Mercedes College

ASPIRE EXCEL LEAD

YEAR 12 ATAR HUMAN BIOLOGICAL SCIENCE

SEMESTER TWO EXAM

MULTIPLE CHOICE ANSWER SHEET 2018

Name: _ANSWERS_ .

Teacher's Name: _____

INSTRUCTIONS

For each question shade the box to indicate your answer.
Use **only** a blue or black **pen** to shade the boxes.

For example, if b is your answer: ☐a ■ ☐ ☐

If you make a mistake, place a cross through that square, do not erase or use correction fluid and shade your new answer.

For example, if b is a mistake and d is your answer: ☐ ✗ ☐ ■

Marks will **not** be deducted for incorrect answers.
No marks will be given if more than one answer is completed for any question.

Question 1 -30

1	☐a ☐b ■c ☐d
2	☐a ☐b ■c ☐d
3	☐a ■b ☐c ☐d
4	☐a ☐b ☐c ■d
5	☐a ■b ☐c ☐d

6	■a ☐b ☐c ☐d
7	☐a ☐b ■c ☐d
8	☐a ☐b ☐c ■d
9	☐a ■b ☐c ☐d
10	☐a ☐b ■c ☐d

11	■a ☐b ☐c ☐d
12	☐a ■b ☐c ☐d
13	☐a ☐b ■c ☐d
14	☐a ☐b ☐c ■d
15	☐a ■b ☐c ☐d

16	☐a ☐b ☐c ■d
17	☐a ☐b ■c ☐d
18	☐a ■b ☐c ☐d
19	☐a ■b ☐c ☐d
20	■a ☐b ☐c ☐d

21	☐a ■b ☐c ☐d
22	☐a ■b ☐c ☐d
23	☐a ☐b ☐c ■d
24	■a ☐b ☐c ☐d
25	☐a ☐b ■c ☐d

26	☐a ☐b ■c ☐d
27	■a ☐b ☐c ☐d
28	■a ☐b ☐c ☐d
29	☐a ☐b ■c ☐d
30	☐a ☐b ☐c ■d

Section Two: Short answer   **50% (100 Marks)**

This section has **eight (8)** questions. Answer **all** questions. Write your answers in the spaces provided.

Additional working space pages at the end of the Question/Answer booklet are for planning or continuing an answer. If you use these pages, indicate at the original answer, the page number it is planned/continued on and write the question number being planned/continued on the additional working space page.

Suggested working time: 90 minutes.

