

**MAY 2009 SESSION  
BIOLOGY  
MARKING SCHEME IIA**

- 1.
- a The researchers studied both biotic and abiotic factors. 1 mark
- b temperature; p.H; water level variations; amount of dissolved oxygen; amount of dissolved minerals; type of substratum; clarity of water; depth of water. (Any TWO)
- (if students mention acidity award 0.5 mark)
- 2 marks
- DO NOT ACCEPT sunlight/ light intensity/humidity/wind/water/currents of water
- c Wet Season: salinity decreases due to rainfall/less evaporation 1 mark
- Dry season: salinity increases due to evaporation of water/ less (no) rainfall 1 mark
- d As salinity increases, organisms in the pool would be living in a more concentrated environment. As a result they tend to lose water. 2 marks
- e Collect using a net/hand grab  
(if beakers, cups, buckets, jars are mentioned award 1 mark)
- 2 marks
- f Algae are producers. They trap light energy, build carbohydrates/food by photosynthesis introducing them in the ecosystem.  
(DO NOT ACCEPT algae provide oxygen)
- 2 marks
- g
- i long segmented body/digestive tract has mouth and anus 1 mark
- ii thin moist/wet skin without scales/adults terrestrial but young are aquatic/adult with lungs young with gills or equivalent 1 mark

**(Total: 13 marks)**

2a. Correct drawing of bar graphs: including title (1), labelling of axis(1), correct scale (1) correct plotting (3). 6 marks

Deduct 1 mark if a histogram is presented

DO NOT AWARD any mark if graph paper is not used.

AWARD ONLY 3 marks if male and female bar graphs are presented separately.

DO NOT AWARD marks if graphs are superimposed.

b total number of deaths = 116(males) + 15 (females) = 131  
% male cases =  $(116/131) \times 100 = 88.55\%$  (Accept 88.5%) 1 mark

% female cases =  $(15/131) \times 100 = 11.45\%$  (Accept 11.5%) 1 mark

c From the data given it is evident that more males are dying of lung cancer than females. 1 mark

Males smoke more cigarettes than females /males are exposed to passive smoking more than females/males are more exposed to air pollutants causing lung cancer

Any TWO 2 marks

If students give TWO reasons justifying the conclusions from the graph award 2 marks

d Emphysema, bronchitis, tuberculosis, pneumonia (Any ONE)

(DO NOT accept Asthma) 1 mark

**(Total: 12 marks)**

3

ai

**Apparatus:** seedlings with straight plumules; clinostat; cork; beaker; cotton wool 1 mark

**Method:** For the control pin a few of the seedlings with the plumule/tip of shoot horizontal on a piece of cork. Place the cork in a beaker and leave the beaker in a fixed position for about 2 days. Put moist cotton wool in beaker.

3 marks

Pin the same number of seedlings again with the plumule in a horizontal position to the cork of the clinostat. Place some moist cotton wool in beaker. Switch the clinostat.

Place both sets of seedlings in the dark and leave the clinostat running for several days.

(Accept diagrams showing the experiment set up) 2 marks

**Results:** The plumules of the seedlings in the clinostat will continue growing horizontally. The plumules of the seedlings in the beaker will grow upwards away from gravity.

1 mark for each point – 2 marks

**Precaution:** Seedlings left in the dark in order to vary one factor only 1 mark

b

ii Seedling with large radicle chosen for experiment and plumule cut off. 1 mark

iii Radicle grows downwards towards gravity therefore radicles are positively geotropic while shoots are negatively geotropic. 2 marks

c

i Plants are autotrophic and need light to produce food. Plants growing in the dark will grow rapidly becoming long and spindly in search of light. The internodes i.e the distance between one node and another are larger than in a shoot growing in the light. 3 marks

ii The tip of the shoot produces a chemical called auxin – this passes down a shoot to the zone of elongation where growth occurs. If the tip of the shoot is cut then no auxin is present to stimulate upward growth. When no auxin is present side branches will develop. 3 marks

iii Stems of the Honeysuckle respond to touch. The side of the stem which is touching the firmer stem grows more slowly than the other side. This will allow the stem of the Honeysuckle to bend and wind itself around firmer stems. 3 marks

iv Auxin produced in the tip passes down the shoot to the zone of elongation where cell growth occurs. When the shoot is lit from one side more auxins gather on the dark side than the light side, so the dark side grows faster. This will make the shoot bend towards the light. Enables plants maximum light absorption.

