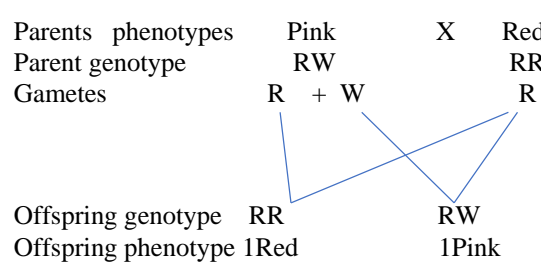


A-level

UACE Biology 2001 paper 1
Section A

NU MB ER	Choice	Justification
1	B	Shivering increase metabolic rate that generate heat chemically
2.	D	
3	C	
4	B	Reduced number of stomata reduce transpiration Deep and extensive root system increase water absorption Few desert plants may have leaves to shed
5	B and C	
6.	C	
7	A	In formation RNA from DNA, T pairs with U NOT A
8	B	Membrane around eggs protect them from predators Gills are useful for gaseous exchange Webbed feet for swimming
9	B	Plasmodium mainly reside in the liver cells
10	B	
11	C	<p>The alleles for red and white are codominant when the phenotype of heterozygotes is intermediate.</p>  <pre> Parents phenotypes Pink X Red Parent genotype RW RR Gametes R + W R / \ Offspring genotype RR RW Offspring phenotype 1Red 1Pink </pre>
12	B	Progesterone prevents miscarriage High concentration of estrogen increases the sensitivity of the uterine walls to oxytocin
13	D	
14	B	

15	B	Longitudinal and circular muscles are antagonistic, when one relax another one contract. In this case the longitudinal muscle are contracted that is why the segment are closure.
16	C	Stinging cells of coelenterates protect the animal from danger and auto controlled
17	A	<p>cyclic AMP (cAMP, adenine monophosphate)</p> <p>a molecule thought to act as an intermediary between a hormone and the biochemical process of its target cell. The process is thought to be</p> <ol style="list-style-type: none"> the hormone arrives at the target cell and becomes complexed to receptor sites in the cell membrane; the adenyl cyclase enzyme is activated, enabling conversion of ATP to cAMP; specific cellular enzymes are activated by cAMP starting a chain reaction.
18	B	Long loop of Henle concentrates urine through counter-current multiplier effect of concentrating salts in the medulla
19	D	Leaching may lower the pH of the soil when it carries away basic ion of potassium, sodium, magnesium, and calcium from the soil.
20	B	Uptake of food by a tape worm is by diffusion. In mass flow mechanisms all particles move in the same direction at the same speed.
21	C	Lymphatic system does not contain plasma proteins because these are too big to filter in blood capillary membranes.
22	B	Sound waves with low frequency and high amplitude cause longer lasting vibration of the basilar membrane and travel farthest along it
23	D	When the buccal cavity in fish contract, the mouth closes
24	D	
25	B	
26	D	Smooth Endoplasmic Reticulum (SER) is mainly concerned with the synthesis of carbohydrate and lipids, and sometimes, with their metabolism
27	A	Estrogen negative feedback on LH production in the early part of the menstrual cycle. However, once estrogen levels reach a critical level as oocytes mature within the ovary in preparation for ovulation, estrogen begins to exert

		positive feedback on LH production, leading to the LH surge.
28	B	A tetrapod at rest is like a four legged table, the center of gravity falling somewhere inside the area delineated by its four legs. When it lifts one of the limbs during movement, the tetrapod becomes a tripod and center of gravity shifts within the triangle to remain stable
29	A	Octopus is in phylum Mollusca while the rest are in phylum Arthropoda
30	D	Thin membrane reduces diffusion distance Biconcave shape increases surface area for absorption of gases Hemoglobin has high affinity for oxygen
31	D	Adaptive radiation, convergent radiation deal with structural modification Terminology of divergent distribution is non existent.
32	D	The four stages are
33	B	
34	D	
35	D	
36	D	
37	B	ADH is secreted by posterior pituitary gland
38	B	Plasma proteins are too big to pass through glomerular filtration membrane
39	B	Blood in open circulation does not transport gases therefore transport mechanism is not necessary.
40	A	Stratified epithelia are located on area such skin and virgin

SECTION B

41. (a) Give three ways in which ions are regulated in the body

(b) The pH of blood and tissue fluid I human remains constant at about 7.4 in spite of metabolic activities which produce hydrogen ions. Explain how this constancy is maintained by the kidney.

