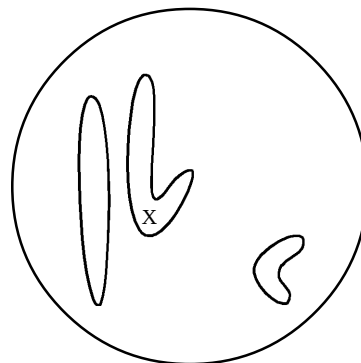
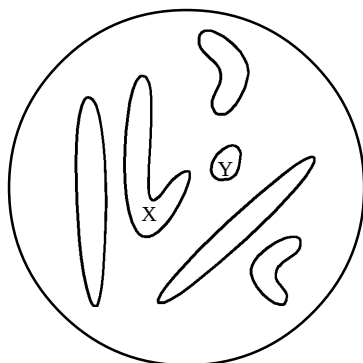


QUESTIONSHEET 1

- (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

QUESTIONSHEET 5

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

TOTAL 6

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)

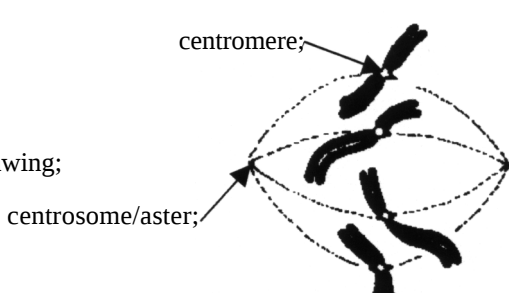
Stage	Description	
Prophase	chromosomes become shorter and thicker;	
Metaphase	chromosomes attach to spindle ends at equator;	
Anaphase	daughter chromosomes move to the poles;	
Telophase	nuclear membranes reappear;	
Interphase	chromosomes replicate except at their centromeres;	
Cytokinesis	division of 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; G₂; 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