

**QUESTIONSHEET 1**

- (a) (i) asexual involves only mitosis whereas sexual involves mitosis and meiosis;  
 asexual does not introduce genetic variation whereas sexual does introduce genetic variation;  
 sexual involves a fertilisation process whereas asexual does not/gametes versus no gametes;  
 sexual may involve larva/embryos/pregnancy/seeds whereas asexual may involve binary fission/runners/  
 offsets/bulbs/stolons/any other examples; **max 3**
- (ii) Any two of: bulbs/corms/rhizomes/stolons/runners/tubers/any other valid example;; **2**
- (iii) Any two of: budding in Hydra/Cnidaria/fragmentation in ribbon worms/strobilisation in tape worms;; **2**
- (b) (i) the transfer of pollen from the stamen/anther to the stigma; **1**
- (ii) (usually achieved) by wind or insects; **1**
- (iii) produces more variation/introduces new genetic material;  
 allowing the possibility of evolutionary change;  
 self pollination only mixes the same genes together (and so no new genetic material is introduced); **max 2**
- TOTAL 11**
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**QUESTIONSHEET 2**

- (a) (i) anthers in A are inside the flower, in B they are exposed/outside flower;  
 filaments in A hold anthers upright, in B filaments pendulous/ anthers hanging;  
 anthers in A are small compared with those in B;  
 5 stamens visible in A/A has 10 stamens, B has only 3 stamens; **max 2**
- (ii) A has many carpels, B has only two carpels;  
 small/simple stigmas in A but large feathery stigmas in B;  
 stigmas in A are inside flower but in B are exposed; **max 2**
- (b) (i) it can be cut along any vertical axis to give 'mirror image' halves; **1**  
 colour attracts (pollinating) insects equally from all directions;  
 disperses scent equally in all directions;  
 insects can land on it equally easily on all sides;  
 anthers can dispense pollen onto insects/stigmas receive pollen from insects on any side; **max 2**
- (ii) wind pollination/anemophily; **1**
- (iii) anthers hang out/shake in wind currents (to shed pollen);  
 large anthers produce an (enormous) lot of pollen;  
 pollen is very light/dusty/smooth to be carried in (wind currents);  
 feathery stigmas have a large surface area (to catch pollen); **max 3**
- TOTAL 11**

**QUESTIONSHEET 3**

Feature	Asexual reproduction	Sexual reproduction
Involves cell division by mitosis	✓	✓ ;
Involves cell division by meiosis	✗	✓ ;
Carried out by flowering plants and mammals	✗	✓ ;
Genetic variation may be introduced by random assortment	✗	✓ ;
Genetic variation may be introduced by mutation	✓	✓ ;
May produce a cloned population	✓	✗ ;
Always involves two individuals	✗	✓ ;
Usually produces sterile offspring	✗	✗ ;
Introduces hybrid vigour (remember- hybrid vigour arises from interbreeding between different species)	✗	✗ ;

**TOTAL 9****QUESTIONSHEET 4**

- (a) (i) the transfer of pollen from the anthers to the stigmas;  
of different plants of the same species; **2**
- (ii) one male nucleus (from the pollen) fuses with the egg cell nucleus (in the embryo sac) to produce a zygote;  
the other male nucleus fuses with the (primary) endosperm nucleus to produce a triploid endosperm nucleus; **2**
- (b) (i) flower A has 5 equal/similar petals enabling bee/insect to land equally well from any direction;  
flower B has petals differentiated into a standard petal, two wing petals and a keel petal;  
ref to standard petal for (bumble) bee/heavy insect to land on;  
ref to weight of insect depresses keel exposing stamens and stigma; **max 3**
- (ii) flower A has 10 stamens/anthers which must brush pollen onto bee/insect as it pushes by to reach nectary;  
flower B has 1 free stamen and 9 stamens fused by their filaments to make a tube/channel around the ovary;  
thus bee must push its (long) tongue into filament tube to reach nectar at base;  
this ensures it brushes against the anthers and stigma; **max 3**
- (iii) flower A has many carpals each with a short style and stigma to receive pollen from any direction;  
flower B has an ovary/fused carpals with one stigma and style;  
style hairy to brush pollen off anthers onto underside of bee (when keel depressed);  
bent style jerks upwards suddenly when keel depressed to hit underside of bee (to receive pollen from another plant); **max 3**
- (iv) flower A has radial symmetry/is actinomorphic;  
this enables it to attract insects equally well from all directions/insects can land on it equally easily from any direction;  
flower B has bilateral symmetry/is zygomorphic;  
can only be landed on from a specific direction/in a particular position to depress keel/ref need for a heavy long-tongued insect; **max 3**

