BIODIVERSITY AND TAXONOMY

QUESTIONSHEET 1

Do not write in margin

The table below refers to four of the five taxonomic Kingdoms.

Kingdom	Features	Examples
Fungi		
Protoctista		
Plantae		
Animalia		

(a) Select features from the following list and write them in the appropriate features box on the table. Some features may be used more than once, or may not be relevant. You should write <u>three</u> features in each box.

has eukaryotic cells
has prokaryotic cells
has cellulosic cell walls
has chitinous cell walls
autotrophic
heterotrophic
consists of hyphae
often unicellular or groups of similar cells
always multicellular
have nervous coordination [4]

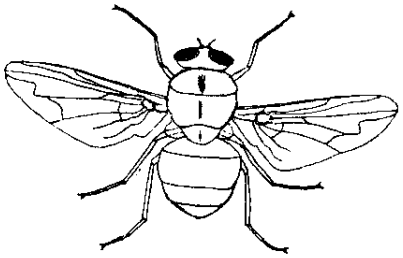
(b) Select organisms from the following list and complete the table by placing them in the appropriate examples box. Give <u>two</u> examples in each box.

Green algae
Penicillium
Ferns
Mushrooms
Bacteria
Amoeba
Malarial parasite
Dicotyledons
Mucor
Frog
Moss
Viruses
Tape worm
Spider [4]

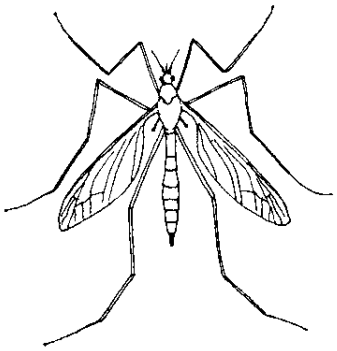
TOTAL / 8

The drawings illustrate the structure of six insects.

