



**Coimisiún na Scrúduithe Stáit**  
**State Examinations Commission**

**Leaving Certificate 2016**

**Marking Scheme**

**Biology**

**Higher Level**

### **Note to teachers and students on the use of published marking schemes**

Marking schemes published by the State Examinations Commission are not intended to be standalone documents. They are an essential resource for examiners who receive training in the correct interpretation and application of the scheme. This training involves, among other things, marking samples of student work and discussing the marks awarded, so as to clarify the correct application of the scheme. The work of examiners is subsequently monitored by Advising Examiners to ensure consistent and accurate application of the marking scheme. This process is overseen by the Chief Examiner, usually assisted by a Chief Advising Examiner. The Chief Examiner is the final authority regarding whether or not the marking scheme has been correctly applied to any piece of candidate work.

Marking schemes are working documents. While a draft marking scheme is prepared in advance of the examination, the scheme is not finalised until examiners have applied it to candidates' work and the feedback from all examiners has been collated and considered in light of the full range of responses of candidates, the overall level of difficulty of the examination and the need to maintain consistency in standards from year to year. This published document contains the finalised scheme, as it was applied to all candidates' work.

In the case of marking schemes that include model solutions or answers, it should be noted that these are not intended to be exhaustive. Variations and alternatives may also be acceptable. Examiners must consider all answers on their merits, and will have consulted with their Advising Examiners when in doubt.

### **Future Marking Schemes**

Assumptions about future marking schemes on the basis of past schemes should be avoided. While the underlying assessment principles remain the same, the details of the marking of a particular type of question may change in the context of the contribution of that question to the overall examination in a given year. The Chief Examiner in any given year has the responsibility to determine how best to ensure the fair and accurate assessment of candidates' work and to ensure consistency in the standard of the assessment from year to year. Accordingly, aspects of the structure, detail and application of the marking scheme for a particular examination are subject to change from one year to the next without notice.

## Introduction

The marking scheme is a guide to awarding marks to candidates' answers. It is a concise and summarised guide and is constructed so as to minimise its word content. Examiners must conform to this scheme and may not allow marks for answering outside this scheme. The scheme contains key words, terms and phrases for which candidates may be awarded marks. This does not preclude synonyms or terms or phrases which convey the same meaning as the answer in the marking scheme. Although synonyms are generally acceptable, there may be instances where the scheme demands an exact scientific term or unequivocal response and will not accept alternatives. The descriptions, methods and definitions in the scheme are not exhaustive and alternative valid answers are acceptable. If it comes to the attention of an examiner that a candidate has presented a valid answer and there is no provision in the scheme for accepting this answer, then the examiner must first consult with his/ her advising examiner before awarding marks. As a general rule, if in doubt about any answer, examiners should consult their advising examiner before awarding marks.

Key words or terms or phrases may be awarded marks, only if presented in the correct context e.g. Question: Outline how water from the soil reaches the leaf.

Marking scheme: Concentration gradient/ root hair/ osmosis/ cell to cell/ root pressure/ xylem/ cohesion (or explained)/ adhesion (or capillarity or explained)/ Dixon and Joly/ transpiration **or** evaporation/ tension *any six 6(3)*.

Answer: "Water is drawn up the xylem by osmosis" Although the candidate has presented two key terms (xylem, osmosis), the statement is incorrect and the candidate can only be awarded 3 marks for referring to the movement of water through the xylem.

## 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)**.

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 uncanceled version only. If two (or more) uncanceled 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, therefore 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 and as the candidate has given more than one answer (i.e. the candidate is answering the question more than once only), the cancelling can be accepted and he/ she may be awarded 4 marks.

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.

In the other sections of the paper, there may be instances where a correct answer is nullified by the addition of an incorrect answer. This happens when the only acceptable answer is a specific word or term. Each such instance is indicated in the scheme by an asterisk \*.

## Conventions

- Where only one answer is required, alternative answers are separated by ‘**or**’.
- Where multiple answers are required each word, term or phrase for which marks are allocated is separated by a solidus ( / ) from the next word, term or phrase.
- The mark awarded for an answer appears in bold next to the answer.
- 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.
- 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 encountered are awarded 4 marks each and each subsequent correct answer is awarded 3 marks.
- A word or term that appears in brackets is not a requirement of the answer, but is used to contextualise the answer or may be an alternative answer.

1.

