SL Paper 1

Which of the following are used as evidence for evolution?

I. Homologous structures
II. Selective breeding of domesticated animals
III. Overproduction of offspring

A. I and II only
B. I and III only
C. II and III only
D. I, II and III

Which phylum includes plants with rhizoids, spores that are produced in a capsule and a height below 0.5 metres?

A. Angiospermophyta

B. Bryophyta

C. Coniferophyta

D. Filicinophyta

A poodle and a chihuahua are both dogs and classified as *Canis familiaris*. What conclusion can be made?

A. They belong to the same genus but not the same species.
B. They are the same species but not the same genus.
C. They are different species but can interbreed.
D. They belong to the same genus and are the same species

Two different trees have been classified as *Pinus pinea* and *Pinus nigra*. Which of the following statements is correct?

A. Both trees belong to the same class but a different genus.
B. Both trees belong to the same family and same genus.
C. The species name of both trees is *Pinus*.
D. The family names are *pinea* and *nigra*.

What is a direct consequence of the overproduction of offspring?

A. Individuals become more adapted to the environment.

B. They will be subject to intraspecific competition.

C. They will diverge to produce different species.

D. They will suffer mutations.

Which of the following represent homologous features?

A. Wings in birds and insects
B. The appendix in humans and horses
C. Fins in fish and wings in birds
D. The striped coat of the zebra and the tiger

What type of process causes antibiotic resistance to develop in bacteria?

A. Competition with viruses
B. Overproduction of offspring
C. Evolution due to environmental change
D. Response by bacteria to an epidemic

Charles Darwin used domesticated animals to provide evidence for evolution by natural selection. What is this evidence?

A. Differences between breeds show that selection can cause species to change.

B. The ancestors of domesticated animals can be found in the fossil record.

C. Some domesticated animals die because the environment cannot support them all.

D. Variation in domesticated animals is due to sexual reproduction.

What is evolution?

A A measure of the relative survival and reproductive success of an individual
B. A cumulative change in the genetically controlled characteristics of a population
C. A physical change during an organism's life that is inherited by its offspring
D. A random change in the proportions of alleles from generation to generation

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Which is a coniferophyte?

A. *Adansonia digitata*, an African baobab tree with white flowers
B. *Cyathea australis*, an Australian tree fern producing spores
C. *Hypnum plumaeforme*, a green plant with no vascular tissue grown in Japanese gardens
D. *Pinus strobus*, a North American tree with ovules on scales not enclosed in an ovary

Which evidence for evolution do the common features in the bone structure of vertebrate limbs provide?

A. Adaptive radiation
B. Divergent radiation
C. Convergent evolution
D. Discontinuous variation

The Atlantic cod (*Gadus callarias*) is a fish which lays about 5 000 000 eggs in its lifetime. On average, only two of these eggs survive to become adult cod. How does this promote evolution?

A. All offspring are genetically identical, so become better adapted.
B. Laying many eggs provides food for other species to survive and become better adapted.
C. Some young cod change to become adapted to the environment and survive and pass on their genes.
D. Offspring with favourable variations survive and pass on their genes.

Which is a characteristic of both bryophyta and filicinophyta?

A. Vascular tissue

B. Membranous leaves

C. Release of spores

D. Evergreen spines

Which process tends to reduce variety within a population?

A. Natural selection
B. Random fertilization
C. Independent assortment
D. Crossing over

Based on binomial nomenclature, which two species are most closely related?

I. Common barberry (*Berberis vulgaris*)
II. Canadian bunchberry (*Cornus canadensis*)
III. Smooth blackberry (*Rubus canadensis*)
IV. Canadian barberry (*Berberis canadensis*)

A. I and IV
B. II and III
C. II and IV

D. III and IV

What is the biological definition of the term evolution?

A. The changes shown by fossils over millions of years

B. The transmission of favourable variations to offspring

C. The cumulative change in the heritable characteristics of a population

D. The promotion of variation in a species by sexual reproduction

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Which example provides evidence of evolution?

A. White wings of a peppered moth turn black in industrial areas.

B. Antibiotic resistant bacteria replace non-resistant bacteria over time.

C. Some Galapagos finches' beaks become smaller during dry years.

D. Polar bears are found in warmer latitudes following global warming.

What is the major contributor to the increase in antibiotic resistance in bacteria?

A. Sexual reproduction
B. Mutation
C. Natural selection
D. New antibiotics

Darwin described evolution as "descent with modification". What would make evolution less probable?

