

**Part I (120 marks)**

**1. any five 2(7) + 3(2)**

- (a) pharynx or throat / larynx / above trachea  
(allow buccal cavity, mouth or above oesophagus)
- (b) corpus luteum
- (c) to equalise (balance) pressure (on each side of the ear drum)
- (d) stems/perennation/storage/buds/adventitious roots/  
/reproduction (propagation)
- (e) open or close stomata (allow exchange of gases or transpiration)
- (f) end of stomach or start of duodenum

**2. 6 (3) + 2**

- (a) (to absorb or remove or test for) oxygen  
(allow "in germination expts. to show O<sub>2</sub> necessary")
- (b) (determine) compensation point (or explain) / test for pH(or explain)
- (c) (test for) water
- (d) (test for) starch/staining or used in experiment on tadpole metamorphosis
- (e) absorb (remove) carbon dioxide or part of Biuret test
- (f) (test for or remove) carbon dioxide
- (g) (test for) reducing sugar (or named)

**3. 2(6) + 4(2)**

Column I	Column II	
Duodenum	mucosa/involuntary muscle	<u>any one</u>
<i>Phytophthora</i>	haustorium	
Endosperm	triploid	
Acrosome	sperm	
Malpighian layer	skin	
Inhalation	diaphragm	

**4. 6(3) + 2**

- (a) virus (or named virus) (allow *Phytophthora* or *Fasciola*, etc.)
- (b) moss/liverwort/named green alga e.g. *Spirogyra*
- (c) fern/named flowering plant or named gymnosperm
- (d) named plant (allow photosynthetic bacterium or chemosynthetic bacterium or named)
- (e) any named free living animal or ectoparasite
- (f) carrot/turnip/etc
- (g) fish or amphibian or reptile /named example of these/named invertebrate

5. [the convention of a wrong answer cancelling a right answer in this Part does not apply in this question as candidates are asked merely to “suggest” reasons] **6(3) + 2**

- (a) high mortality /disease (allow lack of medical knowledge)/food shortage/  
low fertility rate/predation/ poor hygiene/ births = deaths/ low population  
density or isolation /adverse climate/poor housing/primitive agriculture/  
primitive technology/ etc. **any two**
- (b) disease (plague) /named natural disaster (allow war) **any one**
- (c) birth rate greater than death rate/agriculture/increased food supply/  
(improved) food distribution/ (improved) medicine or example of /decreased mortality/  
(improved) housing/technology/ high population density or less isolation  
(improved) hygiene etc. **any two**
- (d) any named limiting resource (space/food supply/oxygen/ water/etc.)/  
equilibrium with parasites (or predators)/competition with other species **any one**  
/build up of waste (materials)/
- (e) disease/predation/named limited resource/cannot use technology/  
human influence **any one**

6. **8(2) + 4 [for (v)]**

- (i) Algae/Thallophyta
- (ii) **W** = hapteron (holdfast) (allow substratum or rock) **Y** = air bladder (allow frond)  
**X** = stipe (stalk) **Z** = vacuole or named content  
*(For either X or Y allow dichotomous branching (once only))*
- (iii) **A** = haploid **B** = diploid
- (iv) sexual
- (v) buoyancy (or description of) /nearer to light/ photosynthesis **any one**

[if “frond” is given as the answer for Y then allow “increased (surface) area as function in (v)"]

7. **5 (2 + 2)**

- (a) **nucleus:** organelle (or relevant structural or functional comment e.g. contains chromosomes)/DNA/ allow control centre/contains the nucleolus/  
**nucleolus:** within the nucleus (if not given above) / relevant comment e.g. involved in nuclear division)/RNA/ forms ribosomes
- (b) **antibiotic:** produced by micro-organisms (bacteria or fungi) / inhibits (kills or fights) micro-organisms (bacteria or fungi)  
**antigen:** stimulates antibody formation (or stimulates immune response)/correct description e.g. protein on cell membrane/acted on (destroyed) by antibody
- (c) **gamete:** sex cell /egg/sperm/capable of fusion  
**gametophyte:** haploid plant (generation or stage)/produces gametes
- (d) **bacillus:** rod shaped (bacterium) or cylindrical  
**coccus :** spherical (bacterium) or round or circular
- (e) **prothrombin;** precursor (or explained) or inactive form or soluble form of thrombin/  
forms thrombin  
**thrombin:** blood-clotting enzyme /converts fibrinogen to fibrin  
[if **prothrombin** not answered allow “formed from prothrombin”]