4 marks

**(Total: 25 marks)**

4a.

i Osmoregulation: the control of water content and concentration of salts in the body of an animal or protist. 2 marks

Award 1 mark if the concentration of salts is not mentioned

ii Excretion: the removal of waste products that arise from metabolic activity. 2 marks

If students mention waste products such as carbon dioxide, urea or sweat as examples award 2 marks.

Award 1 mark if only waste products are mentioned.

b Blood enters the glomerulus from a vessel wider than that leaving the structure. This increases the blood pressure at the glomerulus and solutes in the plasma of the blood filtered through pores in the capillary walls and collect in the Bowman's capsule. 2 marks

The glomerular filtrate contains water, glucose, salts, urea, amino acids. All these are small molecules that are able to pass through the capillary pores. 2 marks

Plasma proteins and blood cells are too large to pass through the capillary wall and so remain in the blood. 2 marks

c

i Urine is made up of water, urea and salts. 3 marks

DO NOT ACCEPT uric acid if mentioned on its own.

ii Urine drains down the ureter into the urinary bladder. 2 marks

It is stored in the bladder until it is expelled via the urethra by voluntary action of the sphincter muscle. 2 marks

(Award 2 marks if students give a simple flowchart of the pathway)

iii The urine output decreases and the urine would be more concentrated, 2 marks  
Accept it becomes darker.

When the student is exercising the student loses water from the body through sweat.

2 marks

d

In distilled water more water enters the *Paramecium* due to a greater difference in concentration ; water enters from a high concentration of water (outside *Paramecium*) to a lower concentration (inside the *Paramecium*)

4 marks

(Total: 25 marks)

5a

i Habitat preservation, conservation of species biodiversity/protection of species/creating awareness

2 marks

DO NOT ACCEPT to feed animals/for recreational purposes/breeding

ii reduction of excessive discharge of phosphates/nitrates in sea water which can in turn result in eutrophication and Biochemical Oxygen Demand (BOD); prevention of the spread of solids in raw sewage floating on the surface rich in pathogenic bacteria/viruses; prevention of the pollution of beaches with unpleasant odour and unsightly muck; production of methane/biogas that can be used to produce electricity.

4 marks

AWARD 1 mark if students mention that treated water is re-used for irrigation/ sludge used to produce fertiliser

iii Such fines reduce the number of oil spillage incidents and thus less damage to beaches, oceans and their ecosystems occurs. Oil spillage will then effect badly the tourism industry. If less oil spillages occur organisms such as molluscs, birds and fish are badly affected by oil slicks causing poisoning of fish, death of sea birds since feathers lose their stability and insulation.

4 marks

DO NOT ACCEPT fines to help in the use of oils/ blocks oxygen into water.

iv. Strip cropping allows farmers to plant strips of two or more crops in single fields in alternating bands. Strip cropping reduces wind and water erosion and increases productivity. It can be combined with contour ploughing to further decrease soil erosion. Prevention of crop diseases by parasites.

2 marks

ACCEPT different uptake of minerals

b

i The use of persistent pesticides to kill pests will persist in the environment and retain their potency/strength for many years. As a result pesticide residues can pass from soil to crops and then to the rest of the food chain. In this way bioaccumulation takes place such that the top carnivore accumulates a higher concentration of pesticide substances/residues. This exerts toxic effects on the body tissues. Pesticides can also leach to rivers/lakes/streams thus causing water pollution.

5 marks

ACCEPT the pesticides remains on surface of crops thus affecting other organisms/damages harmless organisms; pest becomes resistant to pesticide

ii **Reduction in soil fertility** – soil erosion may be rapid in the absence of trees because wind and direct rain remove the soil; the soil structure is no longer stabilised by tree root systems; **Flooding and landslips**, after deforestation water may accumulate rapidly in river valleys, often causing landslips from steep hillsides. **Changes in recycling of nutrients** - fewer trees means atmospheric Carbon dioxide concentration may rise as less carbon dioxide is removed for photosynthesis. Atmospheric oxygen is diminished as less is produced by photosynthesis. **Climatic changes** – reduced transpiration rates and drier atmosphere affect

the water cycle and reduce rainfall; rapid heat absorption by bare soil raises the temperature of the lower atmosphere in some areas, causing thermal gradients that result in more frequent and intense winds; **species extinction** – many species become extinct or in danger of extinction since many are dependent on forest conditions. 5 marks

iii Dumping sites have an impact on the surroundings – unsightly rubbish and impact of smells; dumping sites can attract pests such as flies and rats and these spread disease; damage to air pollution from possible burning of items; ground water and run off pollution; habitat destruction. 3 marks