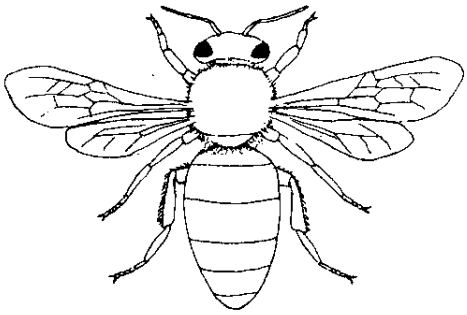
A



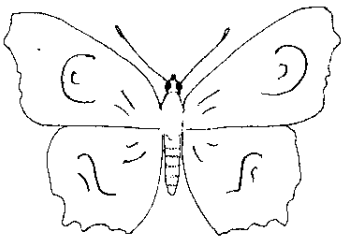
B



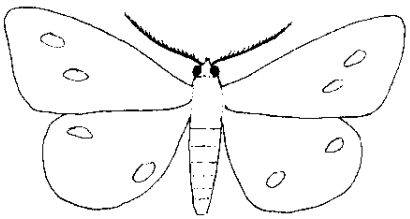
C



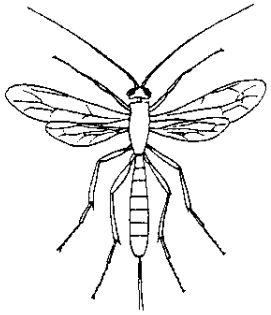
D



E



F



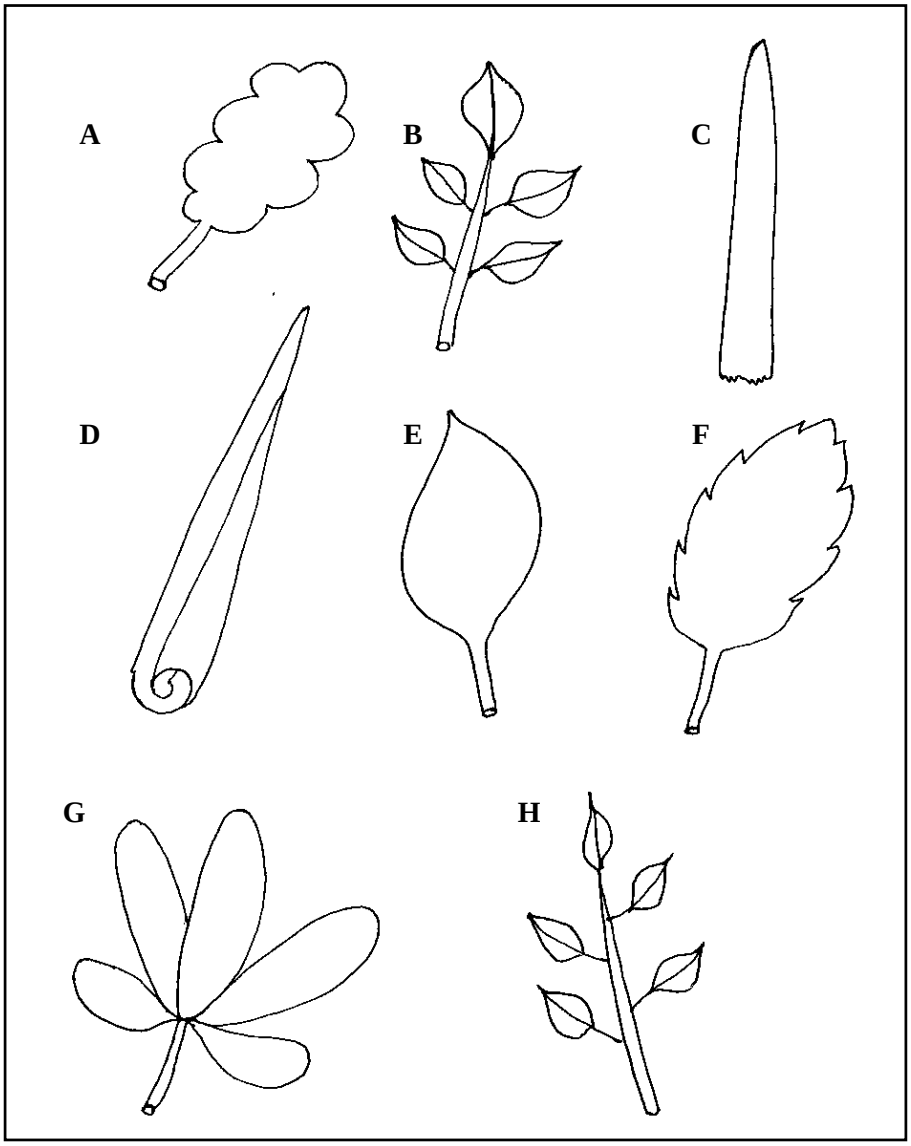
Make a simple dichotomous key which could be used to identify the six insects. Use only the following features in your key:
number of abdominal segments, wing number, wing size and shape, body shape, antennae, leg length.
It may not be necessary to use all these features in your key.

TOTAL / 7

QUESTIONSHEET 3

Leaves consist of a leaf base which joins the stem near an axillary bud, a petiole and a leaf blade or lamina. Leaves may be simple or compound, when they are divided into leaflets.

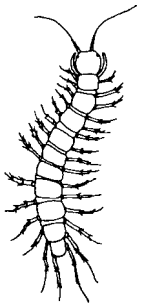
Devise a dichotomous key which would distinguish the following leaves. Only use features that are visible in the drawings in your key.



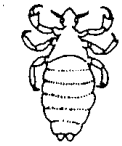
TOTAL / 9

QUESTIONSHEET 4

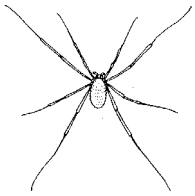
The diagrams below are of seven different Arthropods.