**Part II (280 marks)**

- 8. (a) structure** - phosphate/deoxyribose/nitrogenous base or named base/  
 /matching base pairs (or example) /double (stranded)/ helix/  
 /hydrogen bonding/ nucleotide *words or labels* **5(3)**
- role in heredity** – (DNA is genetic) code (information)/ can be replicated (duplicated)/passed on  
 to next generation/ triplet (codes) for one amino acid/ base sequence is significant/  
any two **2 (3)**
- 21**
- (b) (i) variation** – difference between individuals (phenotypes) **3**  
**mutation** – change in genetic material (gene, chromosome, DNA,  
 genotype) **3**
- (ii)** this is a valid statement (or implied) **3**  
 (because) the genotype controls the phenotype (or explained)/  
 /changed genotype (mutation) may result in inherited variation  
any one **6**
- (iii)** radiation /chemicals/ viruses  
 (or any 2 named examples of radiation and/or chemicals)  
 (allow cigarette smoke)  
any two **2(3)**
- 21**
- (c) evolution** - changes in populations (or species or named species) **4**
- over long period of time/related to environmental change/  
 /by natural selection/ any one **3**
- Evidence:**
- (i) palaeontology** – explanation of fossil / series showing change or example /  
 /change related to environmental change/  
any two **3 + 3**
- (ii) anatomy** – homologous structures (or explained) /example of/  
 /adaptive radiation (or explained)/example of /  
any two **3 + 3**
- (iii) embryology** – similarity between embryos / two examples from fish, amphibians,  
 reptiles, birds, mammals/adult forms different/  
 /vestigial organs or example  
any two **3 + 3**
- any mention of common descent or common ancestry in any of the above  
 (once only) **3**

9. (a) *dissection*

pin animal /through limbs/ ventral side uppermost /to (dissecting) board (tray)/wet fur/  
/lift skin /make incision along mid line (or description of e.g. "from mouth to anus" /side  
incisions or explained/ /using scissors or scalpel /break connective tissue/pin back (skin or  
body wall)//pins at slant/ lift body wall /make incision / not too deep/ wash out/flag label parts

*words or labels*      any seven      4 + 6(3)

*note: max of 3 points from diagram (labels or points identified)*

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(b) (i)

*location:*

**liver:** (located in) upper abdomen/ under diaphragm/  
/on top of (behind or beside) stomach      3

**pancreas:** (located in) upper abdomen/ next to duodenum/  
/beneath stomach      3

*(correct position can be got from labelled diagram)*

(ii) *role in digestion:*

**liver:** produces bile/emulsifies fats/activates pancreatic amylase/  
/neutralises acid

any two      2(3)

**pancreas:** produces pancreatic juice/enzyme or named enzyme/  
/substrate and product of named enzyme/ neutralises acid

any two      2(3)

*other function:*

**liver:** produces bile pigments/regulates carbohydrate metabolism or example/ assimilation  
or example / deamination (or explained) /detoxification (or explained) /storage/production  
of plasma proteins or example/produces heat/

any one      3

**pancreas:** produces insulin or control of blood sugar level      3

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(c)

*experiment*

named enzyme/named substrate/method of measuring rate/water bath/different  
temperatures/pH constant/method /substrate concentration constant/method /enzyme  
concentration constant/ method / result stated or shown in graph/ replicates

*words or labels*

any seven      7(3)

diagram (water bath, thermometer or temperature stated  
or thermostatic control, test tube)      3, 0

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10. *Biological reasons:*

5 (10) + 5 (4)

