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PRE-LEAVING CERTIFICATE EXAMINATION, 2017

MARKING SCHEME

BIOLOGY

HIGHER AND ORDINARY LEVEL

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INTRODUCTION

1. The scheme contains key words or phrases for which candidates may be awarded marks. This does not usually preclude synonyms or phrases which convey the same meaning as the answer in the marking scheme.
2. In relation to particular answers, the scheme may include the words "any valid answer" and examiners will use their professional judgement to determine the validity of the answer.
3. A key word or phrase may be awarded marks only if it is presented in the correct context.
4. The marks are allocated to reflect as closely as possible the SEC papers. However during the SEC marking process, it is sometimes necessary to alter the allocation of marks, this is particularly obvious in Section A. As a result, the allocation of the marks on this paper will not always mirror exactly the allocation of the SEC marking scheme of the preceding year.

CANCELLED ANSWERS

The following is an extract from S**.**63 *Instructions to Examiners, 2016* (section 7.3, p.22) "Where a candidate answers a question or part of a question once only and then cancels the answer, you should ignore the cancelling and treat the answer as if the candidate had not cancelled it."
e.g. *Question:* What is pollination?
Marking Scheme: transfer of pollen / from anther/ to stigma **3(3) marks**
Sample Answer: ~~transfer of pollen/ by insect/ to stigma~~
The candidate has cancelled the answer and has not made another attempt to answer the question and may be awarded 2(3) marks.
If an answer is cancelled and an alternative version given, the cancellation should be accepted and marks awarded, where merited, for the uncancelled version only. If two (or more) uncancelled versions of an answer are given to the same question or part of a question, both (or all) should be marked and the answer accepted that yields the greater (greatest) number of marks. Points may not, however, be combined from multiple versions to arrive at a manufactured total.

SURPLUS ANSWERS

In Section A a surplus wrong answer cancels the marks awarded for a correct answer.

e.g. # 1 *Question*: The walls of xylem vessels are reinforced with ……
Marking Scheme: lignin **4 marks**
Sample answers:

- chitin, lignin – there is a surplus answer, which is incorrect, so the candidate scores 4 – 4 marks = 0.
- ~~lignin~~ – the answer, which is correct, has been cancelled, but there is no additional or surplus answer, therefore the candidate may be awarded 4 marks.
- lignin, ~~chitin~~ - there is a surplus answer, which is incorrect, but it has been cancelled. The candidate has given more than one answer but the cancelling can be accepted and he/she may be awarded 4 marks.
- ~~lignin~~, chitin – the correct answer has been cancelled and replaced with an incorrect one, so no marks are awarded.

e.g. # 2. *Question*: Name the **four** elements that are always present in protein.
Marking Scheme: Carbon / hydrogen / oxygen / nitrogen **4(3)**
Sample answers:

- Carbon, hydrogen, oxygen, nitrogen, calcium – there is a surplus answer, which is incorrect, and which cancels one of the correct answers, therefore the candidate is awarded **3(3)** marks.
- Carbon, hydrogen, oxygen, calcium – there is no surplus answer, there are three correct answers, therefore the candidate is awarded **3(3)** marks.

- Carbon, hydrogen, oxygen, calcium, aluminium – there is a surplus answer, which is incorrect, and which cancels one of the three correct answers, therefore the candidate is awarded **2(3)** marks.
- Carbon, hydrogen, oxygen, calcium, ~~aluminium~~ – there is a surplus answer, which is incorrect, but it has been cancelled so the candidate may be awarded **3(3)** marks.

MARKING SCHEME CONVENTIONS

1. Where only one answer is required, alternative answers are separated by '**or**'.
2. Where multiple answers are required, each word or phrase for which marks are to be awarded, are separated by a solidus (/) from the next word or phrase.
3. The mark allocated to an answer is indicated in bold next to the answer.
4. Where there are several parts in the answer to a question, the mark awarded for each part appears in brackets e.g. **5 (4)** means that there are five parts to the answer, each part allocated 4 marks.
5. The answers to subsections of a question may not necessarily be allocated a specific mark; e.g. there may be six parts to a question – (a), (b), (c), (d), (e), (f) and a total of 20 marks allocated to the question. The marking scheme might be as follows: **2(4) + 4(3).** This means that the first two correct answers are awarded 4 marks each and each subsequent correct answer is awarded 3 marks.
6. A word, term or phrase that appears in brackets is not a requirement of the answer and is given to contextualise the answer.

New Grading Scale for 2017

New Grades	% Marks
H1/O1	90 - 100
H2/O2	80 < 90
H3/O3	70 < 80
H4/O4	60 < 70
H5/O5	50 < 60
H6/O6	40 < 50
H7/O7	30 < 40
H8/O8	0 < 30

The Department of Education and Skills will introduce a new Leaving Certificate grading scale in 2017. The new scale has 8 grades; the highest grade is a Grade 1, the lowest grade a Grade 8. The highest seven grades 1-7 divide the marks range 100% to 30% into seven equal grade bands 10% wide, with a grade 8 being awarded for percentage marks of less than 30%. The grades at higher level and ordinary level are distinguished by prefixing the grade with H or O respectively, giving H1-H8 at higher level and O1-O8 at ordinary level.

HIGHER LEVEL

Section A **Best five** **5(20)**

1.	**5(4) i.e. best FIVE answers from (a) – (f)**
(a)	*Why iron deficiency:* Menstruation **or** explained
(b)	*Vitamin:* B6 **or** B12 **or** C *Source:* *B6*: Whole grains **or** (fortified) breakfast cereals **or** nuts **or** lean meat **or** seeds **or** fish (tuna / salmon / halibut / swordfish / herring) poultry **or** kidney **or** yeast (extract spreads / named spread (marmite)) **or** bran **or** wheat germ **or** liver **or** banana **or** avocado **or** (sweet) potato with skin **or** oatmeal (porridge) **or** legumes **or** soya beans **or** lentils **or** any correct source *B12*: Shell fish (oysters / mussels / clams) **or** beef liver **or** liverwurst sausage **or** kidney **or** paté de foie gras **or** fish (mackerel / smoked salmon / herring / tuna / canned sardines / trout) **or** egg (yolk) **or** whey powder **or** dairy (milk / yogurt) **or** almonds **or** (named) soy product **or** yeast (extract spreads / named spread (marmite)) **or** any correct source (accept cheese) *C*: Vegetables (cabbage / broccoli / peppers / kohlrabi / brussels sprouts / cauliflower / kale / (sweet) potato with skin / Bok choi / asparagus) **or** tomato (sauce) **or** papaya **or** kiwi **or** orange **or** lychee **or** pineapple **or** grapefruit **or** mango **or** avocado **or** berries (strawberry / raspberry / blueberry / blackberry) **or** any correct source
(c)	*Structural role:* (Named) component of cell membrane *Metabolic role:* storage
(d)	*Mineral:* Na (sodium) **or** Mg (magnesium) **or** Cl (chlorine) **or** K (potassium) **or** Ca (calcium) *Function:* *Na*: Regulation of water content of cells **or** (involved in) conduction of nerve impulses **or** (involved in) muscle contraction **or** maintains blood pressure **or** production of ATP **or** any correct function *Mg*: Enzyme cofactor **or** component of skeleton (bone) **or** protein synthesis **or** blood glucose control **or** blood pressure regulation **or** nerve function **or** regulate cholesterol production **or** protects (stabilises) DNA **or** regulates electrolyte balance **or** synthesis of DNA(RNA) **or** any correct function *Cl:* Regulation of water content of cells **or** (involved in) conduction of nerve impulses **or** component of HCl in stomach **or** maintains pH balance **or** any correct function *K*: Formation of protein **or** regulates heartbeat **or** (involved in) muscle contraction **or** carbohydrate metabolism **or** maintains pH balance **or** production of ATP **or** any correct function *Ca*: Formation of bones (teeth) **or** blood clotting **or** sending (receiving) nerve impulses **or** (involved in) muscle contraction **or** regulates heartbeat **or** stabilises blood pressure **or** activation of enzymes **or** transport of ions across cell membrane **or** any correct function *Note*: function must match named mineral
(e)	*Food:* Egg yolk **or** dairy (milk / yogurt / cheese) **or** (named) meat **or** (named) fish **or** (named) legume **or** any correct example *Positive result:* Mauve (purple / lilac) colour appears
(f)	*Water needed:* Component of cytoplasm (body fluids) **or** solvent **or** medium for chemical reactions **or** takes part in chemical reactions **or** movement of materials into (out of) cells **or** (high specific heat capacity) aids in cooling down body *Any two*