2(7) + 3(2) i.e. best five answers from (a) – (f)

- (a) *Ecology*: The study of (the various interactions between) organisms and their environment
- (b) *Symbiosis*: (A relationship) between species in which at least one benefits
- (c) *Nutrient recycling*: Reuse (of nutrients)
- (d) *Contest competition*: A struggle for a resource in which only one wins
- (e) *Edaphic*: (Relating to) soil
- (f) *Biotic*: (Relating to) living (organisms)

2.

2(3) + 7(2)

- (a) *Non-metallic element in proteins*: Sulphur (or S)
- (b) *Metabolic role of protein*: Enzymes **or** hormones **or** antibodies **or** contractile (protein)  
**or** named protein + role
- (c) *Structural role of protein*: (Component of) hair **or** nails **or** muscle **or** membranes **or** chromosomes
- (d) *Components of lipid*: (i) Glycerol  
*Components of lipid*: (ii) Fatty acid
- (e) *Where phospholipids*: Membrane(s)
- (f) Named mineral  
Matching role
- (g) *Human cell water % by mass*: 70 - 95% i.e. percentage or percentage range within this range

3.

2(5) + 5(2)

- (a) *Why asexual:* Only one parent (cell)
- (b) *Asexual reproduction. in yeast:* Budding
- (c) (i) *Genetic make-up compared to parent:* Identical
- (ii) *Explain:* (Reproduced by) mitosis
- (d) *Advantage:* Rapid **or** characteristics maintained (or example) **or** no variation
- Disadvantage:* Increased risk of disease **or** overcrowding **or** increased competition
- or** no variation
- (e) *Same kingdom as yeast:* Rhizopus **or** (field) mushroom **or** named fungus **or** named fungal group

4.

5(3) + 5(1)

- (a) (i) *Chance roan × white → red:* 0%
- (ii) *Chance roan × red → red:* 50%
- (iii) *Chance roan × roan → red:* 25%
- (b) (i) *Sex-linkage:* When genes are carried on the sex (or X or Y) chromosome(s)
- (ii) *More likely:* Males
- (iii) *Male genotypes and phenotypes:*
- Genotype:  $X^nY^-$
- Phenotype: Sufferer

*Female genotypes and phenotypes:*

Genotype:  $X^nX^n$

Phenotype: Sufferer

(or lethal for haemophilia)

Genotype:  $X^NX^n$

Phenotype: Normal

**OR**

*Explain:* Male only needs to inherit the recessive allele (from mother)

**or** female must inherit the recessive allele from each parent.

**or** female may be a carrier

**or** female recessive homozygote is a sufferer (or lethal for haemophilia)

5.

5(3) + 5(1)

- (a) A: Stigma  
B: Pollen tube  
C: Egg (or female gamete or ovum)
- (b) (i) *How D to A:* Wind  
(ii) *How D to A:* Insect (or animal)
- (c) *How E from D:* Mitosis
- (d) (i) *Fate of Es:* (One) fuses with the egg (nucleus)  
(ii) *Fate of Es:* (The other) fuses with the (2) polar nuclei

**OR**

- (d) (i) *Fate of Es* (One) forms gametes  
(ii) *Fate of Es:* (The other) disintegrates
- (e) *Name F:* Ovule  
*Develops into:* Seed

6.

2(5) + 5(2)

- (a) *Long stage of cell cycle:* Interphase
- (b) (i) (ii) *Biomolecule types produced:*  
Nucleic acid (or DNA or RNA)/ protein/ fat/ carbohydrate *Any two*
- (c) *Organelle replicated:* Mitochondrion **or** chloroplast **or** ribosomes **or** centriole
- (d) *Two other changes:* Condensed (short or thick or coiled) chromosomes or chromosomes visible (under microscope)/ disappearance of nuclear membrane/ formation of spindle/ chromosomes duplicated or DNA replicated *Any two*
- (e) *Why no division of red blood cells:* No nucleus

<b>7.</b> (a)	<b>2(3)</b>
<p><i>Two scientific method limitations:</i> The extent of our knowledge/ the basis of investigation/ ability to interpret results (or human error or bias)/ application to the natural world in a state of change/ accidental discovery</p> <p style="text-align: right;"><i>Any two</i></p>	
<b>7.</b> (b)	<b>4(4) + 4(2)</b>
<p>(i) 1. <i>Control substance:</i> Water <b>or</b> a non-reducing sugar (or example) 2. <i>Control colour at end</i> Blue</p> <p>(ii) 1. <i>How add small volume:</i> Dropper <b>or</b> pipette <b>or</b> syringe 2. <i>How keep pH constant:</i> Use a (pH) buffer</p> <p>(iii) 1. <i>How transfer cells:</i> Transfer described (e.g. swab) 2. <i>How improve visibility:</i> Add a stain (or named stain) <b>or</b> add a coverslip</p> <p>(iv) 1. <i>Gel:</i> (Sodium) alginate 2. <i>To make gel insoluble:</i> Calcium chloride</p>	