Question 31   **(13 marks)**
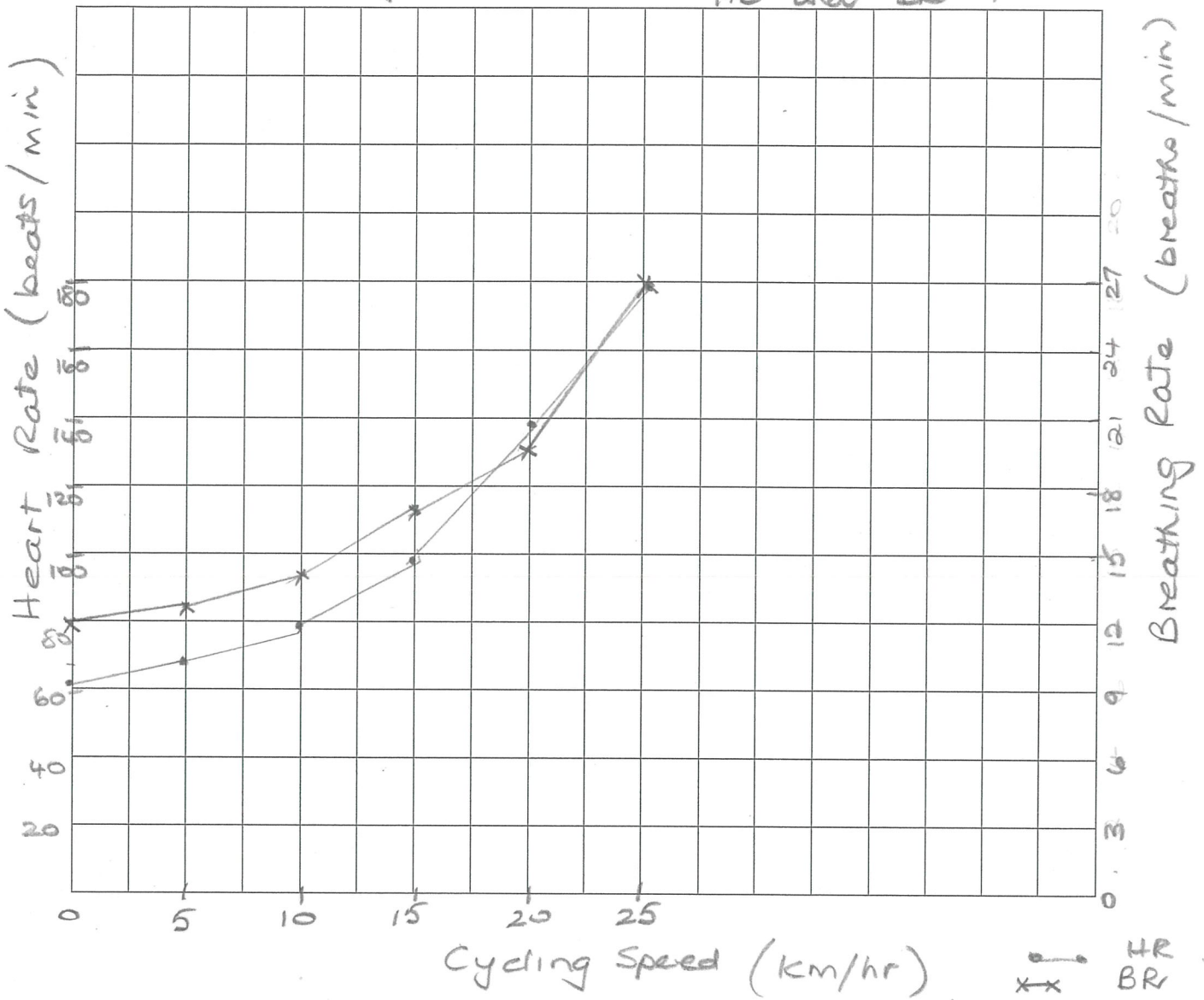
An investigation was carried out into the effects of exercise on the heart rate and breathing rate of a student. His heart rate, breathing rate and blood pH were first measured at rest. Data were collected after he had cycled for 2 minutes at 5km/hr on an exercise bike. After resting for 5 minutes, the procedure was repeated at cycling speeds of 10, 15, 20 and 25km/hr. The results are shown below in the table below.

Cycling Speed (km/hr)	Heart Rate (beats/min)	Breathing Rate (breaths/min)
0	64	12
5	70	13
10	80	14
15	100	17
20	140	20
25	180	27

(a) Graph these results on the grid provided. (If needed there is a second grid on page 34 of this booklet. If you use the second grid, make sure you clearly write cancelled on the grid below)
                                                               (5 marks)

31

The Effect of Different Cycling speeds on
HE and BR.

(b) Describe the relationship between cycling speed and heart rate. (1 mark)

AS cycling speed ↑ HR also ↑

(c) Explain why the breathing rate increased as the cycling rate is increased.

(3 marks)

- ↑ cycling rate will ↑ CO_2 production.
- ↑ CO_2 → ↑ BR.
- ↑ need for O_2

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(d) During the investigation, the student was given a 5 minute rest between each 2 minute cycling session. Suggest why this was done. (1 marks)

To allow both HR & BR to
return to normal resting.