2.	**6(3) + 2**
(a)	*Areas of study:* Botany **or** zoology **or** microbiology **or** anatomy **or** physiology **or** ecology **or** genetics **or** biochemistry **or** taxonomy **or** cytology **or** any correct example *Note*: two areas needed to get the marks
(b)	*Diversity:* Wide variety
(c)	*Life:* (Organism that) shows metabolism / continuity (Answer contains 2 points, so complete answer would be awarded 6 marks)
(d)	*Organisation:* Basic unit (building block) is a cell / all activities carried out by (in) cells (Answer contains 2 points, so complete answer would be awarded 6 marks)
(e)	*Excretion important:* Buildup of poisons (toxins) would (cause) lead to (eventual) death

3.	**6(3) + 2**
(a)	*Denaturation:* Change in shape (of active site)
(b)	1. *Use of pH3:* *Pepsin:* Optimal (highest level of) activity (answer must indicate optimal) *Trypsin:* No activity **or** enzyme (trypsin) completely denatured (if second alternative must indicate completely) 2. *How pH kept constant*: (use of) buffer (solution)
(c)	1. *Immobilised enzymes:* Trapped (attached) to an inert material 2. *How immobilised:* (Trapped in) alginate beads
(d)	*Industrial application:* (Production of) lactose-free milk **or** (convert) corn starch to corn syrup **or** production of fructose **or** (immobilised rennin in) cheese production **or** (named) antibiotic production **or** biodiesel production **or** (used as) biosensors **or** any correct application

4.	**6(3) + 2**
(a)	*Group of bases:* Purines
(b)	*Type of bonding:* Hydrogen bonding
(c)	*Why helix unwinds:* Enzymes
(d)	*Function of RNA polymerase:* Joins nucleotides together (to give mRNA product) **or** to make RNA
(e)	*Part of cell:* 1. *Transcription:* Nucleus *2. Translation:* Cytoplasm
(f)	*Why folding necessary:* (To) become functional

5.	**6(3) + 2**
(a)	*External factors:* Light intensity **or** day length **or** gravity **or** temperature *Any two*
(b)	*1. Region responsible:* Meristematic (region) (don't accept named region) *2. How transported:* Vascular system **or** diffuse from cell to cell
(c)	*Growth regulator:* *Name:* Named regulator and its effect *Note*: No marks awarded for naming regulator, unless its effect is given correctly *Promotes or inhibits growth:* Auxin: promotes (growth) **or** ethane: inhibits (growth) **or** any correct example
(d)	*Methods of protection:* *Anatomical*: (Presence of) bark (dermal tissue / cuticle) **or** stomata and guard cells (both must be named) **or** absence of leaves (in cactus) **or** spikes / thorns (on cactus) **or** thorns (on thistles) **or** (fine) stinging hairs (on nettles) **or** (formation of) callus over a wound *Any one method* *Chemical*: (production of) heat shock proteins **or** (production of) Phytoalexins (to help kill microorganisms that enter plant) **or** (production of) alkaloids **or** (production of named) poison *Any one method*

6.	**6(3) + 2**
(a)	*Is cell motile:* Yes *Explain:* (Presence of) flagellum *Note*: No marks awarded for yes unless correct explanation also given. Also no marks can be awarded for the explanation unless the candidate has correctly answered yes. There are only 3mks being awarded here and yes + correct explanation are both required.
(b)	*Identify parts:* *1. Protection:* Capsule *2. Drug resistance:* Plasmid
(c)	*Organelle absent:* Mitochondria **or** chloroplasts
(d)	*Role of endospores:* (Ensure survival in / allow it to withstand) unfavourable conditions
(e)	*Chemosynthetic*: (Use) energy released from chemical reactions (to make food) *Example*: Nitrifying bacteria **or** any correct example

Section B **Best two** **2(30)**

7. (a) **2(3)**
(i) *Molecule from which lactic acid produced:* Pyruvate (pyruvic acid) (ii) *Where does Kreb's Cycle occur:* Mitochondrion
7. (b) **5(3)**
(i) 1. *Two features to indicate anaerobic:* Oil layer / boiled glucose (solution) 2. *Glucose used up:* No more bubbles **or** reduction in number of bubbles **or** rate of production of bubbles slows (down) 3. *Why boiled yeast suitable control:* (Heat) denatures enzyme(s) *Note:* answer must refer to enzyme(s), killing cells not acceptable 4. *Alternative control:* (Distilled / deionized) water
7. (b) **3(3)**
(ii) 1. *Absence of limewater:* None *Explain:* (Limewater only present to) test for CO_2 2. *One factor apart from temperature kept constant:* (Same) concentration of glucose **or** (same) concentration of yeast

8. (a) **2(3)**
(i) *Ecology:* (Study of) relationships (interactions) among (between) organisms and (their) habitats (environment) (ii) *Purpose of ecological pyramids:* (Method of) comparing different communities (within an ecosystem) in order of different feeding (trophic) levels
8. (b) **8(3)**
(i) *Two pieces of apparatus:* *Any two* *Animal 1*: Any correct but must match named ecosystem *e.g.* beetle *Apparatus*: pitfall trap *Animal 2*: Any correct but must match named ecosystem *e.g.* butterfly *Apparatus*: insect net *Note*: No marks awarded for naming animal unless correct piece of apparatus is named also (ii) *Two points on how apparatus used:* *Any two* Any two valid points *E.g.* Pitfall trap: container (jar / tin) placed in hole in ground with rim level with soil / place grass (leaves) in the bottom / cover with wood (tile / flat stone) / (cover is) slightly raised (above the ground)