<b>8.</b> (a)	<b>2(3)</b>
<p>(i) <i>Pulse:</i> The (rhythmic) stretching (or expanding or vibrating) of an artery</p> <p>(ii) <i>Why pulse at wrist:</i> Artery near the surface</p>	
<b>8.</b> (b)	<b>4(4) + 4(2)</b>
<p>(i) <i>Control:</i> Rate (measured) at rest</p> <p>(ii) <i>Purpose of control:</i> To compare with the results (of the experiment)</p> <p>(iii) <i>Axes labels</i> x-axis 'duration (of exercise)' <b>or</b> 'time' <b>or</b> level of exercise y-axis 'rate'</p> <p><i>Curve or plot showing:</i> B increases by a greater amount</p> <p>(iv) <i>How measure recovery time:</i> Immediately (after exercise)/ count pulse or breathing/ rate or per minute/ measure length of time until resting rate reached</p> <p style="text-align: right;"><i>Any three</i></p>	



9. (a)

2(3)

- (i) *Dormancy:* Period of low (or no) metabolism **or** period during which germination does not occur **or** period of no growth **or** period of low (or no) activity
- (ii) *Contribution of digestion:* To make nutrients (or food) soluble **or** to make nutrients (or food) available **or** to make nutrients (or food) transportable (to the embryo) **or** to make nutrients (or food) more easily absorbed (by embryo)

9. (b)

4(4) + 4(2)

*Starch agar or skimmed milk agar: if neither stated, award maximum of six points i.e. [4(4) + 2(2)]*

*Enzyme in (i) must match named substrate i.e. starch or protein*

*Named reagent colour changes must match named substrate in parts (iv) and (v)*

- (i) *Type of enzyme:* Amylase **or** protease (or named protease)
- (ii) *Why soak seeds:* To enable metabolic activity (or digestion) **or** to start up the germination process **or** to allow nutrients dissolve (or to move) **or** to activate enzymes **or** to soften the testa **or** to break dormancy
- (iii) 1. *Why sterilise seeds:* To kill (or remove) all microorganisms
2. *Why open-side down:* Enzyme exposed to (or in contact with) the substrate
- (iv) *How know had occurred:* (Flooded plates with) iodine or biuret (solution)  
Clear areas around (under) seeds (or described)
- (v) *How know had not occurred:* No clear areas **or** all areas stain positive colour
- (vi) *Reason for observation in (v):* Seeds were dead **or** enzyme had been denatured

10.	(a)	(i)	<i>Niche</i> : An organism's role <b>or</b> an organism's function (in the ecosystem).	3
		(ii)	<i>If answers do not match named ecosystem, maximum of 3 marks</i>	
			1. <i>Safety hazard</i> : Any valid hazard (e.g. wet grass or broken glass)	3
			2. <i>Source of error</i> : Any valid error (e.g. miscounting <b>or</b> misidentification)	3
	(b)	(i)	1. <i>Animal collection method</i> : Pitfall trap <b>or</b> mammal trap <b>or</b> beating tray <b>or</b> pooter <b>or</b> picked up <b>or</b> any named suitable method	3
			2. <i>Identification</i> : (Identification) key <b>or</b> photograph(s) <b>or</b> picture(s)	3
			3. <i>Quantitative method details</i> : (place) quadrat/ count named plant or note presence of named plant/ repeat/ tabulate or record/ how result expressed	2(3)
			How random	3
		(ii)	<i>Why random</i> : To prevent bias	3
		(iii)	<i>Abiotic factors</i> : pH/ temperature/ light intensity/ water current/ air current (or wind)/ dissolved oxygen/ mineral content/ % air in soil/ % water in soil/ % humus/ salinity/ (degree of) exposure/ slope/ aspect/ altitude/ soil type	2(3)
		(iv)	<i>Human activity</i> : Pollution <b>or</b> conservation <b>or</b> waste management <b>or</b> any valid example	3
	(c)	(i)	<i>Trophic level</i> : Position on the food chain <b>or</b> feeding level <b>or</b> energy level <b>or</b> feeding stage	3
		(ii)	<i>Why chains short</i> : Little (10%) energy passed on to next level <b>or</b> large amount (90%) of energy lost at each level	3
		(iii)	<i>Secondary consumer</i> : *C	3
		(iv)	<i>Why C might decline</i> : Predation <b>or</b> increase in D <b>or</b> disease <b>or</b> lack of food <b>or</b> lack of B <b>or</b> migration	3
		(v)	<i>Consequence</i> : (Population A) falls	3
			<i>Explanation</i> : Population of primary consumers increases <b>or</b> population of B increases (which eat large amount of producer A)	3
		(vi)	<i>How D might respond</i> : Migrate <b>or</b> switch prey	3
		(vii)	<i>How possible primary consumer in other food chain</i> : It may be an omnivore <b>or</b> explained	3

