

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**

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

TOTAL 10

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**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