

Name: Jerry Jiang

Block: E

Biology HL – Paper 1 [55 min]

- Do not open this examination paper until instructed to do so.
- Answer all the questions
- For each question, choose the answer you consider to be the best and indicate your choice on the answer sheet below.
- The maximum mark for this examination paper is **[35 marks]**

2020 Feb Block Week

題目: 2019 Nov

1. <u>C ✓</u>	11. <u>D ✓</u>	21. <u>B ✓</u>	31. <u>B ✓</u>	Paper 1
2. <u>D ✓</u>	12. <u>A ✓</u>	22. <u>D B</u>	32. <u>C ✓</u>	
3. <u>B ✓</u>	13. <u>C ✓</u>	23. <u>C ✓</u>	33. <u>A ✓</u>	
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7. <u>D ✓</u>	17. <u>D ✓</u>	27. <u>C ✓</u>		
8. <u>B C</u>	18. <u>A ✓</u>	28. <u>A ✓</u>		
9. <u>D ✓</u>	19. <u>B ✓</u>	29. <u>C D</u>		
10. <u>C ✓</u>	20. <u>C</u>	30. <u>C ✓</u>		



Name: Jerry Jiang

Block: E

Biology HL – Paper 3 [1 hour 15 min]

- Do not open this examination paper until instructed to do so.
- Answer all the questions
- For each question, choose the answer you consider to be the best and indicate your choice on the answer sheet below.
- The maximum mark for this examination paper is **[45 marks]**

Section A: Answer all questions (1-3)

Section B: Option D Human Physiology (19-22)

