SL Paper 2

a. List **two** factors that could cause an increase in the size of an animal population.   [2]

1.   ....
2.   ....

b. Outline how overpopulation of a species in a given environment may lead to evolution.   [4]

Markscheme

a. a. natality / increased birth rate;

b. immigration;

c. extra food/water / breeding sites;

d. expanding habitat;

e. lack of predators/disease/parasites / reduced death rate;

b. a. more are born than can survive;

b. there is variety/variability in the offspring;

c. competition for resources / struggle for survival / selection pressure;

d. only the most able/adapted survive / survival of the fittest;

e. the survivors reproduce and pass on genes;

f. genes of less able/adapted are eliminated / change in the gene pool;

g. natural selection occurs;

Examiners report

a. Most of the candidates obtained both marks. Expanding habitat was hardly mentioned.

b. Many candidates failed to receive points because they often wrongly implied the following: "..competition between species", "survival of the fittest species".

The graph shows a sigmoid population growth curve.
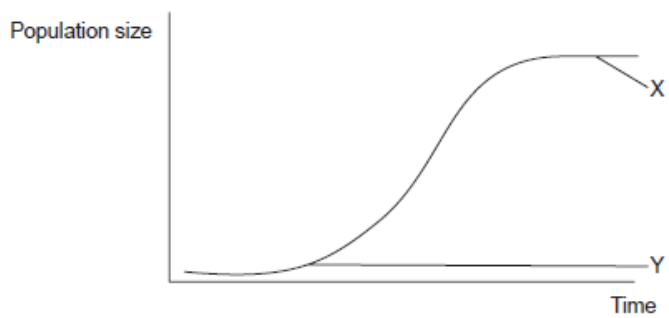
The table summarizes the genome size of several organisms.

Organism type	Organism	Genome size / base pairs
Bacterium	Helicobacter pylori	1 667 867
Fruit fly	Drosophila melanogaster	130 000 000
Rice	Oryza sativa	420 000 000
Human	Homo sapiens	3 200 000 000

The figure shows a pedigree chart for the blood groups of three generations.
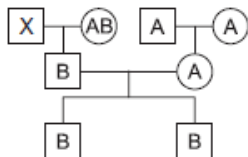
a. Identify the phases labelled X and Y.   [1]

   X:

   Y:

b. Outline how fossil records can provide evidence for evolution.   [2]

c(i) Distinguish between the terms genotype and phenotype.   [1]

c(ii) Outline a structural difference between the chromosomes of *Helicobacter pylori* and *Homo sapiens*.   [1]

c(iii) Deduce the percentage of adenine in *Oryza sativa* if the proportion of guanine in that organism is 30 %.   [1]

d(i) Deduce the possible phenotypes of individual X.   [1]

d(ii) Describe ABO blood groups as an example of codominance.   [1]

Markscheme

a. X: plateau phase

   Y: exponential growth / log phase

   (both needed)

b. a. the sequence in which fossils appear matches the expected sequence of evolution;

   b. comparisons with fossils and living organisms (morphology) shows change in characteristics from an ancestral form / *OWTTE*;

Vestigial organs and homologous structures are acceptable answers.

c. fossils of extinct species show that (evolutionary) change has occurred;

d. fossils can be dated with radioisotopes / geological depth/strata indicates (relative) age/date of organism;

e. can yield DNA for molecular clock analysis;

f. example of any of the above can earn one mark (*eg*: reptiles follow amphibians);

c(i) genotype is the genetic make-up/set of alleles (of an organism) while phenotype is the characteristics (expressed/shown in an organism)

c(ii) chromosome from bacteria has no protein associated/naked DNA / bacteria is circular, H. sapiens is linear / (chromosomes of) H. sapiens are much bigger/have <u>many</u> more base pairs than bacteria

N.B.: Answer must refer to "chromosomes" not genomes of the two organisms.

c(iii) 20 %

d(i) A, B, AB and O

All four phenotypes must be shown to award the mark.

d(ii) allele I^A and the allele I^B are (co)dominant as they are both expressed in the heterozygote/AB type blood / *OWTTE*

Examiners report

a. Well prepared candidates could state 'plateau phase and exponential growth or log phase'. A surprising number reversed the answers, probably due to carelessness.

b. There were many convoluted answers without substance. Most gained the marks by stating that fossils can be compared with living organisms with an example.

c(i) Most managed to give a reasonable explanation of genotype and phenotype.

c(ii) Many missed the word 'chromosomes' in the stem. The knowledge of naked v proteins or circular v linear was expected from the core. Using the data it was expected that the candidates could state that the human chromosomes were <u>much</u> bigger (divide by 46) or that there were many more base pairs as there was about 3×10^3 difference.

c(iii) Considering that everyone on the IB diploma course studies maths at some level, a surprising number left (iii) blank or gave answers that did not make sense.

d(i) A pleasing number were able to state that all 4 blood groups were possible in (i), and most had a reasonable attempt at explaining codominance in part (ii).

d(ii) A pleasing number were able to state that all 4 blood groups were possible in (i), and most had a reasonable attempt at explaining codominance in part (ii).