(iii) *How to investigate one climatic factor:*
Factor: Temperature **or** rainfall **or** humidity **or** wind speed **or** light intensity **or** any valid factor
Procedure: Environmental comparator (thermometer) **or** rain gauge **or** hygrometer **or** light meter (photometer) **or** any valid procedure
Note: Procedure described must match named factor

(iv) *How are results presented:* Tables **or** diagrams **or** (named) graph **or** (named) histogram **or** any correct method

(v) *One way to improve investigation:* Any valid comment *e.g.* repeat the investigation at various times of the year (various times of the day) **or** use of more animals traps

9. (a) **2(3)**

(i) *Metabolism:* Reactions that take place within living cells

(ii) *Why photosynthesis is an anabolic reaction:* Simple (small) molecules built (converted) into complex (large) ones (molecules)

9. (b) **8(3)**

(i) 1. *How rate measured:* Count number of bubbles per minute (stated time frame)
2. *One source of error:* Error in counting bubbles **or** error in measuring time interval **or** error in measuring distance of lamp from plant **or** error in making up concentration of $NaHCO_3$ **or** did not allow pondweed (Elodea) to adjust to its new conditions **or** any valid error

(ii) 1. *Sterile or aseptic environment:* Aseptic
2. *Explain:* Not all microbes are destroyed
3. *Precautions:* Disinfect bench **or** flame cork borer **or** flame forceps **or** reflame forceps **or** seal plates (before incubating) *Any two*

(iii) 1. *What characteristic of membrane:* (They are) semi-permeable (selectively-permeable)
2. *Condition on either side of membrane:* Different concentration (either side of membrane) **or** (presence of) concentration gradient

10. (a)	
(i) *Genotype of each parent:* Rr; Rr *Note*: Candidate may use any letter to denote hair colour but they must indicate clearly the letter they are using.	**2(3)**
(ii) *Chance of next child with red hair:* 25% **or** 1 in 4	**3**
10. (b)	
(i) *DNA Profiling*: Searching (looking) for pattern (band) to compare	**3**
Genetic screening: (Want to) identify (establish) presence (absence) of a (changed) gene	**3**
(ii) *1. Break down the cell wall:* Chopping the tissue **or** use of a blender	**3**
2. Break down the cell membrane: Addition of wash-up liquid	**3**
3. Precipitate the DNA: (Add) ice-cold ethanol	**3**
(iii) *Which step not required when using blood sample:* Chopping **or** blending **or** first step	**3**
Reason: Absence of (no) cell wall *Note:* Mention of plant cell insufficient, must refer to absence of cell wall. No marks can be awarded for second part if the first part isn't answered	**3**
(iv) *Basis of separation:* Size	**3**
(v) *Purpose of staining:* Easier to see **or** (make them) more visible	**3**
10. (c)	
(i) *Two stages of cell cycle:* Interphase / mitosis (accept meiosis)	**2(3)**
(ii) *One function of meiosis:* (Allow) sexual reproduction / produce gametes **or** introduce variation / new combination of genes (produced)	**3**
Location in plant: Pollen grain **or** ovule	**3**
(iii) *Animal or plant cell:* Animal	
Reason: (Presence of) cleavage furrow *Note*: No marks awarded for answering animal unless correct reason given, so no marks for animal on its own	**3**
(iv) *Phase before telophase:* Anaphase	**3**
What happens to chromosomes: (Chromosomes) pulled to opposite ends of the cell	**3**
(v) *Name of disorders:* Cancer	**3**

11. (a)	
(i) *Teeth in adult dog:* 42	**3**
(ii) *Molars in lower jaw:* 6	**3**
(iii) *Type of digestion:* Mechanical *Note:* Do not accept chewing food.	**3**
11. (b)	
(i) 1. *Process shown:* Peristalsis	**3**
2. *Why food enters oesophagus not trachea:* (Presence of) epiglottis *Note:* epiglottis must be named. *Flap of tissue* not sufficient	**3**
3. *Role of sphincter muscles:* Contract and relax / allow food enter (leave) stomach	**2(3)**
(ii) *Two reasons mucosal barrier necessary:* Protect against HCl **or** protect against (auto) digestion by pepsin **or** protect against erosion from acids (caustic substances) ingested *Any two* *Note:* HCl and pepsin must both be named. Acid and enzyme unacceptable.	**2(3)**
(iii) 1. *Site of production of sodium bicarbonate:* Pancreas	**3**
2. *Why sodium bicarbonate necessary:* Neutralise chime (food)	**3**
(iv) *Where does deamination occur:* Liver	**3**
11. (c)	
(i) *Location of ileum:* (Lower) abdomen	**3**
(ii) *How features aid absorption:*	
Long: (Food) in contact (with wall of ileum) longer	**3**
Villi: Increase surface area for absorption	**3**
(iii) *One other way ileum adapted to function:* Micro-villi **or** wall one cell thick **or** well supplied with blood vessels *Any one*	**3**
(iv) *How end products of fat digestion reach liver:* Enter (lymph vessels called) lacteals / found in villi / pass through lymphatic system / enter blood via sub-clavian vein / brought to liver via hepatic portal vein *Any four*	**4(3)**

12. (a)	
(i) *Three germ layers:* Ectoderm, mesoderm, endoderm *Note:* All three layers must be answered correctly, otherwise no marks can be awarded.	**3**
(ii) *One body system from each of two layers:* *Ectoderm:* Brain **or** spinal cord skin **or** hair **or** nails *Mesoderm*: Muscles **or** skeleton **or** blood system **or** reproductive organs **or** kidneys *Endoderm*: Lining of gut **or** lungs **or** pancreas **or** liver *Note*: System named must match germ layer.	**2(3)**
12. (b)	
(i) *One reason hormonal control more appropriate:* Sustained nature (of hormone) action **or** effects last over a period of time **or** good control as a result of negative feedback **or** any valid comment	**3**
(ii) *What is menstruation:* Shedding of endometrium (lining of uterine wall) *Note*: Lining of uterus not acceptable	**3**
Why it occurs: Drop in level of oestrogen (progesterone)	**3**
(iii) *Composition of morula:* Solid ball of (several hundred) cells	**3**
Where located: Fallopian tube	**3**
(iv) *Part which forms placenta:* Trophoblast	**3**
(v) *Is placenta an endocrine gland:* Yes *Explain:* (It) releases hormones directly into the bloodstream *Note*: No marks awarded for answering yes unless correct reason given.	**3**
(vi) *Hormone which causes wall of uterus to contract:* Oxytocin	**3**
Gland responsible for its production: Pituitary (gland)	**3**
12. (c)	
(i) *Stage of development when meiosis occurs:* (Division of) diploid microspore mother cell forming haploid spores	**3**
(ii) *Function of generative nucleus:* Divide by mitosis forming male gametes	**3**
(iii) *Describe double fertilisation:* Male gamete fuses with egg / to form diploid zygote / male gamete fuses with two polar nuclei / to form triploid endosperm	**4(3)**
(iv) *Link between hay fever and pollen:* Allergic reaction (to pollen) **or** hypersensitivity reaction (to pollen)	**3**
(v) *Function of growth regulators produced by seeds:* Stimulate growth of fruit (tissues)	**3**

