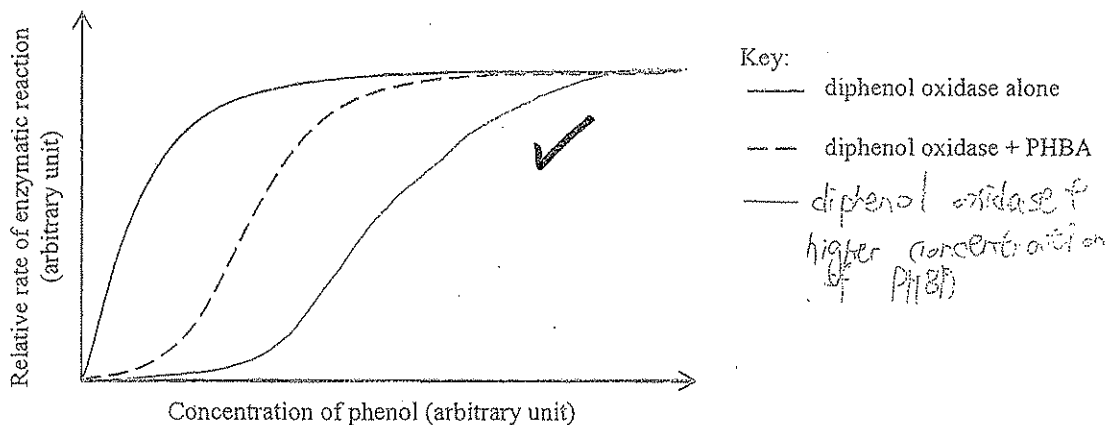


HKDSE Biology Practice Papers Samples of Student Performance

High Performance Sample 1: Paper 1 Section B Question 4

4. When a slice of apple is exposed to air, it quickly turns brown. This is because the enzyme diphenol oxidase catalyzes the oxidation of phenols in the apple to dark-coloured products. In an experiment, the effect of a chemical, PHBA, on the rate of this enzymatic reaction was investigated. The experiment was carried out at the same temperature and the same concentration of diphenol-oxidase was used. The results are shown in the graph below:



- (a) Deduce the relationship between PHBA and diphenol oxidase. (3 marks)

PHBA should be a competitive inhibitor of diphenol oxidase. This is because at the same concentration of phenol, the rate of enzymatic reaction in presence of PHBA is lower than that in the absence of PHBA. However, at increasing concentration of phenol, rate of enzymatic reaction in presence of PHBA increases, showing an increase in concentration of substrate can overcome the inhibitory effect of PHBA so it is a competitive inhibitor.

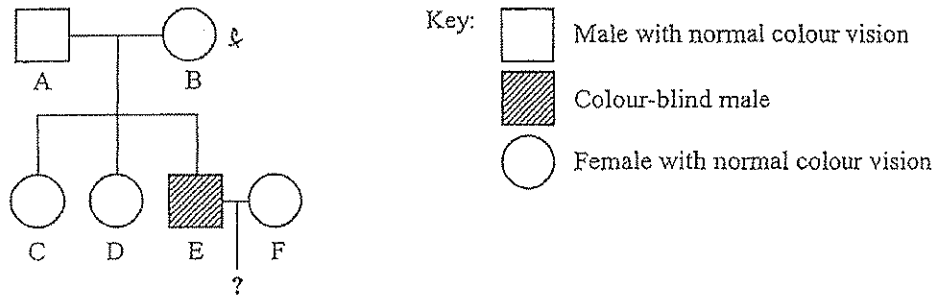
- (b) Draw a curve in the above graph to show the effect of PHBA on the rate of enzymatic reaction if a higher concentration of PHBA had been used. (1 mark)

- (c) Suggest one other factor that should be kept constant in this experiment. Explain how this factor may affect the activity of the enzyme. (3 marks)

The pH of the reaction mixture should be kept constant. Which means enzymatic activity is highest in this pH. The enzyme works best at optimal pH value. At extreme pH values, the enzyme is denatured that shape of its active site is changed. The substrate molecules (phenol) can no longer bind to the active site of the enzyme so the enzymatic activity is very low.

High Performance Sample 2: Paper 1 Section B Question 9

9. A couple (A and B) does not have any family history of Down syndrome, but the female (B) has a family history of colour blindness. The two daughters of this couple do not have colour blindness, but one of them (C) has Down syndrome. The son (E) has colour blindness. The pedigree of this family is shown in the following diagram:



(a) Normal people have 23 pairs of chromosomes in the cell nucleus, but people with Down syndrome have an extra chromosome in the 21st pair of chromosomes. Explain how this couple could give birth to a Down syndrome child (C). (2 marks)

When the male gamete with one extra chromosome 21 fuse with a normal female gamete or when the female gamete with one extra ~~extra~~ chromosome 21 fuse with a normal male gamete. In both ~~cases~~ ^{cases} zygote has one extra chromosome 21.