11.	(a)	(i)	<i>NAD</i> : Nicotinamide Adenine Dinucleotide	3
		(ii)	<i>Particles transferred</i> : Electrons (e <sup>-</sup> )	3
			Protons (or hydrogen ions or H <sup>+</sup> )	3
	(b)	(i)	<i>Where</i> : Chloroplast	3
		(ii)	<i>Substance</i> : Chlorophyll	3
		(iii)	<i>Pathway</i> : Pathway 2	3
		(iv)	<i>How O<sub>2</sub> produced</i> : Water split/ using light (energy)	
			<b>OR</b>	2(3)
			Photolysis/ of water	
		(v)	<i>Fate of O<sub>2</sub></i> : Released (to the atmosphere) <b>or</b> (used in) respiration	3
		(vi)	<i>Fate of carbon</i> : Makes carbohydrate (or named carbohydrate)	3
		(vii)	<i>Why suitable temperature</i> : (Controlled by) enzymes	3
		(viii)	<i>Why Elodea</i> : Bubbles (of oxygen visible for counting)	3
	(c)	(i)	<i>3-carbon intermediate</i> : *Pyruvate <b>or</b> *pyruvic acid	3
		(ii)	<i>Pathway</i> : *Glycolysis	3
		(iii)	<i>Oxidative fate of pyruvate</i> : Converted to Acetyl (Co- Enzyme A) <b>or</b> enters mitochondrion	3
		1.	or <i>Kreb's cycle</i> : CO <sub>2</sub> produced/ ATP produced/ NADH produced	3
		2.	or <i>electron transport system</i> : protons (or H <sup>+</sup> ions) combine with O <sub>2</sub> or electrons (e <sup>-</sup> ) combine with O <sub>2</sub> / to form water/ energy to ADP and P/ to make ATP	3
			Any one further point from 1 or from 2.	3
		(iv)	1. <i>Anaerobic product in muscle</i> : *Lactic acid <b>or</b> *lactate	3
			2. <i>Anaerobic product in yeast</i> : *Ethanol (and carbon dioxide)	3

12.	(a)	(i)	<i>Excretion:</i> Removal of metabolic waste	3	
			<i>Egestion:</i> Removal of undigested (or unabsorbed) material	3	
		(ii)	<i>Simple excretion:</i> Diffusion <b>or</b> contractile vacuole	3	
	(b)	(i)	<i>Excretory products:</i> Carbon dioxide/ urea/ salt(s)	2(3)	
		(ii)	<i>Excretory product production locations:</i> First product + matching location	3	
			Second product + matching location	3	
		(iii)	<i>ADH:</i> (Produced in response to) high salt levels or low water levels or dehydration/ (acts on) collecting ducts or (acts on) distal convoluted tubules/ more permeable/ more water reabsorbed (into blood)/ urine volume lowered (or urine more conc.)	3(3)	
	(iv)	<i>Plant structures:</i> Stomata/ lenticels/ leaves	2(3)		
	(c)	(i)	<i>Homeostasis</i> Maintenance of a constant internal environment	3	
		(ii)	1.	<i>Metabolism:</i> All chemical reactions in the organism (or in the cell or in the body)	3
			2.	<i>Effect of increase:</i> Generates heat <b>or</b> temperature increase	3
			3.	<i>Term:</i> *Endotherm(s) <b>or</b> *Endothermic	3
			4.	<i>Ectotherm response:</i> Take shelter <b>or</b> move to a warm place <b>or</b> hibernate	3
			5.	<i>Piloerection:</i> Hairs standing up	3
				<i>Importance:</i> Traps air <b>or</b> insulates <b>or</b> reduces heat loss	3
6.	<i>Vasoconstriction importance:</i> Reduces blood flow to skin <b>or</b> reduces heat loss	3			

