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- 1 (a) (i) chloroplasts ; **R** chlorophyll
cellulose cell wall ; **A** 'not made of, murein / peptidoglycan'
(sap / large / permanent) vacuole(s) ; **A** tonoplast
nucleus / nuclear membrane / nuclear envelope ; **R** DNA / RNA
nucleolus ;
mitochondria ;
endoplasmic reticulum / Golgi ;
amyloplasts ; **A** starch, grains / granules
more than one chromosome / linear chromosome(s) ; [4]

- (ii) membrane ;
cytoplasm ;
ribosomes ;
chromosomes ; **A** 'strands of DNA' **R** DNA unqualified
glycogen granules ;
oil droplets ; [max 2]

- (b) cheese ; tofu ;
yoghurt ; soya sauce ;
sour milk ; sauerkraut ;
bread ; vinegar ;
alcohol / any named alcoholic drink ; tapai ;
Quorn / mycoprotein ; tempe / tempeh ;
single cell protein ; kimchee ; [max 2]

- (c) *reject bacteria becoming immune and antibiotics causing mutation*

- 1 mutation / mutant ;
2 stronger wall / less permeable wall / enzyme to breakdown antibiotic / AW ;
3 antibiotic kills bacteria except those that are , mutant / resistant ;
4 antibiotic is, selective agent / AW ; **A** ref to (natural) selection
5 (resistant) bacteria reproduce ; *ignore mitosis* [max 3]

- (d) *this may be answered with reference to insulin*

- 1 fast reproduction rate / AW ;
2 identical offspring / cloning ;
3 small number of genes ;
4 single cells ;
5 copy / use, genes from, other organisms / viruses ;
6 makes, protein / named protein, from another organism ;
7 have plasmids ;
8 used to transfer gene(s) into bacteria / easy to put gene(s) in bacteria ;
A DNA for gene
R product / protein, taken from, human / other organism [max 2]

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- 2 (a) (i) produce / secrete, saliva ; **R** excrete
 amylase / ptyalin ;
 digests / breaks down, starch (to maltose) ;
 water for, enzyme action / hydrolysis ;
 lubricates / softens, food (to make it easier to chew) ;
 ref to pH ; [max 3]
- (ii) grinding / chewing / crushing, food to reduce particle size ;
 surface area increases ;
 for enzymes ;
 makes swallowing easier ; [max 3]
- (b) bacteria, feed on / respire, sugars ; **A** sweets / sugary drinks / AW
 produce acid ; **R** 'sugar turns to acid' / 'sugar is acidic'
 acid, dissolves / AW, enamel ;
 dentine is exposed ;
 dentine, softer / dissolves more rapidly, (than enamel) ; [max 3]
- (c) (fluoride) hardens / strengthens, enamel ; [1]
- (d) people do not have a choice if fluoride is in the water / AW ;
 can choose to use toothpaste with fluoride instead ;
 fluoride can cause, mottling / discolouring, of teeth ;
 only benefits children / does not benefit adults ;
 unknown effects / side effects / harmful to health / poisonous in large amounts ; **A** allergic to
 fluoride, 'not healthy'
 bones become, weaker / more brittle ;
 may cause bone cancer (in boys) ;
 ref to cost ; [max 3]

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- 3 (a) removal of waste (products) of, metabolism / chemical reactions ;
A 'made within cells' as alternative to metabolism
harmful / toxic / poisonous / AW ;
substance(s) in excess of requirements ; [3]
- (b) (i) *accept statements from the question instead of letter*
accept letter written on the structure (no label line) or nearby if clear
reject if letter used on two or more areas and one is incorrect
- F** on cortex / white area between fibrous capsule and stippled medulla ; *allow on glomerulus but not anywhere else on tubule*
R on renal artery *including after it divides* ;
U on ureter ; [3]
- (ii) ref to blood pressure ;
due to the heart / AW ;
ref to capillaries ; **A** glomerulus
small molecules forced out (of blood) ;
two examples ;
urea, water, amino acids, glucose / sugar, salts / ions / minerals, uric acid, ammonia,
any named hormone / spent hormone
- A** any two named, ions / hormones as the two examples [max 3]
- (iii) *glucose mark only the first two answers if more than two given*
- diffusion ;
active uptake / active transport ;
A selective , reabsorption / uptake ; [max 2]
- water mark only the first answer if more than one given*
- osmosis ; **A** diffusion [3]