(b) (i) In humans, colour blindness is a sex-linked trait. Based on the above pedigree, deduce the genotype of the mother (B) with respect to colour vision. (Marks will not be awarded for genetic diagrams.) (5 marks)

Individual F is colour-blind, so he must have a Y chromosome from father (individual A) and an X chromosome from mother (individual B). ^{at least one allele for colour blind and} ~~at least~~ ^{at least} X or X chromosome carry the allele for colour-blind. If colour-blind be Y-linked then individual A should be colour-blind but he is normal so it is not Y-linked and it is X-linked. So the X chromosome with allele for colour blind must come from B. As B is normal she must have at least one X chromosome with normal allele. Therefore B is ~~heterozygous~~ heterozygous for ~~she~~ colour blind.

ANSWERS WRITTEN IN THE MARGINS WILL NOT BE MARKED.

Answers written in the margins will not be marked.

High Performance Sample 2: Paper 1 Section B Question 9

- (ii) F is a carrier of the colour blindness allele. With the aid of a genetic diagram, find the probability of E and F giving birth to a colour-blind daughter. (5 marks)

Genetic diagram:

let X^N be ~~normal~~ X chromosome with allele for normal vision
 X^n be X chromosome with allele for colour blind.

Y be Y chromosome with no such allele for colour blind

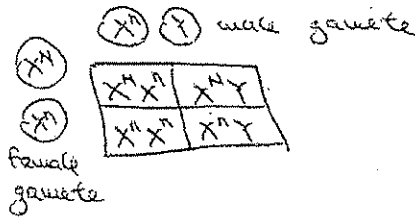
phenotype of parent colour blind x normal
 genotype of parent X^nY x X^NX^n

gamete

X^n Y X^N X^n

fertilisation

F₁



genotypic ratio

X^NX^n : X^nX^n : X^NY : X^nY

phenotypic ratio

normal female : colour blinded female : normal male : colour blinded male

Probability of E and F giving birth to a colour-blind daughter: 25%

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F-1

2(a)(i) Putting electron devices which can emit signals on the birds. ✓

(ii)(1) The average January temperature increases from 1966 to 2005. ~~with some fluctuations~~ ✓

(2) As the average January temperature in the U.S.A increases, the winter destination of bird species also moves from the ~~south~~ southern part of the USA to the northern part. This may be because the bird species do not live in ~~the~~ warm places. As the average January temperature increases, the southern part may be too warm for ~~them~~ the birds to live. They then migrate to the colder, northern part. The northern part was originally too cold but now suitable for them to live due to the increase in average January temperature.

(3) The migratory bird species may compete with the native bird species in the north for food. This can result in a decrease in the ~~native~~ native bird species in the north. The native bird ^{population} species in the south may have an increase in population since there is less competition for food from the migratory bird species.

(4) Burning ~~of~~ fossil fuels produce lots for energy ✓

High Performance Sample 3: Paper 2 Question 2

of carbon dioxide. Carbon dioxide is a greenhouse gas that enhances the greenhouse effect. More heat is trapped inside the atmosphere, resulting in an increase in the average temperature. Besides, deforestation results in a decrease in the removal of carbon dioxide from the air. Trees take in carbon dioxide for photosynthesis. When they are cut for land, less carbon dioxide is removed from the atmosphere. Moreover, burning trees release lots of carbon dioxide into the atmosphere.

2(b)(i) Acid rain can kill organisms and affect the growth of trees. Acid rain, when falling into lakes and rivers, lowers the pH of the water. Organisms living in water can be seriously affected and even die. Besides, acid rain lowers the pH of soil. If the soil is too acidic, trees cannot grow well and may even die. The loss of trees can result in soil erosion as there are no roots to hold soil particles together.

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High Performance Sample 3: Paper 2 Question 2

(ii) Forest B will ~~not~~ reestablish itself more quickly ~~before~~ after logging. ~~The magnesium distribution~~
In forest B ~~the~~ Nitrogen (90%) and Magnesium (70%) are more concentrated below the forest floor than ~~in~~ forest A (60% and 25%). Nitrogen and magnesium are important to the growth of trees as they are raw materials of making proteins and chlorophyll. When the trees are cut, the biomass above the forest floor is removed. Thus, trees can only absorb nutrients from the soil below the forest floor. A higher concentration of inorganic nutrients ~~in~~ forest B ~~will~~ ^{enables} reestablish itself more quickly after logging.

(iii) (1) It can provide different kinds of resources for human uses.
(2) The ~~intention~~ is that the ~~tree species~~ should be able to provide food and shelter to local animals ~~living in the forest~~. ^{inhabitable} One disadvantage of forming a plantation using a single tree species is that ~~the~~ some minerals in the soil, which the trees take up for growth, may soon be depleted. ^{when choosing an exotic tree species} One ~~intention~~ is that the trees will not affect or threaten ~~of~~ the growth of the original tree species in the forest.

