Guide

Uganda Advanced Certificate of Education
BIOLOGY (THEORY). P530/1
PAPER 1

JULY-AUGUST MOCK

SECTION A(40 marks)

1	D	11	C	21	B	31	C
2	B	12	D	22	A	32	C
3	C	13	D	23	A	33	B
4	C	14	A	24	B	34	D
5	B	15	D	25	D	35	D
6	B	16	D	26	A	36	D
7	C	17	B	27	A	37	B
8	B	18	D	28	B	38	A
9	B	19	A	29	B	39	C
10	A	20	C	30	D	40	D

SECTION B(60 marks)

41. Explain the following occurrence;

i) If a mother of blood group O rhesus factor negative is pregnant with a fetus of having rhesus positive blood any group other than O, haemolytic disease of the new born does not arise.(3mks)

Because any other blood group other than blood group O has antigens; and Rh +Ve blood of the child would diffuse through the placenta to mother's circulation stimulating her blood to produce corresponding antibodies; that will result to antigen-antibody reaction causing agglutination of blood.

ii) The oxygen dissociation curve of a bird lies to the right of that for humans.3mks)

Bird haemoglobin has a low affinity to oxygen compared to that of human; but has a higher offloading capacity compared to that of human; because birds are more active and require an efficient supply of oxygen to respiring tissues to generate more energy required for a high metabolism.

iii) What are the main features of the foetal blood circulation which do not occur in the adult man.(4mks)

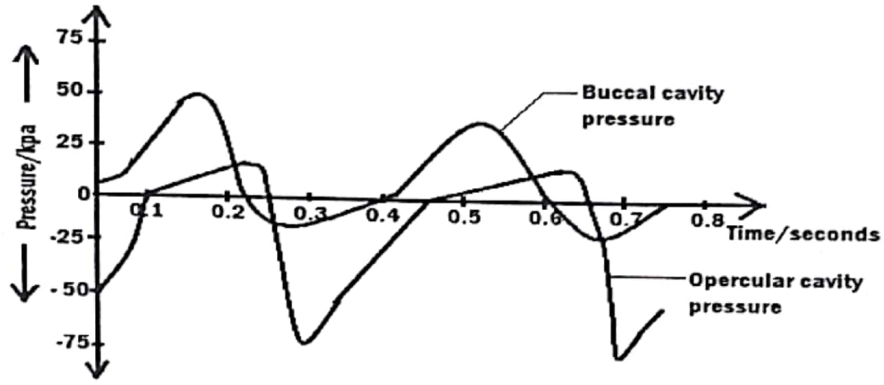
i) Foetal blood circulation has a low blood pressure than that of man.

ii) In fetal circulation, Oxygenated blood enters the heart through the vena cava through the foreman ovale to the aorta and the rest of the body while in man oxygenated blood enters the heart through the pulmonary vein and leaves through the aorta.

iii) Blood flows to the placenta for gaseous exchange in foetus while in adult manit occurs in the lungs

iv) Foetus haemoglobin has a higher affinity for oxygen than that of the adult man.

42.Figure below shows the pressure changes in the buccal and opercula cavities of a teleost fish that were obtained using a hypodermic tubing connected to a pressure recorder.



Use the above information in the figure to answer the questions that follow,

(a) Give explanations for the observed pressure changes in the first 0.4 seconds in the Opercular cavity. (4mks)

Operculum pressures increase gradually from 0.1 upto 0.25 seconds to attain a slight positive pressures ; because operculum muscles contract to increase operculum pressures slightly above that of the surrounding ; operculum valves open ; water is expelled to the outside/expiration ;

Operculum pressures decrease rapidly to attain a more negative pressures from 0.25 upto 0.3 seconds ; this is because of relaxation of the operculum muscles causing the operculum to expand ; pressures within the operculum lowers slightly below that of the buccal cavity ; operculum valves close ; water is drawn into the operculum cavity from the buccal cavity ;

(C) What is the physiological significance of the observed differences between the pressures in the buccal cavity and the opercular cavity. (2mks)

A higher positive pressures in the buccal cavity than in the operculum cavity ; allows water with higher oxygen content to be drawn into the operculum cavity over the gills; where oxygen are extracted from the water/gaseous exchange occurs ; by counter current flow mechanism ;

Slightly higher positive pressures of the operculum than the negative pressures in the buccal cavity ; causes operculum valves to open ; so that water with high content of carbondioxide can be expelled to the exterior/expiration ;

(e) Suggest a reason why the gill lamellae would not provide an efficient respiratory surface on land. (1mks)

Gill lamellae lack the ability to absorb oxygen from the dry air ; it is very moist and so can be dessicated/dehydrated by the high temperatures ; dries out so will lack moisture for dissolution of the respiratory gases ;