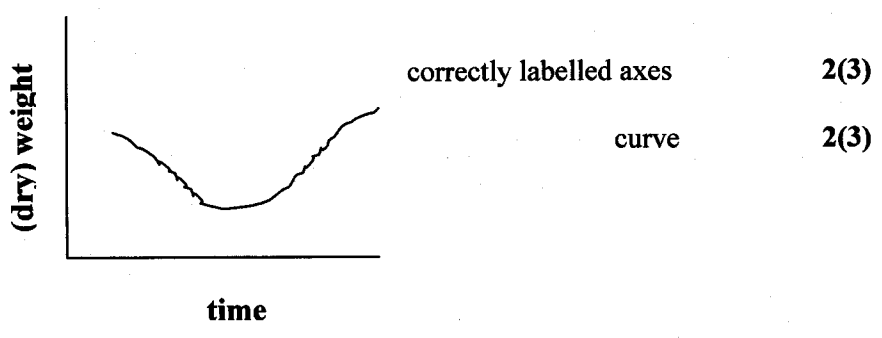
- Amoeba:*
- (i) lives in fresh water (hypotonic) /amoeba is hypertonic /  
water enters by osmosis (or explained)/ osmoregulation (or explained)/ expels excess  
water/ allow "to prevent bursting"  
any one
- ecdysis:*
- (ii) larvae growing/growth restricted by exoskeleton/adult does not grow  
any one
- echinoderms:*
- (iii) spiny skin /radial symmetry/tube feet/  
any one
- earthworm movement:*
- (iv) contraction of circular muscles causes elongation or forward motion/  
contraction of longitudinal muscles causes shortening or restoration of body length/  
/idea of antagonistic muscles  
any one
- risk of liver fluke:*
- (v) too dry for intermediate host (or named) /too dry for larval stages or named larval  
stage or for eggs to hatch  
any one
- vascular system:*
- (vi) fluke absorbs by diffusion /comment on shape or size difference/ earthworm has coelom /  
/fluke no coelom  
any one
- insect/spider:*
- (vii) insects have three pairs of legs/spiders have four pairs of legs/  
/insects have three body regions/spiders have two body regions  
any one
- earthworms in soil:*
- (viii) earthworms improve texture/aerate soil/improve soil drainage/add nitrogen  
compounds/bring down leaf litter/mix soil layers/become humus  
any one
- molluscs:*
- (ix) shell / mantle/ muscular foot / visceral hump or soft body  
any one
- metamorphosis:*
- (x) mammals have no larva /embryo gets food from placenta /  
/young have all basic structures /young resemble adults/  
any one

11. (a)

- (i) **dry weight** - (weight after) water removed 4  
**why used** - wet weight too variable (amount of water can vary) 4
- (ii) 95-105 °C 3  
to avoid combustion/decomposition /destruction 3
- soil sample:*
- (iii) **yes** (stated or implied) 3  
soil contains humus that can combust 3  
(mention of humus sufficient if humus mentioned in (ii))

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(b)



*Explanation:*  
 decrease due to respiration or explained /  
 /increase due to photosynthesis or explained/ 2 (4)

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(c) *organelles:*

**mitochondrion** 3

*diagram* 6, 3, 0  
*[cristae and two membranes required for 6 marks, one missing 3 marks only]*

*labels* – outer membrane, inner membrane, cristae, matrix or lumen  
any three labels 3 (2)

**chloroplast** 3

*diagram* 6, 3, 0  
*[double membrane, granum, lamella required for 6 marks,  
 one missing = 3 marks]*

*labels* – membrane, granum(a), lamella(e) or stroma or starch grain  
any three labels 3 (2)

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12. (a) (i) **name of a deciduous tree** 2
- description**  
 approx. height of mature tree/shape (direction of growth of branches)/ nature of bark /shape of leaf/ /flower/fruit/ *words or labels*  
**any three** 3 (2)
- diagram deciduous tree** (e.g. tree or leaf or flower or fruit) 4, 0  
 (if only the tree is drawn it must be clearly deciduous)
- (ii) **name of a conifer tree** 2
- description**  
 approx. height of mature tree/ /shape (direction of growth of branches)/ shape of leaf, /cone/ male or female cone/ *words or labels*  
**any three** 3 (2)
- diagram coniferous tree** (e.g. tree or leaf or cone) 4, 0  
 ( if only the tree is drawn it must be clearly coniferous)

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- (b) **Diagram Secondary thickening** 6, 3, 0  
 [Show cambium, secondary xylem, secondary phloem, bark, for 6 marks, one missing = 3 marks]

*account of process:*

primary xylem/primary phloem/cambium/new (secondary)xylem to inside/  
 /new (secondary) phloem to outside/cells between bundles become meristematic  
 (interfascicular cambium)/ medullary rays/ cork cambium (phellogen) /  
 cork (phellem)/ secondary cortex (phellogen) /periderm/ annual rings/  
 /heartwood or sapwood/

*words or labels* **any six** 6(2)

*benefit to plant:*

increased water transport/increased food transport/strength or support/  
 /protection/longevity/ stores waste material **any two** 2 (2)

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- (c) **notes on any three:**

