mark***

***(c). Fertilization takes place inside the ovule and it is the union of the nucleus of a male gamete with the nucleus of a female gamete;***

***When the pollen grains land on the stigma; they absorb water and germinate to give the pollen tube;***

***The tube pushes between the cells of the style, the tube nucleus at the tip of the tube and the male nuclei behind;***

***The tube nucleus controls the growth of the pollen tube;***

***The tube is negatively aerotropic and therefore grows into the style;***

***Because of the chemicals produced in the embryo sac the tube further grows towards it showing a positive response;***

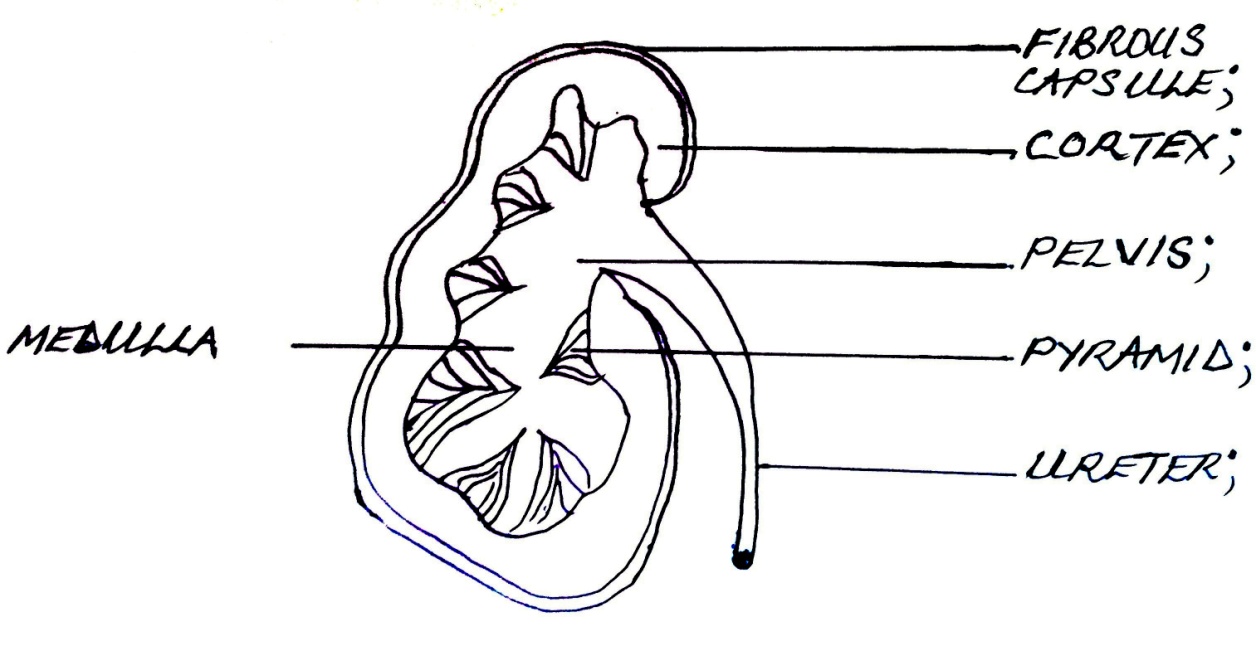
***The tube secretes chemical substances that soften the cells in the style and this enables the tube to grow towards the micropyle;***

***Once the tube penetrates and enters the embryo sac, the tube nucleus degenerates and the two male nuclei enter;***

***One male nucleus fuses with the egg cell to give a diploid zygote;***

***The other fuses with the two polar nuclei to form the triploid primary endosperm;***

***This kind of fertilization in plants is called double fertilization;***

1. ***(a) THE INTERNAL STRUCTURE OF THE RIGHTHUMAN KIDNEY:*** ******

***(b) A nephron is the structural and functional unit of the kidney; OR***

***A nephron is a selective filtering element in the kidney;***

***(c). Blood enters the capillaries of the glomerulus from the renal arteries under normal blood pressure;***

***This blood pressure is increased because the exit capillary is narrower in bore than the capillary delivering blood;***

***Blood under high pressure is forced through the capillary wall into the Bowman’s capsule;***

***This process is called ultra-filtration or pressure filtration, because it is brought about by the enhanced blood pressure;***

***Small molecules, namely water, salts, urea, uric acid, glucose and amino acids are forced through; whereas red blood cells and large molecules, the proteins like fibrinogen remain in the circulating blood;***

***The glomerulus leads into a venule, which takes the new highly concentrated blood from the capsule;***

***The venule then winds around the kidney tubule, which is taking the glomerular filtrate away from the casule;***

***About 98% of the fluid of the fluid passed into the tubules is reabsorbed;***

***The fluid passes down the nephron and the following occurs:***

***Glucose amino acids, salts and most water are reabsorbed;***

***These substances are forced back into the tubule capillaries by active transport;***

***After the selective reabsorption has occurred, the liquid in the nephron consists of urea, uric acid, salts, water and other nitrogenous waste materials;***

***Some salts and water can be reabsorbed in varying quantities according to the amount of each substance in the blood;***

***The remaining solution is now called urine and it trickles into the collecting duct and then flows through ureters to the bladder;***

***When enough has accumulated here, the muscular walls of the bladder contract, the sphincter muscle at the opening relaxes and the urine is ejected to the exterior;***

***15marks***

1. ***(i) Mesophytes flourish in habitats characterized by: adequate rainfall, high humidity ordinary temperatures and less windy conditions;***

***Mesophytes can be adapted either to retain water or lose water rapidly depending on the particular habitat;***

The adaptations will be as follows:

***To get light in a forest some may grow tall, others may be climbers;***

***To utilize light of low intensity in a forest, some mesophytes have numerous chloroplasts;***

***Some plants have mosaic leaf patterns which assist in minimizing overshadowing of leaves so that all leaves receive some light;***

***In areas with heavy rainfall such as tropical rain forests, the plants may have broad leaves, many stomata on both sides of the lead and thin cuticle to enhance water loss;***

***Others have waxy cuticle to drip off rain water;***

***Some plants have buttress roots for extra support; those that have shallow roots. 8 marks***

***(ii). Halophytes flourish in saline soils and marine habitats;***

***The marine habitat has conditions of low light intensity, waves and currents, low level of dissolved gases;***

***The plants suffer physiological drought as they are un able to absorb water***

**The halophytes therefore will be adapted as follows:**

***Endowed with salt glands to secret excess salts;***

***High salt concentration in root hair calls to enable water up take by osmosis;***

***Halophytes have water storage tissues to preserve water;***

***Presence of pneumatophores or breathing roots; for example in mangroves large air spaces in fruits to enable floating;***

***7 marks***

**END**