(f) Give the adaptation of gills as gas exchange surface in bony fishes. (3mks)

- Very thin for rapid diffusion of respiratory gases ;
- Has a network of blood vessels to carry away respiratory gases ;
- very moist for dissolution of respiratory gases ;
- Numerous to increase surface area for absorption of oxygen ,

43(a) How is the process of mechanical osmo-regulation in fresh water Hydrophytes achieved. (3mks)

The concentration of the cell sap of these plants is higher than that of their surroundings; water rapidly enter their vacuolar sap by osmosis ; the volume of the vacuolar sap increase, generating a turgor pressure ; the cell becomes fully turgid ; and the water potential of the cell is equal to that of the surrounding water ; and further influx of water by osmosis is stopped ;

(b) Describe the mechanisms by which mammals get rid of and remove different non-nitrogenous wastes out of their bodies. (mks)

i) In the kidney,((2½mks) carbondioxide from the renal fluid diffuse into the cells of the proximal convoluted tubule ;carbondioxide dissolve in the waters to form carbonic acid ; the acid dissociates to form H+ and hydrogen carbonate ions ; The hydrogen ions are actively pumped back into the lumen ; where it combines with sodium salts and excreted in the urine ; the hydrogen carbonate ions combines with sodium to form sodium hydrogen carbonate ; and secreted back into blood ;

ii)In the lungs(2½mks)The carbondioxide from the respiring tissues are transported to the lungs ; in solution /inform of sodium hydrogen carbonates/ as carbamino-haemoglobin ; in the lungs carbondioxide is released from the different forms and diffuse into the alveoli of the lungs and expired ;

In the highly metabolic cells, hydrogen peroxide produced within the cells are decomposed by the catalase enzymes ; into harmless substances water and oxygen ;

iii) In skin;(2mks) Sweating removes water and minerals salts ; Fragments of red blood cells and haemoglobin from breakdown of Red blood cells are passed in bile into the small intestine and egested with the faeces;

44. a) i) What ismeantbya restingpotential? (02marks)

Arestingpotentialisanegativepotential difference;existingacrossamembrane ofanaxonwhenthe outsideofthemembraneismorepositivewhiletheinsideofthemembraneismorenegative;/membrane is polarized,when there exists nostimulus;

(i)Describehowarestingpotentialismaintainedacrossthemembraneofarestingaxon. (04 marks).

Itismaintainedbytheactivityofsodium-potassiumpumpmechanism;whichactivelypumps3molecules ofsodiumoutside;thememebraneandtwomoleculesofpotassiuminsidethememebrane;Thememebrane remainpermeabletopotassiumionsbutimpermeabletosodiumions;andoutwardflowofnegativeions suchaschloridelons, potassiumionsfreely diffuseoutsidethemembranewhilethenegativeions are retained;inside thememebranecausingtheinside of thememebranemore negativeandoutsideofthe membranemorepositive;

b) Briefly **describehow animpulsearrivesand crossesan excitatory and aninhibitorysynapse.(6marks).**

ThememebraneismorepermeabletooutwarddiffusionofK^+thaninwarddiffusionofNa^+.Thiswillleaveas urplus negative chargesinside and positive chargesoutside hencerestingpotential

Whenanimpulsearrives,thememebranesuddenlybecomepermeabletoNa$^+$;andtheydiffuseintotheaxon rapidlyandreverse the restingpotentialbymaking the insidepositiveandleavingthe outside negative;hence an actionpotentialwhichispropagated along the axon asa current of propagation towardsthesynapse.

When an impulse arrives on the presynaptic knob, the calcium ion channels in thepresynaptic membrane are opened; Calciumionsfromthe synapticcleft enter the knobandcause the vesiclesto move close to the presynapticmembrane;

Whentheseveslclesreachthemembrane,theydischarge/releasethetransmittersubstancesthroughthe

membranetothecleft;Thereleasedneurotransmittersubstancesthendiffuse acrossthesynapticcleftattaches to specificreceptor siteson the postsynapticmembrane;

What followsdependson whether the synapse iseither excitatoryorinhibitory.

***Atexcitatorysynapse**,thereceptionofneurotransmittersubstance(acetylcholine)onthereceptorsitesc hanges their configuration such that the membranechannelsinthemare opened up thusallowing sodiumionstodiffuse;*
throughthepostsynapticmembraneintothepostsynapticknobhencemakingitmorepositive.
Ifathresholdvalue
isreached,potentialdifferenceofthemembranethereforechangesandanexcitatorypostsynapticpotenti al(epsp) results;Thisfillsupuntilthethresholdisreachedwhichresults intoanactionpotential beingfiredinthe post synapticneuron; At that point the impulsehascrossed the synapse.

