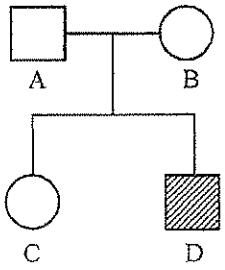
HKDSE Combined Science (Biology Part) Practice Papers
Samples of Student Performance

High Performance Sample 1: Section B Question 5

5. The pedigree below shows the inheritance of colour blindness in a family:



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

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 E is colour-blinded, so he must have at least one allele for colour blind and have a Y chromosome from mother individual B. ✓ At least Y or X chromosome carry the allele for colour-blind. Let colour blind be Y-linked then individual A should be colour-blinded but he is normal so it is not Y-linked and it is X-linked ✓ so that 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 ✓ for colour blind.

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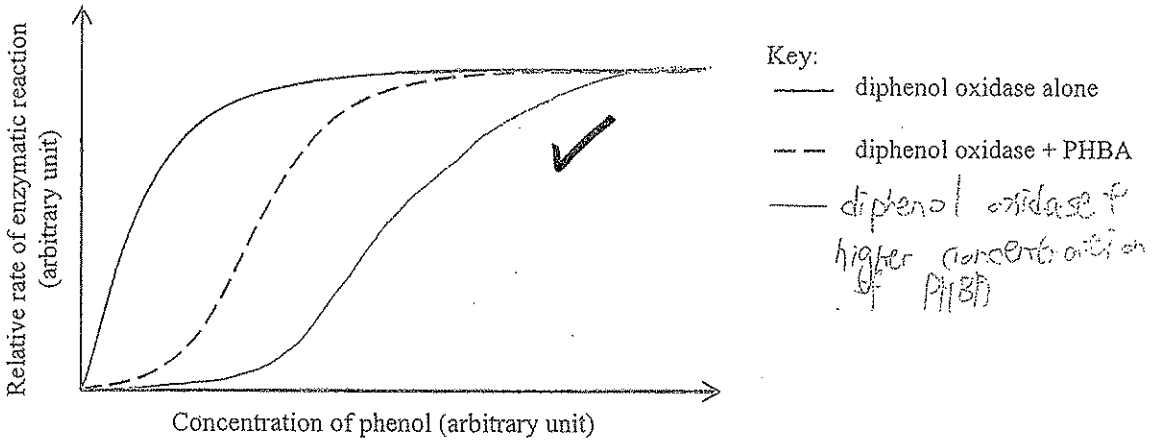
High Performance Sample 2: Section B Question 8

8. 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, showing PHBA inhibit the enzymatic activity 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

(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. inhibitor. (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.

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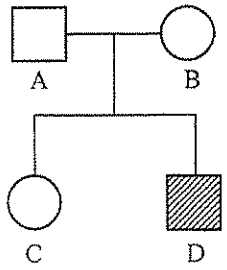
Mid Performance Sample 3: Section B Question 5

5. The pedigree below shows the inheritance of colour blindness in a family:



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

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 ~~be~~ have received an abnormal allele from father or mother. Since E is a male, it must have recieved 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. ✓