13. (a)

(i) *Benefit to bacteria:* The legume (plant) provides carbohydrate **or** favourable environment (shelter) **or** supply sufficient oxygen to make ATP but not enough to inhibit nitrogenase the N-fixing enzyme — **3**

(ii) *Where else free-living nitrogen fixers found:* Soil — **3**

(iii) *One other way nitrates formed:* Lightening — **3**
Note: Accept thunder storms

13. (b)

(i) *Group of organisms bacteria belong to:* Prokaryotes **or** Monera — **3**

(ii) *Why PET used in packaging:* Light (weight) **or** inert (doesn't react with food) **or** easily moulded (or can be made (folded) into many shapes) *Any one* — **3**

(iii) *Both products of breakdown:* Terephthalic acid and ethylene glycol — **3**
Note: Both needed for the three marks

(iv) *Use of landfill sites:*
Advantage: Cheaper **or** (methane) gas produced could be used as fuel (to generate electricity) *Any one* — **3**
Disadvantage: Unsightly **or** could contaminate ground water **or** smell **or** attract vermin *Any one* — **3**

(v) *How bacterium attached to PET:* Tendril-like threads — **3**

(vi) *Why it could be used to remove polluting plastics:* Complete digestion of the plastic **or** digestion can take place in situ (so no need to collect pollutants) *Any one* — **3**

(vii) *Further steps carried out:* Identified the gene — **3**
Significance of the work: Don't need the organism **or** (could) use immobilised enzymes **or** cheaper **or** faster **or** reuse enzymes **or** any valid comment *Any one* — **3**

13. (c)

(i) 1. *Differences:*
Structural: Change in physical structure (of organism) — **3**
Behavioural: Change in the way it (the organism) acts — **3**
Note: Example on its own insufficient

2. *Two examples of structural adaptations and how each benefit animal:* — **2(3)**
Earthworm (snail): Mucus prevents drying out **or** badger: sharp claws for digging **or** squirrel: tail aids in balance when climbing **or** lion (named wild cat): long (sharp) canine (teeth) kill prey **or** bee: proboscis suitable for sucking nectar **or** ladybird: bright colour deters predators **or** molluscs (snails): shell provides protection **or** any valid example *Any one*

3. *Reason adaptation may occur:* Change in vegetation **or** new predator appears **or** change in source of food **or** change in colour of vegetation as seasons change **or** any valid reason *Any one* — **3**

(ii)	*1. Abiotic factor*: *one from each* *Terrestrial*: pH **or** air temperature **or** ground temperature **or** light intensity **or** air current **or** mineral content **or** percentage air in soil **or** percentage soil water **or** percentage humus **or** salinity **or** degree of exposure **or** slope *Any one* *Aquatic*: Temperature **or** light intensity **or** salinity **or** pH **or** water current **or** dissolved oxygen *Any one* 2. *Environmental factor of human origin:* Pollutants **or** burning **or** deforestation **or** invasive species **or** mowing **or** overgrazing (by animals) **or** desertification **or** drainage **or** any valid example *Any one*	**2(3)** **3**

14. (a)		
(i)	1. *Organelle where chlorophyll located:* Chloroplast	**3**
	2. *Wavelength of most absorption:* 470 (accept any value between 460 – 480)	**3**
	3. *Advantage or disadvantage:* Advantage *Explain:* Absorb more (sun) light (energy) so increased rate of photosynthesis *Note:* Marks not awarded unless explanation is correct, so no marks for advantage on its own	**3**
(ii)	1. *Why non-cyclic:* (Energised) electrons that leave chlorophyll trapped in $NADP^+$ so do not return to chlorophyll	**3**
	2. *Role of electron transport chain:* Provide energy to make ATP	**3**
(iii)	R*ole of $NADP^+$:* ($NADP^+$) receives 2 electrons to become $NADP^-$ / which receives H^+ forming NADPH / enters dark (light-independent) stage / the hydrogen used to reduce (added to) CO_2 / glucose formed *Any four*	**4(3)**
(iv)	*Way to increase crop growth and why effective:* (Use of) artificial light: allows photosynthesis to continue beyond daylight hours **or** (use of) artificial heating: allows photosynthesis to continue at an increased rate **or** (use of) additional carbon dioxide: allows photosynthesis to continue at an increased rate *Any one*	**3**

14. (b) (i) *Explain autoimmune disorder:* (Part of) body attacked by itself (its own immune system)	**3**
(ii) *Cell responsible for protective coating:* Schwann cell **or** oligodendrocyte	**3**
(iii) *Effect of damage to coating:* Slow down (prevent) transmission of (nerve) impulse *Part of neurone where coating located:* Axon	**3** **3**
(iv) *Why vitamin D is of benefit:* (Vitamin D may) lessen the frequency and severity of their symptoms	**3**
(v) *Association of kidney stones with prolonged intake:* (Vitamin D) increases the absorption of Calcium	**3**
(vi) *Transmission of nerve impulse:* <u>(When) the ions reach synaptic knobs (of presynaptic neuron / nerve cell)</u> / neurotransmitters (named neurotransmitter / acetylcholine) / released into cleft (synapse / gap between nerve cells (neurons) / impulse set up in next (post synaptic) neuron (nerve cell) / <u>enzymes break down (inactivate) neurotransmitters (named neurotransmitter / acetylcholine)</u> *Any four* *Note:* first and last points compulsory and any other two points	**4(3)**

14. (c) (i) *Two structural differences between blood and lymph systems:* *Blood System*: Closed system / two circuit (double circulatory) system *Note*: This can be answered from the point of view of the lymph system, open (system) / single circuit (system), but in both cases it must be clear to which system the student is referring.	**2(3)**
(ii) *Portal system*: Begins and ends in capillaries	**3**
(iii) *What is a pulse*: Wave of vibrations passing down (along) wall of artery / due to (caused by) expansion of artery	**2(3)**
(iv) *Two differences between blood cells and human cells*: No (absence of) nucleus / no (absence of) mitochondria	**2(3)**
(v) *Where blood pressure measured*: Artery of upper arm	**3**
(vi) *What does blood pressure measure:* Amount of pressure required to stop flow of blood in the artery	**3**
(vii) *Other classification system:* Rhesus	**3**