3(4 + 4)

**primary meristem** – found at tips of roots or shoots (apical meristem)/  
 /cell division takes place (mitosis)/ responsible for growth in length

**lenticels** – pore (or description) on surface of stem (or root)/  
 /surrounded by cork (in bark)/allows gas exchange

**sclerenchyma** – thickened (cell wall)/lignin/fibres or sclereids/support /  
 /non-living (or empty lumen)/location stated

**phloem** – in vascular bundle or next to xylem /transport of food (translocation)  
 /sieve tubes or companion cells

*if diagram only: allow one point only*

24



13. (a) *Explain:*
- predator** – an animal (organism) that hunts (kills) another animal for food/ animal (organism) that preys on another animal [allow “it” for animal if another animal is mentioned] 3
  - producer** – (an organism that) makes its own food/autotroph 3
  - food niche** – role of named organism (position) in a food chain/ what it feeds on 3
  - mesophyte** – normal land plant / plant adapted to normal soil 3
  - succession** – process of change leading to a climax (community) / changes in species of a habitat 3
  - biosphere** – part of the earth that is inhabited by living organisms 3
- 18

- (b)
- (i) any valid method of capture (nets, pitfall traps, mammal traps, anaesthetic darts, etc.) 4
  - (ii) areas frequented by animal / random / all over habitat / 4
  - (iii) any named tag e.g. paint, ear tag, fin tag, ring etc. 4  
[allow “cur fur” for tag if qualified by a shape or location of cut]  
*method suited to animal named* 4
  - (iv) where it was captured or back to where caught 4
  - (v)  $\frac{\text{number captured on day 1} \times \text{number captured on day 2}}{\text{number of tagged animals recaptured}}$  4  
*[or example with figures]*
- 24

(b) *causes*  
over fishing or described e.g. new technology / capture of immature specimens or mesh too small /breeding cycle interrupted / no discrimination in target fish / season too long /damage due to bottom trawling/pollution or example/

Any two causes from above 2(6)

*prevention*  
increase in minimum mesh size/shortening of fishing season/  
imposition of quotas on catch/ rehabilitation of habitat e.g. sewage treatment /laws or penalties or enforcement/ buy out licences/limit fishing areas

Any two prevention methods from above 2(6)

Essay mark 4  
(award essay marks as long as not a set of notes)



14 (a)

- (i) nitrogen cycle 3
- (ii) nitrogen fixation 3  
*example plant: clover/pea/other named legume/  
 Rhizobium/ Azotobacter/etc.*  
any one 3  
*how NO<sub>3</sub> enters*
- (iii) active transport 3  
 passive transport (diffusion) 3  
*form of nutrition*
- (iv) herbivorous/primary consumption/  
 holozoic (allow heterotrophic)  
any one 3  
*process C*
- (v) ammonification/oxidation/decay (decomposition) 3  
any one 3  
 fungi or named group of fungi 3  
 bacteria or named group of bacteria 3  
 saprophytic(saprobic)/ heterotrophic  
any one 3  
*process D*
- (vi) denitrification/reduction any one 3

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(b) *pure culture:*

sterile dish/sterile (nutrient) medium or agar/ *note 'sterile plate' = 2 points*  
 /minimal opening/flame loop or sterile loop/streak or scatter or transfer (soil)/  
 /incubate or leave/2-5 days//at room temperature or in stated temp from range 15 – 40  
 °C/ upside down/select single colony/repeat procedure

any six 4 + 5(3)

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(c) *viruses:*

- (i) **no** 3  
 viruses need living cells in which to multiply or to grow/  
 /are obligate parasites 3
- (ii) non-cellular/absence of organelles or named organelles or named  
 cell structure/ DNA (RNA) and protein only  
any two 2(3)
- (iii) *in animal;*  
 myxomatosis/rabies/mouse pox/foot and mouth/  
 /distemper etc. any one 3  
*in plant:*  
 mosaic diseases/ swollen shoot in cocoa/  
 /roll diseases etc. any one 3

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**Question 15 any two parts (35, 35)**

**15(a)**

- (i) **transpiration** – loss of water vapour from plants (via stomata) **3**  
**guttation** – loss of liquid water (by plants) **3**  
*(plant or plant structure must be mentioned at least once)*
- (ii) **conditions for guttation**  
 high humidity/still air/high soil water/ low temperature/  
 low light intensity **2(3)**
- (iii) **named apparatus**  
 – potometer (or bell jar or plastic bag) **3**