**TOTAL 16**

**QUESTIONSHEET 5**

- (a) ref to tubers/stem tubers/swollen underground stems;  
 contain starch/food reserves to enable growth of new plants from the tubers;  
 ref to terminal/lateral buds on tubers from which new plants grow;  
 by mitosis;  
 one plant produces several tubers each of which can produce another plant;  
 ref to overwintering under soil/perennation; **max 4**
- (b) ref to runners/horizontal stems;  
 grow from axillary/lateral buds (of parent plant);  
 where nodes/lateral buds on runner touch the ground;  
 new growth occurs producing shoots and roots;  
 by mitosis;  
 one plant can produce several runners at a time thus increasing number of plants; **max 4**
- (c) ref to budding;  
 by mitosis;  
 buds grow from body wall and differentiate/develop tentacles/mouth/enteron;  
 bud eventually splits/separates from parent at its base/foot and becomes an independent Hydra; **max 3**
- (d) ref to binary fission;  
 nucleus divides by mitosis;  
 cytoplasm divides by constriction between new/daughter nuclei;  
 each cell receives approximately the same amounts of stored food/organelles; **max 3**
- TOTAL 14**
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**QUESTIONSHEET 6**

- (a) (i) anterior pituitary; **1**  
 (ii) ovarian follicle and corpus luteum; **1**  
 (iii) corpus luteum; **1**
- (b) hypothalamus secretes gonadotropin releasing factor/GnRF;  
 which regulates secretion of FSH and LH by the pituitary;  
 ref to feedback control; **max 2**
- (c) (i) increase in concentration during proliferative phase stimulates development of a primary follicle (in the ovary);  
 to become a mature ovarian follicle/ref phase of growth of oogenesis;  
 stimulates oestrogen secretion by follicle;  
 'spike' of FSH secretion stimulates oogenesis/triggers LH secretion; **max 3**
- (ii) rise in oestrogen concentration during proliferative phase stimulates thickening of uterine wall/endometrium/  
 development of glands/blood supply of endometrium;  
 rise in oestrogen concentration eventually inhibits FSH secretion (by negative feedback);  
 rise in oestrogen concentration also stimulates LH secretion (by positive feedback);  
 rise in oestrogen concentration (thus also) stimulates ovulation; **max 3**
- (iii) 'spike' stimulates ovulation;  
 high LH concentration in secretory phase stimulates development of corpus luteum (from remains of ruptured follicle);  
 stimulates corpus luteum to secrete progesterone/oestrogen and progesterone;  
 fall in LH concentration (if there is no implantation) enables return to the menstrual phase; **max 3**
- (iv) increase in progesterone concentration maintains/causes further development of endometrium;  
 ref to increase in blood supply/glandular tissue;  
 fall in progesterone concentration at 25 – 28 days removes maintaining effect;  
 thus uterine wall/endometrium breaks down/ref menstruation occurs; **max 3**

**TOTAL 17**

**QUESTIONSHEET 7**

- (a) false;  
usually it produces genetically identical offspring/clones by mitosis;  
but genetic variation can still be introduced by mutation;  
(most likely) chromosome mutation/(auto)polyploidy;  
due to failure of chromosomes to segregate during anaphase of mitosis/ref to restitution nucleus;  
ref to gene mutation; **max 4**
- (b) false;  
ferns have gametophytes and sporophytes;  
sea anemones have polyps/hydrroids alternating with medusae;  
polyps are asexual, medusae are sexual; **max 3**
- (c) true;  
an earthworm contains both male and female organs/testes and ovaries;  
but these are in different segments of the body;  
male openings and female genital openings cannot meet in the same worm/can only meet with another worm during pairing;  
ref male openings on segment 15/sperm sac receptacles on segment 9/female openings on segment 13; **max 3**
- (d) true;  
they are hermaphrodite/segments/proglottids contain both testes and ovaries;  
usually only one tape worm is present in the gut/host;  
thus must fertilise itself/ref proglottids may cross-fertilise; **max 3**

**TOTAL 13****QUESTIONSHEET 8**

semiferous tubules; testis/testes; spermatogonia; mitosis/mitotic; primary spermatocytes; secondary spermatocytes;  
spermatids; meiosis/meiotic; Sertoli;

ovary; oogonia; yolk/food\*; cytoplasm\*; ovulation; primary oocyte;  
meiotic/meiosis; secondary oocyte; sperm; menopause;

\* these are interchangeable.