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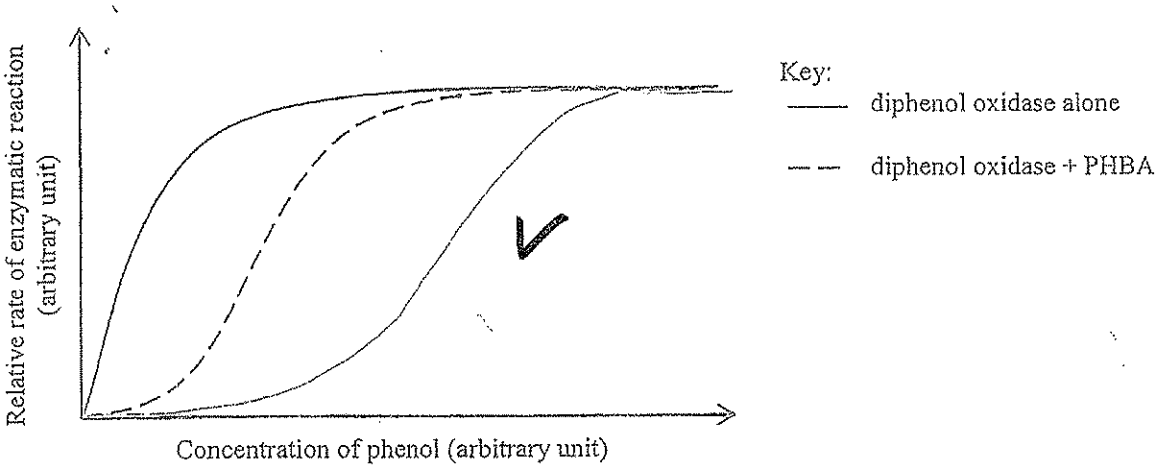
Mid Performance Sample 4: Section B Question 8

8. When a slice of apple is exposed to air, it quickly turns brown. This is because the en diphenol oxidase catalyzes the oxidation of phenols in the apple to dark-coloured products. In 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)

Competitive
PHBA is an inhibitor to 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 ~~rate~~ final relative rate of enzymatic reaction become the same. It shows that the rate of enzymatic reaction can be restored by adding more substrate. Therefore, PHBA 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)

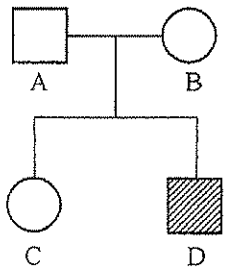
(c) Suggest one other factor that should be kept constant in this experiment. Explain how this factor may affect the activity of the enzyme. (3 marks)

The pH 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 contrasts, under optimum pH value, enzyme can [illegible]

Answers written in the margins will not be marked.

Low Performance Sample 5: Section B Question 5

5. The pedigree below shows the inheritance of colour blindness in a family:



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

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)

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

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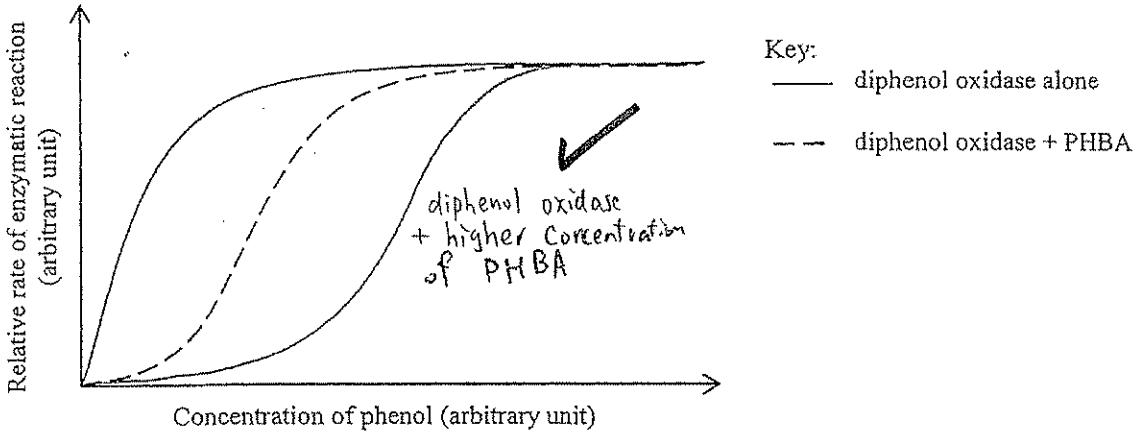
Low Performance Sample 6: Section B Question 8

8. 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 ~~ture~~ 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, ~~and~~ thus the chance of forming enzyme-substrate complex is high. The enzymatic rate is high under high temperature.

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