A. Stable environment

B. Migration

C. Variation in offspring

D. Random mutation

The long-term exposure of bacteria to antibiotics has led to the spread of resistant strains (for example, of *Clostridium difficile*). What is this an example of?

A. Convergent evolution
B. Immunity
C. Natural selection
D. Dominance

A plant has cambium in its vascular tissue and pollen is produced in male cones. The plant disperses seeds but does not produce fruit. In which phylum does this plant belong?

A. Coniferophyta

B. Angiospermophyta

C. Filicinophyta

D. Bryophyta

A collection of four animal specimens is observed and a dichotomous key is applied. Which specimen is an arthropod?

1. Non-segmented body .....go to 2
   Segmented body .....go to 3
2. Body is not symmetrical.....specimen A
   Body is symmetrical . . . . . specimen B
3. Jointed appendages present.....specimen C
   Jointed appendages absent .....specimen D

A. Specimen A
B. Specimen B
C. Specimen C
D. Specimen D

A bacterial population with no resistance to an antibiotic may develop into a bacterial population with some resistance to an antibiotic. Which event could lead to this?

A. Antibiotic resistance was inherited from an ancestral population.

B. An antibiotic resistance plasmid is received from a bacterium in another population.

C. The enzyme needed for antibiotic resistance is received from a bacterium in another population.

D. The bacterial population mutated in response to antibiotics in the environment.

Which process promotes variation in a population?

A. Mutation
B. Mitosis
C. Ageing in a population
D. Asexual reproduction

What characteristics describe homologous structures?

A. They have the same ancestral origin but may have different functions.
B. They have the same ancestral origin and always have the same function.
C. They have different ancestral origins and may have different functions.
D. They have different ancestral origins but always have the same function.

To which phylum do organisms with exoskeleton, jointed appendages and segmented bodies belong?

A. Mollusca
B. Porifera
C. Arthropoda
D. Annelida

In which domain are bryophyta found?

A. Plantae
B. Archaea
C. Eubacteria
D. Eukaryote

What causes variation within a population?

A. Fertilization and change in the environment

B. Fertilization and mutation

C. Mutation and evolution

D. Evolution and adaptive radiation

Which organisms have flowers?

A. Bryophyta
B. Porifera
C. Angiospermophyta
D. Cnidaria

The table shows the number of differences between humans and other selected organisms for the protein cytochrome c oxidase. This protein, consisting of 104 amino acids, is located in the mitochondria and functions as an enzyme during cell respiration.

Organism pairs	Number of amino acid differences
Human – chimpanzee	0
Human – fruit fly	29
Human – horse	12
Human – pigeon	12
Human – rattlesnake	14
Human – rhesus monkey	1
Human – screwworm fly	27
Human – snapping turtle	15
Human – tuna fish	21

If the data were used to draw a cladogram, which chordates would be furthest apart from humans?

A. Chimpanzee because it has zero differences

B. Fruit fly because it has the most differences

C. Tuna fish because it is the chordate with the most differences

D. Horse because it is in the same class

What causes heritable variation in a species?

I. Muscle development through exercise
II. Increased rainfall in the ecosystem
III. Changes in the genome of the species

A. I and III only
B. II only
C. III only
D. I, II and III

Pseudolarix amabilis produces seeds but not flowers. *Physcomitrella patens* has leaves but not roots. To which groups do they belong?

	Pseudolarix amabilis	*Physcomitrella patens*
A.	coniferophyta	filicinophyta
B.	filicinophyta	angiospermophyta
C.	coniferophyta	bryophyta
D.	angiospermophyta	coniferophyta

Ants, bees and wasps are classified in the same order. What can be deduced about these animals?