(a) hormone regulate the concentration of ions by

(i) controlling uptake of ions from the gut

(ii) controlling release of ions from storage organs such as bones

(iii) controlling their elimination from the kidney

(b)

- In the cells of proximal convolute tubule, carbon dioxide reacts with water to form carbonic acid. the reaction is catalyzed by carbonic anhydrase enzyme
- Carbonic acid dissociated into hydrogen and bicarbonate ions.
- The hydrogen ions are pumped into the lumen by an ATP dependent Na^+/H^+ exchanger.
- Here hydrogen ions are buffered by sodium hydrogen phosphate to form sodium dihydrogen phosphate.
- When the pH of the renal fluid falls too low, the cells of the distal convoluted tubules produce ammonia from glutamine.
- Ammonia combines with excess hydrogen ions to form ammonium ions that are excreted.
- When the pH of renal fluid rises too high, the cells of distal convoluted tubules excrete bicarbonate ions and retain hydrogen ions

42. (a) Giving examples, differentiate between photosynthetic and chemosynthetic bacteria

(b) Explain how certain bacteria, which require light for photosynthesis, survive under weeds in ponds and rocks

- (a) (i) Photosynthetic bacteria have chlorophyll and use energy for photosynthesis derived from sunlight. Examples are cyanobacteria or blue-green bacteria
- (ii) chemosynthetic bacteria lack chlorophyll and derive their energy from oxidation of inorganic compounds example, iron bacteria, hydrogen bacteria
- (b) Rocks and ponds have abundant supply of hydrogen sulphide from decomposition of organic matter. Hydrogen sulphide is the source of hydrogen for reduction of carbon dioxide to produce carbohydrates.
Bacteria in that situation have bacterial chlorophyll that uses different wavelength of light from those used by plants. These wavelengths of light pass through to the bacteria unabsorbed.

43. (a) what is a gene pool

(b) What causes a gene pool to be static?

(c) (i) state three factors that may contribute to the change in frequency of dominant and recessive alleles in a population

(ii) Explain how each factor stated in (c) (i) above may cause changes in the frequency of dominant and recessive alleles in a population.

Solution

- (a) A gene pool is the total variety of genes and alleles present in a sexually reproducing population
- (b) – when genetic variation are inadequate to bring about evolutionary change
 - Lack of destructive influences like mutation, emigration, immigration or environmental change
 - When mating is random
- (c) (i) – genetic drift
 - Mutation
 - Natural selection
 - Nonrandom mating
 - Environmental change

- (ii) - Genetic drift is the change in gene frequency due to chance rather than natural selection for example when the only organism that carry a particular gene dies before reproduction
- Interbreeding may result into a population gaining or losing alleles or allowing genetic change
- Nonrandom mating may promote some genes in a population
- Mutation introduces new alleles in a population or alter genes and chromosomes.
- Environmental change cause alteration in selection pressure that may favor certain alleles than others.
- Natural selection, favorable alleles are promoted while unfavorable alleles are eliminated.

44. In Poultry feather color is controlled by two sets of alleles, W(white) dominant over w(colored) and B(black) dominant over (brown), a fowl heterozygous for both alleles (WwBb) is white.

(a) Explain why the genetic constitution (WwBb) is white.

(b) Work out to show the phenotypic ratio of crossing, a white cock (WwBb), with a brown hen.

(c) State the possible genotypes of a black fowl

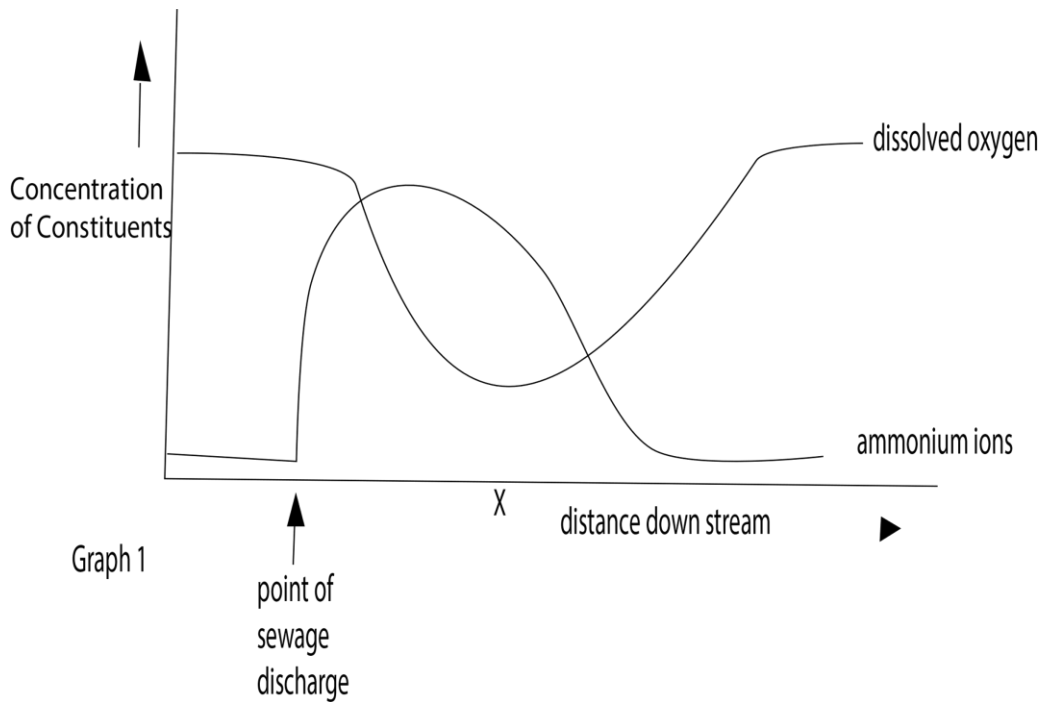
(a) When both genes are present in a genotype, gene W prevents the expression of Gene B in the phenotype, a condition called epistasis.

