

2019 Pure Biology 6093 Preliminary Examination
Answers

Paper 1

1	A	11	D	21	D	31	D
2	A	12	B	22	B	32	B
3	B	13	B	23	C	33	A
4	B	14	C	24	A	34	B
5	C	15	C	25	A	35	D
6	C	16	B	26	A	36	B
7	A	17	C	27	D	37	A
8	B	18	D	28	A	38	D
9	B	19	C	29	A	39	D
10	C	20	A	30	D	40	B

Section A (50 marks)
Answer all questions in the spaces provided.

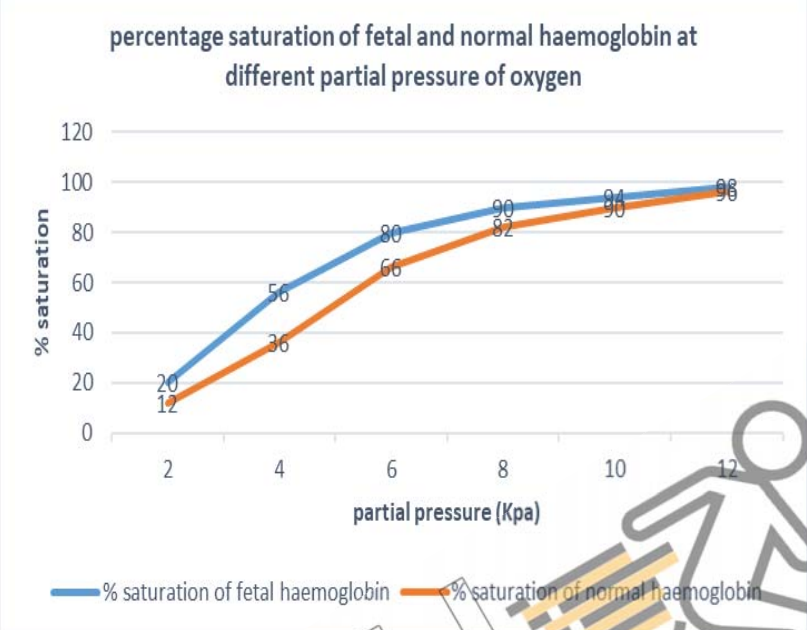
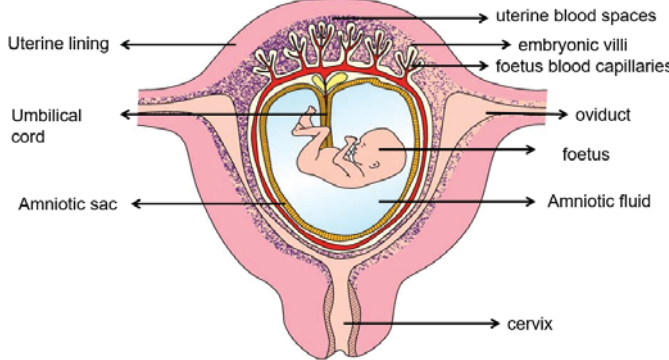
No.	Answers	Marks
1.		
a.	Rate of water uptake for all three days are same at 4ml/hr [1] Reason: Lower temperature at midnight so loss of water to the surrounding is also low [1] and therefore the plant will take in less water.[1] OR There is no light at midnight so no photosynthesis takes place, stomata closes, less water lost to the surrounding therefore plant take in less water[1]	2
b.	The rate of water uptake is higher at 1200 on day 2 compared with day 1 and day 3. [1] It could be due to the higher temperature/lower humidity/more windy on day 2 as compared to the other two days [1] As a result, the plant loses more water through transpiration leading to the increase in water uptake. [1]	3
2.		
a.	Any two environmental conditions: same habitat[1], temperature of surrounding [1], amount of water given to rat[1], humidity[1], type of food [1], amount of oxygen[1]	2
(b) (i)	from respiration – water is the byproduct <i>metabolic waste comes from metabolic reactions takes place in living cells like respiration, deamination of amino acids, digestion is not metabolic reactions</i>	1
(ii)	The cells will either crenated or burst	1
b.	Amount of sweat increase Reason: to remove heat from the body so to reduce body temperature Volume of urine decreases, concentration of urine increases, Reason: so to maintain stable water potential in blood Faeces become hard Reason: water reabsorbed from undigested waste [1 mark describe change] [1 mark to explain the reason]	2
3.		
a.	M: 3800 units[1] $(1000-(5000+1200))= 3800$ units N: 80 units [1] $(1200-(1000+120)) = 80$ units	2
b.	decomposer	1
c.	Any two points: Heat during respiration, uneaten body parts, removal of undigested waste, removal of excretory products like urea	2
d.	The greatest amount of energy is already lost during a transfer from producer to herbivore so there is less energy available to the herbivore. [1] As a result, the herbivore loses less energy to the surrounding as energy is required to carry out living processes like respiration, growth etc.[1]	[1] [1]
4.		
(a)	X: anther [1] Y: pollen grains [1]	2