A. They are classified in the same class.

B. They are classified in different phyla.

C. They are classified in the same family.

D. They are classified in different kingdoms.

The image shows a drawing of an organism

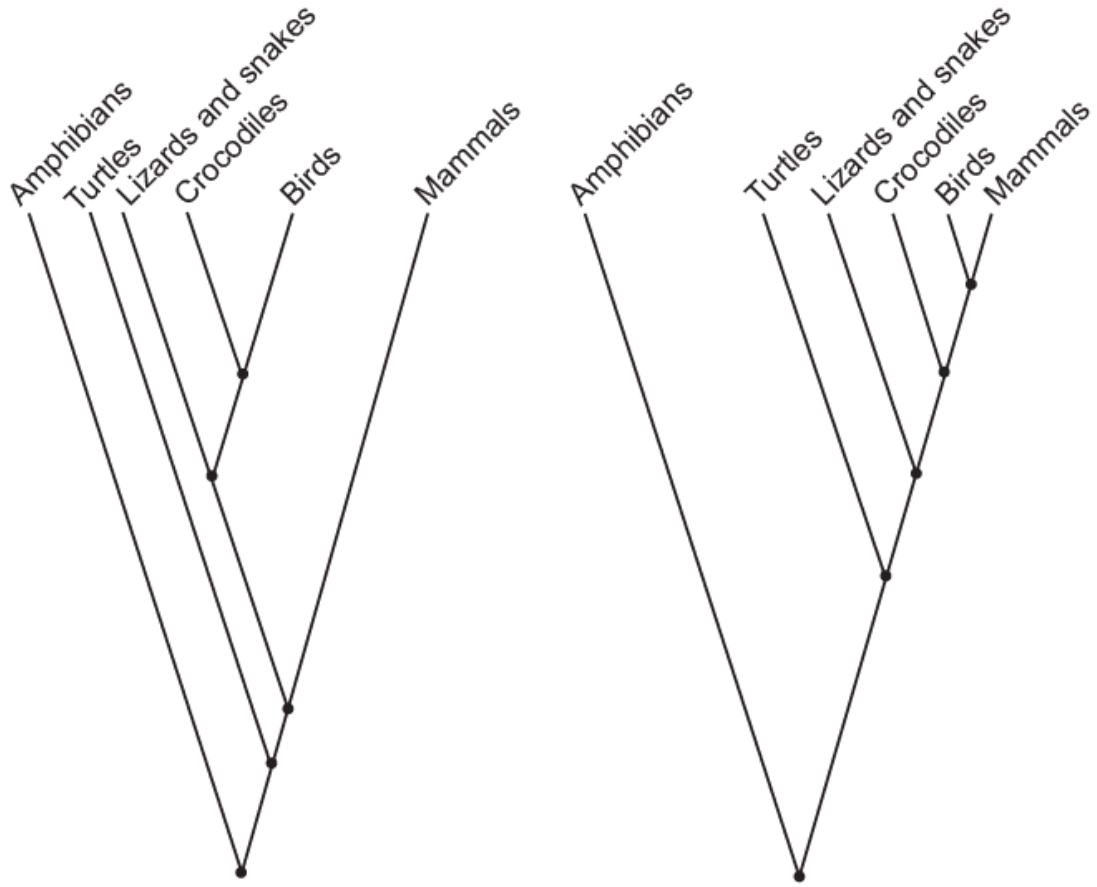
To which phylum of plants does this organism belong?

A. Bryophyta
B. Filicinophyta
C. Coniferophyta
D. Angiospermophyta

Which of the organisms A–D, identified by the key, represents a reptile?

1. fins, gills, 2-chamber heart . . . . . fish
   no fins, more than 2 chambers in heart . . . . . go to 2
2. mucus on skin, gills and lungs . . . . . A.
   no gills, breathes with lungs . . . . . go to 3
3. dry scales, lays eggs on land or live birth . . . . . B.
   constant body temperature, 4 limbs . . . . . go to 4
4. lays eggs with hard shells . . . . . C.
   hair or fur, live birth . . . . . D.

Cladograms can be created by comparing DNA or protein sequences. The cladogram on the left is based on DNA sequences and the cladogram on the right is based on comparing protein sequences.



What is the reason that cladograms based on DNA sequences are more reliable predictors of the phylogenetic relationship of species than cladograms based on protein sequences?

