**PART II TWIN PILLARS OF THE DARWINIAN PARADIGM**

Chapter 3

1. What is meant by teleology?
2. The study of the ends of chromosomes that determine the longevity of a cell
3. The phylogenetic movement of species through time
4. The idea that certain forms inhabit the sensory world but are not part of it
5. The suggestion that natural events happen for some purpose and towards some end
6. The idea of random and purposeless change
7. The role of teleology in modern biology is:
8. It was refuted by Darwin and others and has no role
9. It is an essential principle in understanding the direction of natural selection
10. A useful idea to explain the concept of a species
11. A useful concept underpinning inclusive fitness
12. A set of principles that aids in the construction of phylogenetic trees
13. Who is famous for his clockmaker analogy for the existence of God?

a) Archbishop Ussher

b) William Paley

c) William Wilberforce

d) Richard Dawkins

e) William Whewell

1. Which of the following sentences is correct?
2. Darwin always thought that the human mind was immune from analysis by selectionist thinking
3. Darwin did accept Lamarckian type inheritance
4. Darwin thought that mutations in the genome of sex cells were the main driving force behind evolutionary change
5. The botanist Hooker was known as “Darwin’s bulldog”
6. Darwin always retained his Christian faith.
7. Which sentence best describes the ultimate purpose of evolutionary change?
8. Evolution seeks to produce organisms of increasing complexity
9. Evolution aims to maximize the offspring of each species on this planet
10. Evolution seeks to provide the best possible match of an organism to its environment.
11. Evolutionary change is a product of a blind natural process (natural selection) and as such has no ultimate purpose
12. Evolutionary change gradually ensures the progress of all living things towards a state of perfect harmony with their environment.
13. Which sentence best describes the transmutationist view of Jean Baptise Lamarck?
14. Lamarck’s ideas are essentially the same as Wallace and Darwin, which is why Darwin eventually recognised his contribution in later editions of *The Origin.*
15. Lamarck argued that random genetic changes would lead to a variety of phenotypes some of which would survive better than others.
16. Lamarck sent a letter to Darwin in 1858 outlining a very similar set of ideas to those Darwin was working on.
17. Lamarck believed that bodily changes caused by the exertions of an organism could be passed on to its offspring – thereby bringing about gradual change through time.
18. Lamarck clarified the relationship between the somatic and germ line cells, pointing out that information can only flow one way.
19. Which sentence best describes the nature and significance of Single Nucleotide Polymorphisms (SNPs)?
20. These are often mutations affecting one base pair on DNA, and because only one base pair is affected they cause no damage to the cell.
21. They are mutations that only affect a single nucleotide in a base pair in DNA, consequently the other nucleotide does not bond correctly and such mutations are always harmful
22. This is where a single base pair change can give rise to several different polymorphic phenotypes
23. These only occur in non-c0ding regions of DNA and so are harmless
24. They are changes to a base pair and can occur in both coding and non-coding regions. Some will have an effect on protein structure but most will not.
25. Which sentence is most accurate in the context of understanding heritability?
26. Heritability describes differences between individuals attributable to differences in the genome. Heritability will be low for universal human features.
27. Heritability describes the % of a trait that is inherited. For universal human features this will be high since they will be genetically based.
28. Heritability will vary with environment. If individuals experience very different environments heritability will increase
29. Heritability is a concept that tell so if a trait is inherited genetically or not.
30. Heritability estimates will decrease if individuals are all exposed to the same environment.
31. Altruism is a problem for evolutionary theory because:
32. Genes for altruism are only found in low frequencies
33. The genes for altruism are likely to be pleiotropic
34. Altruistic genes are haploid but humans are diploid
35. It is difficult to see how genes for altruism can survive if they act at a cost to their holders
36. Altruistic traits always carry some benefit to the phenotype but not the genotype so it is difficult to see how altruistic genes can persist.
37. Which is the best explanation for kin directed altruism?
38. We behave altruistically towards those with the highest percentage of our genome in common
39. If such altruism does have a genetic base then such genes will have been selected to act altruistically towards those also possessing the same altruistic genes