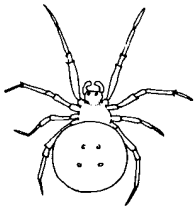
centipede



head louse

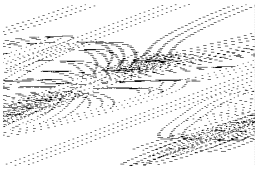


harvestman

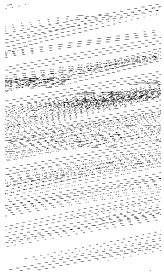


spider

bee



wax moth



crane Fly

(a) (i) State a typical feature of Arthropods which is visible in all the organisms above.

..... [1]

(ii) The phylum Arthropoda contains several classes, four of which are shown in the table below. Complete the table by naming the organisms above in the correct columns.

Insecta	Crustacea	Arachnida	Chilopoda (Myriapoda)

[3]

(a) Devise a simple dichotomous key which would distinguish between the seven organisms. Only use features that are visible in the drawings.

[8]

TOTAL / 12

QUESTIONSHEET 5

(a) (i) The following taxons are commonly used in the classification of organisms:
Species, Class, Order, Kingdom, Genus, Phylum and Family. Place the taxons into a correct sequence.

..... [1]

(ii) State two differences between the Kingdom Fungi and the Kingdom Plantae.

1: .....

2: ..... [2]

(iii) State two differences between the Kingdom Protoctista and the Kingdom Prokaryotae.

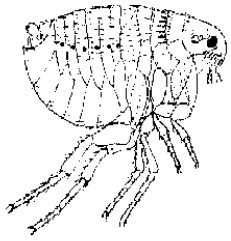
1: .....

2: ..... [2]

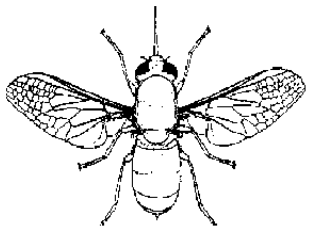
(b) The following organisms all belong to the Class Insecta but belong to different Orders of that group.

A

B



C



(i) Suggest three features shown by insects A, B and C that are characteristic of the Class Insecta.

1: .....

2: .....

3: ..... [3]

(ii) Suggest two features, which differ in each insect, which could be characteristic of different Orders.

1: .....

2: ..... [2]

(c) Organism B is a common ectoparasite of humans and other mammals, and can act as a disease vector.

(i) What is insect B?

..... [1]

(ii) Suggest an adaptation that it possesses which enables it to transfer easily from host to host.

..... [1]

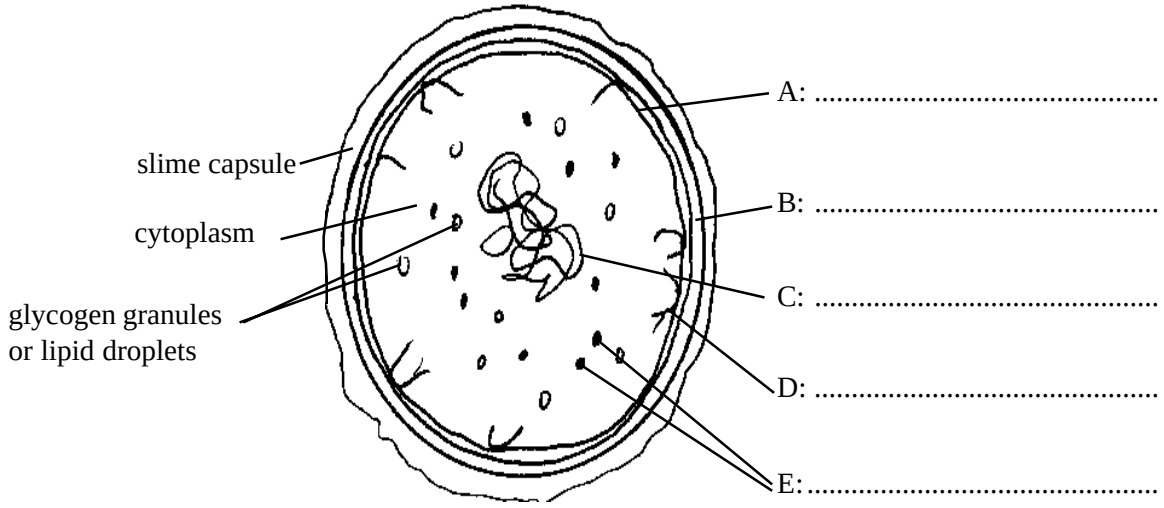
(iii) Name a disease which it transfers to humans.

