1. Which of the following are pentadactyl limbs?

I Bee front leg

II Bird wing

III Dolphin flipper

A II only

B 1 and II only

C I and III only

D II and III only

2. An endemic species best described as a species that is found …

1. On an island
2. In a certain geographical area
3. Breeding with other species
4. After speciation

3. Analogous structures are similar because of

1. Common ancestry
2. Identical appearance
3. Convergent evolution
4. Artificial selection

4. The figwort family (a member of the Angiosperms) has been reclassified based on evidence not available when the family was first proposed in 1789. This evidence was based on

1. The use of microscopes
2. Histological studies
3. Ribosome size
4. Chloroplast DNA

5. Speciation can occur when

1. Two species interbreed
2. Geographical isolation occurs
3. Two populations cohabit the same area but do not interbreed

A I only

B 1 and II only

C II and III only

D I, II and III

6. The characteristics that develop during the lifetime of an individual are

1. Heritable
2. Inherited
3. Acquired
4. Learnt

7. The binomial system of nomenclatures used by scientist is

1. A means of classifying species
2. An international system of nomenclature
3. To avoid confusion in translation from different languages
4. In order to give names to new species

8. The correct binomial name for the Western Gorilla is

1. Gorilla gorilla
2. G gorilla
3. *Gorilla gorilla*
4. *Western gorilla*

9. In cladistics, reclassification is most likely to occur when …

1. New organisms are discovered
2. Evidence of evolutionary relationships are discovered
3. Biologists decide that a binomial name is incorrect
4. Morphology changes

10. The hierarchy of taxa used to classify eukaryotes, from the group containing the highest number of species is …

1. Kingdom, Family, Class, Order, Phylum, Genus, Species
2. Three domains of life containing many Phyla
3. Kingdom, Phylum, Class, Order, Family, Genus, Species
4. Groups of Phyla with increasing numbers of species

Structured answer questions

11. The olinguito is a newly discovered species of the class Mammalia. Suggest three characteristics possessed by the olinguito. (3 marks)

External ears

Fur

Mammary glands

Lungs with alveoli

Ventilation with ribs and diaphragm

12. Define the word clade. (2 marks)

Group of related organisms/morphologically similar

Evolved from a common ancestor

13. In cladistics the construction of cladograms shows the most probable evolutionary relationships between organisms. List three types of evidence on which a cladogram can be drawn and explain why a cladogram is drawn using more than one piece of evidence. (5 marks)

DNA (base sequencing)

Amino acid sequences in polypeptides

Morphology/shared characteristics

Fossil record

Mitochondrial/chloroplast DNA (base sequencing)

One type of evidence can be misleading/be contradicted by another type of evidence

More evidence gives a greater degree of certainty

14. Explain why antibiotic resistance in bacteria is an example of natural selection. (2 marks)

Mutation to create resistance

Allows resistant individuals to survive

Trait passed to future generations

15. Give two reasons why it is necessary that international groups of scientists decide upon the generic name of a species. (2 marks)

Common names for the same organism vary in different areas/languages

One scientific name for scientific communication (WTTE)

16. Complete the following table giving the characteristics of the three domains. (8 marks)

Characteristic feature	Domain		
	Bacteria	Archaea	Eukaryota
Structure of cell walls	Peptidoglycan Murein	Never contain peptidoglycans	Sometimes absent/Cellulose if present

DNA association with protein	Never	Associated with protein	Histone proteins always associated with DNA
Form of glycerol esters in cell membranes	d-glycerol/ unbranched (fatty acids)	l-glycerol/ unbranched (fatty acids)	d-form of Glycerol, no side chains
Presence of introns in genes	Absent/Rare	Present	Common

17. Label the positions of the following animals into the correct branch of the cladogram. (4 marks)

Animals labeled across the top of the cladogram in this order; goldfish, lizard, rat Chimpanzee,

18. Mutations in DNA occur at a relatively constant rate. Mitochondrial DNA has been studied in many species. Explain why studies of mitochondrial DNA are a useful tool for developing cladograms based on the idea of a molecular clock showing when various organisms diverged from a common ancestor. (3 marks)

Mitochondrial DNA/genes are short sequences/easier to examine

Mutations accumulate over time

Divergence is shown by the amount of differences (in base sequences)

Greater amount of difference shows earlier time of divergence/determine biological clock

19. Explain how natural selection causes changes in gene frequency within a population over many generations (4 marks)

Variety of genes within a population/genetic diversity

Genes with survival value are handed on to offspring

Genes that are disadvantageous are lost to population

Frequency of genes changes as natural selection acts

Favour genes with survival value

20. The photograph shows fossil shells. Look carefully at the photograph and answer the questions below.

1. The scale bar is 1cm long. Calculate the maximum width of shell A. Show your working. (2 marks)

4cm (accept 3.8 to 4.2 cm)

Mark for correct working

2. Deduce which modern Phylum do these organisms most closely resemble and explain why? (2 marks)

Mollusca / Molluscs

Presence of a shell / muscular foot

3. Suggest why fossils of this type are relatively common? (1 mark)

   Shell is hard / it fossilises easily / it is easily preserved

4. Design a dichotomous key to differentiate between these fossils. (6 marks)

The following words may help (you may also use others)

Ridge, whorl, rib, apex, cone, aperture, band,

Key: One mark for each successful point/use of method

Initial division into two groups

Use of numerical guide

Second/third division into individuals/one individual and two in a group

Second/third division of second group

Six shell types identified