High Performance Sample 4: Paper 2 Question 4

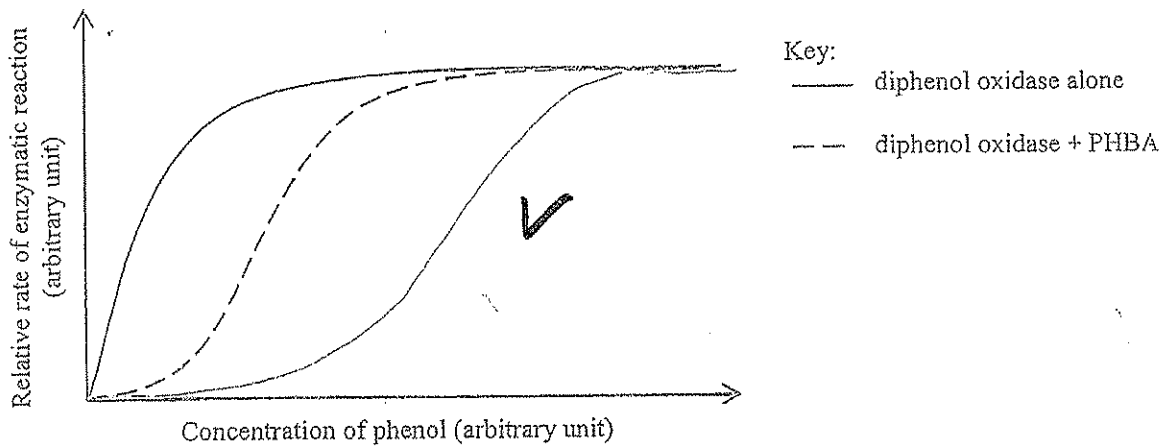
4a.i	The transplanted stem cell contains normal genes so lymphocytes can be produced by these stem cells.	X
4a.ii	Normal gene inserted incorporated to the bone marrow cell will express and produce lymphocyte replace replace the function of mutated gene. Somatic cell gene therapy is less likely to trigger immune response especially cell mediated immune response because foreign the genes do not carry foreign antigen while the bone marrow stem cell may carry foreign antigen.	
4a.iii	Somatic cell gene therapy involves the insertion of normal genes producing lymphocyte in somatic cell only while germ line gene gene therapy involves the insertion of normal producing lymphocyte gene in sex cells. Somatic gene therapy will not affect the next generation so they still suffer from SCID while germ line germ line gene therapy still transmit genetic make up to offspring so that offspring will not suffer from SCID.	
4a.iv	The virus = may carry oncogene that cause leukaemia. The virus may inject the genetic information in human cell together with the oncogene so that people develop leukaemia.	
4b.i	At stage 1 (95°C), the hydrogen bond between DNA strands are broken.	
	At stage 2 (65°C), primer annealing occurs.	
	At stage 3 (72°C), Taq DNA polymerase catalyse the formation of bond between adjacent DNA nucleotide.	

High Performance Sample 4: Paper 2 Question 4

Hair	<p>(1) PCR can amplify the DNA so enough DNA can be generated for the PCR-STR analysis.</p>	
	<p>(2) The amplified DNA of hair found and DNA of the suspect is separated by the adding them to the wells of agarose gel in buffer then run electrophoresis. The DNA is separated according to size. Compare the bands of DNA of hair and the suspect. If they are identical then the hair belongs to suspect.</p>	
4 hair	<p>(1) Natural non GM maize plant will not contain 101 bp in its DNA while 101 bp is present in GM maize. So the addition of the 101 bp allowed us to distinguish whether the maize is GM or not non GM.</p>	
4 hair	<p>(2) Golden rice. Golden rice is a GM crop with β-carotene gene added. β-carotene can is not can be converted to vitamin A in human body. So eating golden rice can lower the chance of developing vitamin A deficiency disease like night blindness.</p>	
hair	<p>(3) The biodiversity will decrease if the toxin produced by GM plant killed the insects and cause it to extinct.</p> <p>(The amount of flowering plant in that area may decrease because some from flowering plant are insect pollinated. If insects killed are responsible for pollinating of flower like bees, then ^{lack of} pollination the decrease and the ^{flowers} decrease the the number of ^{flowering} plant.</p>	

Mid Performance Sample 5: Paper 1 Section B Question 4

4. When a slice of apple is exposed to air, it quickly turns brown. This is because the enzyme diphenol oxidase catalyzes the oxidation of phenols in the apple to dark-coloured products. In an experiment, the effect of a chemical, PHBA, on the rate of this enzymatic reaction was investigated. The experiment was carried out at the same temperature and the same concentration of diphenol oxidase was used. The results are shown in the graph below:



- (a) Deduce the relationship between PHBA and diphenol oxidase. (3 marks)

PHBA is a ^{competitive} inhibitor of diphenol oxidase. From the graph, when diphenol oxidase acts alone, the relative rate of enzymatic reaction at first is higher than that of diphenol oxidase + PHBA. However, when the concentration of phenol gets high, the ~~relative~~ relative rate of enzymatic reaction become the same. It shows that

- (b) Draw a curve in the above graph to show the effect of PHBA on the rate of enzymatic reaction if a higher concentration of PHBA had been used. (3 marks)
 the rate of enzymatic reaction can be restored by adding more substrate.
- (c) Suggest one other factor that should be kept constant in this experiment. Explain how this factor may affect the activity of the enzyme. (3 marks)
 Therefore, PHBA is a competitive inhibitor.