(e) The student in this investigation had blood samples taken before any cycling activity and at the end of the investigation. The pH was measured for both samples and it was found that the pH had dropped from 7.4 to 7.2 during the investigation.
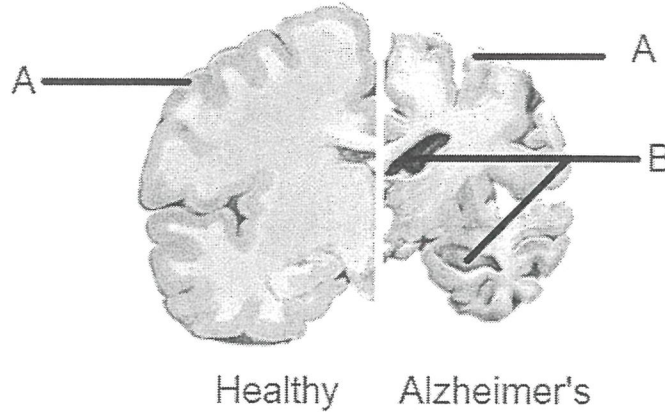
Explain why this change would have occurred. (3 marks)

- ↑ activity ⟶ ↑ CO_2 produced.
- ↑ CO_2 ⟶ ↑ H^+ ions in blood
- ↑ H^+ ⟶ ↓ pH.

Question 32 **(11 marks)**

Parts (a), (b) and (d) of the following question refer to the diagram of a healthy brain compared to a brain suffering from Alzheimer's disease shown below.

Healthy   Alzheimer's

(a) State the name of the matter found at the locations labelled A. (1 mark)

Description	Mark
Grey matter	1
Total	1

(b) State **one** change that can be seen between the healthy and Alzheimer's affected brain. (1 mark)

Description	Mark
Any one of the following for one mark:	
• Cerebral Cortex / Cerebrum, shrivels up/reduces in size • Hippocampus reduces in size/shrivels up • Ventricles/fluid-filled areas of the brain increase in size/grow larger	1
Total	1

Decreased brain size
Less white matter

(c) Repetitive questions and conversations are a common sign of Alzheimer' Disease. Suggest how damage to the outer areas of the brain would cause this occur. (3 marks)

Description	Mark
Damage to the association areas/temporal lobe/frontal lobe	1
Severs the links/connections between nerve pathways	1
(which are) associated with memory	1
Total	3

(d) Alzheimer's disease is also associated with dysfunctional autonomic nervous systems. Compare and contrast the somatic and autonomic nervous systems.

(3 marks)

Description	Mark
One similarity for 1 mark from the following:	1
• Acetylcholine used • Excitatory capabilities • Receive input from sensory neurons	
Two differences for 1 mark each from the following rows:	1-2

Somatic	Autonomic
Effector: skeletal muscle	Effector: smooth and cardiac muscle and glands
Voluntary	Involuntary
One motor neuron	Two motor neurons
No use of epinephrine	Use of epinephrine
No inhibitory capability	Inhibitory capability

Total	3

(e) There is currently no cure for Alzheimer's disease; however, cell replacement therapy has the potential to treat such nervous system disorders. Explain the process of cell replacement therapy in the context of Alzheimer's disease.   (3 marks)

Description	Mark
Stem cells are isolated	1
(stem) cells are cultured/grown ex-vivo	1
Cells are reintroduced into damaged areas of the brain	1
Total	3

Question 33   **(13 marks)**

An increasing number of young patients have been diagnosed with severe intestinal infections. Scientists believe that the microorganism responsible has a high rate of mutation and has shown resistance to common antibiotic treatments.

(a) State the most likely microorganism associated with the intestinal infection.

(1 mark)

Description	Mark
Bacteria	1
Total	1

(b) State and briefly describe the process by which this microorganism gains antibiotic resistance.   (4 marks)

Description	Mark
Natural Selection	1
Some bacteria show (antibiotic) resistance	1
Antibiotics kill 'normal' bacteria / do not kill resistance bacteria	1
Resistant bacteria multiply/grow	1
Total	4

(a) Since it is difficult to cure the intestinal infection caused by this organism, explain how the spread of this infection can be prevented by using the body's immune system synthetically.