15. (a)	
(i) *Feature of eukaryotes:* (Possess) membrane bound nucleus **or** membrane-bound organelles **or** named organelle *Any one*	**3**
(ii) *Example of unicellular:* (Baker's / brewer's) yeast **or** Saccharomyces (cerevisiae / boulardii) **or** Candida (albicans) **or** Cryptococcus neoformans **or** Pityrosporum ovale **or** any correct example *Any one*	**3**
Example of multicellular: Bread mould **or** Rhizopus **or** mushrooms **or** toadstools **or** Penicillium **or** Aspergillis **or** Mucor **or** any correct example *Any one*	**3**
(iii) *Whether beneficial or harmful and explained:* Named example, whether beneficial or harmful and explanation provided Yeast: Beneficial: bread making **or** Penicillium: beneficial: provides antibiotics **or** Candida albicans: harmful: causes thrush *Note:* Answer must include example, if beneficial or harmful, and an explanation to back up answer. **All three** necessary to get the 3mks	**3**
(iv) *Which group of biomolecule does chitin belong:* Carbohydrates	**3**
(v) *Types of nutrition in fungi:* (Fungi are) heterotrophs / saprophytes (gain nutrition / live on) dead (organic) matter / parasites (gain nutrition / live on) live (organic) matter	**3(3)**
(vi) *Importance of role as decomposers:* Recycling of minerals (named mineral) **or** minerals (named mineral) returned to soil	**3**
(vii) *Purpose of budding:* Reproduction	**3**

15. (b)	
1.	
(i) *What is a tissue:* group of (similar) cells adapted to carry out similar function	**3**
Function of dermal tissue: protection	**3**
(ii) *Differences between vessels and tracheids:* Tracheids tapered at both ends, vessels no end walls (perforated end walls) **or** tracheids narrower (than vessels) **or** tracheids shorter in length (than vessels) **or** tracheids have pits on side-walls (vessels don't) *Any two*	**2(3)**
One other function of xylem: Support	**3**
(iii) *Feature shared with red blood cells:* (Both) dead at maturity	**3**
2.	
(i) *Process of movement of water:* Osmosis	**3**
(ii) *Structures on stem through which water lost:* Lenticels	**3**
(iii) *Role played by adhesive and cohesive forces:*	
Adhesive forces: (Water molecules) adhere (stick / cling) to the walls of the vessels, maintaining an unbroken column of water (preventing the column of water breaking)	**3**
Cohesive: (Water molecules) stick (cling / adhere) together (due to Hydrogen bonding) so forming an unbroken column of water (preventing the column of water breaking)	**3**

15. (c)	
(i) *Type of joints:*	
(a) immovable (fused)	**3**
(b) slightly movable	**3**
(ii) *Where are bones shown in (b) located:* Spine (backbone)	**3**
(iii) *Biomolecule in cartilage:* Protein	**3**
(iv) *Type of joint:* Synovial (joint)	**3**
Location: Knee	**3**
(v) *Function of ligaments:* Hold bones together	**3**
(vi) *Effect of torn cruciate ligament:* Excess movement of bones **or** dislocation **or** damage synovial membrane **or** meniscal tear	**3**
(vii) *To what type of tissue tendons are attached:* Muscle	**3**
(viii) *Other protective feature:* Synovial fluid	**3**

ORDINARY LEVEL

Section A. Answer **five** questions **2(30)**

1			**5(4)**
	(a)	*Element only in protein:* Nitrogen (N)	(1 pt)
	(b)	*Form carbohydrates stored in body:* Glycogen	(1 pt)
	(c)	*Two types of molecules which make up fat:* Fatty acids / glycerol	(2 pts)
	(d)	*Two groups of vitamins are:* Water soluble / fat soluble	(2 pts)
	(e)	*Two reasons water is important in the body:* (Helps) keep (body) temperature constant (because slow to heat up and cool down) **or** solvent (for transport of substances) **or** medium for metabolism (chemical reactions to take place) **or** reactant (product) in (named) chemical reaction **or** good absorber of energy (heat) (so helps keep temperature constant) **or** aids in movement of dissolved materials (in and out of cells)	(2 pts)

2			**5(4)**
	(a)	*Explain hypothesis:* Educated guess **or** (possible) explanation **or** attempt to explain observations	(1 pt)
	(b)	*Two steps before forming a conclusion:* Design a controlled experiment / collect and interpret (analyse) data	(2 pts)
	(c)	*What is conclusion compared with:* Existing knowledge	(1 pt)
	(d)	*Explain random selection:* (Choosing / selecting) without bias (conscious thought / method)	(1 pt)
	(e)	*Why is sample size significant:* Bigger sample (gives / provides) more accurate (better results)	(1 pt)

3			**6(3) + 2**
	(a)	*Explain terms:* *Allele*: alternative form of a gene *Dominant*: gene that is expressed **or** masks (hides / prevents) expression of other gene (recessive gene)	(2 pts)
	(b)	*Write out genotypes:* *Homozygous taster:* TT *Heterozygous taster:* Tt	(2 pts)
	(c)	*All possible gametes of heterozygous taster:* T / t	(2 pts)
	(d)	*Term used to describe physical expression of genotype:* Phenotype	(1 pt)

4			**6(3) + 2**
	(a)	*Basis on which bacteria classified:* Shape	(1pt)
	(b)	*Explain terms:* *Photosynthetic*: use energy from the sun (to make food) *Chemosynthetic*: use energy from chemical reactions (to make food)	(2 pts)
	(c)	*Substance responsible for resistance to antibiotics:* Plasmid	(1pt)
	(d)	*Structure found outside wall for extra protection:* Capsule **or** slime layer	(1pt)
	(e)	*Two factors which affect growth of bacteria:* Temperature / oxygen (concentration) / pH / external solute concentration / pressure	(2 pts)

5			6(3) + 2
	(a)	*Explain cell diversity:* Structure changes according to function.	(1pt)
	(b)	*Explain relationship between organ and tissues:* Organ is made up of group of similar tissues / that work together	(2 pts)
	(c)	*One type of organ in plants:* Root **or** stem **or** leaf **or** flower **or** seed **or** fruit	(1pt)
	(d)	*What is a clone:* Genetically identical to parent	(1pt)
	(e)	*Name two conditions necessary for tissue growth apart from oxygen and food:* Growth factors (hormones) / correct pH / optimum temperature / sterile conditions / freedom from competition *Note* two points must be given to get the marks.	(1pt)
	(f)	*One application of tissue cultures:* Plant breeding **or** vegetative propagation **or** micropropagation **or** skin grafts **or** cancer research **or** antibodies **or** insulin **or** interferon **or** (human) organs for transplant **or** any correct application	(1pt)

