Adaptations of organisms, Selection, Biodiversity and Classification test – ms

Section A

1 Simpson's index;
species;
ecological niche;
edaphic factors; [4]

2 **(a)** Hydrophyte; [1]

(b) Air spaces aid flotation/facilitates gaseous diffusion through plant; [1]

(c) On the upper surface;
Any two from
- allow gases to diffuse in from the air;
- as gases are not very soluble in water
- prevent water entering the large airspaces (which would cause the leaf to sink); [3]

3 **(a)** Mammalia; [1]

(b) *erminea*; [1]

(c) A group of actually or potentially interbreeding natural populations; producing fertile offspring; [2]

OR

Any two from
- a species is a group of individuals normally capable of interbreeding
- to produce fertile offspring
- unable to breed with members of other groups and produce viable offspring [2]

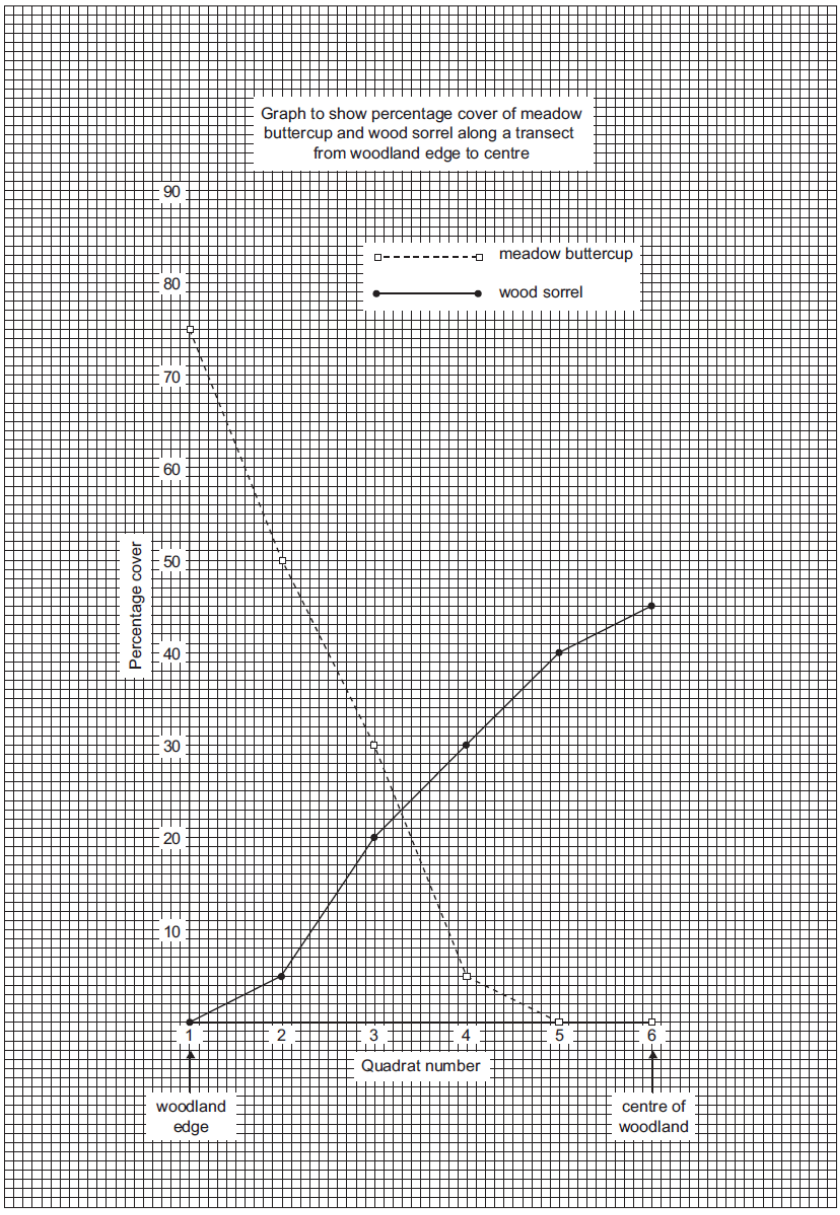
4 **(a)** **(i)** **Any two from**
- plants in the hedge provide food and shelter
- nesting sites
- offering more ecological niches/creates habitats
- they allow a means of dispersal and migration to other habitats/act as wildlife corridors
- hedges reduce soil erosion
- associated predator strips may be used as pest control
- other appropriate response [2]

(ii) Promote the use of polyculture/maintain set-aside areas/conserve existing woodland/promote the use of organic fertiliser as an alternative to chemical fertiliser/reduction in grazing density/maintain meadows by only allowing grazing in summer months/cutting grass for hay (species-rich meadows) rather than for silage/planting broad-leaf trees in areas less accessible to farm machinery/reduce use of broad spectrum pesticides/other appropriate example; [1]

(b) (i) Environmental gradient/zonation of vegetation; [1]

(ii) It may be difficult to identify individual plants due to their spreading nature/it takes better account of total biomass/plants may be of different size; [1]

(c) (i) Caption;
selection of graph, line graph/kite diagram/bar chart;
scaling of the graph (using the graph paper to maximal effect) and quadrat number as the independent variable along the *x*-axis;
axes labelled with annotations to show edge and centre of woodland;
points accurately plotted and joined with straight line/kites accurately constructed;
lines/kites identified with key/labels; [6]
Caption must include both species and area of shading