(3 marks)

Description	Mark
Vaccine/Vaccination	1
Any two of the following for 1 mark each: • Use of weakened/attenuated pathogen and/or dead pathogen • Ability to manufacture antibodies / creates memory cells • Artificial active immunity	1-2
Total	3

(b) Pathologists were able to observe the cells of the patients and saw them to be infected with the microorganism. Draw a flowchart, or annotated diagram, to demonstrate the appropriate response of the immune system.
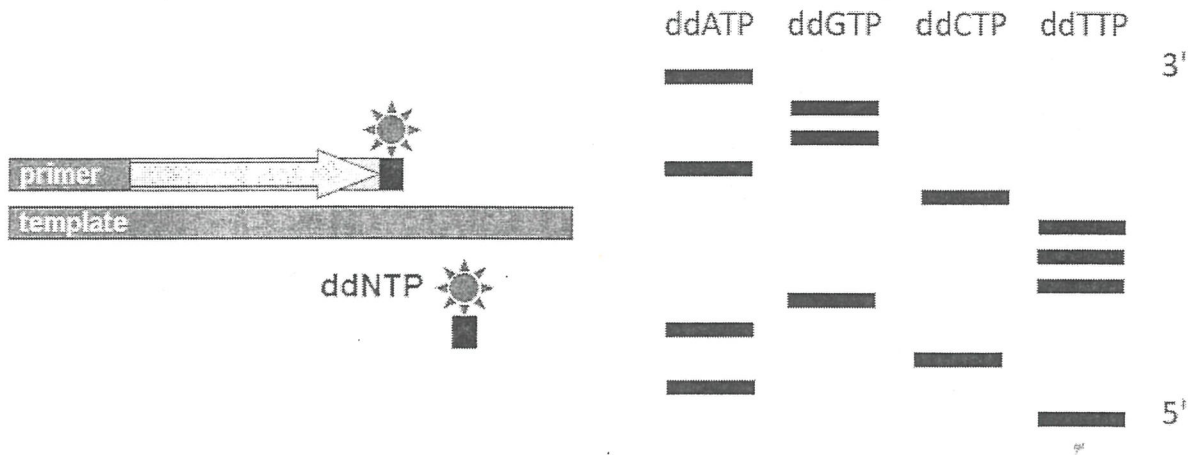
(5 marks)

Description	Mark
Flowchart/annotated diagram must include any five of the following for 1 mark each:	
- T-cells in lymphoid tissue - T-cell is presented with antigen from B-cell / macrophage - T-cell is sensitised/activated - T-cell enlarges - T-cell divides / Clones of T-cells are produced - T-cells become Killer T-cells, Helper T-cells, memory cells	1-5

Example:

T-Cell in lymphoid tissue

B-Cell presents Antigen

T-cell is sensitised and enlarges

Clones are produced

Most clones become Killer T-Cells, Helper T-Cells,

Some become memory cells

	Total	5

Question 34 (11 marks)

The following question refers to the diagrams below that show Sanger's method of DNA Sequencing when undertaking comparative genomics.

(a) Explain the ~~importance~~ *structure + function* of the dideoxynucleotide (ddNTP) in this technique.

(3 marks)

Description	Mark
Stops/terminates chain elongation / chain-elongation inhibitors / don't allow other nucleotides to be added	1
Lack OH/hydroxyl group	1
Allow the strands to be compared	1
Total	3

(b) State the sequence of bases of DNA in a 5' to 3' direction. (1 mark)

Description	Mark
TAC AGT TTC AGG A	1
Total	1

(c) DNA Sequencing, and other associated techniques, have allowed for comparative studies of DNA. Explain how comparing nuclear DNA sequences can provide evidence for evolution. (3 marks)