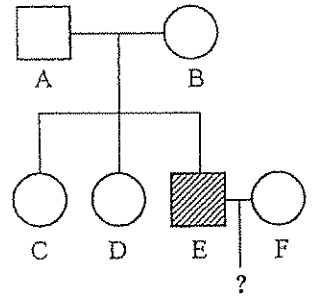
The pH value of the reaction experiment should be kept constant. Enzyme has its own optimum pH value. Under extreme pH value, enzyme cannot function well and hence it results in low activity of the enzyme. In the contrast, under optimum pH value, enzyme can

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Mid Performance Sample 6: Paper 1 Section B Question 9

9. A couple (A and B) does not have any family history of Down syndrome, but the female (B) has a family history of colour blindness. The two daughters of this couple do not have colour blindness, but one of them (C) has Down syndrome. The son (E) has colour blindness. The pedigree of this family is shown in the following diagram:



Key:
 □ Male with normal colour vision
 ■ Colour-blind male
 ○ Female with normal colour vision

(a) Normal people have 23 pairs of chromosomes in the cell nucleus, but people with Down syndrome have an extra chromosome in the 21st pair of chromosomes. Explain how this couple could give birth to a Down syndrome child (C). (2 marks)

During the formation of female gametes, the 21st pair of chromosomes failed to separate in metaphase II. As a result, one of the gametes contains a pair of 21st chromosomes. After the fusion of male and female gametes in fertilization, the zygote results in three chromosomes in the 21st pair chromosomes.

(b) (i) In humans, colour blindness is a sex-linked trait. Based on the above pedigree, deduce the genotype of the mother (B) with respect to colour vision. (Marks will not be awarded for genetic diagrams.) (5 marks)

Both father (A) and mother (B) are with normal vision, it means each of them must have at least one normal allele. Individual E suffers from colour-blind, it means E must have received an abnormal allele from father or mother ~~or both~~. Since E is a male, it must have received a Y-chromosome from his father without an abnormal allele. Therefore, E must have received the abnormal allele from his mother (B). Therefore, B is a heterozygous. ~~In heterozygous case, only the dominant fee~~

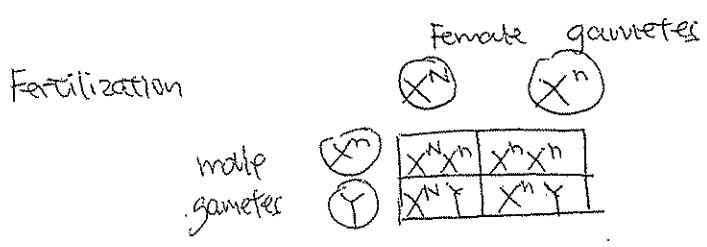
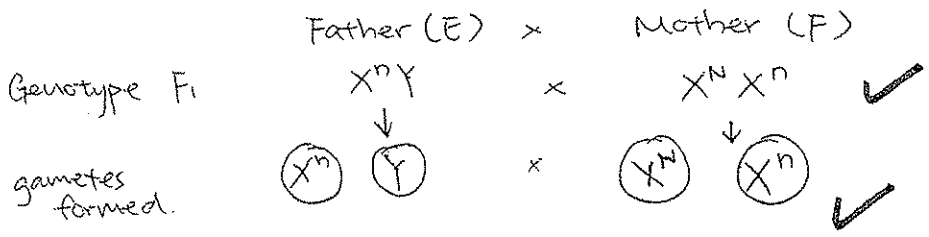
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Mid Performance Sample 6: Paper 1 Section B Question 9

(ii) F is a carrier of the colour blindness allele. With the aid of a genetic diagram, find the probability of E and F giving birth to a colour-blind daughter. (5 marks)

Genetic diagram:
 let X^N be the ^{X-chromosome} allele representing carrying a normal allele
 let X^n be the X-chromosome carrying an abnormal allele for colour-blindness
 Y be the Y-chromosome.



genotype F_2 $X^N X^n = X^n X^n = X^N Y = X^n Y$

phenotype F_2 Carrier daughter = colour-blindness daughter = normal vision son = colour-blindness son

Probability of E and F giving birth to a colour-blind daughter: 1/4

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Mid Performance Sample 7: Paper 2 Question 1

ai) Ovulation ✓

laii) The plasma concentration of progesterone increases from day 14 to day 17.

Initially, the increase in concentration of progesterone is brought out by increase in luteinising hormone^{LH}.

But at about day 16, the progesterone continuously increases while the luteinising hormone^{LH} concentration is low, because there are other chemicals acting like LH to enhance the secretion of progesterone.

While progesterone can inhibit the secretion of LH and follicle stimulating hormone FSH.

aiii) Menstruation ✓

aiiv) When there is high level of progesterone, the concentration of FSH and LH is low.

It is seen that the progesterone can inhibit the secretion of FSH and LH.

FSH is responsible for developing follicles in ovary and LH is responsible for ovulation.

When adding progesterone, LH and FSH secretion is inhibited. There will not be ovulation and menstruation, so progesterone can be used as contraceptive drugs.

(cont'd)

Mid Performance Sample 7: Paper 2 Question 1

(bi)

$$\text{Cardiac output at rest} = 75 \times 0.07$$

$$\approx 5.25 \text{ dm}^3/\text{min}$$

$$\text{Ventilation rate at rest} = 14 \times 0.86$$

$$\approx 12.04 \text{ dm}^3/\text{min}$$

$$\text{Cardiac output at light exercise} = 145 \times 0.09$$

$$\approx 13.05 \text{ dm}^3/\text{min}$$

$$\text{Ventilation rate at light exercise} = 24 \times 1.67$$

$$\approx 40.08 \text{ dm}^3/\text{min}$$

$$\text{Cardiac output at vigorous exercise} = 190 \times 0.11$$

$$\approx 20.9 \text{ dm}^3/\text{min}$$

$$\text{Ventilation rate at vigorous exercise} = 40 \times 2.5$$

$$= 100 \text{ dm}^3/\text{min}$$

(bii)

When the level of exercise increases, both the cardiac output and the ventilation rate increase.

