

**QUESTIONSHEET 1**

FEATURE	MITOSIS	MEIOSIS
Involves two successive nuclear divisions	✗	✓
Does not occur in a haploid cell	✗	✓
Involves synapsis forming bivalents	✗	✓
Involves chiasmata formation	✗	✓
Leads to random assortment of chromatids	✗	✓
Leads to random assortment of chromosomes	✗	✓
Occurs during gamete formation in a mammal	✓	✓
Daughter nuclei have identical genetic content	✓	✗
DNA replicates before cell division commences	✓	✓
Involves two chromosomal replications	✗	✗

**TOTAL 10****QUESTIONSHEET 2**

- random assortment of chromosomes in Anaphase I;  
produces new combinations of chromosomes and the genes/alleles they carry from each homologous pair;  
resulting nuclei thus have new combinations of the genes/alleles present; **3**
  - random assortment of chromatids during Anaphase II;  
produces new combinations of alleles in the regrouped chromatids;  
resulting nuclei thus have new combinations of the alleles present; **3**
  - chiasmata form between chromatids of different but homologous chromosomes;  
thus moving alleles from chromosome to chromosome into new combinations;  
thus modifying the linkage groups present; **3**
- TOTAL 9**

**QUESTIONSHEET 3**

- (a) B A C; A= anaphase, B = prophase, C = telophase; **2**
- (b) Structure:  
chromosomes would be replicated into chromatids;  
chiasmata would be showing between chromatids of homologous chromosomes;
- Arrangement:  
chromosomes would be arranged into homologous pairs;  
with centromeres attached to the opposite spindles; **4**
- (c) (i) 2;  
(ii) 4;  
(iii) 6; **3**
- TOTAL 9**

**QUESTIONSHEET 4**

- (a) in animals consists of a furrowing/tucking in of the cell membrane;  
eventually separating two nuclei by constriction (of cytoplasm);  
in plants a cell plate/ middle lamella is synthesised between nuclei;  
calcium /magnesium pectate/cellulose secreted to form new cell wall; 4
- (b) centromere in chromosome holds chromatids together;  
provides attachment to spindle during cell division;  
centriole is made of microtubules (in animal cells);  
forms spindle during cell division; 4
- (c) synapsis is pairing of homologous chromosomes;  
in zygotene/early prophase of meiosis;  
chiasmata formation occurs in diakinesis/late prophase of meiosis;  
is cross over of genetic material between chromatids of homologous chromosomes; 4
- TOTAL 12**
- 

**QUESTIONSHEET 5**

- (a) DNA double helix unwinds to give single stranded (primer) DNA;  
upon which the complementary strand is assembled;  
from surrounding nucleotides;  
forming double stranded daughter DNA;  
thus each new DNA has one strand from parent DNA and one new strand; max 4
- (b) genes consist of alleles at corresponding loci on homologous chromosomes;  
all alleles on a particular chromosome/chromatid must be carried together during inheritance;  
chiasmata will swap some of these alleles with those on the sister chromosome;  
thus the allelic make up of the linkage groups is modified; 4
- (c) meiosis reduces two sets of chromosomes to one set/diploid state to haploid state;  
fertilisation joins two haploid nuclei together restoring the diploid state; 2
- TOTAL 10**
- 

**QUESTIONSHEET 6**

- (a) A = chromatid; B = spindle fibre; C = centriole; D = centromere; E = chiasma; 5
- (b) (i) mitosis;  
(ii) metaphase;  
(iii) meiosis;  
(iv) early anaphase I; 4
- (c) cell 2;  
it is purely random which chromosomes of the homologous pairs go to a particular pole;  
thus groups of alleles/linkage groups are mixed up in random fashion;  
giving continuous variation; 3
- (d) will mix up alleles between linkage groups into new combinations;  
giving (more) variation; 2
- TOTAL 14**

**QUESTIONSHEET 7**

- (a) (i) two homologous chromosomes that have paired closely together; 1
- (ii) meiosis; early prophase I/zygotene; 2
- (iii) synapsis; 1
- (b) A = centromere; B = chromatid; C = chromosome; D = chiasma; 4
- (c) (early) anaphase;  
centromeres have moved apart;  
but chiasma is still intact/not yet completed; 3
- TOTAL 11**
- 

