Year 9 Inheritance and DNA Worksheet - Mark Scheme

Year 9 · KS3 Biology · DNA, genes, inheritance and variation

Section A: DNA, genes and chromosomes [19 marks]

1(a)	nucleus	**1**
1(b)	gene	**1**
1(c)	chromosomes	**1**
1(d)	DNA	**1**
1(e)	allele	**1**
1(f)	gamete	**1**
2	46; 23; 23; 46. Guidance: 1 mark each.	**4**
3	(a) The shape of the DNA molecule (1 mark for double helix). (b) Name two scientists whose work led to the model of DNA (2 marks: any two of Watson, Crick, Franklin, Wilkins). Guidance: 1 mark for double helix, 1 mark each for two correct scientists.	**3**
4	Inherited; environmental; both; inherited; environmental; both. Guidance: 1 mark each.	**6**

Section B: Patterns of inheritance [23 marks]

5	Genotype; phenotype; dominant; recessive; homozygous; heterozygous. Guidance: 1 mark each.	**6**
6(a)	Tt	**1**
6(b)	Top row gametes T, t; side gametes T, t; offspring TT, Tt, Tt, tt. Guidance: 1 mark for correct gametes, 3 marks for correct offspring (1 mark for any two correct).	**4**
6(c)	3 : 1	**1**
6(d)	1 in 4, 25% or 0.25	**1**
6(e)	20 (80 ÷ 4)	**1**
7(a)	Gametes X, X and X, Y; offspring XX, XY, XX, XY. Guidance: 1 mark for correct gametes, 3 marks for offspring (1 mark for any two correct).	**4**
7(b)	50% (1 in 2)	**1**
8	(a) Parents are both carriers, genotype Ff (1). (b) Each parent passes on a recessive allele f in a gamete (1); the child receives two recessive alleles, ff (1). (c) The chance of another child having cystic fibrosis is 1 in 4 or 25% (1). Guidance: Write the genotype of the parents (1), explain how the child inherited the condition (2) and give the chance of another child with the condition (1).	**4**

Section C: Variation and natural selection [6 marks]

9	Mutations (new alleles) (1). Sexual reproduction mixes alleles from two parents / random fertilisation (1).	**2**
10	Variation: some moths were dark and some light (1). Dark moths were better camouflaged on dark trees so were eaten less (1). They survived and reproduced (1) and passed the dark allele to offspring, so the allele became more common (1).	**4**

Section D: Data and application [7 marks]

12(a)	62 ÷ 18 (1) = 3.4 : 1 (1)	**2**
12(b)	Both Tt (heterozygous), because the ratio is close to 3 : 1.	**1**
12(c)	Fertilisation is random so the results are due to chance.	**1**
12(d)	Use a larger number of offspring (bigger sample).	**1**
13	Advantage: can avoid serious genetic disease / lets parents make informed choices (1). Disadvantage: embryos are destroyed (ethical concern) / expensive / may be used to choose other features (1).	**2**

Total: 55 marks. Accept any scientifically correct alternative wording.