The ventilation rate increase because the more rapid gas exchange can provide more oxygen for respiration for releasing energy and carry out more carbon dioxide out of the body faster.

The cardiac output rises as the more and faster blood circulation through out the body, the body cell can be more richly supplied with oxygen and nutrients for carry out respiration to release energy. Besides, the the waste of the cells can be carried away more rapidly.

(cont'd)

Mid Performance Sample 7: Paper 2 Question 1

(bii) The sympathetic nerve links the cardiovascular centre in medulla oblongata and the pacemaker in heart. The medulla oblongata will generate nerve impulses through the sympathetic nerve to the pacemaker to let the heart contract ^{more or less} more frequent, the heart rate and the stroke volume increases, the cardiac output increases.

(biv) When the person is after exercise, some water is lost as sweat. The water content in blood decreases. The hypothalamus detect the drop in water content in blood. It secretes ~~hormones~~ ^{more} hormone to let the pituitary gland to secrete ^{more} hormone called antidiuretic hormone ADH. ADH will increase the permeability of the collecting duct in kidneys. More water is reabsorbed from the collecting duct to blood by osmosis and diffusion. So the volume of urine is less than usual.

Mid Performance Sample 8: Paper 2 Question 2

2.(a)(i) By counting the birds in the destination X

(ii)(1) The average January temperature in the U.S. A from 1966 to 2005 generally increases. ✓

(2) Generally speaking, the destination in 2005 is closer to the north pole when compared to that in 1966. This is due to the increase in the average January temperature in USA from 1966 to 2005. ✓

(3) The native bird species will face direct competition from these migratory bird species for the scarce and limited resources. If they fail to compete with the migratory one, they may face a decrease in the population. Also, they may have insufficient area for winter destination. ✓

(4) Human burns excessive fossil fuels to satisfy the increasing demand from industry and vehicles. The fossil fuels combustion emits carbon dioxide in the atmosphere. The ^{increase in} concentration of carbon dioxide originally will be decreased by photosynthesis carried out by plants. Yet, now with increasing deforestation, a lot of trees are cut down. Thus, they can no longer absorb carbon dioxide. The excessive carbon dioxide from human activities thus remain stayed in the atmosphere. They are greenhouse gases which can trap the infrared radiation from the atmosphere and keep the Earth warm. ✓

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Mid Performance Sample 8: Paper 2 Question 2

2.(b) (i) Acid rain would cause the soil pH of soil to decrease. Thus, the acidic soil no longer favours the growth of plants. They may thus die. Also, acid rain would corrode some buildings as the calcium carbonate presents in cements of buildings reacts with the hydrogen ions in acid rain. Thus, after continuous attack by acid rain, the building would flake off.

(ii) (1) Biodiversity is about how many types of organisms are present in a particular habitat, but not how many organisms are there. It is important because the more the bio diversity, the more ^{complicated} as the feeding relationship (food chain and food web) is how more the ecosystem. Thus, the complex ecosystem can be more self-supportive and will not be easily destroyed when there are some undesirable changes in the habitat.

(2) When choosing an appropriate exotic tree species for reforestation, we need to consider whether the relative humidity there is available and favourable for the species, because some species may prefer those of higher relative humidity. Yet, the disadvantage of forming a plantation using a single tree species would be that the ecosystem there would be more fragile. This is because if there is a certain factor inhibits the growth of the tree species, then the tree species would probably die. The organisms that count on the species would all die. Subsequently, More tree species would make the ecosystem more capable of withstanding changing factors. Even though there

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Mid Performance Sample 8: Paper 2 Question 2

are some species die due to the changing factor, it is not likely that all other species would be inhibited by a particular factor. As a result, the ecosystem can remain still with changes.

Mid Performance Sample 9: Paper 2 Question 3

Section C

3(a) i) The fungus will convert the glucose store in soy beans and wheat grains to simple sugar.

So the simple sugar formed can be directly used for fermentation in stage 2.

3(a) ii) Brine is concentrated salt (sodium chloride)

solution. It may provide an alkaline medium for the yeast to work best for fermentation.

Also, Brine gives its salty flavour of the soy sauce.

3(a) iii) As pasteurization doesn't involve extreme high temperature (only 71°C) so it won't change

the flavour and taste of the soy sauce. But by pasteurization, microorganisms ^{is growth} can be inhibited.

It can sterilize the raw soy sauce for safety consumption.

3(a) iv) Aseptic techniques involve using equipments free from microorganisms in the whole process. It

can prevent the bacteria and any other microorganisms in the environment contaminate the food in the

manufacturing process to provide safety food. Also, it prevents the microorganisms used in the manufacturing

process from contaminate the surrounding environment to affect the environment.

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3(b) i) (1) Microbe M is a virus. Microbe M is smaller in size and attached on the cell membrane of E. coli, while E. coli is bigger in size and being attached.