40
45

P1 + P3

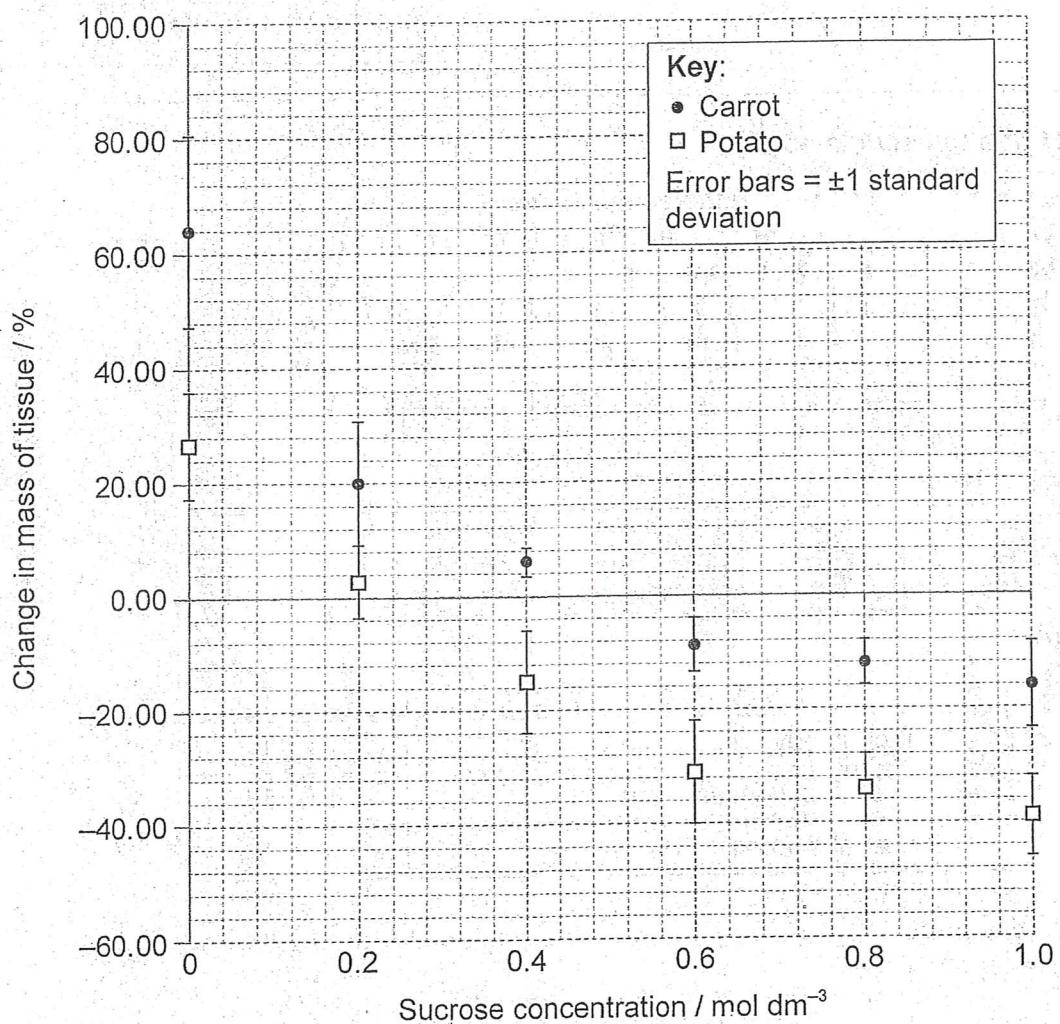
37.9

(7)

Section A

Answer all questions. Answers must be written within the answer boxes provided.

1. An experiment was carried out on osmosis in carrot (*Daucus carota*) root tissue and potato (*Solanum tuberosum*) tuber tissue. Similar sized pieces of tissue were cut and soaked in different sucrose solutions for 24 hours. The results are shown in the graph below.



- (a) Using the graph, estimate isotonic sucrose solutions for potato tissue and carrot tissue. [2]

Potato: ... 0.22 mol / dm³ ✓
Carrot: ... 0.48 mol / dm³ range 0.6-0.8 mol dm⁻³ +1

(This question continues on the following page)



(Question 1 continued)

- (b) Suggest a reason for the difference in the isotonic points for the potato and the carrot tissues.

[1]

Potato and carrot contain different amount of sucrose.
 tuber taproot

+0

- (c) From the evidence provided by the graph, evaluate the reliability of these data.

[2]

- For carrot, the error bar is quite large, especially for $c=0$ or 0.2 M .
- Potential inaccuracy might be present... (get even more than 30% for $c>0\text{ M}$).
- For potatoes, the error bar is always within 20%, so the result is relatively reliable.

+2

- (d) Explain one reason for calculating the percentage change in mass.

[2]

- The tissue size used in each case can't be identical and larger tissue will have more dramatic absolute change in mass.
- Calculating the percentage change is a more accurate way of presenting and comparing the trend.

+2

- (e) Predict what would happen to a red blood cell placed in distilled water.

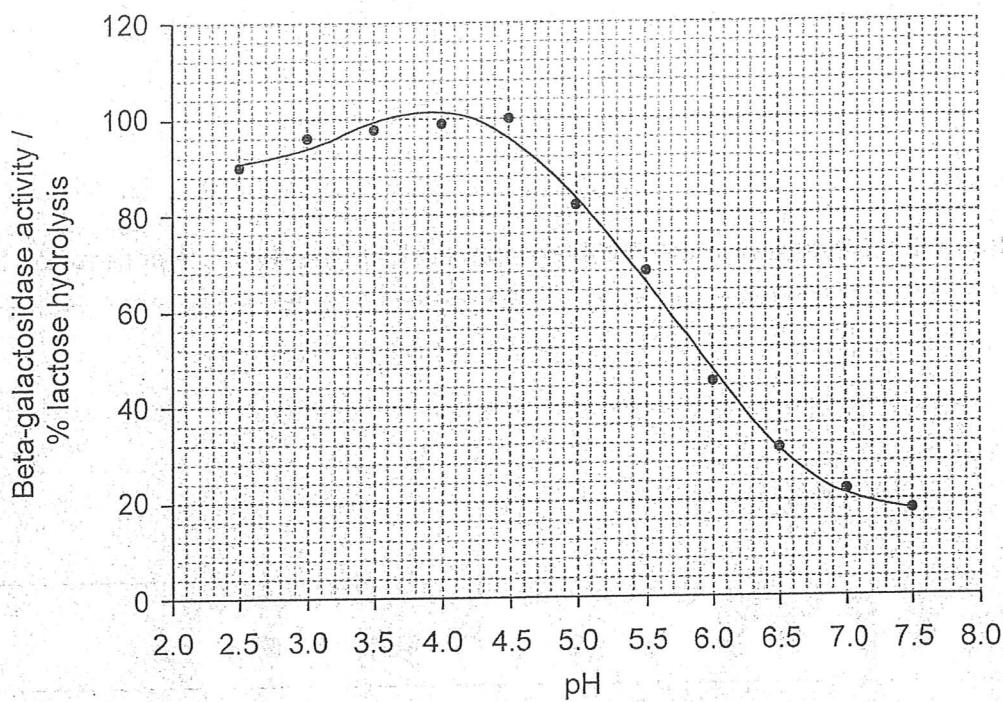
[1]

In the hypotonic solution, water will enter the red blood cell and make it bigger or even burst.

