SL Paper 3

- a. Draw a labelled diagram to show the structure of a sarcomere.
- b. Explain the roles of actin and myosin in muscle contraction.

Inadequate filtering of waste products from the blood is known as kidney failure. If this condition is found in a patient, or albumin is present in their urine, it shows that the patient has chronic kidney disease. Type II diabetes is the leading cause of chronic kidney disease in Australia. The bar graph shows the frequency of kidney failure in patients with type II diabetes in different Australian ethnic groups. It also shows the level of albumin in the urine of patients with both type II diabetes and kidney failure.



[Source: Thomas M. C. et al. The burden of chronic kidney disease in Australian patients with type 2 diabetes (the NEFRON study). Med. J. Aust. 2006; 185 (3): 140–144. © Copyright 2006. The Medical Journal of Australia – adapted and translated with permission. The Medical Journal of Australia does not accept responsibility for any errors in translation.]

a.i. State the ethnic group with the lowest frequency of kidney failure.

a.ii.State the frequency of both kidney failure and greater than normal albumin levels in patients of European ancestry with type II diabetes. [1]

.....%

b. Compare the levels of albumin in urine of patients with kidney failure in the different ethnic groups.

[3]

[1]

[2]

[4]

c. The usual method of screening for chronic kidney disease is to test for kidney failure. Using the data in the bar chart, suggest why this method [2] leads to more cases being missed in patients of indigenous Australian ancestry than in patients with European ancestry.

a. Draw a labelled diagram to show the structure of a skeletal muscle sarcomere.	[3]
b. Outline the role of myoglobin in muscle fibres.	[2]
a. Outline the function of myosin and actin in muscle contraction.	[3]
b (i)State the function of the following structures in the human elbow.	[1]
Synovial fluid	
b (istate the function of the following structures in the human elbow.	[1]
Biceps	
Draw a labelled diagram to show the structure of a sarcomere in striated muscle.	
b (i)State the role of ligaments in human movement.	[1]
d. Explain the changes in ventilation rate during exercise.	[2]
a. Label the following diagram of the side view of the human elbow joint.	[1]

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b. State the function of structures I and II.

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a. Draw a labelled diagram of a sarcomere.	[3]
b. Explain the role of calcium ions in muscle contraction.	[2]
Draw a labelled diagram showing the arrangement of proteins in a sarcomere.	
a. State the names and functions of the antagonistic muscles of the human elbow joint.c. Explain the role of ATP in muscle contraction.	[2]
List two structural features of a joint that reduce friction between bones. 1 2	
a. Draw a labelled diagram to show the structure of a sarcomere.b. Describe how skeletal muscle contracts.	[3] [3]
Oxygen consumption by a tissue or organism arises from mitochondrial respiration and non-mitochondrial oxygen consumption. High oxy in the cell can damage DNA, proteins and lipids. In early embryo development, elevated non-mitochondrial oxygen consumption acts as a	rgen levels an essential

mechanism for protection. The bar chart shows the oxygen consumption rates per embryo (OCR) measured in Zebrafish (Danio rerio) during embryo

development in the hours after fertilization.



[Source: Adapted from: Stackley, K.D., Beeson, C.C., Rahn, J.J. and Chan, S.S.L. (2011) Bioenergetic Profiling of Zebrafish Embryonic Development. *PLoS ONE* 6(9): e25652. doi:10.1371/journal.pone.0025652. Figure 3.]

a. State the OCR in mitochondrial respiration 24 hours after fertilization.

..... pmol O₂ min⁻¹

b.	Compare OCR due to non-mitochondrial oxygen consumption and mitochondrial respiration after fertilization.	[2]
c.	Suggest reasons for the rise in mitochondrial respiration in the 48 hours after fertilization.	[2]
d.	Non-mitochondrial oxygen consumption does not produce ATP and decreases in relation to mitochondrial respiration 48 hours after	[1]
	fertilization. Discuss the importance of non-mitochondrial oxygen consumption in a developing embryo.	

[1]

The diagram below shows an elbow joint.

GI	
A	

- a (i)On the diagram, label a pair of antagonistic muscles.
- a (ii\$tate the function of the structure labelled A.
- b. Explain the role of ATP in the contraction of skeletal muscle.
- a. Analyse the electron micrograph for the state of contraction of the muscle fibre.



Z line

[Source: http://click4biology.info/c4b/11/hum11.2.htm Used with permission.]

- b. Outline ATP production in muscle fibres during intense exercise.
- c. Explain the role of ATP in muscle contraction.

Label the parts of the following micrograph of the striated muscle.

[2]

[2]

[2]

[1]

[1]

[3]



[Coen A.C. Ottenbeijm, Leo M.A. Heunks and Richard P.N. Dekhuijzen(2008) Diaphragm adaptations in patients with COPD. _Respiratory Research_, 9(12), doi:10.1186/1465-9921-9-12. © 2008 Ottenheijm _et al._; licensee BioMed Central Ltd.]

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The following is a diagram of a sarcomere.



[Acknowledgment: http://upload.wikimedia.org/wikipedia/commons/6/6e/Sarcomere.svg]

Label parts I, II, III and IV

- I.
- III.
- IV.