40. Altruism is based on favours returned at a later date and this can be expected from close kin since they belong to the same family
41. It is not really altruism since favours are returned and so mutualism would be a better name
42. Kin belong to the same species and so such altruism helps to maintain the fitness of the whole species
43. Which sentence best describes the coefficient of genetic relatedness?
44. A measure of the likelihood that any one gene taken at random will be present in another individual by common descent
45. A measure of the similarity of each chromosome in a diploid cell
46. A measure of the likelihood of paternity certainty
47. A measure of our genetic relatedness to other animals in terms of the % of genes that are similar
48. A measure of the cost/benefit ratio in cases of mutualism
49. Imagine that you have a half brother or sister (same mother but different father). What is the coefficient of genetic relatedness (r) between you and your half sib?
50. 0.75
51. 0.5
52. 0.125
53. 0.25
54. 0.0625
55. What is the r value between grandparents and their grandchildren in a monogamous mating group?
56. 0.125
57. 0.25
58. 0.75
59. 1.0
60. 0.5
61. What would happen to the r value between a father and his son in a situation where covert polyandry was practised?
62. It could vary from 0.5 to near zero
63. It would vary between 0.75 and 0.25
64. It would stay at 0.5
65. It would always be zero
66. It would be 0.25
67. Which sentence best describes Dawkins’ concept of the selfish gene
68. Genes like people are selfish – they only care for themsleves and show no compassion or loyalty
69. People are selfish because they contain selfish genes; selfishness has a strong genetic component
70. The concept became very controversial since later it was discovered that animals and people behave altruistically and so Hamilton and Dawkins had to introduce the concept of altruistic genes.
71. Dawkins did not mean that genes are selfish in the sense of a personality trait but simply that they operated to promote their own kind
72. Genes will be selfish so long as the conditons in the Hamilton equation of altruism hold true (i.e benefts are greater than the costs)
73. Which sentence best decribes the process of evolutionary change?
74. Species come and go, those species best adapted to survive change will survive. But gradually mutations accumulate and they will change. Those species which leave most offspring will do better than those that leave few and so eventually species change.
75. Individual members of a species leave offspring, sometimes mutations in the parents gene line cause their offspring and their future descendents to survive better and themselves leave more offsping than other individuals in the species. When this happens the newly mutated genes become more frequent in the gene pool.
76. Creatures gradually adapt to their surroundings in their own lifetime. These adaptations are passed on and if they help the species then they will survive and by this means species change occurs.
77. Pressures on the phenotype cause genotype changes, these changes help individuals survive and so phenotypical change drives evolutionary change.
78. Nature may be red in tooth and claw but due to the concept of r – coefficient of relatedness- those individuals such as wasps and bees and humans that practise altruism will survive since sacrifice for fellow members of the species helps the species survive and adapt.
79. Which set of statements best describes the relationship between the mechanisms underlying evolutionary change proposed by Charles Darwin and Jean Baptiste Lamarck
80. Lamarck’s view of evolution was progressive with the result of the striving of animals passed on to their offspring – a process known as the inheritance of acquired characteristics
81. Lamarck embraced teleological reasoning and argued that evolutionary change was blind and purposeless
82. Darwin accepted the inheritance of acquired characteristics but is renowned for his suggestion that natural selection works upon spontaneous novelty
83. Darwin accepted that teleology underlay natural processes and that organisms were driven towards some final form
84. Darwin was persuaded by Mendel’s work to accept the particulate nature of inheritance but Lamarck died before Mendel’s work was published

A (i), (ii) and (v)

B (i) and (iii)

C (ii) and v)

D (ii), (iii) and (iv)

E (i), (ii), (iii), (iv) and (v)

Chapter 4

1. Which is the best definition of anisogamy?
2. Dislike of females
3. Dislike of males
4. Asexual reproduction involving diploid gametes
5. Differences between male and female investment in the process of reproduction
6. Monogamous bonding where both parents donate the same parental investment
7. Consider the following table:

Table Four basic mating systems.

|  |  |  |
| --- | --- | --- |
|  | **Uni-male** | **Multi-male** |
| Uni-female | A | B |
| **Multi-female** | C | D |