6			6(3) + 2
	(a)	*Why breathe through nose rather than mouth:* Moistens (air) **or** warms (air) **or** filters (air by hair and mucus)	(1pt)
	(b)	*Place where cartilage located in breathing system:* Trachea **or** bronchus	(1pt)
	(c)	*Where in diagram does exchange of gases occur:* Alveoli	(1pt)
	(d)	*Which labelled part of diagram is called the voicebox:* Larynx	(1pt)
	(e)	*What happens diaphragm when we breathe in:* Moves down **or** flattens	(1pt)
	(f)	*Possible cause and treatment of named disorder:* ***Asthma:*** *Cause*: allergen (pollen / fruit mould / feathers / animal hair (fur) / household dust / dust mites / cold air / perfumes / household chemicals / paint) **or** air pollutants (coal / dust / chalk dust / cigarette smoke) **or** allergic reaction to (named) medicines **or** allergic reaction to (named) foods **or** lung infections (bacterial / viral) **or** mucus from sinusitis **or** exercise **or** stress (anxiety) **or** any valid cause *Treatment*: (bronchodilator) inhalers **or** named inhaler **or** (named) medication **or** avoid (known) triggers **or** any valid treatment ***Bronchitis:*** *Cause*: Viral infection (common cold) **or** following flu **or** bacterial infection (Streptococci / Staphylococci) **or** smoking **or** air pollutants **or** repeated chest infections **or** any valid *Treatment*: stop smoking **or** (bronchodilator) inhalers **or** oxygen cylinder (in extreme cases) **or** antibiotics (to clear infection) **or** exercise (strengthens muscles) **or** mucolytics (to make mucus easier to cough up) **or** take plenty of fluids (thins mucus so easier to cough up) **or** any valid treatment	(2 pts)

Section B. Answer **two** questions **2(30)**

7	**(a)**			**5+1**
		(i)	*Name arteries that supply blood to heart:* Coronary (arteries) *Accept* cardiac (arteries)	(1pt)
		(ii)	*Location of intercostal muscles:* (Between the) ribs **or** rib cage	(1pt)
	(b)			**8(3)**
	(i)	**1.**	*How to position heart on dissection board:* Ventral side (front) up **or** dorsal side down **or** more rounded side up **or** flatter side down	(1pt)
		2.	*Instrument used for dissection:* Scalpel **or** blade **or** scissors **or** knife	(1pt)
		3.	*Two safety procedures:* White coat / safety glasses / gloves / any other correct	(2 pts)
	(ii)	**1.**	*Purpose of measuring rate at rest:* Resting (normal) rate **or** control **or** mention of comparison	(1pt)
		2.	*How recovery time measured:* Take breathing rate (pulse rate) / after exercise stops / until it returns to resting rate *Any two*	(2 pts)
		3.	*What does long recovery time indicate:* Lack of (don't take) regular exercise *Accept* (people / group are) unfit	(1pt)

8	**(a)**			**5+1**
		(i)	*Name the storage carbohydrate found in animals:* Glycogen	(1pt)
		(ii)	*Name the storage carbohydrate found in plants:* Starch	(1pt)
	(b)	**(i)**		**8(3)**
		1.	*Colour change if test is positive with iodine:* (turns) blue (black)	(1pt)
		2.	*One food that will test positive with iodine:* bread **or** rice **or** potato **or** pasta **or** any valid example	(1pt)
		s3.	Plant (cell) **or** onion (cell) **or** named plant cell	(1pt)
		(ii)	*One other stain used:* Methylene blue	(1pt)
		(iii)	*How to vary pH:* (Use of) buffer (solution) **or** explanation of use of (named) acid and (named) base	(1pt)
			How temperature kept constant: Thermostatically controlled water bath **or** explanation of using water bath with thermometer	(1pt)
		(iv)	*How to vary light intensity:* (Use of) bulbs of various wattage **or** light source at different distance	(1pt)
			How to vary CO_2 concentration: (Use of) different concentrations of sodium hydrogen carbonate solution (bread soda)	(1pt)

9	**(a)**			**5+1**
		(i)	*In what part of cell does anaerobic respiration occur:* Cytosol (accept cytoplasm)	(1pt)
		(ii)	*Name end-product of anaerobic respiration in humans:* Lactic acid	(1pt)
	(b)			**8(3)**
		(i)	*Two ways of ensuring anaerobic conditions:* Use of cold boiled water to make up (named) solutions / layer of oil covering solution (use of fermentation lock)	(2 pts)
		(ii)	*Proof CO_2 produced:* Limewater / turns milky	(2 pts)
		(iii)	*Control used:* No yeast **or** boiled yeast	(1pt)
		(iv)	*How do you know fermentation stopped:* No more bubbles **or** no more CO_2 produced	(1pt)
		(v)	*Name the second product of the reaction:* Alcohol **or** ethanol	(1pt)
		(vi)	Iodoform test (potassium iodide and sodium hypochlorite) **or** bleach **or** (acidified potassium / sodium) dichromate	(1pt)

Section C. Answer any **four** questions

10	**(a)**			**7 + 2(1)**
		(i)	*Explain the term genetics:* (Study of) inheritance **or** heredity **or** chromosomes **or** genes **or** DNA	(1pt)
		(ii)	*Explain the term species:* (Organisms) capable of (able to) interbreeding and producing fertile offspring	(1pt)
		(iii)	*In DNA what does D stand for:* Deoxyribose	(1pt)
	(b)			**9(3)**
		(i)	*Where in the nucleus are the genes located:* (On the) chromosomes	(1pt)
		(ii)	*Explain the term gene expression:* (Taking/decoding) information from gene / to make a protein	(2 pts)
		(iii)	*What is the function of non-coding DNA:* (Involved in) gene expression **or** separates genes *Accept*: does not contain genes	(1pt)
		(iv)	*One way in which DNA and RNA are structurally similar and also how they differ:* *Same*: both contain adenine (guanine/cytosine) *Different*: DNA: (made up of) double strand (RNA: single strand) **or** DNA: (contains) deoxyribose (RNA: ribose) **or** DNA: (contains) thymine (RNA: uracil) **or** DNA: long (molecule) (RNA: short) *Note*: candidate can answer from either point of view but unless it's clearly stated then assume answer refers to DNA. Differences must be structural otherwise no marks awarded	(1pt) (1pt)
		(v)	*Role played by RNA in protein synthesis:* Code on DNA transcribed / onto mRNA / (leaves cell and) goes to ribosome / code translated / amino acids assembled in correct sequence *Any three*	(3 pts)
	(c)			**8(3)**
		(i)	*Term used to describe the cell when not undergoing cell division*: Interphase *One organelle produced during this stage*: mitochondrion **or** chloroplast **or** any correct organelle	(1pt) (1pt)
		(ii)	*Diploid number of cell:* 4	(1pt)
		(iii)	*Function of mitosis in multicellular organisms:* Growth **or** repair	(1pt)
		(iv)	*Define meiosis*: daughter nuclei contain half the number of chromosomes (of parent nucleus) **or** explained *Note*: do not accept production of gametes *One location in humans where meiosis occurs*: ovaries **or** testes	(1pt) (1pt)
		(v)	*Explain relationship between mitosis and cancer:* Loss of ability to control rate (of mitosis/cell division)	(1pt)
		(vi)	*One possible cause of cancer:* Smoking **or** uv radiation **or** viruses **or** asbestos (fibres) **or** inherited genetic defect **or** Hepatitis B **or** Hepatitis C **or** Human Papilloma virus (HPV) **or** Helicobacter pylori **or** Epstein Barr virus **or** obesity **or** poor diet **or** lack of physical activity **or** alcohol **or** BRCA1 (gene) **or** BRCA2 (gene) **or** any valid example	(1pt)

