

**Sample questions & answers
for the SNAB Unit 6 exam,
based around the synoptic ar-
ticle, from Jules Pretty's 'The
Earth Only Endures'**

Unofficial!

1.

a) Pretty states *'survival of the fittest also means those that influence their environments in a favourable way'* **How does this relate to, and what is an example of, niche construction?**

(3)

b) Which environment does Pretty claim that humans are evolved to survive in?

(1)

c) Explain the idea of recapitulation, or 'ontogeny mimics phylogeny', and explain why it has since been proved outdated.

(3)

2.

a) What is genetic determinism?

(1)

b) Ridley states *'genes spend just as much of their time responding to our actions as they do causing them. Genes do not constrain human freedom, they enable it.'*

i) What is a transcription factor?

(1)

(ii) What is a promoter region?

(1)

(iii) In what way can our treatment of the environment affect genetic diversity, and why is genetic diversity important?

(3)

(c) What is your understanding of the term 'epigenetics', and which chemical group does Pretty cite as being a chemical effector of epigenetics, and in what way?

(3)

3.

a) What role does a FOXP2 gene play in humans, and why has it been so successful?

(2)

i) Describe the mechanism by which the FOXP2 gene became predominant in the human gene-pool.

(3)

ii) What evidence is there that evolution has taken place in the last 10,000 years, and why would many argue that selection of the fit test is no longer relevant to modern society?

(2)

b) What role do Hox, or homeotic genes, play, and in what way do they lend support to the idea of descent from a common ancestor?

(2)

4.

a) What does Pretty mean by his phrase 'Ecolution', and in what way is this theory obviously flawed?

(2)

b) Which type of study does Pretty use to discuss the nurture/nature debate, and which does he declare to be the dominant force?

(2)

c) What might be the physiological basis for diseases such as depression, and how might they be treated?

(3)

Total Mark: 32

ANSWERS

1.

a) Pretty states 'survival of the fittest also means those that influence their environments in a favourable way' How does this relate to, and what is an example of, niche construction?

- **Niche construction is modifying the environment to facilitate your own survival**
- **Therefore, Pretty implies that the successful creation of niches is a selection pressure**
- **Examples of niches: Beavers creating dams, Hippos trampling grassland, Eider duck keeping ice open for migration, earthworms changing edaphic conditions etc.**

(3)

b) Which environment does Pretty claim that humans are evolved to survive in?

- **The Pleistocene environment.**

(1)

c) Explain the idea of recapitulation, or 'ontogeny mimics phylogeny', and explain why it has since been proved outdated.

- **The idea that developing young within the womb pass through a series of stages that resemble its less developed relations e.g. Human fetuses might look like fish at one point.**
- **However, once we recognize that evolution has NO DIRECTION, then we must abandon the idea of more or less 'developed' or 'advanced' relations, and the idea of recapitulation.**
- **Additionally, it just isn't true; a close examination of anatomy reveals very few similarities between embryonic animals and their adult relatives.**

(3)

2.

a) What is genetic determinism?

- **The idea that our genes determine our fate, and that we are powerless to influence it ourselves.**

(1)

b) Ridley states 'genes spend just as much of their time responding to our actions as they do causing them. Genes do not constrain human freedom, they enable it.'

i) What is a transcription factor?

• **A molecule which must be present for the induction, or 'switching on' of a gene.**

(1)

(ii) What is a promoter region?

• **The region to which a transcription factor binds during gene induction.**

(1)

(iii) In what way can our treatment of the environment affect genetic diversity, and why is genetic diversity important?

- **The environment influences selection pressures**
- **So more varied environments lead to a more varied gene pool, and more genetic diversity**
- **Genetic diversity is important as it offers flexibility and an ability to adapt to new situations**

(2)

(c) What is your understanding of the term 'epigenetics', and which chemical group does Pretty cite as being a chemical effector of epigenetics, and in what way?

- **Epigenetics is the idea that there can be a changes in gene expression and phenotype involving the genome but not in terms of the order of bases in our DNA**
- **Methy groups/ Methylation is cited as an epigenetic factor**
- **Methyl groups are added to receptor genes**
- **And can influence the stress levels of rat pups and people**
- **Methylation also helps suppress retroviruses**

(3)

3.

a) What role does a FOXP2 gene play in humans, and why has it been so successful?

- **FOXP2 facilitates language/ communication**
- **The ability to communicate is extremely useful, allowing cooperation in terms of hunting, building houses, and tribal warfare etc.**
- **Thus giving a selective advantage**

(2)

i) Describe the mechanism by which the FOXP2 gene became predominant in the human gene-pool.

- **Natural selection**
- **A mutation (arginine replaces serine at 325th position) caused the FOXP2 gene to exist**
- **This mutation provided those humans that had it with a selective advantage**
- **They therefore outbred and outsurvived those unfortunate early humans who didn't have the mutation**
- **To the extent where it has become ubiquitous in human populations**

(3)

ii) What evidence is there that evolution has taken place in the last 10,000 years, and why would many argue that survival of the fittest is no longer relevant to modern society?

- **The fact that SNP (Single Nucleotide Polymorphisms) analysis has revealed that new alleles have developed in the last 10 000 years indicates that evolution is ongoing**
- **However, in modern society there are few selection pressures**
- **As we keep those who can't survive, alive through advanced health-care**
- **The Malthusian population pressure is therefore removed (bar in some LEDCs), so natural selection can't take place.**

b) What role do Hox, or homeotic genes, play, and in what way do they lend support to the idea of descent from a common ancestor?

- **Hox genes are involved in anatomical development**

- **Laying out the body in segments, and directing ontogeny**
- **Since they are unanimous in nature, they support the idea that we all evolved from a common ancestor**

(2)

4.

a) What does Pretty mean by his phrase 'Ecolution', and in what way is this theory obviously flawed?

- **'Survival of the greenest'; those who take care of their environment with most diligence and success survive**
- **It is flawed because the actions of others impact our environment massively**
- **And so there is no uninterrupted causal link between our actions and our environment, so natural selection on the basis of 'the greenest' is impossible**

(2)

b) Which type of study does Pretty use to discuss the nurture/nature debate, and which does he declare to be the dominant force?

- **Twin studies**
- **Pretty asserts that both are involved to varying extents, neither is universally dominant**
- **With some variation in how important both are depending on the situation**
- **Examples such as IQ, height, weight.**

(2)

c) What might be the physiological basis for diseases such as depression, and how might they be treated?

- **Corrupted neurotransmission in the brain**
- **Serotonin affected (serotonin synthesis low)**
- **Treated with SSRIs (Selective Serotonin Reuptake Inhibitors)**
- **Which prevent the reuptake of serotonin from synapses**
- **Hence boosting serotonin levels in synapses, and boosting transmission in those pathways**

(3)

Total Mark: 32