..... [1]

TOTAL / 13

QUESTIONSHEET 6

The kingdom Prokaryotae contains single celled organisms like non-photosynthetic bacteria, for example, Escherischia coli, and photosynthetic blue green bacteria, for example, Nostoc. The drawing below shows the ultrastructure of E. coli.



(a) (i) Label structures A to E on the drawing.

[5]

(ii) State a function of part D.

..... [1]

(iii) What term is given to this bacterial shape?

..... [1]

(b) (i) List three ways in which prokaryotic cells differ from eukaryotic cells.

1: .....

2: .....

3: ..... [3]

(ii) Nostoc used to be classed as a blue green alga. Why was this illogical?

..... [1]

(iii) Suggest where the photosynthetic pigments are found in a blue green alga such as Nostoc.

..... [1]

TOTAL / 12

QUESTIONSHEET 7

Do not write in margin

The table below refers to viruses, bacteria, algae and protozoa. If the statement is correct for the organism place a tick (✓) in the appropriate box and if a statement is incorrect, place a cross (✗) in the appropriate box.

Feature	Viruses	Bacteria	Algae	Protozoa
Cannot reproduce independently				
Are heterotrophic				
Can cause diseases				
Contain DNA or RNA but not both				
Can photosynthesise				

TOTAL / 5

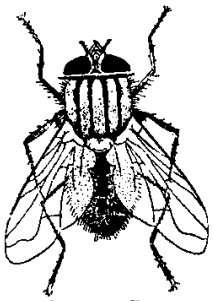
QUESTIONSHEET 8

Organisms and biological structures may be radially or bilaterally symmetrical. In radial symmetry an organism can be cut in any vertical plane to give two halves which are mirror images of each other. In bilateral symmetry there is only one vertical plane through which the organism could be cut to obtain two mirror image halves. The diagrams below show various organisms or organs which have different symmetries.

A

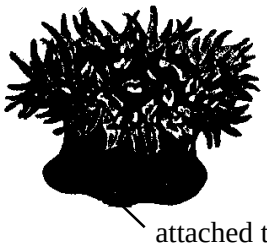
dog rose flower

B



house fly

C



attached to rock

sea anemone

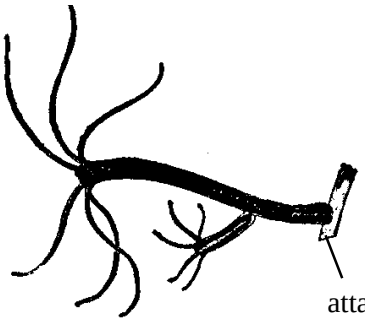
E

dead nettle flower

F

frog

D



attached to stem

Hydra

(a) (i) For each of the organisms or organs above state whether it is radially or bilaterally symmetrical.

A: ..... B: ..... C: .....

D: ..... E: ..... F: ..... [6]

(ii) Suggest two advantages that their symmetry gives to animals C and D.

1: .....

2: ..... [2]

(iii) What advantage does the symmetry of the dog rose flower give to it?

..... [1]

(*Continued...*).

Do not write in margin

(b) (i) State one feature shown by the housefly that is common to arthropods.

..... [1]

(ii) State two features shown by the house fly that are common to insects.

1: .....

2: ..... [2]

(c) (i) Though the frog, as an Amphibian, lives primarily on land, it still shows several aquatic features. Suggest two such features.

.....

