1. (a)

mitosis	meiosis	neither
		✓
✓		
✓		
	✓	

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

(b) Four haploid cells, each with two chromosomes;
Correct combinations of chromosomes; 2

(c) 8 chromosomes/4 pairs; 1

[5]

2. ***x*** ✓ ***x*** ; 1

✓ ***x*** ✓ ; 1

x ✓ ***x*** ; 1

x ***x*** ***x*** ; 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 2nd 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]