13.	(a)	(i)	Where growth regulators secreted: (Apical) meristems [Accept root tip <b>or</b> stem tip]	3
		(ii)	Negative regulator: Ethene <b>or</b> IAA ( <b>or</b> any named growth regulator)	3
		(iii)	Thigmotropism: Growth response (of a plant) to touch	3
	(b)	(i)	Diagram: with correctly located labelled parts  <b>pinna    semi-circular canals    stirrup    eardrum    cochlea    Eustachian tube</b>	6(2)
		(ii)	1. Function of pinna: Collects sound	3
			2. Eustachian tube connected to: Throat <b>or</b> pharynx	3
			3. Role of Eustachian tube: To equalise pressure <b>or</b> to relieve (or prevent) pressure	3
			4. Other ossicle: Hammer <b>or</b> anvil	3
			5. Why three semi-circular canals: To control (balance) in three planes (or dimensions or axes)	3
	(c)	(i)	Corresponding part of eye: *Retina <b>or</b> *fovea	3
			Why: Both contain receptors (or both detect stimuli) <b>or</b> both generate impulses  <b>or</b> both send impulses to the brain	3
		(ii)	1. Structure that determines pupil diameter: *Iris	3
			2. Why pupil diameter changeable: To control the amount of light entering the eye <b>or</b> to prevent too much light entering the eye <b>or</b> to let more light enter the eye	3
	(iii)	1. Transparent and curved: Cornea	3	
		Lens	3	
		2. How curvature helps eye: To focus <b>or</b> to bend light <b>or</b> to refract light	3	
	(iv)	Carnivores: Better judgement of distance <b>or</b> better focus on prey	3	
		<b>OR</b>	3	
		Herbivores: Better detection of predators <b>or</b> wider field of vision (to detect predators)	3	

<b>14.</b>	(a)	(i)	<i>Species:</i> A group of organisms capable of interbreeding to produce fertile offspring.	<b>3</b>
		(ii)	<i>Intraspecific differences:</i> *Variation	<b>3</b>
		(iii)	1. <i>Evolution:</i> Genetic changes (in populations)/ in response to environment/ over time/ giving rise to new species	<b>2(3)</b>
			2. <i>Role of natural selection:</i> Better adapted survive/ reproduce/ adaptation is inherited/ adaptation (becomes) more common	<b>2(3)</b>
		(iv)	<i>Mutation:</i> A change in DNA (or gene or chromosome or genetic material)	<b>3</b>
		(v)	1. <i>Gene mutation disorder:</i> Sickle cell anaemia <b>or</b> any valid example	<b>3</b>
			2. <i>Chromosome mutation disorder:</i> Down syndrome <b>or</b> any valid example	<b>3</b>
		(vi)	<i>Cause of variation:</i> Sexual reproduction <b>or</b> meiosis <b>or</b> formation of gametes <b>or</b> fertilisation of gametes <b>or</b> independent assortment	<b>3</b>

<b>14.</b>	(b)	(i)	<i>Eukaryotic cell features:</i> Possess a nucleus/ membrane-enclosed organelles (or chloroplasts or mitochondria)	<b>2(3)</b>
		(ii)	<i>Function of plant tissue:</i> Named tissue + matching function (plant)	<b>3</b>
		(iii)	<i>Function of animal tissue:</i> Named tissue + matching function (animal)	<b>3</b>
		(iv)	<i>Adaptations:</i> Named plant tissue + matching adaptation	<b>3</b>
			Named animal tissue + matching adaptation	<b>3</b>
		(v)	<i>Organ v. tissue:</i> Organ is a group of tissues (working together)	<b>3</b>
		(vi)	1. <i>Tissue culture:</i> Growth of cells on a (nutrient) medium <b>or</b> growth of cells outside the organism <b>or</b> growth of cells in vitro	<b>3</b>
			2. <i>Requirements:</i> Sterile (conditions)/ nutrients/ hormones or growth regulators/ suitable medium/ suitable temperature/ suitable pH/ oxygen supply	<b>2(3)</b>

