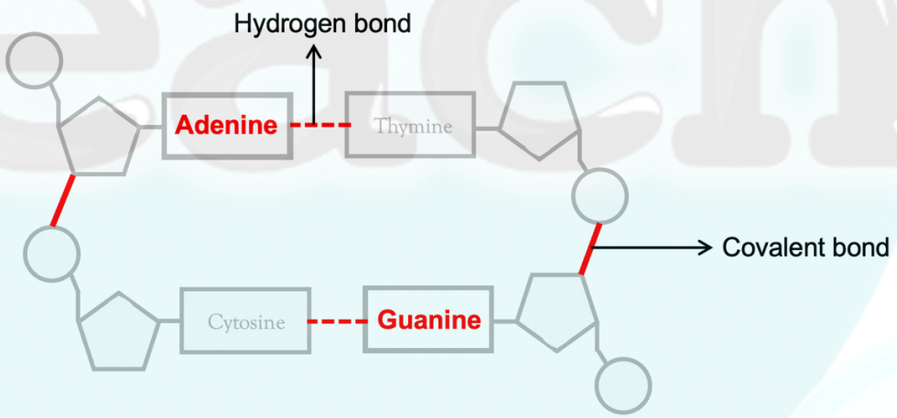
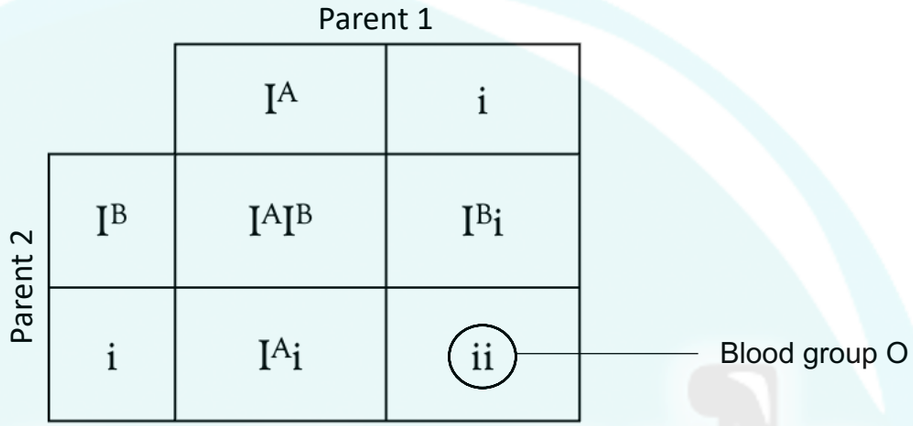
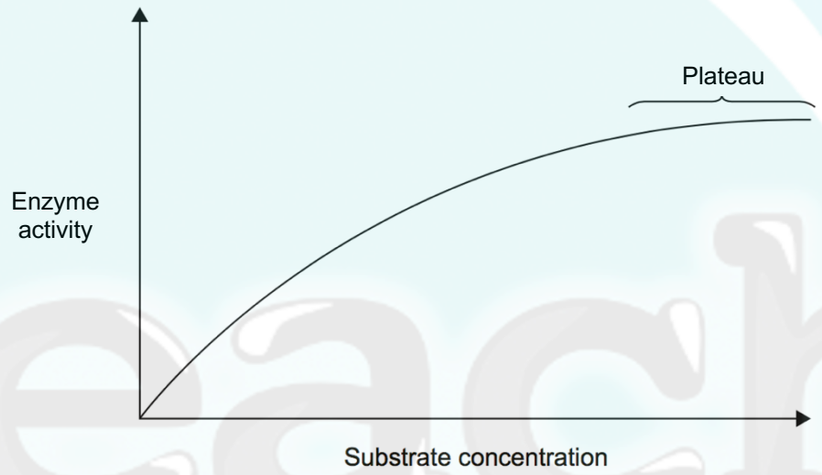
Markscheme

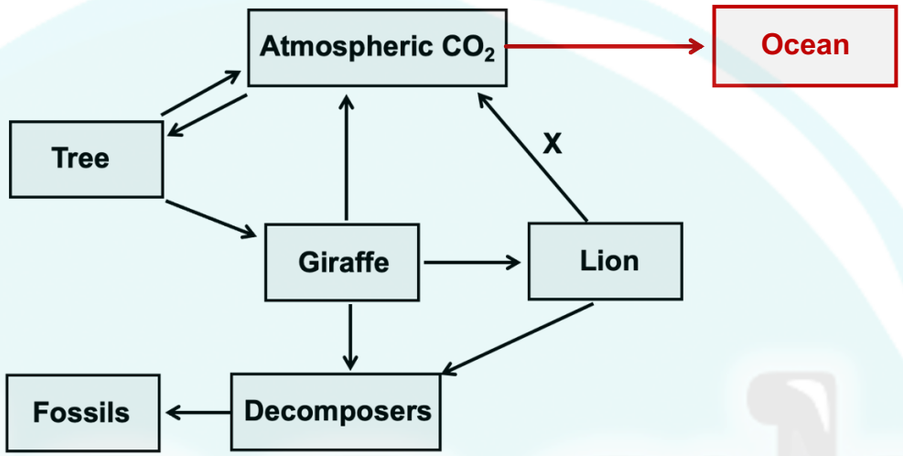
(paper 2 SL)

