

Multiple choices:

1. C
2. B
3. D
4. I
5. F

Question 1:

Definition of intelligence (ability to model the world and the organism itself) 4 points

Key development earlier than 65Myr ago (e.g., Cambrian explosion) 4 points

Key development in last 65Myr (e.g., appearance of hominoids) 4 points

Any evolution step in the correct time range is fine. For each step the answer has to be a specific event at some specific time or period. Very general and abstract description gets less than half points each. The steps also have to be biological, not cultural, otherwise only get less than half points.

Intelligence explained by biological evolution 4 points

Biological evolution increases diversity which increases complexity in some organisms, leading to intelligence.

Speciation and extinction 4 points

Get full points if correctly explain them using random inheritable mutations and natural selection.

Question 2:

Recent information by comparing human and chimps genomes

1. 99.4% similar 3 points

2. Difference on what genes evolved fast 3 points

Human: genes controlling brain development

Chimps: genes controlling skeleton and skin

Selection for the differences 4 points

Answers can be any of the following: tool use, group hunting, and feedback loop of upright walking, tool use and brain size, etc.

Evaluation of f_i (anywhere between 1 and 10^{-9}) 10 points

(Two kinds of answers)

1. List important evolution steps and evaluate the probability of steps occurring again or on other planets.

(Points depend on description of the steps and explanation for the probabilities picked)

2. Use one or several of the following arguments to choose a value: contingency, convergence arguments, Galactic habitable zone, implication of the fact that it took about 4 Gyr for intelligence to arise on the Earth etc.

(Points mainly depend on description of the arguments. If use only one argument, get no more than 8 points. The value picked for f_i has to be consistent with arguments used and your discussion, otherwise get no more than 7 points.)

Question 5:

Human activity (anything from resource depletion, population explosion, global warming, nuclear war etc) 8 points

Natural catastrophe (anything from volcano, asteroid collision, cyclic behavior of solar luminosity, solar luminosity increase, evolution off main sequence etc) 8 points
(Need to give considerable details on each problem to show what is learned from the class, e.g., clear and detailed explanation of “nuclear winter”, exponential population growth and/or demographic transition, “asteroid winter” and/or examples of nearly asteroids etc. Otherwise, get less than half points each.)

Evaluation of L 4 points

Consistent discussion for the choice of L, e.g., if L taken from the timescale of one of the 2 problems you picked, discuss why the other problem is not important or how it can be solved. If L not from the timescales of the 2 problems you picked, explain why the 2 problems are not important or how they can be solved.