

1. (a)

mitosis	meiosis	neither
		✓
✓		
✓		
	✓	

All four answers correct, 2 marks  
 At least two answers correct 1 mark

2

(b) Four haploid cells, each with two chromosomes;  
 Correct combinations of chromosomes;

2

(c) 8 chromosomes/4 pairs;

1

[5]

2. **x**    **✓**    **x**    ;  
**✓**    **x**    **✓**    ;  
**x**    **✓**    **x**    ;  
**x**    **x**    **x**    ;

1

1

1

1

[4]

3. (a)

Event	Division I / II	Phase (anaphase, metaphase, prophase or telophase)
1	I	telophase
2	I	prophase
3	II	anaphase
4	I	metaphase

*One mark per row;;;*

4

(b) 3;

1

[5]

4. (a) 1. Chromosomes shorten/thicken/condense;  
 2. Chromosomes associate in homologous/(described) pairs / formation of bivalents / tetrads;  
 3. Crossing-over / chiasma formation;  
 4. Join to spindle (fibres) / moved by spindle;(\*)  
 5. (At) equator/middle of cell;(\*)  
 6. (join via) centromere / kinetochore;(\*)  
 7. (Homologous) chromosomes move to opposite poles / chromosomes separate/move apart; (*ALLOW* ‘are pulled apart’)  
 8. (Pairs of) chromatids separated in 2<sup>nd</sup> division; max 6  
 (\*) OR “ independent assortment”  
 unqualified = 1 mark

- (b) 1. Crossing-over; [*IGNORE* any wrong ref. to timing]  
 2. Independent/random assortment/orientation/segregation of (homologous) chromosomes in meiosis I;  
 3. Independent/random assortment/orientation/segregation of chromatids in meiosis II;

+ Any three from:

4. Different adaptations / some better adapted;  
 5. Some survive / example described;  
 6. To reproduce;  
 7. Pass on gene/allele;  
 8. Allows for changing environment/different environment/example described; max 5

- (c) (i) 21; 1  
 (ii) 1. *T. aestivum* has 2 copies of each type of chromosome/is diploid;  
 2. *T. aestivum*’s chromosomes can form bivalents/can assort in meiosis/ can produce haploid gametes;  
 3. *T. aestivum*’s gametes receive a copy of every chromosome/ receive all the genetic information; 3  
 [*ACCEPT* converse argument for hybrid plants]

[15]

5. (a) (meiosis) anaphase I;  
chromosomes are moving apart;  
 chromosomes still double structures; 3

- (b) chromosomes in each (homologous) pair twist around each other;  
 chromatids break and rejoin to chromatid on sister chromosome; 2  
 (*accept points from a suitable diagram*)

[5]

6. (a) First meiotic division (**A**) will show cells with chromosomes appearing as double structures/two chromatids still joined/ chromosomes in **A** and chromatids in **B** /homologous pairs are separating;

*Must be in context of anaphase*

Diploid number of chromosomes /appropriate number for **A** and **B**; 2

*Allow reverse argument for second meiotic division If answer is unqualified, assume that it refers to cells at A, since this is the logic of the question.*

- (b) Crossing over / chromatids exchange sequences of DNA / chiasmata;  
Random/independent segregation/assortment (of chromosomes) /  
chromosomes from homologous pairs move independently at meiosis I;  
And meiosis II;

max 2

[4]