

SLS 12 Midterm 1

Maddie Pagel

TOTAL POINTS

70.5 / 75

QUESTION 1

1 Eugenics 5 / 5

✓ - **0 pts** Correct

QUESTION 2

2 Geology 5 / 5

✓ - **0 pts** Correct

QUESTION 3

3 The Darwins 5 / 5

✓ - **0 pts** Correct

- ☞ b) good, more specifically Darwin had the mechanism of natural selection to explain his theory of evolution

QUESTION 4

4 Acquired characters 5 / 5

✓ - **0 pts** Correct

QUESTION 5

Who said 5 pts

5.1 A 1 / 1

✓ - **0 pts** Correct - as long as the last name, Huxley, is there

- **0.5 pts** a. T.H. Huxley - a correct description of who he was without his name

- **1 pts** a. T.H. Huxley - the wrong name

5.2 B 0.5 / 1

- **0 pts** b. Oliver Wendall Holmes - Correct - as long as last name "Holmes" is written

✓ - **0.5 pts** b. Oliver Wendall Holmes - a description of the person or the context without the name or with the wrong name; identify Buck vs. Bell trial

- **1 pts** b. Oliver Wendall Holmes - the wrong name

5.3 C 0 / 1

- **0 pts** c. Theodosius Dobzhansky - Correct - if last name is present and spelled recognizably (even if not spelled completely correctly)

- **0.5 pts** c. Theodosius Dobzhansky - half credit for a correct description of the person even if the name is incorrect, or if name is minimally recognizable from the spelling. Half credit for first name without last name.

✓ - **1 pts** c. Theodosius Dobzhansky - incorrect if wrong name is given

5.4 D 1 / 1

✓ - **0 pts** d. Charles Darwin - Correct as long as last name is there

- **0.5 pts** d. Charles Darwin - Half credit for correct description of the person or correct context given

- **1 pts** d. Charles Darwin - wrong name

5.5 E 1 / 1

✓ - **0 pts** e. Alfred Russel Wallace - Correct last name

- **0.5 pts** e. Alfred Russel Wallace - Half credit for correct description of person or correct context given.

- **1 pts** e. Alfred Russel Wallace - wrong name

QUESTION 6

6 Natural Selection 5 / 5

✓ - **0 pts** Correct - Darwin liked the term because of its analogy to artificial selection and Wallace disliked the term due to the problem of agency implied by the analogy - artificial selection requires a selector.

- **0.5 pts** missing the term "artificial selection"

- **1 pts** mostly correct explanation, but lacking or incorrect use of key terms.

- **2.5 pts** Half credit if the correct reason is given for either Darwin or Wallace, but not for both.

- **3 pts** Rubric categories 3 and 4 apply

- **4 pts** Partially accurate but not the reasoning we were looking for
- **5 pts** Incorrect if neither reason given is correct.

QUESTION 7

Dating the Earth 5 pts

7.1 A 1 / 2.5

- **0 pts** Correct
- ✓ - **1.5 pts** Added up ages in biblical chronology
 - **1 pts** Calculation: added up ages in biblical chronology
 - **0.5 pts** Added up ages in biblical chronology
 - **1 pts** Be more specific. Added up ages in biblical chronology
 - **2 pts** Added up ages in biblical chronology
 - **2.5 pts** Added up ages in biblical chronology
 - **0.5 pts** Completely independent of Leclerc
 - **2.5 pts** Added up ages in biblical chronology
 - **2 pts** Added up ages in chronology of Old Testament

7.2 B 2.5 / 2.5

- ✓ - **0 pts** Correct
 - **0.5 pts** Iron
 - **1.5 pts** Measured the cooling rate of hot iron balls
 - **1 pts** Measured cooling rate
 - **0.5 pts** Heated, not melted
 - **0.5 pts** Earth was not a liquid
 - **0.5 pts** Measured cooling rate

QUESTION 8

8 Mono v. Polygenism 5 / 5

- ✓ - **0 pts** Correct
 - **1 pts** Polygenism applies specifically to the creation by God of multiple human species.
 - **2 pts** Mono and polygenism descriptions are reversed
 - **2 pts** Polygenism is a creationist, not evolutionary, belief. Separate species of humans created by God.
 - **0.5 pts** Human races created as separate species by God (polygenism)
 - **1 pts** Polygenism states that multiple human

species were created separately by God.

- **1 pts** Connect abolitionism/slavery more specifically to these theories.
- **1 pts** Connect imperialism more specifically to these theories.
- **2 pts** Slavery/colonialism justified using polygenic theories
- **1 pts** Monogenism states that all humans have one common ancestor, not necessarily that the human species descended from Adam and Eve.
- **1 pts** Slavery/colonialism justified using polygenic theories
- **2 pts** Mono and polygenism apply specifically to the creation by God of one or multiple human races.
- **1 pts** Slavery/colonialism justified using polygenic theories
- **1 pts** Polygenism is a creationist, not evolutionary, belief. Separate species of humans created by God.