3(b) i) (2) Microbe M attach to the cell membrane of E. coli and its sheath is lowered to inject its DNA or RNA genetic material into the E. coli's cytoplasm.

3(b) i) (3) The bacteria is readily to accept the gene of interest and they can multiple with carrying the gene of interest by cell division. Thus, a large amount of cells carrying the gene of interest can be ~~re~~ greatly produced in low cost since bacteria is a low cost raw material.

3(b) ii) (1) Microorganisms like E. coli may easily enter human bodies when swimming (may be ^{by} drinking a little amount of sea water) will easily cause infection. Therefore, there is a health risk.

3(b) ii) (2) (i) As the bacteria will develop colony in the agar plate by supplying sufficient nutrient. By counting the numbers of colony, the number of E. coli bacteria can be known. Incubated for 24 hours can provide sufficient time to see the development of colony.

3(b) ii) (2) (ii) E. coli count per 100 cm³ = 26 x 2 = 52 per 100 cm³
so the beach is not very poor.

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4a) Bone marrow stem cells are undifferentiated cells. They can develop into different kind of cells such as lymphocytes to treat SCID.

ii) The basis is to treat the disease by inserting normal gene to the defective cells of the patients. The advantage of somatic cell therapy is that it does not cause rejection but transplanting normal bone marrow stem cells may result in rejection and have to take immunosuppressive drugs.

iii) The treatment done by germ line gene therapy is inheritable and the offspring is affected. While somatic cell gene therapy is not inheritable and the offspring is not affected.

The treatment done by germ line gene therapy can affect the genome of the population while somatic cell gene therapy cannot.

iv) The viral vector may cause immuno-disease to the body and weaken their body defense. The gene carried by the viral vector may also affect the normal functioning of the body cells.

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4(ii) Denature the DNA double helix by heating the reaction mixture to 95°C . Cool down the mixture to allow primers to bond with the single strand DNA for synthesis of DNA. Rise the temperature again to allow the process to repeat by DNA polymerase.

ii) 1) To amplify the DNA as the DNA found in the crime scene may be too little and incomplete.

2) The product of PCR are cut into different fragments by restriction enzyme. The short tandem repeats then run through gel electrophoresis. Compare the bands pattern with that of victims, suspects and blood samples found in the crime scene. If the bands of the suspect match the bands of the blood sample but not that of victims, the suspect is likely to be the criminals.

iii) 1) To select the transformed bacteria in GM maize as not all bacteria cells can take in the primers X

2) GM plant may contain extra nutrients such as vitamins to improve the health of people. GM plant can resist pests so that the GM plant will not be infected by pests. X

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Mid Performance Sample 10: Paper 2 Question 4

i) The gene of the GM plants may pass to the wildlife of other species. This damage the ecological equilibrium and reduces the biodiversity. X

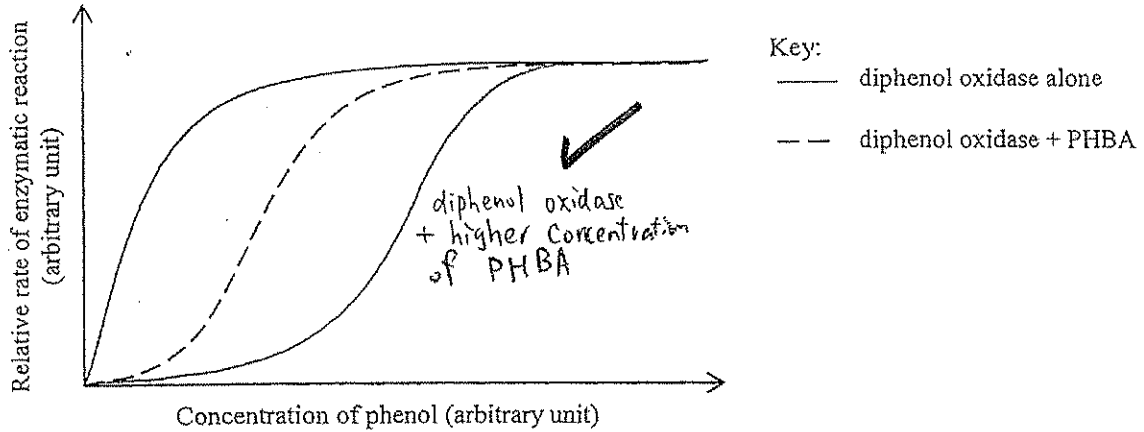
The GM plants may give rise to "super-bugs" as the toxin produced to kill insects may speed up mutation and put selection pressure on pests. ✓

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Low Performance Sample 11: Paper 1 Section B Question 4

4. When a slice of apple is exposed to air, it quickly turns brown. This is because the enzyme diphenol oxidase catalyzes the oxidation of phenols in the apple to dark-coloured products. In an experiment, the effect of a chemical, PHBA, on the rate of this enzymatic reaction was investigated. The experiment was carried out at the same temperature and the same concentration of diphenol oxidase was used. The results are shown in the graph below:



(a) Deduce the relationship between PHBA and diphenol oxidase. (3 marks)

PHBA is a competitive inhibitor to diphenol oxidase. It is because when diphenol oxidase is used alone, the relative rate of enzymatic rate is high. However, when PHBA is added to diphenol oxidase, the rate of enzymatic reaction is decreased.