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- 4 (a) (where sperm are stored before ejaculation) **E** ;
(is cut or tied during a vasectomy) **B** ;
(produces fluid for sperm to swim in) **C** ;
(where meiosis occurs) **F** ; [4]
- (b) (i) urethra ; [1]
- (ii) reduction in flow of urine / difficult to urinate ;
difficult to empty bladder ;
pain (when urinating) ;
needing to urinate more often ;
dribbling / spraying, of urine ;
increased risk of infections of, bladder / kidney / prostate / urethra ;
difficult to ejaculate ; **A** difficulty in release of, sperm / semen [max 2]
- (c) *many examples that candidates may give*
- named structure ;
how diameter is reduced ;
purpose ; [3]
- (d) fertility drugs
FSH / LH / clomiphene / clomid ; **R** oestrogen
causes the ovaries to produce more eggs / AW ;
increases chance of fertilisation ;
ref to in vitro fertilisation ;
female hCG ;
stimulates follicles to release eggs ;
progesterone ;
causes, lining of uterus / endometrium, to thicken ; **A** maintains lining
increases chance of implantation ;
male hCG ;
to stimulate testosterone production ;
FSH / LH / testosterone ;
stimulates sperm production ; max 3
- chemical methods of birth control*
oestrogen / progesterone ;
(contraceptive) pill / patch / injection / implant ; **R** tablet / medicine
prevents FSH release / AW ;
prevents, egg / follicle, development ;
prevents, ovulation / release of eggs ; **A** no egg to be fertilised
(progesterone only pills)
inhibit sperm movement through cervix / plug of mucus at cervix ;
prevents implantation ;
kills sperm in, vagina / cervix ;
prevents sperm, reaching egg / entering oviduct ; max 3 [6]

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- 5 (a) idea that gaseous exchange surface is
place where gases move between organism and its environment ; [1]
- (b) thin / one cell thick / short distance ; **A** ref to, cuticle / epidermis
capillary / blood, near to, surface / epidermis ;
gases dissolve in layer of, water / mucus ; [max 2]
- (c) (i) softens testa ;
activation of enzymes ;
provide medium for transport / AW ;
vacuolation of cells ; **A** ref to cytoplasm
water is a solvent ;
hydrolysis / breakdown of, food stores ;
A involved in reactions **R** photosynthesis [max 1]
- (ii) growth / development (of plumule / radicle / cells) ;
formation of, cytoplasm / organelles / membranes / cell walls / named molecule ;
to metabolise food stores / AW ;
transport ;
active uptake of, minerals / ions ;
cell division / mitosis ; [max 1]
- (d) (i) to (oil droplet) moves, towards the peas / to the left / towards the tube ;
due to uptake of oxygen by seeds ;
carbon dioxide produced is absorbed by soda lime ;
volume of oxygen absorbed = volume of carbon dioxide produced ;
reduction in gas volume in boiling tube ;
reduction in pressure of gas in tube ; [max 3]
- (ii) 1 carry out at, different temperatures / stated temperatures ;
2 allow peas to adjust to (new) temperature ;
3 measure distance travelled by oil droplet ;
4 over known period of time ;
5 rate = distance divided by time ; **A** cm min^{-1}
6 remove bung to allow fresh air in to apparatus / replace soda lime ;
7 repeats at each temperature ;
8 named variable to be controlled ; e.g. mass of, seeds / soda lime [max 5]
- (iii) kinetic energy influenced by temperature ;
more frequent collisions at higher temperatures / fewer collisions at low temperature ;
respiration is controlled by enzymes / AW ;
enzymes denatured by high temperatures ; [max 2]

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- 6 (a) community / (all) organisms / animals and plants / (all) species / (all) populations / AW ;
 (living together) in same, area / place / environment ; **R** habitat
 many habitats ;
 interacting / interdependent / AW ; **A** food chains / food web
 (together with) abiotic / physical / non-living, factors / features ; [max 2]
- (b) they provide excellent food for humans ;
 they provide, sport / fishing, for tourists ; [2]
- (c) (producer) algae ;
 (herbivore) cichlid fish + prawns ;
 (carnivore) Nile perch + humans ; [3]
- (d) 1 algae grow / plants grow ; **A** algal bloom
 2 less light for, plants / photosynthesis ; **A** more competition for light
 3 (therefore) plants die ;
 4 plants stop producing oxygen ;
 5 (aerobic) bacteria / decomposers, feed on dead plants ;
 6 use up oxygen (in respiration) / ref to aerobic ;
 7 low levels of oxygen cause fish to, die / suffocate ; **A** not enough oxygen to breathe /
 AW
 8 bacteria produce toxins which cause fish to die ; [max 4]

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