QUESTION 9

9 Malthus 5 / 5

- ✓ - **0 pts** Correct.
 - **1 pts** need to mention: exponential/ very rapid growth of population if unchecked.
 - **1 pts** need to mention: very limited resource
 - **1 pts** need to mention: competition/ survival of the fittest as a result of 2 and 3.
 - **5 pts** Incorrect

QUESTION 10

Paley 5 pts

10.1 A 2.5 / 2.5

- **2.5 pts** No answer given or to get points right
- ✓ + **2.5 pts** Design in nature means designer
 - + **1 pts** Explanation of watch metaphor
 - + **1 pts** Divine creator
 - **0.25 pts** Flipping logic
 - + **1 pts** Perfection or complexity of natural world
 - **0.5 pts** no explanation of complexity/perfection as evidence of design.
 - ☹ This is true, but the logic is off when you use

created & creator instead of designed & designer.

10.2 B 2 / 2.5

- 0 pts Correct

- 2.5 pts No answer given

✓ - 0.5 pts **Get the main point, but just describe evolution**

- 0.5 pts Suggest Paley accepting evolution/change!

- 0.25 pts No speciation

- 1.25 pts No Paley, no rapid evolution

- 1 pts No Paley answer or wrong answer

- 1 pts Adaptive radiation incorrect

💬 This is essentially correct, but didn't quite get how adaptive radiation is different than evolution in general. Also doesn't describe how Paley would explain the similarities among species in an adaptive radiation (remember, this isn't seen in every ecosystem!).

QUESTION 11

11 Eureka! 5 / 5

✓ + 2.5 pts **The formulation of Darwin's theory in the Origin of Species was the culmination of careful thought and the meticulous acquisition of evidence over a prolonged period of time, rather than the expression of a single moment of inspiration.**

✓ + 2.5 pts **There were many factors that influenced Darwin's thinking both during his voyage on HMS Beagle (his geological interest guided by Lyell's work, his interaction with fossils, etc.) and after his return (collaboration with other scientists, e.g. John Gould, reading of Malthus, etc.), not just the Galapagos finches.**

+ 2.5 pts Darwin recognized the importance of his theory and overcame barriers to articulate his ideas in a cultural environment where natural theology was the accepted standard.

+ 0 pts Incorrect

QUESTION 12

12 Vestiges 5 / 5

✓ - 0 pts **Correct**

- 2 pts Darwin was not pre-empted by Vestiges since the basic idea was somewhat different. Rather, it gave him a picture of how unreceptive the scientific community was to transmutationist ideas, at least those without much scientific support.

- 5 pts Left blank.

- 2 pts Darwin was not inspired by Vestiges, instead the negative scientific reaction to it was part of his hesitation to publish. It caused him to step back and gather more data instead.

- 1 pts Wallace was not just supportive of Vestiges, he was inspired to name himself a transmutationist from the minute of reading it. This work turned his thought to theoretical aspects of the natural world.

- 1 pts Wallace was did not yet have a theory to compare Vestiges to. Instead, it was the very start of his theoretical thought about the natural world, and marks the origin of his transmutationist perspective.

- 1 pts Vestiges not only inspired Wallace to explore, but it also opened him up to the idea of theorizing about the natural world in a transmutationist context.

QUESTION 13

13 Sarawak 5 / 5

✓ - 0 pts **Correct**

- 1 pts Click here to replace this description.

- 5 pts Click here to replace this description.

- 2.5 pts Wallace is stating that a new species will have arisen from an existing ancestor, and so will exist in a similar space and time as that recent ancestor. It is an argument against spontaneous creation.

- 2 pts Click here to replace this description.

- 2 pts Why do you find closely related species in the same time and space? Recent descent from a common ancestor

- 1 pts He had not figured out the mechanism of evolution yet. He is suggesting here that because of

common descent from an ancestor, you find closely related species in similar space and time.

- **1 pts** Wallace is referring to a genealogical tree of life where you find closely related species in a similar space and from similar times due to common descent from an ancestor

- **5 pts** Wallace is referring to a genealogical tree of life where you find closely related species in a similar space and from similar times due to common descent from an ancestor

- **5 pts** No answer provided

- **3 pts** Wallace is referring to a genealogical tree of life where you find closely related species in a similar space and from similar times due to common descent from an ancestor

various varieties occupying different ecological niches.

QUESTION 14

14 Species and varieties 5 / 5

✓ + **2 pts** Relationship between species and varieties: Darwin argues that the line demarcating species and varieties is fuzzy.

✓ + **2 pts** Citation of experts: Darwin cites disagreement among experts about whether to classify organisms as species or mere varieties.