+1



2. The enzyme beta-galactosidase hydrolyses lactose to release glucose and fructose. A study was carried out to determine how acidity affects the activity of a beta-galactosidase enzyme, extracted from the fungus *Penicillium simplicissimum*.



[Source: Rubens Cruz, et al., (1999), *Revista de Microbiología*, 30, pages 265–271]

- (a) State another independent variable that would affect the activity of this enzyme. [1]

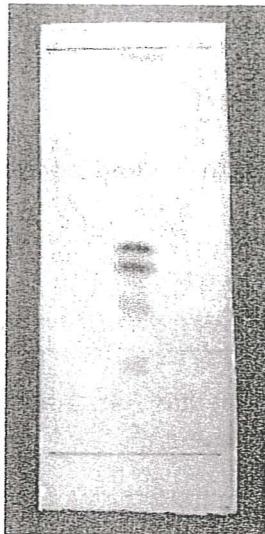
.....temperature..... ✓ +1

- (b) Outline the measurements which would need to be taken to determine the activity of the beta-galactosidase at different pH values. [2]

..... prepare .. solutions .. at .. different .. p.H .. values .. and .. record ..
..... measure .. the .. ~~ab~~ .. amount .. of .. lactose .. decreasing .. or .. the .. +2
..... amount .. of .. glucose .. / .. fructose .. increasing .. to .. see .. the .. efficiency ..
..... and .. activity .. of .. the .. enzyme ..



3. Pigments were extracted from spinach (*Spinacia oleracea*) leaves and separated on a thin layer chromatogram.



- (a) Describe how the spinach leaf pigment extract should be applied to a chromatogram so that the pigment bands separate clearly. [2]

... the pigment should be ~~mixed with polar solvent~~ applied to the starting line on the chromatogram in a straight line. ✓
... the volume of the extract applied shouldn't be too large at a time
... so that the liquid band won't spread out. ✓

+2

- (b) State **one** advantage of using thin layer chromatograms over paper chromatograms. [1]

The SiO_2 powder on the thin layer chromatograms help more polar pigment to travel faster and help the bands separate. ✓

+1

- (c) The chromatogram reveals that the spinach leaves contain a variety of coloured pigments. Explain the observation that spinach leaves appear green. [2]

... The color of the dominant pigment in spinach appears green because photosystems tend to absorb red light around 700 nm during photosynthesis.
... Having more green pigment assist spinach in the process of photosynthesis.

Chlorophyll most abundant

+1



Option D — Human physiology

19. The table below summarizes the distribution of the amino acids lysine and tryptophan in four food items.

	Lysine / mg g ⁻¹ of protein	Tryptophan / mg g ⁻¹ of protein
Beef	203	213
Milk	158	417
Rice	86	224
Wheat	57	217

The table below shows the average content of lysine and tryptophan in diets of the UK and India. The Indian diet is mainly vegetarian.

	Lysine / mg g ⁻¹ of protein	Tryptophan / mg g ⁻¹ of protein
UK diet	140	211
Indian diet	87	293

[Source: WHO Technical report 935 (2002)]

- (a) Distinguish between essential and non-essential amino acids. [1]

...essential amino acids... have to be... ingested and can't be produced by...
the body... while... non-essential ones... can be synthesized by... the body... ✓ +1

- (b) Using the data from the tables, suggest a reason for the differences in lysine concentration in the diets from the UK and India. [1]

...India... has... mainly... vegetarian... diet... and... lysine... concentration... is... high... ✓
...in meat... and... low... in rice... and... wheat... so... lysine... is... lower... for... Indian... compared
to UK diet. +1

(Option D continues on the following page)



(Option D, question 19 continued)

- (c) Explain the consequences of protein deficiency malnutrition.

[2]

... essential amino acids ... are in absent ... and certain protein / enzymes/hormones
... in the body ... can't ... be ... synthesized and stop metabolic processes ... ✓
... break down of ... important tissue ... (like muscle) ... to support the ...
... demand of amino acids ... so this can lead to ... organ deficiency or ... ✓ +2
... other ... diseases:

- (d) List two dietary sources of vitamin D.