(b) Draw a curve in the above graph to show the effect of PHBA on the rate of enzymatic reaction if a higher concentration of PHBA had been used. (1 mark)

(c) Suggest ~~one other~~ factor that should be kept constant in this experiment. Explain ~~how~~ this factor may affect the activity of the enzyme. (3 marks)

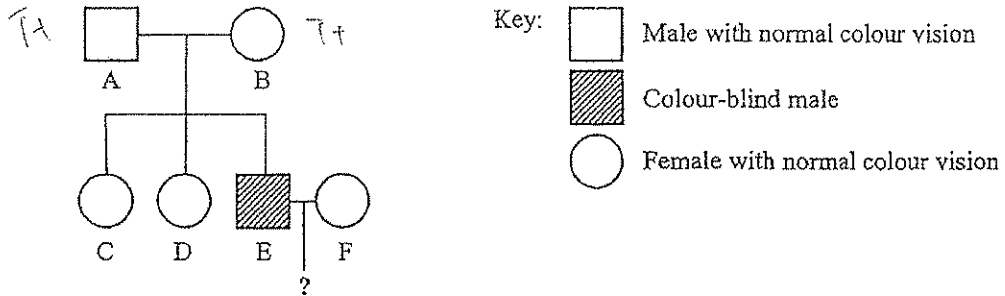
Temperature. When the temperature is low, the enzyme is inactive, and enzymatic rate is low. The chance of forming enzyme-substrate complex is low. However, with an increase in temperature, the particles can gain more kinetic energy and collide against each other more frequently, ^{thus} and the chance of forming enzyme-substrate complex is high.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Low Performance Sample 12: Paper 1 Section B Question 9

9. A couple (A and B) does not have any family history of Down syndrome, but the female (B) has a family history of colour blindness. The two daughters of this couple do not have colour blindness, but one of them (C) has Down syndrome. The son (E) has colour blindness. The pedigree of this family is shown in the following diagram:



(a) Normal people have 23 pairs of chromosomes in the cell nucleus, but people with Down syndrome have an extra chromosome in the 21st pair of chromosomes. Explain how this couple could give birth to a Down syndrome child (C). (2 marks)

neither
 when the male gamete of female gamete contain
 one a chromosome consist two chromosome, they fuse
 together form a zygote of three chromosome then there is
 a extra chromosome, the fusion of gamete can not restore to a normal

(b) (i) In humans, colour blindness is a sex-linked trait. Based on the above pedigree, deduce the genotype of the mother (B) with respect to colour vision. (Marks will not be awarded for genetic diagrams.) (5 marks)

The mother (B) and father (A) have a offspring
 is a colour blindness. The gender of the. Since the
 colour blindness is a sex-linked trait, in the X chromosome.
 Therefore there is a higher chance for the colour blindness
 X chromosome come from the mother than the father.
 So I can deduce that the genotype of the mother (B)
 is ~~normal colour vision~~ consist a colour blindness
 X-linked and has a normal colour vision.

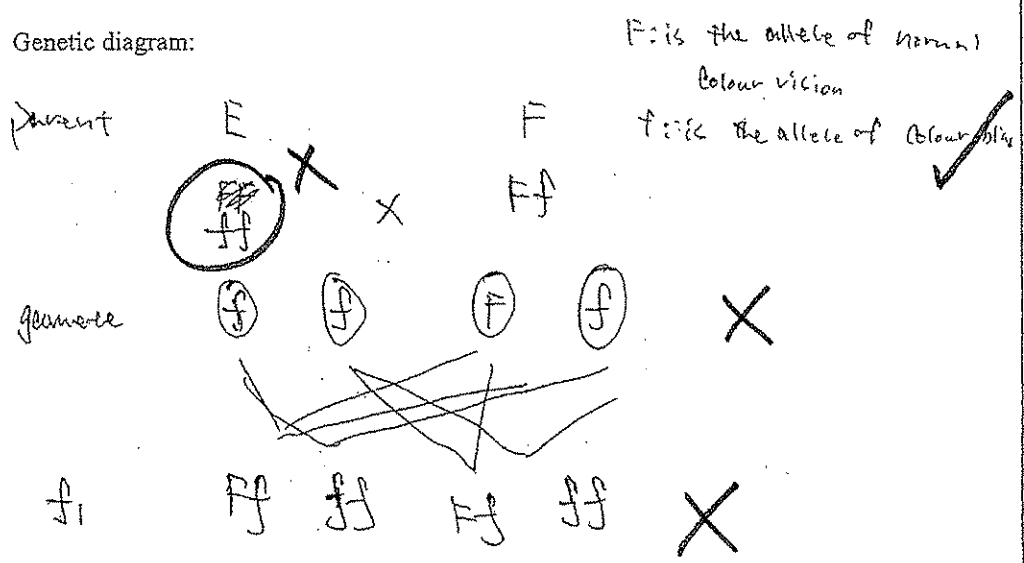
Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Low Performance Sample 12: Paper 1 Section B Question 9

(ii) F is a carrier of the colour blindness allele. With the aid of a genetic diagram, find the probability of E and F giving birth to a colour-blind daughter. (5 marks)

Genetic diagram:



The ratio: 1 : 1 : 1 : 1 : 1 : 1
 Colour-blind : Normal Colour vision : daughter
 is $\frac{1}{2}$

Probability of E and F giving birth to a colour-blind daughter: $\frac{1}{2}$ X

Answers written in the margins will not be marked.