✓ + **1 pts** Evidence for descent with modification: Darwin argues that the poor demarcation between species and varieties exists because varieties are incipient species.

+ **0 pts** Click here to replace this description.

Great!

QUESTION 15

15 Struggle for survival 4 / 5

- **0 pts** Correct

✓ - **1 pts** Click here to replace this description.

- **0.5 pts** Click here to replace this description.

- **2 pts** Click here to replace this description.

- **5 pts** Empty

Didn't mention divergence of character will MITIGATE THE COMPETITION within species, which is the primary mechanism to generate

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Name: Maddie Pagel

SLS 12 2018 Understanding Darwinism
Mid-term 1, 2 Oct 2108

Please be sure to put your Harvard ID, Name, and Section Leader on **every** page. Answer all the questions. Answer **only** in the spaces provided. Each question is worth 5 points. Please make sure that your answers are legible and succinct (you will be penalized for adding to your answer irrelevant material that is not germane to the question). You have 75 minutes for the exam, and there is a total of 75 points available; pace yourself accordingly

1. Distinguish between positive and negative eugenics.

POSITIVE - encouraging the 'fit' to breed

NEGATIVE - discouraging the 'unfit' to breed

* In both cases, fit is not necessarily equated w/ biological fitness, but usually, understood as 'positive' societal traits (ie free from mental illness)

2. Compare and contrast catastrophism and uniformitarianism. For each perspective, give the name of the historical figure most closely associated with its development.

Catastrophism, which Cuvier came up with is the theory that all major epochs of time have ended w/ major events (ie volcanic eruptions & such). Like uniformitarianism it wanted to explain differences in past geological records. Uniformitarianism, pioneered by Lyell, said that the only processes that have shaped the earth are those visible today. This theory advocated for a much slower change than catastrophism which claimed change happened in bursts.

Do not write below line (for grading purposes)

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3. Charles Darwin's grandfather, Erasmus Darwin, wrote the following description of evolution:

Organic life beneath the shoreless waves
Was born and rais'd in Ocean's pearly caves
First forms minute, unseen by spheric glass,
Move on the mud, or pierce the watery mass;
These, as successive generations bloom,
New powers acquire, and larger limbs assume;
Whence countless groups of vegetation spring,
And breathing realms of fin, and feet and wing

a. What does he mean by "spheric glass"?

Early microscopes/glasses - the new organisms were so extremely small as to be undetectable.

b. Outline one key difference between the evolutionary theories of Erasmus and Charles Darwin.

Erasmus Darwin underestimated the extent to which the environment shaped (& pushed to extinction) organisms. Erasmus thought more teleologically than Darwin (everything came from shells & all), whereas Darwin recognized many animals evolved many paths were heavily shaped by their environments.

4. What is meant by "inheritance of acquired characters?" Give the name of the figure in the history of biology most closely associated with this idea.

Lamarck
Lamarck believed evolution happened as animals adapted to a specific need during life. For instance, giraffes have long necks because generations of giraffes had to stretch their necks (they acquire this characteristic during life) & eventually it is then passed down (inherited) by next generations. It was an attempt to explain inherited evolution through inherited traits, but mistakenly focused on traits that are not necessarily genetically coded (i.e. skills) & acquired after conception.

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5. Who said:

a. How extremely stupid not to have thought of that!

Huxley (Darwin's Bulldog)

b. Three generations of imbeciles are enough

W H Howell (Supreme Court Judge in Bell v Bucky - compulsory sterilization of mentally ill)

c. Nothing in biology makes sense except in the light of evolution

Lyell

d. Seeing this gradation and diversity of structure in one small, intimately related group of birds, one might really fancy that from an original paucity of birds in this archipelago, one species had been taken and modified for different ends

Darwin

e. All the human inhabitants of any one country should have equal rights and liberties before the law; women are human beings; therefore they should have votes as well as men

A R Wallace

6. Darwin and Wallace disagreed over the term "natural selection." Give **one** reason why Darwin favoured it, and **one** reason Wallace objected to it.

Darwin favored - the term illustrates that nature gives rise to evolution by killing off the weak. It also provides a good contrast/seque from his discussion of artificial selection, ~~perhaps~~ allowing his readership to better grasp the idea.

Wallace objected - natural selection implies a selector, which might caused readers to conflate this theory w/ divine design. The context of the time (very religious + bc of French rev, more likely to believe in a design) led Wallace to be wary of unintentional implication of a selector (or designer).

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Sunday
Oct 23

7. a. Archbishop Ussher concluded that creation was completed in 4004 BC. How did he come up with this figure?

He examined church/historical records & the bible in consultation with a calendar that lists all the weekdays & decided that if the bible was accurate & a literal record (which it was considered contemporarily) then 4004 BC must have been the date.

b. Georges Leclerc, Comte de Buffon gauged the age of the planet to be 75,000 years. How did he come up with this figure?