(b)(i)	Meiosis[1]	1
(b) (ii)	To produce haploid gametes [1] so when gametes fuse, the diploid number is restored, this helps to maintain the normal diploid number of chromosome To produce variation in species [1] variations occur when crossing over and independent assortment of chromosomes variations increase the chance of survival of species during change in environment [1]	3
(c)	Pollinated by insects [1]; small with hairs which look like hooks to cling to legs of insects [1] OR Pollinated by wind [1]; small and numerous [1]	2
(d)	Similarity: both are sex gametes Different :male sperms have tail swim to the egg can move independently but pollen are carried by agent	1 1

5.		
a.	Diffusion [1] Active transport [1]	2
b.	Absorption of the ions are greater in the presence of oxygen [1] which means besides normal diffusion of ions, active transport increases the uptake of the ions because it requires energy to take place[1] <i>** active transport can take place simultaneously with diffusion</i>	2
c.	Roots are small and numerous which increases surface area to volume ratio [1]. This increases surface area for absorption of ions into the roots [1]	2
d.	From roots, bromine diffuses into the root cells [1] then enter the xylem vessels [1] which brings the bromine to the leaves. Transpiration pull provide pulling force to move bromide from stem to leaves [1]	3
6.		
a.	Individual 1: Hh [1] Individual 2: Hh [1] Explanation: From the crossings of heterozygous parents, 50% of the offsprings are carriers and 50% have normal genotype. [1]	3
b.	Parent Genotype [1] Hh x hh Gametes [1] (H) (h) (h) (h) F1 genotype[1] Hh Hh hh hh Phenotype ratio [1] 1(normal): 1(huntington) The chance of second child from couple 6 and 7 to be normal is 50%. [1]	5
c.	Not possible. [1] A normal individual will have a homozygous recessive genotype so if individual 4 who is also homozygous recessive marries the normal individual, there will no gene for Huntington disease [1]	2

7		
a.	% change in mass -6.5% Change in mass $6.5/100 \times 3.2 = 0.208\text{g}$ [1] Final mass $3.2 - 0.208 = 2.299\text{g}$ [1]	2
b.	0.36M sucrose solution [1] no change in final mass as no net movement of water/ similar water pot in cell sap and solution[1]	2

Secion B (30 marks)

No.	Answers	Marks																					
8																							
a.	percentage saturation of fetal and normal haemoglobin at different partial pressure of oxygen  <table border="1"> <thead> <tr> <th>partial pressure (Kpa)</th> <th>% saturation of fetal haemoglobin</th> <th>% saturation of normal haemoglobin</th> </tr> </thead> <tbody> <tr> <td>2</td> <td>20</td> <td>12</td> </tr> <tr> <td>4</td> <td>56</td> <td>36</td> </tr> <tr> <td>6</td> <td>80</td> <td>66</td> </tr> <tr> <td>8</td> <td>90</td> <td>82</td> </tr> <tr> <td>10</td> <td>94</td> <td>90</td> </tr> <tr> <td>12</td> <td>96</td> <td>96</td> </tr> </tbody> </table> Accuracy points plotted [1]; Best Fit line [1]; Accurate labeling of axes [1]; Correct scale [1]	partial pressure (Kpa)	% saturation of fetal haemoglobin	% saturation of normal haemoglobin	2	20	12	4	56	36	6	80	66	8	90	82	10	94	90	12	96	96	4
partial pressure (Kpa)	% saturation of fetal haemoglobin	% saturation of normal haemoglobin																					
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6	80	66																					
8	90	82																					
10	94	90																					
12	96	96																					
b.	The fetal haemoglobin shows a higher % saturation of oxygen compared to normal haemoglobin [1] Fetal haemoglobin binds more readily to oxygen than normal haemoglobin[1] As result, fetal haemoglobin can take more oxygen from the maternal blood spaces [1]	3																					
c.	The fetal blood capillaries are separated from the mother's blood by maternal blood spaces / a thin layer of tissue in the placenta.[1] The oxygen concentration in mother's blood is higher than the fetal's blood.[1] Oxygen from the mother's blood diffuses into the blood spaces / layer of ten issue and then into the fetal's blood.[1] 	3																					