11	**(a)**			**7 +2(1)**
		(i)	*Purpose of nervous system in animals:* (Allow them to) respond to changes in their environment (surroundings/body) **or** explained	(1pt)
		(ii)	*Difference between CNS and PNS:* *CNS*: (composed of) brain and spinal cord *PNS*: all nerves outside of CNS **or** nerves leading to and from CNS	(1pt) (1pt)
	(b)			**9(3)**
		(i)	*Explain difference between dendrites and axons:* *Dendrite*: transmit (conduct/bring) (nerve) impulse to cell body *Axon*: transport (conduct/bring) (nerve) impulses away from the cell body	(1pt) (1pt)
		(ii)	*Which part of neuron produces neurotransmitter chemicals:* Cell body	(1pt)
		(iii)	*Location of myelin sheath in neuron*: (around) axon *Effect of myelin sheath on transmission of impulses*: speed up (transmission)	(1pt) (1pt)
		(iv)	*What is an interneuron*: carry impulses (messages) between (sensory and motor) neurons *Where is it located*: CNS (central nervous system)	(1pt) (1pt)
		(v)	*Explain difference between grey and white matter:* *White matter*: (contains/composed/made up of) axons *Grey matter*: (contains/composed/made up of) cell bodies and dendrites	(1pt) (1pt)
	(c)			**8(3)**
		(i)	*What are hormones:* Chemical messengers	(1pt)
		(ii)	*Explain exocrine and endocrine:* *Exocrine*: has ducts **or** secretes hormones through ducts *Endocrine:* Ductless glands **or** secrete (hormones/products/chemicals) directly into blood stream	(1pt) (1pt)
		(iii)	*Location of thyroid gland*: neck *Hormone produced by thyroid*: thyroxine	(1pt) (1pt)
		(iv)	*One example of use of hormone supplements:* Treatment of diabetes (using insulin) **or** HRT (alleviate menopause symptoms) **or** contraception (pill) **or** growth hormone (to treat potential dwarfism) **or** thyroid hormone (to treat potential cretinism) **or** (anabolic steroids in) body building **or** any valid use	(1pt)
		(v)	*Two ways nervous and hormonal systems differ:* *Nervous*: electrochemical **or** carried by nerves **or** fast acting **or** short term *Hormonal:* chemical **or** carried in blood **or** slow acting **or** long term *Note:* question can be answered from the point of view of the hormonal system but it must be clear to which system they are referring to.	(2 pts)

12	**(a)**			**7+2(1)**
		(i)	*Main source of energy in ecosystem:* Sun	(1pt)
		(ii)	*Explain the terms ecology and biosphere:* *Ecology:* (Study of relationship between) organisms and their environment *Biosphere:* Part of the earth (and atmosphere) that supports life	(1pt) (1pt)
	(b)			**9(3)**
		(i)	*How does author define noise pollution:* Excessive sounds that can harm the balance of both human and animal life **or** explained	(1pt)
		(ii)	*Is noise pollution a recent problem*: yes *Explain the answer above*: more roads **or** more (named) vehicles **or** more heavy machinery **or** aircraft **or** any valid example *Note:* candidate can answer no but must be able to back up the statement with a reasonable comment	(1pt) (1pt)
		(iii)	*Explain the term habitat:* where an organism lives	(1pt)
		(iv)	*One example of how organisms lives are interrelated:* Animals depend on plants for food (shelter) **or** plants depend on animals (insects) to pollinate them **or** plants depend on animals to disperse seeds **or** any valid example	(1pt)
		(v)	*Two other forms of pollution due to human activity:* Light **or** thermal **or** named source of air pollution **or** CFC's **or** (named) plastics **or** oil slick **or** slurry **or** fertiliser run off **or** glass **or** batteries **or** any valid example	(2 pts)
		(vi)	*What is conservation*: wise management of natural resources *Why is it necessary*: prevent extinction **or** (to maintain) biodiversity **or** (to maintain) the balance of nature **or** reduce (effects of) pollution	(1pt) (1pt)
	(c)			**8(3)**
		(i)	*What is a food web*: (shows the) feeding connections in a habitat (ecosystem) *How is a food web constructed*: interconnect the food chains **or** explained	(1pt) (1pt)
		(ii)	*What is a grazing food chain:* Initial plant is living (producer / green plant)	(1pt)
		(iii)	*Name a primary producer from food web shown*: grain **or** grass **or** carrot *Name a secondary consumer*: fox **or** owl **or** bird	(1pt) (1pt)
		(iv)	*What term is used to describe animal at second trophic level:* Herbivore	(1pt)
		(v)	*At what position would you expect to find:* *Grasses:* Base **or** bottom (layer) *Owls:* Apex **or** top (layer)	(1pt) (1pt)

13	**(a)**			**7+2(1)**
		(i)	*Explain the terms:* *Ingestion:* Taking in food **or** taking food into body (mouth) *Digestion:* Breaking down food (into smaller pieces)	(1pt) (1pt)
		(ii)	*Why is digestion necessary:* (To make the) food small enough to be absorbed (pass into the bloodstream)	(1pt)
	(b)			**9(3)**
		(i)	*Location of incisor teeth*: front (of mouth) *Function of incisor teeth*: cutting **or** biting **or** slicing *One structural feature which helps in carrying out this function*: sharp **or** chisel-shaped (flat)	(1pt) (1pt) (1pt)
		(ii)	*Name of flap of tissue that prevents food entering trachea:* Epiglottis	(1pt)
		(iii)	*Location of HCl*: stomach *Function of HCl*: converts (the inactive enzyme) pepsinogen to pepsin (accept activates pepsin) **or** sterilises food (kills microorganisms/ bacteria) **or** loosens fibrous (cellular) foods **or** denatures (salivary) amylase	(1pt) (1pt)
		(iv)	*In the case of lipase state:* *Where produced:* Pancreas **or** (named part of) small intestine *Site of action* Duodenum **or** ileum *End-products:* Fatty acids and glycerol (both required)	(1pt) (1pt) (1pt)
	(c)			**8(3)**
		(i)	*Where are bile salts* *Made:* Liver *Stored:* Gall bladder	(1pt) (1pt)
		(ii)	*Two functions of large intestine:* Reabsorption of water / elimination of faeces	(2 pts)
		(iii)	*Two benefits to humans of symbiotic bacteria:* Production of vitamin B (K) **or** protect against pathogenic bacteria **or** (may) protect against bowel cancer (by inhibiting the growth of tumours)	(2 pts)
		(iv)	*Two advantages of diet high in fibre:* Stimulates peristalsis (bulks up food giving muscles something to push against) **or** (helps) prevent constipation (by absorbing water and keeping faeces soft) **or** (helps) eliminate cholesterol **or** (helps) prevent bowel cancer **or** makes you feel full so (helps) prevent over-eating **or** encourages growth of symbiotic bacteria	(2 pts)