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Low Performance Sample 13: Paper 2 Question 1

1.(a)(i) Ovulation ✓

(ii) The plasma concentration of progesterone from day 14 to day 42 increases.

This is because after ovulation, the remaining follicles would be converted to yellow body (Corpus luteum). Yellow body would secrete progesterone and oestrogen respectively.

(iii) The endometrium would shed off. ✓

1.(b)(i) Cardiac output when he is at rest

$$= 0.07 \times 75$$

$$= 5.25 \text{ dm}^3/\text{min}$$

Cardiac output when he is doing light exercise

$$= 0.09 \times 145$$

$$= 13.05 \text{ dm}^3/\text{min}$$

Cardiac output when he is doing vigorous exercise

$$= 0.11 \times 190$$

$$= 20.9 \text{ dm}^3/\text{min}$$
 ✓

Ventilation rate when he is at rest

$$= 0.86 \times 14$$

$$= 12.04 \text{ dm}^3/\text{min}$$

Ventilation rate when he is doing light exercise

$$= 1.67 \times 24$$

$$= 40.08 \text{ dm}^3/\text{min}$$

Ventilation rate when he is doing vigorous exercise

$$= 2.50 \times 40 = 100 \text{ dm}^3/\text{min}$$
 ✓

寫於邊界以外的答將不評閱。

Answers written in the margins will not be marked.

寫於邊界以外的答將不評閱。

Answers written in the margins will not be marked.

(cont'd)

Low Performance Sample 13: Paper 2 Question 1

1.(b)(ii) The cardiac output and ventilation rate increase ^{to increase muscle contraction.} with the increasing level of exercise. The increase in cardiac output ^{and ventilation rate} is to increase the blood arrived to the muscle cells for supply ^{for carrying out aerobic respiration} enough oxygen and ^{as well.} removing metabolic wastes from the cells, such as CO₂ and lactic acid

(iii) During exercise, the venous blood returning to the heart increases. This stimulates the stretch receptors present. Nerve impulses are sent to the cardiovascular centre. The cardiovascular centre responds ^{by sending nerve impulses via} sympathetic nerve to S.A. node, the pacemaker for ~~X~~ increasing the cardiac output.

(iv) Upon vigorous exercise, by evaporation of sweat from the skin surface, both the blood volume and water potential would decrease. ~~X~~ The decrease in blood volume is detected by baroreceptors while that decrease in water potential is detected by osmoreceptors. The baroreceptors and osmoreceptors send nerve impulses to hypothalamus. Hypothalamus is stimulated and secretes more ADH. It then sends nerve impulses to the anterior pituitary gland. The ~~X~~ anterior pituitary gland releases less ADH and thus the concentration of ADH in blood decreases. The permeability of collecting duct to water and urea is increased. A higher proportion of water and urea is absorbed back. As a result, ~~the~~ less and concentrated urea is produced.

1.(a)(iv) Without progesterone, the endometrium would shed off. Thus, the drug for contraception has the inhibitor to ~~X~~ progesterone. Implantation is thus not possible as the endometrium is shed off.

Answers written in the margins will not be marked.

寫於邊界以外的答將不評閱。

Low Performance Sample 14: Paper 2 Question 3

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Answers written in the margins will not be marked.

寫於邊界以外的答案，將不予評閱。
Answers written in the margins will not be marked.

a) i) if the mixture is not inoculated and incubated properly, unwanted impurities or bacteria may enter the dish, which contaminates the mixture

ii) Adding brine to the mixture can kill bacteria except salt-tolerant lactic acid bacteria and yeast by osmosis. This can ensure the quality of soy sauce

iii) Using pasteurization to ~~sterilize~~ sterilize the raw soy sauce will cause less damage to the soy sauce, when compared to other heat-related ~~sterilizing~~ aseptic methods. Also it is going to be bottled, therefore bacteria in the sauce are to be killed to avoid further bacterial growth in the sauce.

iv) The principle of aseptic techniques is to minimize the number of bacteria in the products, without dealing much damage to the product quality.

b) i) 1) Virus. Size of E. coli is bigger than the microbe M.

2) The event shown in Figure 2 is the attachment of virus on the cell membrane of E. coli. By recognizing the surface protein of E. coli, virus is able to bind themselves with the surface protein.

3) X

(cont'd)

寫於邊界以外的答案，將不予評閱。

Answers written in the margins will not be marked.

寫於邊界以外的答案，將不予評閱。

Answers written in the margins will not be marked.

b) (i) 1) Since E. coli may enter ~~our~~ their bodies during swimming and cause diseases. X

2) (i) By pouring E. coli - ~~not~~ containing water on the agar plate and allow them to grow, (we can see count the number of ~~of~~ E. coli in the sample by counting the number of spots) and calculate it with the volume of water used.

(ii) number of spots = 26.

\therefore E. coli count per 100 cm^3 = $\frac{26 \times 20}{50} = 52$ counts per 100 cm^3 < 1000.

\therefore the beach is now "very poor" ✓