Accept any reference to dumping in the sea/biodegradable rubbish

DO NOT ACCEPT animals use it as shelter/eat rubbish and die

**(Total: 25 marks)**

6

a They have large wings with feathers – flight feathers provide a large wing area for very little weight; a light skeleton – the bones are hollow and very light; a streamlined shape; powerful flight muscles 5 marks

b Fish have a streamlined shape to reduce water resistance( ACCEPT if students mention arrangement of scales to limit resistance); a broad tail and tailfin to push the fish through the water; a swim bladder to control vertical movement; additional fins to provide stability; spine is extremely flexible; lateral line a sensory organ that is sensitive to movements and vibrations in water. 5 marks

DO NOT ACCEPT any reference to gills

c Conifers have needle shaped leaves with a very thick cuticle that prevents water loss (since it is difficult to absorb water from cold soils); conifers do not rely on insects for pollination(since flying insects are uncommon in cold areas). 3 marks

DO NOT ACCEPT seeds in cones

d Pin mould has no green pigment chlorophyll they do not require light for photosynthesis. The mycelium of the Pin mould grows over food digesting and absorbing the nutrients. 3 marks

e Reptiles have dry skins and the outer layer of epidermis forms a pattern of scales. Their dry scaly skin resists water loss by evaporation thus reptiles are not restricted to damp habitats not even for breeding. Eggs enclosed in leathery shell; internal fertilisation

Lungs help reptiles to survive on land

3 marks

f Saprophytic bacteria feed on the dead bodies and waste of other organisms causing them to decay. The mutualistic bacteria form a partnership with a host organism to the benefit of both organisms – such as the mutualistic bacteria living in the guts of herbivores – the bacteria help herbivores to digest the cellulose that makes the bulk of their diet. Another example is that of the root nodule bacteria of leguminous plants. 3 marks

g Amphibians need a moist skin for gas exchange purpose – since gas exchange takes place across the skin as well since lungs are inefficient for gas exchange. The need to have a moist skin means that amphibians are limited to damp places otherwise they run the risk of drying out.

3 marks

(Total: 25 marks)

7.

a **VASODILATION** – the arterioles/blood vessels/capillaries dilate/widen/expand and more blood flows towards the skin surface

2 marks

such that more blood flows in capillaries and more heat is lost

1 mark

b **GAMETE FORMATION** in humans – Gamete formation takes place by means of meiosis ; the testes in males produce spermatozoa while the ovaries in females produce eggs.

3 marks

Gametes carrying genetic information from the mother and father join and fuse in the process of fertilisation forming the zygote.

2 marks

Award 1 mark if variation is mentioned/

Award 2 marks when students mention *forming a diploid zygote*

c **VASECTOMY** –the sperm ducts in the male reproductive organs are cut and tied in a surgical operation

2 marks

to prevent pregnancy in a relatively permanent manner/birth control.

1 mark

d **SEED DISPERSAL** – seeds are spread/dispersed away from the parent plant by various methods such as water/animal/wind.

2 marks

This limits competition for water/light/carbon dioxide and helps plant to establish itself within new environments.

2 marks

e **VEGETATIVE PROPAGATION** in plants – this is a form of asexual reproduction in plants that takes place naturally by the formation of runners and stem tubers/cuttings/tissue culture.

2 marks

By this method a large number of plants is produced in a relatively short time, and there is no need of external agents for pollination or dispersal or complex germination process; good plant qualities are retained; only one parent is required.

2 marks

f **NITROGEN FIXATION** - In nitrogen fixation atmospheric nitrogen is changed to nitrates in soil by nitrogen fixing bacteria.

2 marks

(Accept in nitrogen fixation nitrogen and hydrogen are combined to form ammonium and then nitrate.)

Nitrogen fixation increases nitrate content in soil; therefore soil is more fertile and crops grow bigger and healthier. Nitrates used for building proteins.

1 mark

g **FERMENTATION in a bakery** – flour, sugar, water and salt are mixed with yeast . In the fermentation process glucose is changed to alcohol , carbon dioxide and energy.

Glucose  $\xrightarrow{\text{Enzymes}}$  alcohol + carbon dioxide + energy

2 marks

The yeast ferments the sugar and the bubbles of carbon dioxide are trapped in the dough.

This makes the dough expand/rise.

1 mark

DO NOT ACCEPT yeast makes dough rise/ bread rises

**(Total: 25 marks)**