[1]

... fish ... ✓
... dairy product ... (fortified milk, cheese, etc) ...

+1

- (e) State one possible cause and one symptom of type II diabetes.

[1]

Cause: ... obesity ... or ... unhealthy life style ... cause resistant to insulin ...
Symptom: ... resistant to insulin ... lead to ... high blood sugar level ... ✓

+1

- (f) Outline a function of fats in the body.

[1]

... long term ... stable ... storage ... of ... large amounts ... of ... energy ... ✓

+1

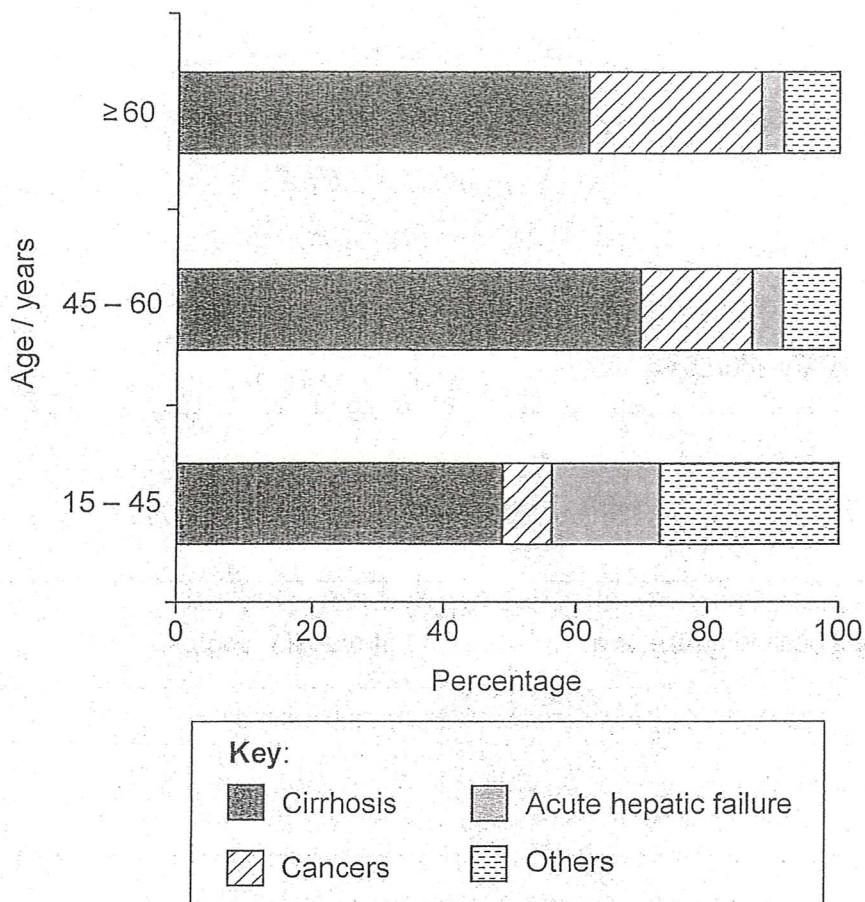


40FP33

Turn over

(Option D continued)

20. Liver transplantation is a viable treatment option for end-stage liver disease and acute hepatic failure. The graph below shows the main diseases leading to liver transplants, in three age groups.



[Source: www.eltr.org]

- (a) Describe the relationship between age and liver transplants due to cancers. [1]

As age increase, probability of liver transplant due to cancer increases.

+1

(Option D continues on the following page)



(Option D, question 20 continued)

(b) One of the functions of the liver is to break down hemoglobin.

(i) Describe the breakdown of hemoglobin in the liver.

[3]

..... kuppfer cells in sinusoids phagocytose broken red blood cells.
..... hemoglobin in the red blood cell is broken down into heme and
..... globin:
..... protein in globin is reused while iron is ~~also~~ from heme
..... is ~~also~~ also recycled and the excess stored in liver. ✓ +3
..... bilirubin is formed from heme and combined with bile....
..... salt produced by hepatocytes using excess cholesterol ~~using~~ to form
..... bile. ✓
..... bile is then stored in the gall bladder.

(ii) Outline **one** other function of the liver.

[1]

..... Detoxifye ~~detox~~ drug / alcohol / toxins. ✓

+1

(c) State **one** material not produced by the human body that is egested from the digestive system.

[1]

..... cellulose / food fibers. ✓

+1

21. (a) The stomach secretes hydrochloric acid into its lumen.