Leclerc heated small iron balls arbitrarily & recorded their cooling. He then extrapolated this to a ball of earth's size, thinking that the earth (which he thought must have started as a red-hot iron ball) must have taken 75,000 yrs to cool to current temps.

8. Outline the differences between the monogenic and polygenic theories of human origins. Why was this debate so topical during the 19th century?

Agassiz

↳ Polygenic - God had 'warm-ups' for Adam & Eve - other non-white races were a result of earlier creations of humans & were inferior - the races do not have a common ancestor.

Monogenic - There was a single human creation event - all humans were descended from a common ancestor (usually Adam & Eve) - races were created after expansion of humans into different environments.

This debate was so topical during the 19th century as polygenism was often used as a justification for colonialism & slavery - hot button topics of the time

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9. Both Darwin and Wallace report that T. R. Malthus was an important influence on their development of the theory of natural selection. Outline the key idea of Malthus that had such an impact.

Malthus, a natural theologian, believed in the power of population. He thought that population (growing exponentially) would always struggle under societies' scarce (arithmetically growing) resources. He believed people (lower class in particular) had a moral imperative to stop breeding so as to not compound population issues.

10. Darwin studied Paley at Cambridge.

a. Outline the essence of Paley's natural theology.

Paley believed that everything must have been created, as ^{organisms} ~~people~~ are too complex to have naturally occurred, thus as everything created must have a creator - God exists. He uses a watch in a field. If you're walking in a marsh & hit a rock, whatever, but if you find a watch, you know someone put it there. Organisms are the watch.

b. What is an adaptive radiation? Using a Paleyan perspective, explain adaptive radiation.

Species, as they radiate from the original environment will grow more diverse as each group adapts to its new unique environment. They may eventually become new species. Paleyan - The species are not adapted to their environment, they have always been that way. They appear as such as God has created them to perfectly fit their specific area.

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11. An historian of Darwin's Galapagos visit, Frank Sulloway, has written that the chief offence of the Darwin-Galapagos Eureka! legend is that it "masks the complex nature of scientific discovery, and, thereby, the real nature of Darwin's genius." Use what you know about the development of Darwin's thinking to illuminate the "real nature of Darwin's genius."

Darwin studied many books & contemporary authors in addition to making the voyage. He had a barrack room - he did much thinking outside of his legendary Eureka moment. This sort can be evidenced by 2 clear events - 1) He, after reading Malthus said that he then finally had a theory to work on - he used others thinking to buttress his own. He also carefully (2) worked to prove his theory & spent some time reworking it after he noticed the public outcry to vestiges - between that & his inclusion of pigeons, we see he is also very socially conscious which helped promote his theories. Ultimately, though, his genius was found through reading many prominent theories - not alone on an island.

12. The anonymously published Vestiges of the Natural History of Creation affected Darwin and Wallace in very different ways. Describe the impacts on each of them.

On Darwin: It freaked Darwin out - he saw the public outcry & then felt the need to go back & bolster evidence for his theory. In many ways, Vestiges likely made Origins much stronger as Darwin was in fear of a great failure.

On Wallace: Wallace thought the book was delightful. He didn't learn anything from its reception - which is evidenced by its later blunders. He was inspired by it scientifically & thought it a core text.

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13. In his 1855 "Sarawak Law" paper, A. R. Wallace wrote, "Every species has come into existence coincident both in space and time with a pre-existing closely allied species." What does this mean?

He means that species don't just arise from nothing randomly. He means that species are often coexisting w/ their ancestors for a bit. Because evolution is slow, new species find themselves w/ older versions of the species & other similar organisms potentially occupying the same niche.

14. Darwin frequently makes use of experts to support his arguments in the *Origin of Species*. How does he use various experts to support his arguments on defining species and varieties and the relationship between species and varieties?

His invocation of the confusion of experts in differentiating between species & varieties allows him to put forth his ideas that, indeed, species & varieties & distinguishing between the two is confusing, because the slow process of evolution is at work. He stands on the shoulders of confused giants to purport that his confusion is in fact evidence for his theory.

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15. On the struggle for survival, Darwin states, "The struggle almost invariably will be the most severe between the individuals of the same species, for they frequent the same districts, require the same food, and are exposed to the same dangers." How might this support Darwin's ideas of divergence of character and how species come about?

Darwin believes that incredibly small, often imperceptible traits can lead to an advantage over others. If there is severe interspecies competition, then these traits will allow a single animal to be better adapted than its peers & pass along its genes. If there wasn't severe competition within the same species then there would be much less evolutionary pressure. As their characters diverge & they are better adapted to their niche (or niches) they are more likely to pass on their genes, & after an accumulation of enough differences, they may become a different species.

Do not write below line (for grading purposes)