<b>14.</b>	<b>(c)</b>	<b>(i)</b>	1. <i>Turgor:</i> Pressure of cell contents against the cell wall	<b>3</b>
			2. <i>How plant cells stay turgid:</i> By taking in as much water as they lose	<b>3</b>
			By osmosis (or explained)	<b>3</b>
			3. <i>Consequence for plant of turgidity loss:</i> Wilt <b>or</b> lose rigidity <b>or</b> fail to stay upright <b>or</b> droop	<b>3</b>
	4. <i>Animal cell:</i> Bursts	<b>3</b>		
	<i>Why:</i> No cell wall	<b>3</b>		
	<b>(ii)</b>	1. <i>Diffusion:</i> Movement (of material) from region of high concentration to a region of low(er) concentration	<b>3</b>	
		<i>Osmosis:</i> Movement of water from a region of high water concentration to a region of low(er) water concentration across a semi-permeable membrane	<b>3</b>	
		2. <i>Active transport; location:</i> Nephron <b>or</b> named part	<b>3</b>	
		<i>Active transport; material:</i> Glucose <b>or</b> amino acid(s) <b>or</b> salt(s) <b>or</b> water	<b>3</b>	

<b>15.</b>	<b>(a)</b>	<b>(i)</b>	<i>T.S. vein diagram:</i>	thin wall + large lumen (> 50% total diameter)	<b>3, 0</b>
			<i>L.S. vein diagram:</i>	clearly longitudinal + valve	<b>3, 0</b>
			<i>Labels:</i>	lumen/ muscle or wall or endothelium/ valve	<b>3(1)</b>
	<b>(ii)</b>	1.	<i>Heart muscle:</i>	Cardiac <b>or</b> coronary (vein)	<b>3</b>
			<i>Kidney:</i>	Renal (vein)	<b>3</b>
			<i>Little CO<sub>2</sub>:</i>	Pulmonary (vein)	<b>3</b>
			<i>Into R.A.:</i>	Vena cava	<b>3</b>
			<i>Capillaries at both ends:</i>	Hepatic portal (vein)	<b>3</b>
	<b>(iii)</b>		<i>How blood moved through veins:</i>		
			(Skeletal or voluntary) muscles contracting (squeezing)/ valves prevent backflow		<b>2(3)</b>



<b>15</b>	(b)	(i)	1. <i>Endometrium:</i>	Breaks down (shed)	(Days) 1 – 5	<b>3 + 3</b>		
			<b>or</b>	Thickens	(Days) 6 – 28			
			2. <i>Ovary:</i>	Follicle (or ovum or egg) matures	(Days) 1 – 14	<b>3 + 3</b>		
			<b>or</b>	Ovulation	(Days) 13 – 15			
			<b>or</b>	Corpus luteum develops	(Days) 15 – 28			
			(ii)	<i>Where FSH and LH produced:</i>	*Pituitary (gland)			<b>3</b>
			(iii)	<i>FSH:</i>	Stimulates follicle (egg) to develop (in ovary) <b>or</b> stimulates (ovary) to produce oestrogen <b>or</b> stimulates LH (production)			<b>3</b>
				<i>LH:</i>	Stimulates ovulation <b>or</b> described <b>or</b> causes (Graafian follicle) to develop into corpus luteum <b>or</b> stimulates progesterone (production)			<b>3</b>
			(iv)	<i>Other hormones:</i>	Oestrogen/ progesterone			<b>2(3)</b>
			(v)	<i>Fn oestrogen:</i>	Causes endometrium to build up <b>or</b> inhibits FSH <b>or</b> stimulates LH			<b>3</b>
	<i>Fn progesterone:</i>	Maintains endometrium <b>or</b> inhibits LH <b>or</b> inhibits FSH						

<b>15.</b>	(c)	(i)	<i>Yellow marrow:</i> Stores fat <b>or</b> converts to red marrow	<b>3</b>
			<i>Red marrow:</i> Produces blood cells	<b>3</b>
	(ii)	1.	<i>Lack of water-soluble vitamin in diet:</i> Named disease and deficient vitamin + matching recognition	<b>3, 2, 0</b>
		2.	<i>Sex-linked:</i> Named disease + matching recognition	<b>3, 2, 0</b>
		3.	<i>Excess hormone:</i> Named hormone + matching recognition	<b>3, 2, 0</b>
		4.	<i>Virus:</i> Named disease + matching recognition	<b>3, 2, 0</b>
	(iii)	1.	<i>Microorganisms &amp; waste:</i> Composting <b>or</b> decomposition <b>or</b> decay	<b>3</b>
		2.	<i>Vaccination:</i> Stimulates antibody production <b>or</b> stimulates active immunity	<b>3</b>
		3.	<i>Artificial propagation:</i> Maintain desired trait <b>or</b> mitosis	<b>3</b>
		4.	<i>Increasing wholegrain foods in diet:</i> Stimulates peristalsis <b>or</b> moves food through alimentary canal	<b>3</b>

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