(i) State **one** mechanism that controls gastric secretion.

nervous control

hormonal control

..... Stomach can sense the amount of food in it and only secretes HCl...
..... according to the amount of food. - nervous control

+0

(ii) State the type of gland that secretes juices into the digestive system.

[1]

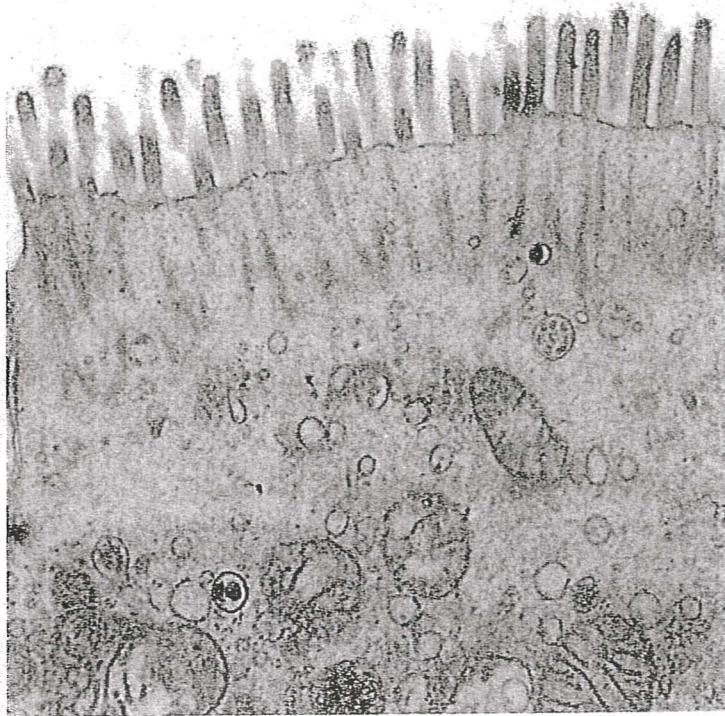
..... exocrine gland (like pancreas). ✓

+1



(Option D, question 17 continued)

- (b) The electron micrograph below shows part of an epithelial cell from the digestive system.



[Source: http://131.229.88.77/microscopy/Portfolios/Frances/Portfolio2_files/Pf2_004.html]

- (i) State where this type of cell can be found in the digestive system. [1]

internal linings of small intestine or stomach wall

careful - only give one answer

+1

- (ii) Outline two adaptations of this cell to its function that are visible in this electron micrograph. [2]

micro
the villi on the cell increase surface area to facilitate absorption of nutrients.
a lot of ribosomes to produce digestive juices to secrete.
a lot of mitochondria to provide energy to digest / twist to push food forward.

+2

(Option D continues on the following page)

IB examiners will only mark 1st two provided



(iii) State a cause and a consequence of jaundice.

[2]

Cause: ... deficient liver ... lead to excess bilirubin in blood ✓

Consequence: yellow spots on skin or eye white.....

+2

22. Explain the heart sounds.

[3]

- when atrium/ventricle contracts, the pressure pushes blood out.
(AV valves open in vent/atrial diastole)
- during diastole, all valves are closed and blood enters atriums.
- atrial systole, blood pushes open b/tricuspid valve and enter ventricles.
- atrial *not enough pressure, one* diastole, pressure push b/tricuspid valve back to close and make "lub".
due to Vent. Systole.
- Meanwhile, ventricle systole, blood pushes open semi-lunar valves and enter arteries.
- finally, ventricle diastole, ~~blood~~ pressure push semi-lunar valves back to close and make "Dub".

Please do not write on this page.

Answers written on this page will not
be marked.



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(Option D continued)

22. Outline the ways in which the liver regulates the chemical and cellular composition of the blood.

[6]

- remove toxin / alcohol / drug ✓
- kuffer cells phagocytose bacteria ✓
- store nutrients in excess like vitamin D. ✓
- store glucose as glycogen ✓

- respond to insulin / glucagon that dependent on blood sugar level. ✓
- ~~phagocytose~~ kuffer cells phagocytose bad red blood cells
- hemoglobin break into heme and globin. +6
- iron in heme is recycled or stored in liver. ✓
- bilirubin is converted from heme to form bile pigment.
- Hepatocytes produce bile salt from excess cholesterol. ✓
- Bile is formed combining bilirubin and bile salt, then stored in gall bladder.

End of Option D