***Ataninhibitorysynapse**,releaseoftransmittersubstances(noradrenaline)intothesynapticcleftleadst othe*

opening up of chlorideion channels; inthepost synaptic membraneresulting into chloride ionsenteringand potassiumionsleaving.Asa result,theinteriorofthepost synapticmembranebecomesmorenegative;this increasesthe threshold making the post synapticmembraneharder to be excited;

45(a)(i) anteriorpituitary.**½ mk**

(ii) ovarianfollicleandcorpusluteum. ½ mk

(iii) corpusluteum. ½ mk

(b)hypothalamussecretesgonadotropinreleasingfactor/GnRF;whichregulatessecretionofFSHandLHbythepituitary; reftofeedbackcontrol.**2mks**

(c)(i)
increaseinconcentrationduringproliferativephasestimulatesdevelopmentofaprimaryfollicle(intheovary);tobecomeamatureovarianfollicle/refphaseofgrowthofoogenesis;
stimulatesoestrogensecretionbyfollicle;
'spike'ofFSHsecretionstimulatesoogenesis/triggersLHsecretion; 2mks

(ii)
riseinoestrogenconcentrationduringproliferativephasestimulatesthickeningofuterinewall/endometrium/developmentofglands/bloodsupplyofendometrium;

riseinoestrogenconcentrationeventuallyinhibitsFSHsecretion(bynegativefeedback);

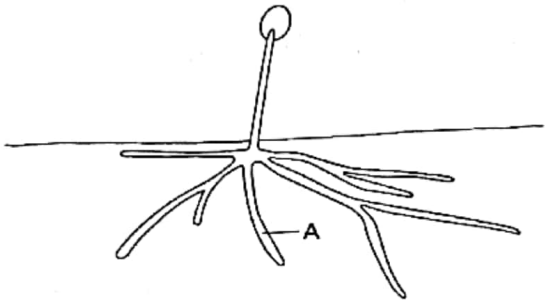
riseinoestrogenconcentrationalsostimulatesLHsecretion(bypositivefeedback);

riseinoestrogenconcentration(thusalso)stimulatesovulation; 2 ½ mks

(iii)'spike'stimulatesovulation;highLHconcentrationinsecretoryphasestimulatesdevelopmentofcorpusluteum(fromremainsofrupturedfollicle);stimulatescorpusluteumtosecreteprogesterone/oestrogenandprogesterone;fallinLHconcentration(ifthereisnoimplantation)enablesreturntothemenstrualphase; **2mks**

(iv)
increaseinprogesteroneconcentrationmaintains/causesfurtherdevelopmentofendometrium;reftoincreaseinbloodsupply/glandulartissue;fallinprogesteroneconcentrationat25–28daysremovesmaintainingeffect;thusuterinewall/endometriumbreaksdown/refmenstruationoccurs; 2mks

46. The figure below shows the pin mould *Rhizopus* growing across bread. Study it and use to answer the following questions.



a) **Name part labeled A**...*Hypha/hyphae*(1mk)
b) **How does this fungus obtain its food? (2mks)**
Extra*cellular digestion/enzymes are secreted onto food; digested food absorbed into hyphae.*
c) **Describe the adaptations of part labeled A to its function. (3mk)**
- *They are thin walled to reduce diffusing distance for the absorption of digested nutrients.*
- *Secrete digestive enzymes* whichcatalyze thebreakdownof insolublecomplexorganicsubstancesintosimplesolublesubstances to be absorbed.

- *Are numerous to increase the surface area for absorption of digested food.*

d) **What is this mode of nutrition and how does the mode differ from that of a parasite? (3mks)**

Saprophytic/saprobiontic nutrition; saprophytes obtain their nutrition values from dead and decaying organic matter; parasites gain their food from living host.

Differences

Parasites	**Saprophytes**
Energy derived from living organisms	*Energy derived from dead Organisms*
Many stages in lifecycle	*Usually a single adult stage, with spores inclusive*
Very specific to their host	*Use a variety of food sources*
Nutritionally highly adapted	*Simple methods of nutrition*
Most plant and animal groups have representatives	*Almost totally fungi and bacteria*
Most are aerobic	*Anaerobic and aerobic*

e) State the importance of organisms with these mode of nutrition. (3mks)

- *Recycling of materials e.g. carbon, nitrogen, phosphorus*
- *Brewing and baking e.g. yeast(Saccharomyces)*
- *Making antibiotics e.g. Penicillin*
- *Decomposition of wastes e.g. sewage*
- *Production of yoghurt and cheese*
- *Food source e.g. mushrooms*
- *Industrial applications e.g. leather*
- *tanning, production of vitamins, etc.*

END

- *Are numerous to increase the surface area for absorption of digested food.*

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