**TOTAL 19**

**QUESTIONSHEET 9**

Hormones	Action
Gibberellins in seeds	<b>Stimulates synthesis of enzymes/amylase/protease/lipase;</b>
<b>Testosterone ;</b>	Stimulates development of male secondary sexual characteristics
Oxytocin during birth	<b>Stimulates uterine contractions/dilation of the cervix;</b>
<b>Prolactin ;</b>	Regulates <u>production</u> of milk in mammary glands
Gonadotropin releasing factor	<b>Regulates release of FSH/LH from (anterior) pituitary;</b>
Progesterone in the menstrual cycle	<b>Maintains endometrium/causes further thickening of endometrium;</b>
Progesterone in pregnancy	<b>Inhibits contractions of uterine smooth muscle (thus preventing miscarriage);</b>
Oestrogen before puberty	<b>Stimulates development of female secondary sexual characteristics/breasts/wide hips/other eg;</b>
Ethene in plants	<b>Promotes ripening of fruits;</b>
Chorionic gonadotropin	<b>Maintains corpus luteum and progesterone secretion/takes over role of LH in early pregnancy;</b>

TOTAL 10

## A2.16 ASEXUAL/SEXUAL REPRODUCTION IN PLANTS AND ANIMALS

### ANSWERS & MARK SCHEMES

#### QUESTIONSHEET 10

- (a) so that offspring/seedlings do not compete with parent plants for water/salts/sunlight/do not overcrowd the area and so deplete its resources;  
it will promote outbreeding since when seedlings mature in another area they can cross pollinate with genetically different stock;  
it increases the possibility of becoming established in new habitats/locations; **3**
- (b) (i) explosive/propulsive;  
as pod wall dries it shrinks, thus building up tension;  
suddenly snaps at margins forcibly ejecting seeds (for several metres); **max 2**
- (ii) wind;  
fruit wall/pericarp extended into two wings/reference (double) samara;  
to increase surface area for wind resistance; **max 2**
- (iii) censer mechanism/shaking;  
seeds are shaken out through small holes;  
ref very light seeds/long flexible fruit stem which easily bends in wind; **max 2**
- (iv) animal;  
fleshy fruit contains much sugar/is sweet so eaten by animals;  
seed enclosed in hard endocarp is thrown away/passes through gut into faeces (without digestion); **max 2**
- (v) animal;  
hook catches in animal's fur and is carried away until dislodged;  
hairs on fruit wall also aid attachment to animals; **max 2**
- (vi) wind;  
fruit wall modified into a parachute/pappus of hairs;  
increases surface area for better wind resistance; **max 2**
- (vii) water/ocean currents;  
fibrous fruit wall makes it buoyant/float/traps air to make it buoyant;  
hard/woody endocarp prevents sea water from damaging seed; **max 2**

**TOTAL 17**

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#### QUESTIONSHEET 11

- (a) select several hydroid organisms of similar size/age/number of feeding polyps;  
but with no reproductive polyps/forming polyps;  
must be attached to small stones/bits of seaweed;  
place in tanks of well balanced/fresh seawater:  
maintained over suitable temperature range/eg.5 – 30°C at 5°C intervals;  
oxygenate the water (with diffuser pump);  
agitate water/magnetic stirrer to simulate tidal action;  
experiment should take several weeks;  
observe periodically and record polyps development;  
count number of feeding and reproductive polyps formed at different temperatures;  
replications at each temperature; **max 7**
- (b) put some hydroid organisms with no forming polyps into cool water and some into warm water;  
when polyps start to form transfer half of the organisms in cool water to warm water and half of the organisms in warm water to cool water;  
observe after differentiation to assess whether differentiation differs in organisms which were in cold/warm water throughout and those which were transferred from cold to warm/warm to cold; **3**

**TOTAL 10**

**QUESTIONSHEET 12**

- (a) growing fetus/baby requires a lot of calcium for bone development/ossification;  
this is obtained from mother/mother's blood via placenta;  
calcium could be withdrawn from mother's bones/teeth to supply baby (if mother's intake is low); **3**
- (b) growing fetus needs plenty of iron for haemoglobin/red cell formation;  
obtains iron from mother across placenta/ref transferrin/ferritin;  
iron could be drawn from mother's reserves if her intake is low;  
thus mother/fetus could become anaemic; **max 3**
- (c) fetal haemoglobin is different to adult/post-birth haemoglobin;  
adapted for gas exchange across placenta rather than from air;  
thus in new born babies the fetal haemoglobin is rapidly broken down and replaced with adult haemoglobin;  
the waste products/bilirubin may build up (causing jaundice) if liver cannot deal with them quickly enough; **max 3**
- (d) first milk is colostrum;  
contains many antibodies needed by the baby;  
giving baby passive immunity/immunity for first few weeks of life; **3**
- (e) chemicals in tobacco/alcohol can cross placental barrier into baby;  
may act as a teratogen/cause fetal defects/ref 'fetal alcohol' syndrome;  
baby may become addicted/suffer withdrawal symptoms;  
ref to reduced birth weight of babies from heavy smokers/alcohol drinkers; **max 3**

**TOTAL 15**