Description	Mark
Species have different DNA sequences/codes	1
Use of hybridisation/ERVs/non-functional (junk) DNA	1
The more similarities in DNA, the closer the relation / the greater the differences, the more distant relation	1
Total	3

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(d) Suggest **two** reasons why mitochondrial DNA (mtDNA) is best used when comparing individuals within a species.   (2 marks)

Description	Mark
Any two of the following:	
• mtDNA is inherited from the mother • Lack of recombination • Higher mutation rate • Higher copy number	1-2
Total	2

Comparative evidence has shown approximately 20% of *Homo sapiens* DNA is shared with *Homo neanderthalensis*. Both physical characteristics and cultural behaviours of these two hominins have evolved, allowing the species to become more suited to the environment.
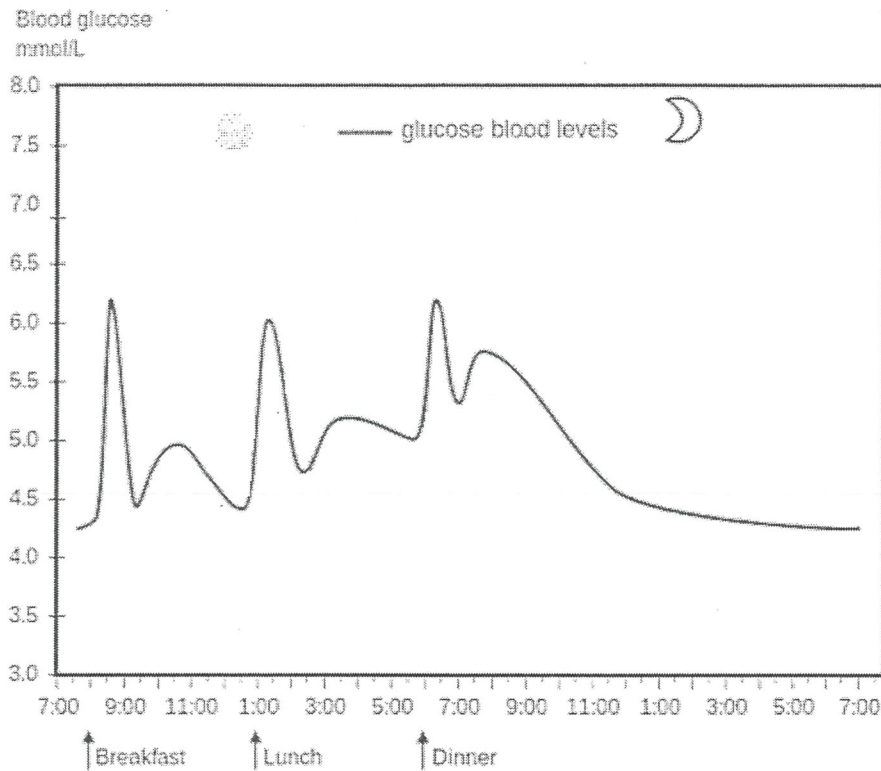
(e) Describe the effect of Natural Selection on the development of tools in Hominin culture.

(2 marks)

Description	Mark
There is no effect	1
Culture is not inherited / culture is passed on through learning	1
Total	2

Question 35   **(14 marks)**

The following question refers to the graph below of a Year 12 student's glucose levels during the course of a day.

(a) Explain why you would expect the insulin levels to increase when blood glucose levels do, and give **two** reasons for the fall in blood glucose after eating a meal.

(5 marks)

Description	Mark
Any three of the following for 1 mark each:	
• Increased levels of glucose stimulate insulin release • Chemoreceptors in the Islets of Langerhans • Islets of Langerhans are located in Pancreas • Beta cells produce insulin • Causes a decrease in blood glucose	1-3
Any two of the following for 1 mark each:	
• Increases glucose uptake into body/liver cells • Conversion to fatty acids/promotes fat storage • Promotes glycogenesis/conversion of glucose to glycogen • Used for respiration/glycolysis/metabolic activity	1-2