Question			Answers	Notes	Total
Section A					
1	a		• Insulin levels (gradually or drastically) rise initially after the (carbohydrate) meal; • After the insulin levels peak, they (gradually) decline back to pre-meal level;	Information in parenthesis isn't required to earn mark.	2
	b		• The glucose group shows a rapid spike in insulin levels within the initial phase; • The lentil group shows a slower and more gradual increase within the initial phase; • The lentils group's insulin levels peak at a lower level than glucose group;		2
	c		• Lentils cause a slower increase in blood glucose compared to potatoes, leading to lower and more stable insulin release/response; • (This helps) prevent high blood glucose due to insulin resistance issues in diabetic people;		1
	d		• Post-program insulin levels shows a more rapid initial increase after meal compared to pre-program insulin levels; • Post-program insulin levels return to pre-meal levels faster after a rice meal compared to pre-program mice;		2
	e		• Fasting ensures a baseline insulin level for accurate comparison of post meal insulin responses;		1
	f		• GLUT4 levels are higher in skeletal muscles of the post-program than pre-program mice;		1
	g		• GLUT4 enhances glucose uptake by muscle cells, reducing the need for insulin and lowering blood glucose levels;		1
	h		• Exercise increased GLUT4 transporter on skeletal muscle cells which improves glucose uptake by cells; • Thereby exercise increases insulin sensitivity; • Requiring less insulin to regulate blood glucose levels;		1

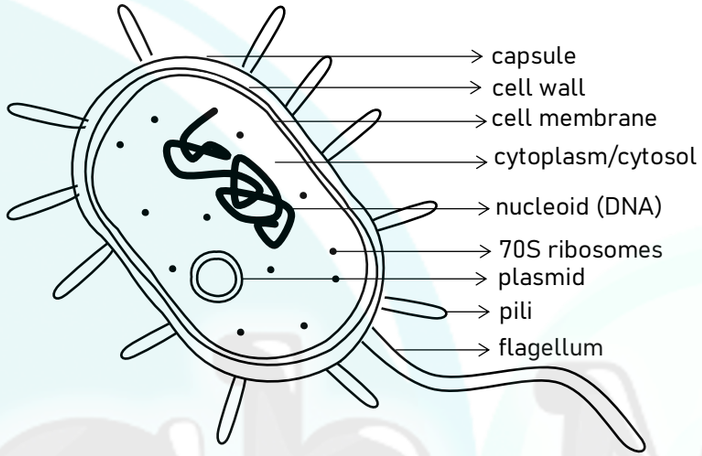
2	a	i	Red blood cell (RBC);	Accept “Erythrocyte”	1
		ii	• Membrane active transport; • Synthesis of macromolecules; • Cellular movement; • Intracellular component movement; • Muscle contraction;	Accept “anabolism” Accept “biosynthesis” Accept other valid examples	2
	b		Mother, as the sperm passes on nothing other than paternal DNA when it fertilizes the egg;		2
3	a		DNA OR Deoxyribonucleic acid; **AND** The nucleotide structure contains a deoxyribose sugar;		2
	b	i & ii		Award 1 mark for correct labeling of BOTH bonds. Award 1 mark for correct labeling of BOTH bases. Only accept the full names Do not accept, A or G Accept two hydrogen bonds between A and T and three bonds between C and G.	3
	c		Uracil;	Do not accept U	1

4	a			Award mark if both parents are heterozygous for their blood group. Award mark if the offspring potential genotypes are correctly shown.	2
	b		• Because haemophilia is a X-linked disorder; • Males only have one X chromosome, so a recessive allele on it will be expressed; • Females have two X chromosomes, so one can mask the recessive allele OR be a carrier;		2
	c		• Increases genetic variation; • Exchanges alleles between homologous chromosomes;		1

5	a		• Proteins that catalyze biological reactions; • By lowering the activation energy; • They are not consumed during the chemical reaction;		2
	b			Award mark for correct axis and labels. Award mark for correct curve with plateau at the end. Label “Plateau” is not necessary to earn mark.	2
	c		• High temperatures break hydrogen bonds in the enzymes; • Alters\ tertiary protein structure; • Alters the active site;		1