..... [2]

(ii) The dead nettle flower is insect pollinated. Suggest two features it could possess to aid insect pollination.

1: .....

2: ..... [2]

TOTAL / 16

QUESTIONSHEET 9

Biologists have traditionally recognised three different subspecies of chimpanzee based on physical characteristics, genetics and geography. *Pan troglodytes troglodytes* lives in Central Africa, *Pan troglodytes schweinfurthei* lives in East Africa and *Pan troglodytes verus* lives in West Africa.

Recently, a small new population of chimpanzees living in southeastern Nigeria has come to the attention of biologists. It is suspected that this small population make up a new subspecies. Genetic analysis of animals for taxonomic purposes is usually carried out on mitochondrial DNA, using genetic fingerprinting and DNA hybridisation studies.

In DNA hybridisation, purified DNA from two subspecies are heated to separate the strands, these are mixed together and allowed to cool. As they cool the strands rejoin to form double helices, however, some helices will be hybrid, consisting of a strand from each subspecies.
The strands in hybrid DNA separate at a lower temperature than those in single subspecies DNA. The more divergent the two subspecies the greater the difference between the separation temperatures of the hybrid and single species DNA.

The table below shows the difference between the separation temperatures of hybrid DNA and single subspecies DNA for the various groups of chimpanzees.

Sources of hybrid DNA	Difference in separation temperature/^{o}C
Pan troglodytes troglodytes/Nigerian group	1.0
Pan troglodytes schweinfurthei/Nigerian group	1.1
Pan troglodytes verus/Nigerian group	0.85
Pan troglodytes troglodytes/Pan troglodytes schweinfurthei	0.6
Pan troglodytes troglodytes/Pan troglodytes verus	0.7
Pan troglodytes schweinfurthei/Pan troglodytes verus	0.85

(a) (i) Suggest why strands in hybrid DNA separate at lower temperatures than single subspecies DNA.

.....

.....

..... [2]

(ii) Suggest why separation temperatures show greater differences between less closely related subspecies.

.....

.....

..... [2]

(Continued....)

Do not write in margin

(iii) Comment on the possible significance of the differences shown in separation temperatures shown in the table.

.....

.....

..... [3]

(b)(i) What features of genetic fingerprints are used in assessing affinities between organisms?

.....

.....

..... [2]

(ii) Using information from the temperature separation data above, suggest a pair of subspecies or possible subspecies which would probably:

1. show the greatest similarity in their DNA fingerprints.

..... [1]

2. show the greatest diversity in their DNA fingerprints.

..... [1]

TOTAL / 11

QUESTIONSHEET 10

The full classification of the tiger is as follows:

Kingdom: **Animalia**
Phylum: **Chordata**
Class: **Mammalia**
Order: **Carnivora**
Family: **Felidae**
Genus: **Panthera**
Species: **P. tigris**

(a) (i) Suggest two features of tigers that place them into the animal kingdom.

1: .....

2: ..... [2]

(ii) Suggest two features of tigers that place them into the phylum Chordata.

1: .....

2: ..... [2]

(iii) Suggest two features of tigers that place them in the class Mammalia.

1: .....

2: ..... [2]

(iv) Suggest one feature of a tiger that places it in the order Carnivora.

..... [1]

(b) (i) The family Felidae is the cat family. Suggest another family of animals which is classified in the Carnivora.

..... [1]

(ii) The genus Panthera includes the tigers and panthers. Name another genus of the family Felidae.

..... [1]

(c) The classification of a group of organisms is supposed to represent their phylogeny. What does this mean?