(b)

Parent genotype	WwBb				x	wwbb			
Gametes	WB	Wb	wB	wb		wb			
Offspring genotype	WwBb		Wwbb			wwBb		wwbb	
Phenotype ratio	white		white			black		brown	

(c) A black fowl may have phenotypes: wwBB and wwBb

45 The graph below shows the effect of sewage discharge on some chemical constituent of a river at increasing distance down stream from the point of sewage



- (a) Give explanations for the variation of ammonium ions and dissolved oxygen, down stream from the point of sewage discharge.
- Ammonium ions
 - Dissolved oxygen (6marks)
- (b) Describe the effect of sewage on ecosystem at distance X down stream. (04marks)

Solution

- (i) Ammonium ions

Variation

Ammonium ions level downstream increase rapidly at the point of sewage discharge then decreases gradually and the exponentially to a low almost constant level farther down stream

Explanation

- Sewage contains ammonium ions from decomposition of organic dead matter that is added to the stream at the point of discharge.
- Down stream the concentration ammonium ions decrease due to dilution and being converted to nitrites and nitrates by bacteria

- (ii) Dissolved oxygen

Variation

- Oxygen in solution decreases exponentially first just after the discharge of sewage into the stream the gradually to a low level and latter increases gradually further downstream to a normal value.

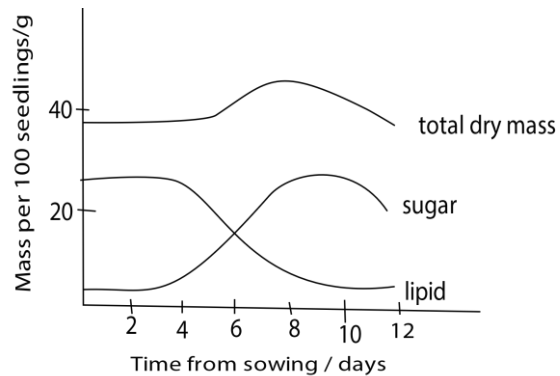
Explanation

Sewage contains aerobic bacteria that use oxygen to decompose organic matter. The oxygen concentration later increases to normal due photosynthetic algae activities that adds oxygen to water and mixing with water full of oxygen.

- (b)

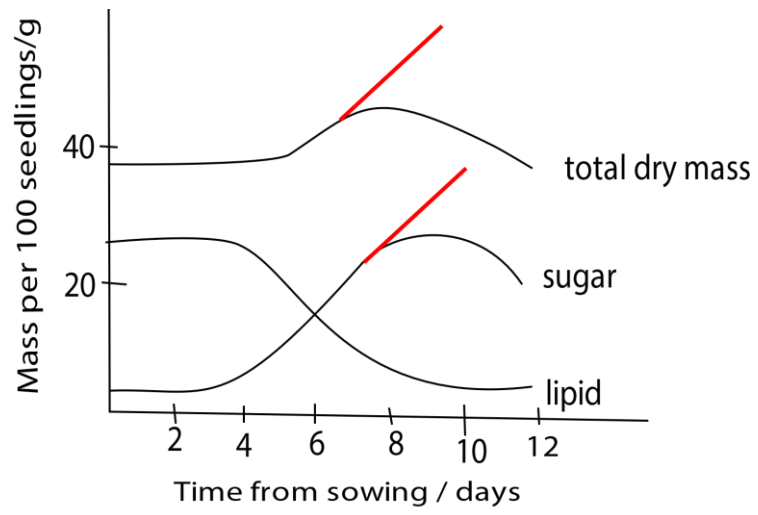
- proliferation of algae and other aquatic organism due to availability of nitrates
- less light penetration
- reduction of oxygen content in water may lead to death of fish and other aquatic mammals
- bad odor

46. Graph 2 below shows changes in lipid and sugar content of castor oil seed during germination in the dark



Graph 2

- (a) Explain the changes in lipids and sugar content and total dry mass during experimental period.
- (b) On the same graph, indicate the shape of the curves if the seed were to germinate in light
- (a)
- The main storage food reserve is lipid
 - During germination, lipids decrease as they are broken down to fatty acids and glycerol
 - The fatty acids are either used directly for respiration or are converted to sugars. The sugar content therefore rises.
 - Sugar is translocated to the embryo
 - The dry mass at day 6, because of assimilation of sugars to structural materials and growth occurs.
 - Dry mass then fall because the lipids are exhausted and sugar decrease due to respiration



Graph 2