1. The best description of A is:
2. Monogamy
3. Polyandry
4. Polygyny
5. Polygynandry
6. Monadrogyny
7. The best description of B is:

a) Monogamy

b Polyandry

c) Polygyny

d) Polygynandry

e) Monadrogyny

1. The best description of C is:

a) Monogamy

b) Polyandry

c) Polygyny

d) Polygynandry

e) Monadrogyny

1. The best description of D is:

a) Monogamy

b) Polyandry

c) Polygyny

d) Polygynandry

e) Monadrogyny

1. In polygynous mating the harem size is often correlated positively to the degree of sexual dimorphism (male body size/female body size). The best explanation of this is: (choose one only)
2. Males need much strength to fertilise so many females
3. Males prefer large females and large body size enables females of large body size to be chosen.
4. Harems are difficult to provision and large males are able to obtain the most food supplies
5. This is an example of intra sexual selection where competition between males has driven up body size
6. Sperm competition will be so great that large males produce the largest number of sperm
7. What is the “Kamikazi sperm hypothesis”? Choose one response only.
8. That Kamikazi pilots were of a special genetic type prone to suicide on the male side
9. The idea that some sperm may simply be produced to attack rival sperm
10. The idea that in polyandrous mating systems males will need to produce lots of sperm
11. The idea that eggs can reject substandard sperm
12. The suggestion that in polygyny sperm will need to be larger in relation to the size of the male

The next two questions [Qs 9 & 10)] require you to examine the list (below) of features of animals that may be related to mating behaviour:

1. Long horns on males
2. Claws on males
3. Bright colouration on males (e.g. birds)
4. High volume of sperm produced by males
5. High sexual dimorphism such that males are larger than females
6. Elaborate courtship display by males
7. Mate guarding
8. Nuptial gifts (males to females)
9. Which of the above are likely to be a result of INTER sexual selection? (Select one response.)
10. (i) only
11. (iii),(vi) and (viii)
12. (ii), (vi) and (vii)
13. All of the above
14. (iv) only
15. Which of the above are likely to have arisen as a result of INTRA sexual selection? (Select one response.)
16. (iii), (vi) and (viii)
17. (ii) only
18. (i), (ii) and (iii)
19. (vii) only)
20. (i), (ii),(iv),(v), (vii)
21. One male can fertilize in principle many females, yet the human sex ratio at birth is close to 1:1. Which statement below best accords with Fisher’s reasoning on this?
22. Nature always produces an excess of males to ensure that the fittest are those which produce offspring
23. Females need some choice to exercise sexual selection, so end up choosing the fittest mate.
24. This is an example of stabilising selection. If the sex ratio ever drifted far from 1:1 then a selective force would operate to bring it back again
25. The sex ratio of 1:1 shows that we are largely a monogamous species
26. Sex is determined by X and Y chromosomes and males produce equal numbers of gametes with these two variants
27. What is the difference between polygamy and polygyny?
28. Polygyny is one male mating with multiple females, polygamy just means one sex mating with many of the opposite sex
29. Polygamy is one male mating with multiple females, polygyny just means one sex mating with many of the opposite sex
30. Polygamy is multi male –multi-female grouping, polygyny is just multiple females, single male.
31. Polygyny is multi male –multi-female grouping, polygamy is just multiple females, single male.
32. They mean exactly the same thing.
33. Which of the following conditions would tend to **most** favour female choosiness in human mating?
    1. Excess of females over males, high paternal investment.
    2. Low rates of encounter, low variation in mate quality
    3. Excess of males over females, low paternal investment, high maternal investment, high variation in male quality
    4. Excess of males over females, high paternal investment, low variation in male quality
    5. Excess of females over males, high maternal investment, low variation in male quality.
34. Which sentence is the most accurate in describing the relationship between natural and sexual selection?
35. Natural selection can cause run away effects such that animals come possess elaborate ornamentation. Female choice limits this runaway effect.
36. Sexual selection can lead to features that are not ecologically optimum; there may come a point where sexual and natural selection oppose each other.
37. Sexual selection drives features towards their ecological optimum, natural selection slows down this process.
38. Natural selection underpins male choice whilst sexual selection drives female choice
39. Sexual selection explains why male animals are always bigger than female animals of the same species.