(ii) Wood sorrel is not very abundant at the woodland edge, but becomes more abundant as you move towards the centre of the woodland; meadow buttercup is abundant at the woodland edge, but decreases in abundance as you approach the centre of the woodland; [2]

(iii) Wood sorrel is adapted to live in low light conditions, while meadow buttercup is not/edaphic features in woodland suits wood sorrel, but not meadow buttercup/any other appropriate answer; [1]

5 **(a)** 9.84 – 9.42 = 0.42;
0.42/9.42 × 100 = 4.46%; [2]

(b) The extent to which an organism shows adaptations to its environment/ indication of an organism's competitiveness/selective advantage; [1]

(c) **Any four from**
- beak depth is variable in population
- finches with larger beaks can exploit more food sources/can compete more successfully for food (converse for smaller beaks)
- and so are more likely to survive than those with smaller beaks (allow converse)
- higher chance of reproduction/more likely to mate with other large-beaked finches
- genes for larger beaks passed on to next generation
- higher percentage of birds will have larger beaks in next generation [4]

(d) Directional selection; [1]

(e) **Any two from**
- external features (morphological)
- internal features (anatomical)
- behavioural features
- DNA analysis/DNA hybridisation
- protein structure
- RNA/ribosomal analysis
- biochemical analysis [2]

(f) **(i)** *Geospiza fuliginosa*; [1]

(ii) *Vidua macroura*; [1]

Section B

Explain how organisms are classified into taxonomic groups; [3]
And describe the distinguishing characteristics of each of the 5 kingdoms [10]
Quality of written communication is awarded a maximum of 2 marks in this section [2]

How organisms are classified into taxonomic groups:
- Study of arranging organisms into groups is Taxonomy and the practice is classification
- Organisms are classified according to similarities and differences/how related they are/this is known as systematics
- Measurable factors include: Morphology and anatomy, Physiology, Cell structure, Biochemistry and molecular arrangement, Genetic, Immunology, Behaviour, Life cycles, Ecology
- Carl Linnaeus devised the binomial naming system of genus and species names (generic and specific names)/this is known as nomenclature
- Phylogenetics classifies organisms according to ancestral or evolutionary relationships
- Members of a species resemble each other, are of common ancestry, and normally interbreed to produce fertile offspring
- Sub-species can exist if the organisms fit the dpecies definition but have formed two distinct populations
- Species can be placed in a hierarchical classification system of levels of taxa of increasing size and decreasing similarity (Species, Genus, Family, Order, Class, Phylum, Kingdom)
- Organisms are placed into one of 5 kingdoms (Animalia, Plantae, Fungi, Protoctista, and Prokaryotae)
- Owing to recent developments in molecular analysis, Prokaryotes are now classified as two domains, the Archaea and the Bacteria; all other organisms i.e. the Eukaryotes are classified within the domain Eukarya

[3]

■**The distinguishing features of the 5 kingdoms: Animalia** – mulitcellular eukaryotes
- Heterotrophic (consume organic food)
- capable of locomotion
- No cell wall
- Has a digestive system/extracellular digestion in a gut cavity (i.e. ingest food to digest it rather than fungi which perform external digestion)
- store lipids as fats and carbohydrates as glycogen (e.g. flatworms, insects, chordates (animals with backbones))

■**Plantae** – multicellular eukaryotes
- photosynthetic autotrophs (create complex organic materials from simple inorganic raw materials)
- containing a cellulose cell wall and contain chlorophyll
- they store carbohydrates as starch, and lipids as oils e.g. mosses, ferns, conifers, flowering plants

■**Fungi** – unicellular e.g. yeast or multicellulare.g. bracket fungus eukaryotes
- chitin (non-cellulose) cell walls
- multicellular fungi are filamentous to form a mycelium network of hyphae
- Hyphal strands are often multinucleate and not divided clearly into separate cells
- use lysotrophic/saprophytic nutrition (e.g. toadstools, yeast)
- Secrete hydrolytic enzymes by exocytosis and absorb the products of digestions
- Store glucose as glycogen

■**Protoctista** – eukaryotic unicellular or multicellular organisms
- Some are filamentous (with cells joined end on end) e.g. some green seaweeds
- If multicellular they show limited differentiation of cells e.g. brown seaweed
- Very diverse group often for organisms that don't fit in the other kingdoms
- Some have cell walls (cellulose and non-cellulose), some also contain chlorophyll, some are motile
- show a range of methods of nutrition e.g.. heterotrophic Phylum Protozoa e.g. *Amoeba* ingest and digest food (not classed as animal as unicellular)
- Can be autotrophic/photosynthetic e.g. Phylum Chlorophyta (green algae)

■**Prokaryotae** – single-celled or clusters/strings of cells stuck together
- prokaryotic microorganisms i.e no nucleus, no membrane bound organelles
- DNA lies free in the cytoplasm
- have a peptidoglycan cell wall
- range of nutrition strategies: lysotrophic, parasitic, photosynthetic
- Reproduce/cell division by simple fission (splitting into two without undergoing mitosis)
- Include bacteria and blue-green algae

(need 1 from each in order to gain more than 5) [10]