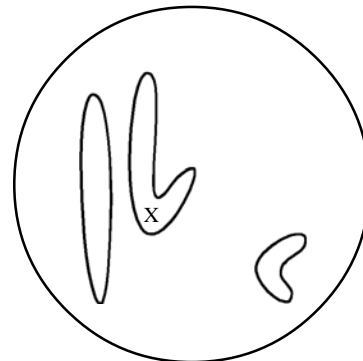


**QUESTIONSHEET 1**

- (a) (double helix) of DNA unravels to form two single stranded (primer) DNA molecules;  
 these attract complementary (energy rich) nucleotides/nucleoside triphosphates (to primer strands);  
 these join to (primer) strands forming daughter DNA;  
 under influence of DNA polymerase;  
 bases join by hydrogen bonds between complementary pairs;  
 and adjacent sugars join by phosphate bridges; **max 4**
- (b) 2 (arbitrary) units; **1**
- (c) chromatids separate to poles;  
 during anaphase;  
 nuclear membranes then reform around two daughter nuclei;  
 each containing the diploid number of chromosomes; **max 3**
- (d) 1 (arbitrary) unit; **1**
- TOTAL 9**
- 

**QUESTIONSHEET 2**

- (a) (i) quality;  
 correct chromosomes;  
 (could have two X chromosomes) **4**
- (ii) quality;  
 correct chromosomes;



(For quality marks, lines should be clear and joined up properly.  
 For chromosome mark, chromosomes should be clearly recognisable/correct shape).

- (b) Male; two chromosomes did not match/ref sex chromosome/X and Y; **2**
- TOTAL 6**
- 

**QUESTIONSHEET 3**

- (a) (i) 9;  
 (ii) 36;  
 (iii) 36;  
 (iv) 18;  
 (v) 9; **5**
- (b) female nucleus = 9 + male nucleus = 9 = 18; **1**
- (c) chromosomes of cabbage and radish differ structurally;  
 thus bivalents could not form and meiosis/gamete production would fail; **2**

**TOTAL 8**

**QUESTIONSHEET 4**

- (a) (i) mitosis;  
(ii) mitosis;  
(iii) mitosis and meiosis;  
(iv) mitosis and meiosis;  
(v) meiosis; 5
- (b) germination of haploid spores to form gametophyte in mosses/liverworts;  
growth of the haploid gametophyte in mosses/liverworts/growth of fern gametophyte;  
/production of haploid gametes in fern gametophyte; max 2

**TOTAL 7**

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**QUESTIONSHEET 5**

- (a) (i) anaphase;  
(ii) telophase;  
(iii) metaphase;  
(iv) prophase; 4
- (b) (i) 20 units;  
(ii) 10 units; 2

**TOTAL 6**

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**QUESTIONSHEET 6**

- (a) A: pole/aster/centrosome;  
B: chromosome;  
C: spindle; 3
- (b) (i) prophase; 1  
(ii) anaphase; 1
- (c) metaphase; 1
- (d) root/shoot tip;  
vascular cambium;  
cork cambium; max 2

**TOTAL 8**

**QUESTIONSHEET 7**

- (a) chromosomes replicate into chromatids (except at the centromere);  
DNA deposits on chromosomes (making them stainable/visible);  
chromosomes condense/become shorter/fatter;  
chromosomes become attached to spindle;  
chromosomes complete replication (at centromere);  
one set migrates to one pole and the other set to the other pole;  
chromosomes revert to interphase condition/long and thin/unstainable/lose DNA;  
allow one mark if sequence is correct; **max 5**
- (b) (i) telophase; **1**
- (ii) cell plate/phragmoplast forms;  
involves vesicles from Golgi complex;  
cell wall forms;  
spindle disintegrates; **max 2**
- TOTAL 8**
- 

**QUESTIONSHEET 8**

- (a) (i) point where sister chromatids join;  
position is constant;  
point of attachment to spindle;  
chromatids unable to separate without centromere/drawn apart at centromeres (by spindle); **max 2**
- (ii) composed of microtubules/tubulin;  
spindle fibres shorten during anaphase;  
pull sister chromatids apart; **max 2**
- (b) produces haploid cells from diploid cells;  
so preserving diploid state when gametes fuse;  
random assortment gives genetic variation;  
chiasmata give genetic variation; **max 2**
- TOTAL 6**
- 

**QUESTIONSHEET 9**

- (a) replication of chromosomes occurs;  
in the S phase;  
synthesis of proteins occurs;  
synthesis of rRNA/mRNA/tRNA occurs;  
cell organelles are produced;  
cell carries out all its (metabolic) functions; **max 3**
- (b) A: prophase;  
C: anaphase;  
E: cytokinesis;  
F: interphase; **4**
- TOTAL 7**

**QUESTIONSHEET 10**

(a)

Stage	Description
Prophase	chromosomes become shorter and thicker;
Metaphase	chromosomes attach to spindle ends at equator;
Anaphase	daughter chromosomes move to the poles;
Telophase	nuclear membranes reappear;
Interphase	chromosomes replicate except at their centromeres;
Cytokinesis	division of the cytoplasm occurs;

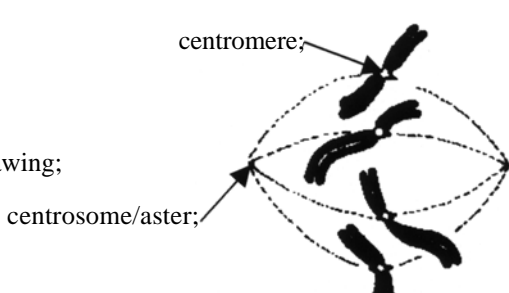
**6**

(b) (in animals) cytoplasm divides by constriction (between daughter nuclei);  
(in plants) a phragmoplast/cell plate/new cell wall is synthesised (between the daughter nuclei);

**2**

**TOTAL 8**

**QUESTIONSHEET 11**

- (a) spindles formed from centrosomes/centrioles;  
(daughter/replicated) chromosomes migrating to the poles;  
pulled by contracting spindles;  
which are attached to the centromeres;  
one set of chromosomes goes to one pole and other set to the other pole;
- max 4**
- (b) (i) and (ii)  
Drawing:  
4 chromosomes not yet replicated;  
attached to spindles by their centromeres;  
same chromatid length/centromere positions as in anaphase drawing;
- 

**5**

**TOTAL 9**

**QUESTIONSHEET 12**

- (a) meristems; buds/intercalary meristems; allometric; S; G<sub>2</sub>; prophase; chromatids;  
centromere; 40/20 pairs; 20/10 pairs; diploid; 20;
- 12**
- (b) can secrete/release colchicine into surrounding soil;  
where it can inhibit mitosis/root growth of nearby plants/inhibit seed germination;  
thus reducing competition from other plants;  
ref to Autumn Crocus being an 'aggressive' plant;
- max 2**
- TOTAL 14**