Solutions

Marking: **M1** a correct method, **A1** the correct answer, **B1** an independent mark.

Each answer shows the steps, then the **result**.

2.1

domain, kingdom, phylum, class, order, family, genus, species

2.2

ribosomal RNA sequences of Archaea differ greatly from those of Bacteria; Archaea have different membrane lipids / some enzymes and histones like eukaryotes; so they share a more recent common ancestor with Eukarya, despite having no nucleus

2.3

a clade is a common ancestor and all of its descendants; a node is a common ancestor / the point where two lineages split

2.4

organisms that look alike may not be related, e.g. analogous features from convergent evolution; grouping by ancestry predicts shared features of newly found members

2.5

mutation rates differ between genes; and between groups of organisms / over time, so the rate is not constant

3.1

(a) rhesus monkey; fewest differences, so the most recent common ancestor

(b) yeast branches first, then chicken, then dog, with monkey and human as the closest pair

(c) mutations in the gene build up at a roughly constant rate; so more differences mean a longer time since the two species shared an ancestor

3.2

(a) jaws

(b) lizard

(c) e.g. “reptiles without birds”, or lamprey + shark; a clade must contain all descendants of the common ancestor, and this group leaves some out

(d) sequences give many measurable characters / are objective; anatomy can mislead because of convergent evolution