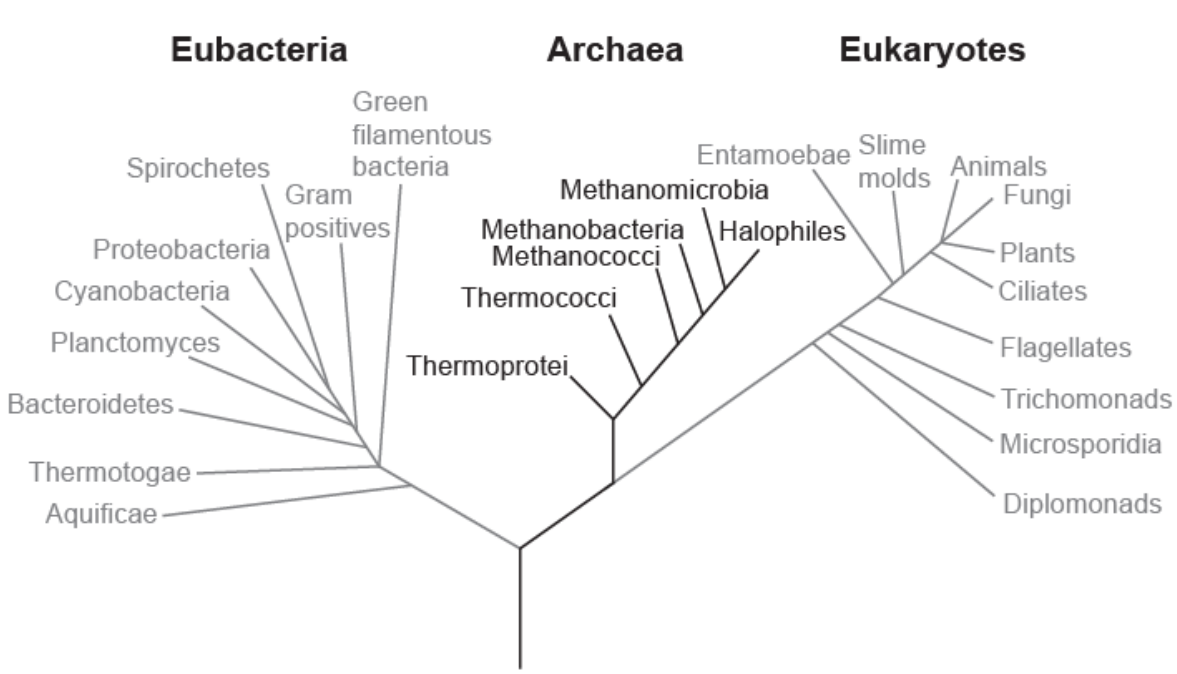
A. Amino acids are not as chemically stable as DNA nucleotides.

B. DNA mutates but amino acids do not.

C. Several different triplets of bases can code for the same amino acid.

D. There are 20 different amino acids but only 4 nucleotides.

Below is a phylogenetic tree of the three domains.



There are important differences between the three domains. Which of these domains have organelles?

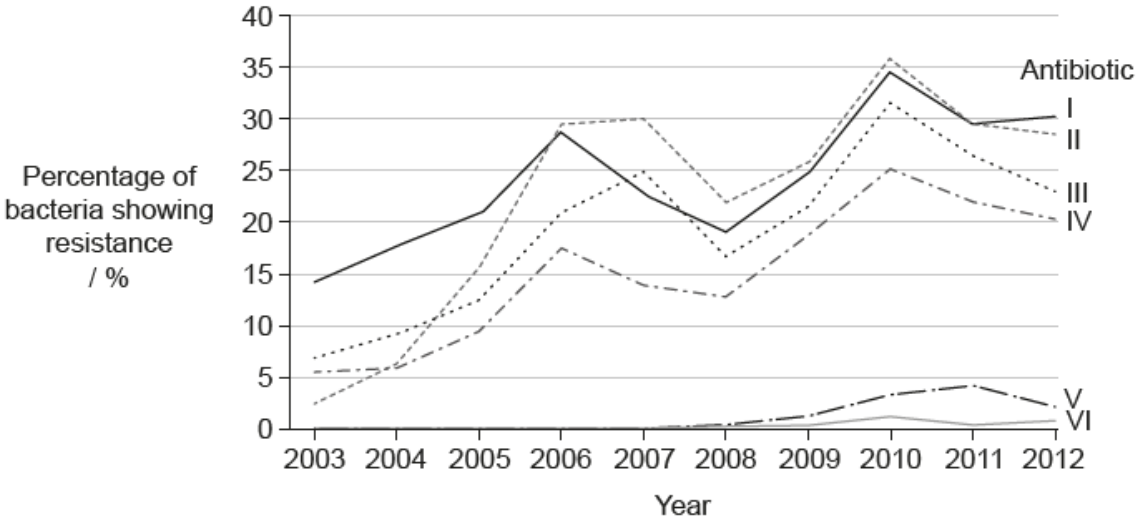
A. Eubacteria and archaea

B. Archaea only

C. Eukaryotes and archaea

D. Eukaryotes only

The bacterium *Neisseria gonorrhoeae* causes infections related to the human reproductive system. The graph shows the percentage of samples in which this bacterium showed resistance to six antibiotics over a period of ten years.



What is a possible explanation for the total percentage resistance being larger than 100% in 2010?

