B2.4 Genome, Chromosomes, DNA and Genetics Test - Answers

/79

1.

(a) (Correct gametes for parents)
- H and h;
- h and h;
- Punnett square constructed (┼);
- Correct cross for offspring from this cross (2Hh, 2hh); Apply CM [4]

(b) Phenotypes = long hair and short hair;
Ratio 1:1 or 2:2 or 50%:50%; Apply CM
If cross correct but phenotypes not specified, allow ratio from their Punnett
If cross wrong **must** specify phenotypes in order to get ratio marks [2] 6

2.

(a) **(i)** DNA B [1]

(ii) Two nuclei or two cells drawn;
Two chromosomes in each;
identical chromosomes to parent in each; [3]

(b) **(i)** Punnett square; C
Hh;
hh;
correct cross;

	H	h
h	Hh	hh
h	Hh	hh

[4]

(ii) 50:50/1:1 [1]

(c) Cross with homozygous recessive/wrinkled; D
Any wrinkled offspring – then parent was heterozygous;
All offspring smooth – then parent was homozygous; [3] 12

3.

Feature	Type of cell division	
	Mitosis	Meiosis
Exact copy made of cells	✓	✗
Used to replace damaged cells	✓	✗
Produces 4 haploid cells	✗	✓

A

([1] for each correct row, do not penalise if no ✗) [3] 3

4.

(a) double helix I [1]

(b) sugar/deoxyribose;
phosphate; [2]

(c) A–T/Adenine–Thymine
C–G/Cytosine–Guanine J [2]

5

5. **(a)** 6 chromosomes; 3 pairs (but don't have to be lined up in pairs); [2]

(b) **(i)** Ovaries/testes; [1]

(ii) 4; [1]

(iii) (Need to restore) **46/diploid** (number); [1]

K

6. **(a)** Punnett;
RR for parent;
Rr for parent;
correct offspring

	R	R
R	RR	RR
r	Rr	Rr

[4]

(b) two crosses
both with rr;
1 parent RR, other parent Rr;
correct crosses [4]

(c) **(i)** 3:1 [1]

(ii) discontinuous [1]

(iii) blood groups/tongue rolling/(attached) ear lobes/eye colour/gender [1]

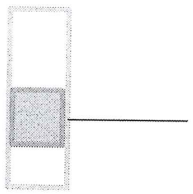
5

H

11

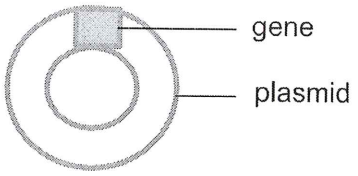
7. **(a)** insulin [1]

(b) **(i)**



([1] for **drawing** of chymosin gene in a chromosome;
[1] for a **correct label** – either the gene **or** chromosome) [2]

(ii)



([1] for drawing; [1] for correct label) [2]

(iii) multiplication/replication/reproduction/protein synthesis [1]

(iv) amino acids [1]

(v) no animals used/vegetarians can eat the cheese
don't have to kill animals [1]

M

8

8.

(a) (i) TAG; Gly; [2]

(ii) 153; [1]

(iii) Any **two** from:
- (Triplet) code would change;
- Gly not made/amino acid will be different
- Different protein formed

[2]

(b) (i) Plasmid/with label;
Gene correctly joined and labelled;
All within bacterial cell; [3]

(ii) The bacteria multiply/replicate; [1]

(iii) Any **two** from:
- Less side effects/it's human insulin/not from cattle
- Can produce large quantities of insulin
- Cheaper
- Quicker
- Avoids the use of animal products

[2]

(c) (i) Any **two** from:
- The child has to receive one C.F. allele
- one from each parent
- It is homozygous recessive

[2]

(ii) Any **two** from:
- Risk of miscarriage
- Should they terminate the pregnancy?
- e.g. if they know the child has cystic fibrosis – is it right to bring this child into the world?

[2]

(iii) Down syndrome [1] 16

9.

(a) Any **three** from:
- Remove the **gene for insulin**
- Remove the plasmid (from the bacterium)
- Cut the plasmid open/split the plasmid open
- Insert insulin gene (into plasmid/bacterial DNA)

[3]

(b) The bacteria reproduce/clone themselves/bacteria put into a fermenter/ bioreactor; [1]

(c) Any **two** from:
- human insulin has no side effects/no allergic reactions/no rejection
- don't have to kill/harm any animals/no ethical issues;

[2]

(d) Diabetes; [1] 7

10.

(a) Punnett square ——+—— ; gametes correct; × 2; correct cross; [4]

Q

	B	b
B	BB	Bb
b	Bb	bb

R

(b) **(i)** Baby won't have sickle cell anaemia unless **both** parents are carriers/ unless it has two b/two recessive alleles, i.e. one allele from each parent/ If mother doesn't have the gene/allele there is **no chance** of the baby having it [1]

(ii) more cost-effective/save time; [1]

6