**diagram** **6, 3, 0**  
*[for 6 marks - shoot, water or reservoir, air bubble]*  
*or [for 6 marks - potted plant, bell jar or plastic bag, relevant sealing]*  
*any one missing = 3 marks*

**description** [maximum of two points from labels] **4(2)**  
 potted plant/pot or plant covered in plastic bag/ sealed around stem/  
 /sealed / bell jar/ leave in warm environment/ test droplets with cobalt chloride  
**OR**  
 cut stem at an angle/under water/potometer with water/ by immersion/  
 /insert stem/ seal /air bubble/ observe movement of air bubble  
**OR**  
 cut shoot at an angle/under water/connect burette to tube/ fill apparatus /  
 with water / burette tap open/ insert stem /seal /observe drop in water level

- (iv) **named xerophyte**  
 cactus/ marram grass/ pine/ gorse/ heather/ etc. **2**  
**adaptations** [must match named plant; if no plant or wrong name, allow a maximum of 2 marks for one adaptation only]  
 rolled leaf/few (small) stomata/ thick (waxy) cuticle /  
 sunken stomata/spines/ water storage or fleshy stem / long roots  
any two **2(2)**

**35**

- 15 (b) (i)** **allele** – a form of a gene **3**  
**locus** – position of a gene on a chromosome **3**  
**homologous chromosomes** – (a pair of chromosomes) with  
 matching (same or similar) genes (alleles) (or containing identical gene loci) **3**  
**heterosomes** – sex chromosomes (X and Y chromosomes) **3**  
**sex linkage** – (location of a) gene on a sex (or X) chromosome **3**

- (ii)
 

1.	50% ( $\frac{1}{2}$ ) - allow 25% ( $\frac{1}{4}$ )	<b>3</b>
2.	50% ( $\frac{1}{2}$ ) - allow 25% ( $\frac{1}{4}$ )	<b>3</b>
	father's genotype (n -)	<b>3</b>
	mother's genotype (N n)	<b>3</b>
	father's gametes n -	<b>2</b>
	mother's gametes N n	<b>2</b>

*offspring*

genotype	nN	nn	- N	- n	<b>2</b>
phenotype	female	female	male	male	<b>2</b>
	(carrier)	normal	blind	normal	blind

*[if father is given two alleles, then marks awarded for mother's genotype and gametes only in the resulting cross]*

- 15 (c) (i) plasma leaks from capillaries (or blood)/some fluid goes to lymph duct  
or any two valid comparisons e.g. watery fluids, proteins, white cells, etc. 2(3)

**diagram** 7, 3, 0

[capillary network, lymph duct, cells or arrows or ECF  
any three for 7 marks; 1 missing = 3 marks]  
[venule, arteriole acceptable as labels] labels 2 (2)  
[accept diagram of a villus]

- (ii) muscular activity or example (or inhalation) /squeezes  
lymph ducts/lymph ducts contract/ valves prevent back flow/gravity/  
any two 2 (3)

- (iii) **transport** - returns leaked plasma (or fluid)/transport of fats /  
/transport of hormones /transport of antibodies/transport of waste matter  
any two 2 (3)

**defence** - produces lymphocytes/produces antibodies/lymph nodes filter  
/action of phagocytes any two 2 (3)

35

- 15(d) (i) **hormone**  
chemical messenger /produced by an endocrine gland /  
/transported in blood/to target area/causes response (has an effect)  
any two 2(3)

**hormones v nerves**  
slower response (nervous faster)/effect of longer duration (nervous of shorter  
duration)/chemical (nervous electrical)/may have several targets (nervous has more  
specific targets  
any two 2 (3)

- (ii) **functions**  
development or growth/role in metabolism or  
examples – increases rate of respiration /increases rate  
of absorption of carbohydrates /regulates lipid metabolism/metamorphosis in tadpoles  
[role in metabolism and example is one point only] 2(3)

**diseases**  
myxoedema/cretinism  
Grave's disease/goitre  
any two 2 (3)

- (iv) **experiment**  
equal numbers of tadpoles / pond water /from same batch of spawn/  
with identical conditions e.g. same temp or food supply/  
any varying concentrations of thyroxine (or iodine) /  
control or comparison /replicates or more than one in  
each container/ results of experiment./ result of control 3 (3)+ 2

(35)