A. People do not take the antibiotics as prescribed.

B. More people have been sampled in that year.

C. There was an epidemic of *Neisseria gonorrhoeae* in that year.

D. Some bacteria are resistant to more than one antibiotic.

Which phylum does the plant below belong to?

A. Angiospermophyta
B. Bryophyta
C. Coniferophyta
D. Filicinophyta

The image shows an *Acacia tortilis* tree which is one of 13 species of Acacia. All such flowering trees are examples of Fabaceae.

[Source: adapted from www.elicriso.it]

What is the highest level of taxa for *Acacia tortilis*?

A. *Acacia*

B. *Tortilis*

C. Fabaceae

D. Angiospermophyta

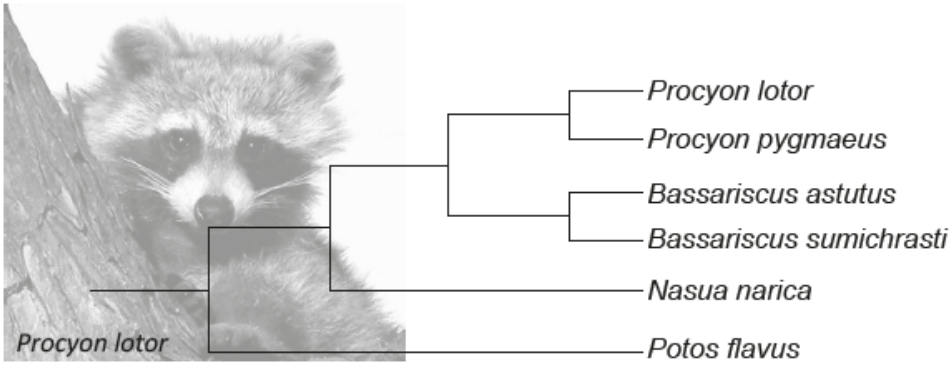
Lichens are returning to the forests of the industrial areas of the United Kingdom due to strict pollution control.

[Source: adapted from www.the-scientist.com]

What is the expected outcome in the population of peppered moths (*Biston betularia*)?

A. Increased numbers of light-coloured peppered moths
B. Increased industrial melanism in peppered moths
C. Increased predation of peppered moths
D. Increased speciation of peppered moths

The diagram represents a cladogram of the family Procyonidae.



[Source: © International Baccalaureate Organization 2017]

What would justify classifying these organisms into four different genera?

A. They live in different habitats.

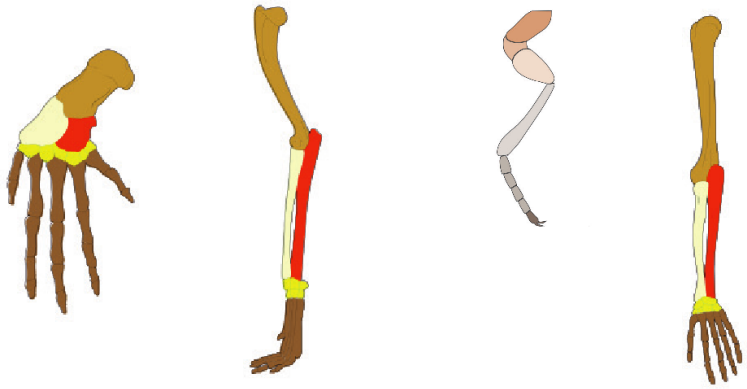
B. They do not share any common ancestors.

C. There are enough differences between them.

D. The number of times that the species have split.

Which of these structures is not homologous?

A. B. C. D.



[Source: https://en.wikipedia.org/wiki/Comparative_anatomy#/media/File:Homology_vertebrates-en.svg and https://commons.wikimedia.org/wiki/File:Insect_leg_scheme.svg] (https://commons.wikimedia.org/wiki/File:Insect_leg_scheme.svg])

The scientific name of the Wakatobi flowerpecker is *Dicaeum kuehni*.

[Source: By Seán B. A. Kelly, David J. Kelly, Natalie Cooper, Andi Bahrun, Kangkuso Analuddin, Nicola M. Marples - Edit of File:Dicaeum_celebicum_compared_to_Dicaeum_kuehni_(realigned).jpg, CC BY 4.0, https://commons.wikimedia.org/w/index.php?curid=33618785]

Which species is most closely related?

A. *Amerila kuehni*
B. Wakatobi white-eye
C. *Kuehneon duchyense*
D. *Dicaeum celebicum*