9.		
a.	Describe Benedict's/Fehling's solution test Add a few drops of Benedict's reagent to the urine sample in a test-tube. [1] Place the test-tube in boiling water bath for about ten minutes. If reducing sugar is present in the urine sample, orange red precipitate will form otherwise the Benedict's solution remains blue. [1]	2
b.	(i) - insulin gene is taken from human chromosome - the gene is cut with restriction enzyme which produces the sticky end - Obtain a plasmid in bacteria cut using same restriction enzyme, this produces the complementary sticky ends - Mix the DNA fragment and the plasmid. insulin gene inserted into plasmid using DNA ligase - Mix the plasmid with E.coli bacteria. Apply heat shock to open up the pores in the cell membrane for the plasmid to enter. Bacteria will use the new gene to make insulin - Bacteria can be isolated and grown in fermenters to produce large amounts of insulin	6
	(ii) any two reasons - reduced cost of medicine so more patients have access to insulin - faster production as bacteria multiply faster - no life is harmed as it is obtained from bacteria	2
10	<u>Either</u>	
a.	Day 1-5 : menstruation due to cessation of progesterone from corpus luteum, FSH secreted by pituitary gland Day 6-13 : FSH stimulates forming of follicles , Graafian follicle secretes oestrogen, effects of oestrogen: causes repair of uterine lining, inhibits FSH, stimulates pituitary gland to secrete luteinising hormone (LH) Day 13-15: LH causes ovulation and causes formation of corpus luteum. Corpus luteum ruptures and releases egg into oviduct, Corpus luteum secretes progesterone Day 16-28 : Uterine lining continues to thicken with blood capillaries, preparing for fertilised egg, inhibits ovulation, inhibits FSH production If no fertilization, progesterone continues to increase, inhibits LH, corpus luteum breakdown, progesterone level drops, uterus lining breakdown and the whole cycle repeats	6
b.	Any the four points above below: - Wall of uterus filled with blood & nutrients for implanted embryo – providing embryo with cushion, protection & food[1] - Formation of placenta in wall of uterus to provide foetus with oxygen and food & to remove carbon dioxide & waste from it;[1] - Amnion & amniotic fluid in uterus space to protect foetus from physical harm & fluctuations in temperature; [1] - Contractions of wall of uterus to help push foetus out of vagina during birth[1].	4

10	OR	
a.	In cold weather, blood vessels near the skin surface constrict thus reducing blood flow to prevent heat loss to the surrounding [1] so to preserve the core body temperature;[1] In prolonged cold weather, prolonged vascular contraction will cut blood supply to the surface of skin. [1] Thus fingers and toes which are near the surface of skin may be deprived of nutrients and oxygen which may lead to further heat loss and cell death [1] Thick gloves, socks and shoes may not able to maintain core body temperature over prolonged cold weather because poor blood circulation, low activity rate [1]	5
b.	<u>Cold weather:</u> Drop in temperature of the blood detected by hypothalamus;[1] Impulses sent to muscles which contract violently to produce heat;[1] Body temperature return to normal[1/2] <u>Hot weather:</u> Increase blood temperature detected by hypothalamus;[1] Impulses sent to sweat glands to produce more sweat; Sweat evaporated, more heat loss[1] Body temperature return to normal [1/2]	5