6	a				1
	b		• It reduces photosynthesis, increasing atmospheric CO_2 **OR** reducing negative carbon flux; • It accelerates decomposition and burning of biomass, thereby increasing atmospheric CO_2 **OR** increasing positive carbon flux;		2
	c		• Detritivores ingest dead organic matter whereas saprotrophs do not; • Detritivores internally digest dead organic matter whereas saprotrophs secrete digestive enzymes externally and absorb the nutrients;		1

Section B					
7	a		• [Definition] – non self antigens • Phagocytes (such as macrophages), engulf pathogens by endocytosis; • Cell plasma membrane engulfs/encloses pathogen; • Endocytosis relies on fluidity of membrane; • Plasma membrane then pulled inwards (invaginates); • Membranes pinches off (OR seals back on itself); • Pathogen becomes enclosed in a vesicle called a phagosome; • Inside of plasma membrane becomes outside of vesicle (and vice versa); • Active process that requires energy; • Phagosome (OR vesicles) fuses with lysosomes, where enzymes digest the pathogens;		7
	b		• Vaccines introduce antigens from pathogens into the body; • Stimulates an adaptive immune response; • Plasma cells produce antibodies specific to the pathogen; • Memory cells are produced; • Memory cells enable a faster and stronger secondary response; • Secondary response can be triggered by a booster shot/second dose (to increase pathogen antibodies); • Provides long-term protection without causing disease;		4

	c		Award maximum [2] if exclusively eukaryotic cell structures are included in the answer. • Label nucleoid (DNA); • Label plasmid; • Label capsule (outer layer); • Label cell wall; • Label cell membrane (inner layer); • Label cytoplasm/cytosol; • Label 70S ribosomes; • Label flagellum (longer than pili); • Label pili (shorter than flagellum); 	Do not accept 80s ribosomes	4

<table>
<tr>
<td>8</td>
<td>a</td>
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<td>
<table>
<tr><th></th><th>Arteries</th><th>Veins</th></tr>
<tr><td>Walls</td><td>Thick – withstand high pressure;</td><td>Thin – withstand low pressure;</td></tr>
<tr><td>Lumen</td><td>Narrow – Maintains high pressure and blood flow;</td><td>Wide – Large capacity for blood storage;</td></tr>
<tr><td>Valves</td><td>No;</td><td>Yes – prevent backflow of blood;</td></tr>
<tr><td>Muscle layer</td><td>Thick – Contract to maintain pressure and flow;</td><td>Thin;</td></tr>
<tr><td>Elastic fibres</td><td>Yes – provides flexibility OR stretch and recoil;</td><td>No;</td></tr>
<tr><td>Function</td><td>Carries blood away from the heart towards the capillary beds;</td><td>Carries blood towards the heart away from the capillary beds;</td></tr>
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<td>Award one mark for each correct row.

Answer is not required to be in table format.

Do not accept arteries as carrying oxygenated blood and veins carrying deoxygenated blood.</td>
<td>4</td>
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<tr>
<td></td>
<td>b</td>
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<td>
• GnRH released from hypothalamus stimulated FSH and LH release from the pituitary;
• FSH (released from anterior pituitary) stimulates (ovary) for (Graafian) follicle development;
• Follicle cells produce estrogen;
• Estrogen signals endometrium/lining of uterus to thicken OR increase blood vessel density;
• (High levels of) estrogen stimulates secretion of LH (positive feedback);
• LH spike/surge stimulates ovulation OR follicle ruptures releasing oocyte/ova/egg cells;
• Remaining follicle cells (from graafian follicle) develops into corpus luteum;
• Follicle cells produce and secrete progesterone;
• Progesterone simulates continued development/maintenance of lining of uterus;
• Progesterone inhibit FSH/LH release (negative feedback);
• If no pregnancy, then corpus luteum disintegrates;
• Hence, progesterone levels drop and FSH production returns,
• Fall in progesterone levels causes breakdown in uterine lining OR menstruation;
• The cycle restarts;
</td>
<td>Information in parenthesis is not required to earn mark.

Accept if points are clearly illustrated in a diagram.</td>
<td>8</td>
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	c		• In vitro fertilization (IVF) is a medical procedure involving the fertilization of an egg outside the body and implanting the embryo into the uterus; • Plays a role when natural conception is difficult or impossible; • Infertility can arise in either males or females, • Examples of infertility causes: blocked fallopian tubes, ovulation disorders, low sperm count, poor sperm motility, or unexplained infertility; • Can involve donor eggs, donor sperm for individuals with severe fertility issues;	Accept other valid examples of infertility.	3