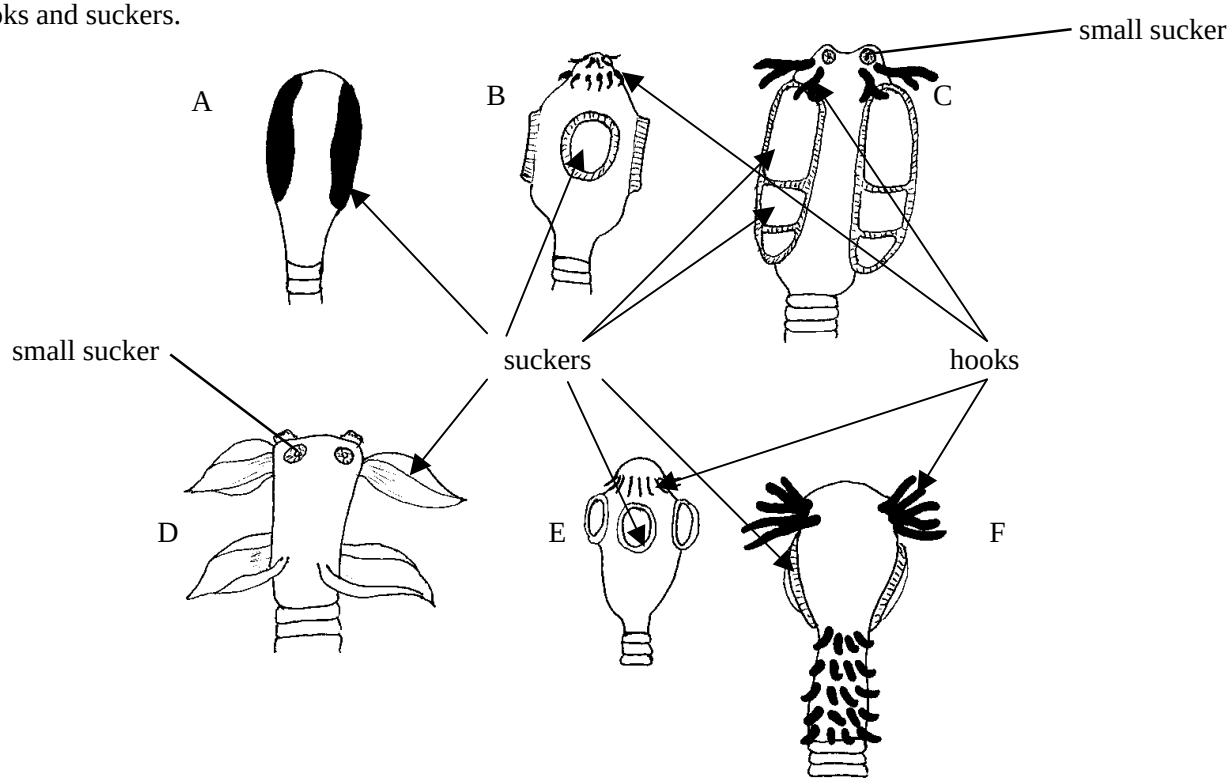
.....

..... [2]

TOTAL / 11

QUESTIONSHEET 11

The drawings below illustrate the heads (scolices) of six tapeworms which show differing arrangements of hooks and suckers.



(a) What are the functions of the suckers and hooks?

.....

..... [2]

(b) Devise a dichotomous key which would distinguish the six species of tapeworms shown above. Only use features which you can see in the drawings.

[7]

TOTAL / 9

QUESTIONSHEET 12

Do not write in margin

(a) List two features shown by a bacterium such as Escherischia coli and a cyanobacterium, such as Nostoc, which place them both in the kingdom Prokaryotae.

1: .....

2: ..... [2]

(b) List two features shown by Mucor (pin mould) and a mushroom which place them both in the kingdom Fungi.

1: .....

2: ..... [2]

(c) List two features shown by a moss and a pine tree which place them both in the kingdom Plantae.

1. .....

2. ..... [2]

(d) Suggest two features which distinguish monocotyledonous plants from dicotyledonous plants.

1. .....

2. ..... [2]

(e) Why are fishes, frogs and elephants classed together in the phylum Chordata?

.....

.....

..... [2]

(f) Why are dolphins, bats, weasels, seals and humans placed together in the class Mammalia?

.....

.....

..... [2]

TOTAL / 12