

Answers for support worksheet – Option D

- 1**
- a** 25% (1)
 - b** 1/16 (1)
 - c** Because the half-life of ^{14}C is 5700 years, in a specimen that is 10 000 years old, nearly three-quarters of the ^{14}C atoms will have decayed to ^{12}C and about one-quarter will remain (because nearly two half-lives have passed). This enables scientists to take useful measurements of their relative amounts. Because the half-life of ^{40}K is much longer, very few ^{40}K atoms will have decayed in a sample that is 10 000 years old. (1)
- 2**
- a** Speciation is the formation of a new species by splitting of an existing one. (1)
 - b** Allopatric speciation, because it is a result of the populations being geographically separated by the physical barrier of the mountains. (2)
 - c** The individuals might be able to breed, if they had not developed differences in mating behaviour, but because they have different numbers of chromosomes it is unlikely they would be able to produce fertile offspring. (2)
- 3**
- a** a positive correlation (1)
 - b** More energy is needed to generate action potentials between larger numbers of neurons in the brain. (1)
 - c** Changes to jaws and teeth related to consumption of meat. Evidence of tools used in hunting and use of fire to cook food. (2)
 - d** Natural selection would favour individuals with higher quality diets, whose larger brains would enable them to cooperate in groups and develop hunting strategies and more sophisticated tools. With better hunting techniques, it would have been possible to obtain high-energy food more efficiently, allowing brain size to evolve even further over generations. (2)

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(3 – 1 mark for each comparison)

Genetic evolution	Cultural evolution
Involves chromosomes and genes.	Involves communication (either language or visual) of acquired knowledge.
Members of a group must carry the alleles in order to pass them on. Genes can only be passed from parent to child.	Skills, customs and rituals can be passed on to many individuals within a group, either from generation to generation or within a generation.
Responsible for morphological changes such as brain size and dentition.	Responsible for customs such as burial of the dead, art, and technology for provision of food and comfort.