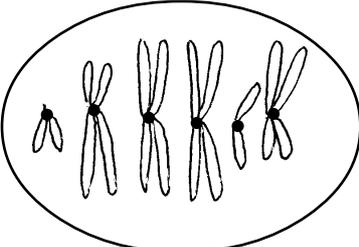
**QUESTIONSHEET 8**

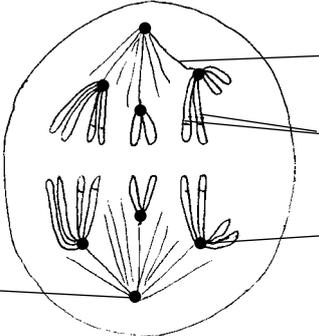
- (a) (i) where there are clear-cut alternatives of a given trait;  
with no intermediate forms;  
tall and short peas/round and wrinkled peas/pigmentation and albinism/any other valid examples;; (any two examples) 4
- (ii) where a given trait has many variations;  
with only minor differences between them;  
height in humans/intelligence/yield in crop plants/any other valid examples;;(any two examples) 4
- (b) genes contain two or more different forms called alleles;  
at corresponding loci on homologous chromosomes;  
thus any individual will have two alleles of the gene;  
if the gene only has two alleles the number of characters available for expression will only be two (thus giving discontinuous variation);  
if a gene has many alleles (polygene) then many variations of the character can occur;  
individual can inherit any two of the variety of alleles (thus continual variation occurs); **max 5**
- TOTAL 13**
- 

**QUESTIONSHEET 9**

- (a) random assortment of chromosomes (at anaphase I);  
random assortment of chromatids (at anaphase II);  
chiasmata formation (in late prophase I/diakinesis); 3
- (b) alleles mixed together from two individuals;  
these alleles may be different forms of the gene thus causing different effects; 2
- (c) most genes are polygenes/contain hundreds of different alleles;  
these have arisen by continued mutation (over millions of years);  
alleles from different parts of the gene pool/population are likely to have different effects (in the phenotype); **max 2**
- (d) (i) shell size/height/width; 1
- (ii) D;  
lines/ridges on the shell; 2
- TOTAL 10**

**QUESTIONSHEET 10**

(a)  6 chromosomes in a row on equator;  
same morphology of chromosomes as in metaphase 1 of meiosis diagram;  
quality and clarity of diagram;  
(chromosomes can be in any order but must not be paired or show chiasmata) **3**

(b)  **5**

Any two of the labels (reject chiasmata) - 2 marks;;  
chromosomes correctly segregating to poles (in correct order and shape);  
spindle and completed chiasmata correctly shown;  
quality and clarity of diagram; (clean, well drawn, joined up lines/  
no shading /reasonable size)

**TOTAL 8**

**QUESTIONSHEET 11**

(a) mitosis maintains the same chromosome number (reject diploid state since mitosis can take place as haploid to haploid) whereas meiosis halves the chromosome number/reduces the diploid state to the haploid state;  
mitosis maintains the same genotype whereas meiosis introduces genetic variation; **2**

(b) random assortment of chromosomes at Anaphase 1;  
random assortment of chromatids at Anaphase 2 ;  
formation of chiasmata; **3**

(c) best answered by a genetic diagram, eg.

P	Aa	×	Aa	alleles A and a in each parent; (any letters acceptable)
gametes	(A)(a)	↓	(A)(a)	equal proportions of each gamete;
F <sub>1</sub>	AA Aa	↓	Aa aa	A is dominant so 3 dominants to 1 recessive;

**3**

**TOTAL 8**

**QUESTIONSHEET 12**

Feature	Mitosis	Meiosis 1	Meiosis 2	
Occurs during gametogenesis	√	√	√	;
DNA replicates before prophase	√	√	×	;
Bivalents form during prophase	×	√	×	;
Chiasmata are formed	×	√	×	;
Chromatids randomly assort during anaphase	×	×	√	;

**TOTAL 5**

(1 mark per correct line)