14			Any two parts from (a), (b), (c)	30, 30
	(a)			**10(3)**
		(i)	*Explain germination:* Growth (of seed)	(1pt)
		(ii)	*Which factor is being investigated:* Water (is necessary)	(1pt)
		(iii)	*Function of A:* Control	(1pt)
		(iv)	*Temperature for this investigation:* Room temperature **or** 15ºC – 25ºC	(1pt)
		(v)	*Colour change you expect in the limewater:* Turns (goes) milky	(1pt)
		(vi)	*Why does this colour change occur*: carbon dioxide (CO2) produced *Name of biochemical process responsible for colour change*: respiration	(1pt) (1pt)
		(vii)	*Name the part of the seed that:* *Develops into the plant:* Embryo *Protects the seed:* Testa (accept seed coat) *Stores food:* Cotyledon **or** endosperm	 (1pt) (1pt) (1pt)
	(b)			**10(3)**
		(i)	*One place in body where this type of joint is found:* Knee **or** hip **or** shoulder **or** elbow	(1pt)
		(ii)	*Name one other type of joint*: immovable **or** slightly movable *Location of this type of joint*: between skull bones / in skull (accept in the head) **or** between vertebrae (accept in the back bone) / between hip bones	(1pt) (1pt)
		(iii)	*Two functions of cartilage:* Prevents friction (between bones) / acts as shock absorber (don't accept: protection without clarification)	2pts
		(iv)	*Cartilage living or non-living:* Living	(1pt)
		(v)	*Type of tissue connecting muscle to bone:* Tendons	(1pt)
		(vi)	*Name used to describe muscle pairs:* Antagonistic	(1pt)
		(vii)	*Describe how a muscle pair brings about movement:* One (named) muscle moves (brings) bone up (bends joint) / other (named) muscle straightens joint (brings bone down)	(2pts)
	(c)			**10(3)**
		(i)	*Explain terms:* *Permeable*: lets everything through (in and out) *Impermeable*: lets some things through (in and out)	 (1pt) (1pt)
		(ii)	*What is passive transport:* No energy required	(1pt)
		(iii)	*One example of diffusion:* Smell of perfume (smoke/cooking/baking/ coffee/any valid example) **or** sugar in tea **or** salt in cooking (soup) **or** dye in water **or** oxygen (O_2) into lungs **or** CO_2 into blood **or** stink bomb **or** any valid example	(1pt)
		(iv)	*Name the semi-permeable membrane you used:* Visking tubing **or** potato **or** egg **or** any correct example	(1pt)
		(v)	*Describe process of turgidity:* (Plant) cell surroundings more concentrated / water flows in / vacuoles collect water / cells swell (push) against cell wall *Any three*	(3pts)
		(vi)	*Explain how high salt / sugar solutions preserve food:* (Named) micro-organism surrounded by more concentrated solution / lose water to surroundings / cell shrinks (becomes plasmolysed) and dies A*ny two*	(2pts)

15			Any two parts from (a), (b), (c)	30, 30
	(a)			**10(3)**
		(i)	*Hormone responsible for secondary sexual characteristics in males:* Testosterone	(1pt)
		(ii)	*What part of testes are sperm stored:* Epididymis	(1pt)
		(iii)	*Why are testes found outside the body:* Sperm must be stored (kept) below body temperature	(1pt)
		(iv)	*Explain the difference the following terms:* *Ovulation*: Release of egg (from ovary) *Fertilisation*: Fusion of (named) gametes / forming a zygote *At what stage of cycle does ovulation occur*: (Day) 14 (accept day 13 – 15)	(1pt) (2 pts) (1pt)
		(v)	*Name one hormone produced by the placenta:* Progesterone **or** oestrogen	(1pt)
		(vi)	*One cause of male infertility*: low sperm count **or** low (poor/loss of) sperm mobility **or** endocrine gland failure (low level of testosterone) *One corrective measure*: change in diet (lifestyle) **or** place sperm directly into fallopian tube **or** drug therapy **or** IVF **or** concentrate sperm **or** (use of) sperm donor **or** any valid measure	(1pt) (1pt)
	(b)			**10(3)**
		(i)	*Chamber of heart that pumps blood around body:* Ventricle	(1pt)
		(ii)	*To which part of body does pulmonary system carry blood:* Lungs	(1pt)
		(iii)	*Molecule in RBC that carries O_2:* Haemoglobin	(1pt)
		(iv)	*Two ways structure of arteries and veins differ: Arteries:* thicker wall / no valves / small lumen *Note*: answer can be given from point of view of veins but it must be clear from which point of view the question is being answered (Veins: thinner walls / valves (present) / large lumen)	(2 pts)
		(v)	*One way blood system protects the body:* White (blood) cells produce antibodies **or** platelets help blood clotting	(1pt)
		(vi)	*One protective function of lymph*: phagocytes destroy micro-organisms **or** production of antibodies *One transport function*: transport digested fats (products of fat digestion) **or** return tissue fluid to blood **or** transport hormones	(1pt) (1pt)
		(vii)	*Two ways change of lifestyle would benefit circulatory system:* Eat less (saturated) fat **or** exercise regularly **or** avoid excess stress **or** eat less salt **or** don't smoke *Any two*	(2 pts)

	(c)			**10(3)**
		(i)	*Explain terms:* *Saprophyte*: obtains food from / dead (decaying) organism (matter) *Parasite*: obtains food from / another living organism *Note*: obtains food from is only awarded the marks once *Rhizopus*: saprophyte	(3 pts) (1pt)
		(ii)	*Process by which Rhizopus obtains nutrients from bread:* Enzymes released into bread / (bread) broken down into soluble components (chemicals) / (which) diffuse back into *Rhizopus* (hyphae) *Any two*	(2 pts)
		(iii)	*Is Rhizopus harmful or beneficial*: harmful *Explain you answer*: (named) food spoilage (decay/goes off/goes bad) **or** (named) food waste *Note*: no marks awarded for stating harmful, but no marks can be awarded for the second part unless *Rhizopus* is classified as harmful	(1pt)
		(iv)	*One aseptic technique used:* Swab bench with disinfectant **or** sterilise instrument (equipment) **or** named piece of equipment **or** seal Petri dish **or** flame equipment **or** place equipment in disinfectant **or** correct method of disposal (autoclave / pressure cooker / place in a sealed bag and give to teacher / soaked in disinfectant) *Temperature at which plates incubated:* Room temperature **or** (any temperature within the range 15ºC – 25ºC) *Appearance of yeast colonies:* Pink (blobs / spheres)	(1pt) (1pt) (1pt)

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