Q1.(a) Describe the roles of calcium ions and ATP in the contraction of a myofibril.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(Extra space) .....

.....

.....

.....

.....

(5)

(b) ATP is an energy source used in many cell processes. Give **two** ways in which ATP is a suitable energy source for cells to use.

1 .....

.....

2 .....

.....

(2)
(Total 7 marks)

Q2.(a) The table contains statements about three biological processes.

Complete the table with a tick if the statement in the first column is true, for each process.

	Photosynthesis	**Anaerobic respiration**	**Aerobic respiration**
ATP produced			
Occurs in organelles			
Electron transport chain involved			

(3)

(b) Write a simple equation to show how ATP is synthesised from ADP.

.....

(1)

(c) Give **two** ways in which the properties of ATP make it a suitable source of energy in biological processes.

1 .....

.....

2 .....

.....

(2)

(d) Humans synthesise more than their body mass of ATP each day. Explain why it is necessary for them to synthesise such a large amount of ATP.

.....

.....

.....

.....

.....

(2)
(Total 8 marks)

Q3. (a) Describe the part played by the inner membrane of a mitochondrion in producing ATP.

.....

.....

.....

.....

.....

.....

(3)

(b) A scientist investigated ATP production in a preparation of isolated mitochondria. He suspended the mitochondria in an isotonic solution and added a suitable respiratory substrate together with ADP and phosphate. He bubbled oxygen through the preparation.

(i) Why was the solution in which the mitochondria were suspended isotonic?

.....

.....

(1)

(ii) Explain why the scientist did **not** use glucose as the respiratory substrate.

.....

.....

.....

.....

.....

(2)

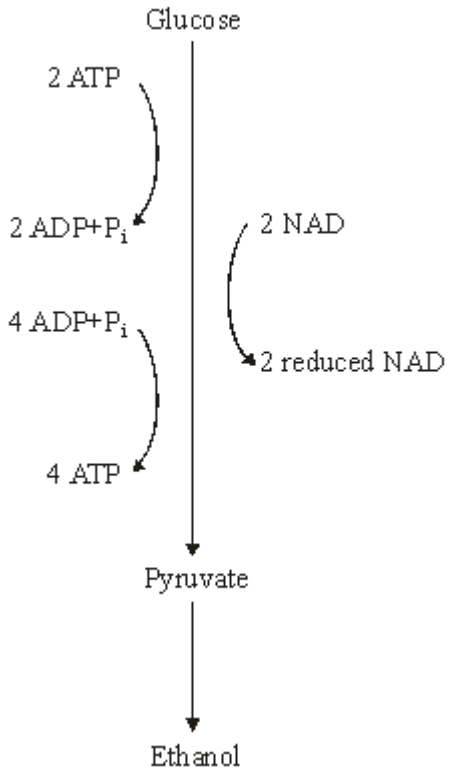
(iii) Explain why the oxygen concentration would change during this investigation.

.....

.....

(1)
(Total 7 marks)

Q4. The diagram summarises the process of anaerobic respiration in yeast cells.



(a) (i) In anaerobic respiration, what is the net yield of ATP molecules per molecule of glucose?

.....

(1)

(ii) Give **two** advantages of ATP as an energy-storage molecule within a cell.

1 .....

.....

2 .....

.....

(2)

(b) Describe how NAD is regenerated in anaerobic respiration in yeast cells.

.....

.....

(1)
(Total 4 marks)

Q5. (a) Mitochondria in muscle cells have more cristae than mitochondria in skin cells. Explain the advantage of mitochondria in muscle cells having more cristae.

.....

.....

.....

.....

(2)

(b) Substance **X** enters the mitochondrion from the cytoplasm. Each molecule of substance **X** has three carbon atoms.

(i) Name substance **X**.

.....

(1)

(ii) In the link reaction substance **X** is converted to a substance with molecules effectively containing only two carbon atoms. Describe what happens in this process.

.....

.....

.....

.....

(2)

(c) The Krebs cycle, which takes place in the matrix, releases hydrogen ions. These hydrogen ions provide a source of energy for the synthesis of ATP, using coenzymes and carrier proteins in the inner membrane of the mitochondrion.

Describe the roles of the coenzymes and carrier proteins in the synthesis of ATP.

.....

.....

.....

.....

.....

.....

(3)
(Total 8 marks)

Q6. When one mole of glucose is burned, 2800 kJ of energy are released. However, when one mole of glucose is respired aerobically, only 40% of the energy released is incorporated into ATP. Each mole of glucose respired aerobically produces 38 moles of ATP.

(a) (i) Calculate how much energy is incorporated into each mole of ATP. Show your working.

Answer ..... kJ

(2)

(ii) When glucose is respired what happens to the energy which is **not** incorporated into ATP?

.....

(1)

(b) (i) When one mole of glucose is respired anaerobically, only 2 moles of ATP are produced. Explain why less energy is released in anaerobic respiration.

.....

.....

(1)

(ii) At the end of a sprint race, a runner continues to breathe rapidly for some time. Explain the advantage of this.

.....

.....

.....

.....

(2)
(Total 6 marks)

Q7. (a) Name the substance that muscles use as their immediate energy source.

.....

(1)

(b) Sports scientists investigated the change in energy sources used during exercise. They measured the percentage of energy obtained from carbohydrate and the percentage of energy obtained from fat in two groups of athletes.

- **Group A** exercised at different intensities for the same time.
- **Group B** exercised at the same intensity for different times.

They calculated the intensity of the exercise as a percentage of VO_2 max.
VO_2 max is the maximum volume of oxygen the athletes can take in per minute.

The results for **Group A** are shown in **Figure 1** and the results for **Group B** are shown in **Figure 2**.

Figure 1

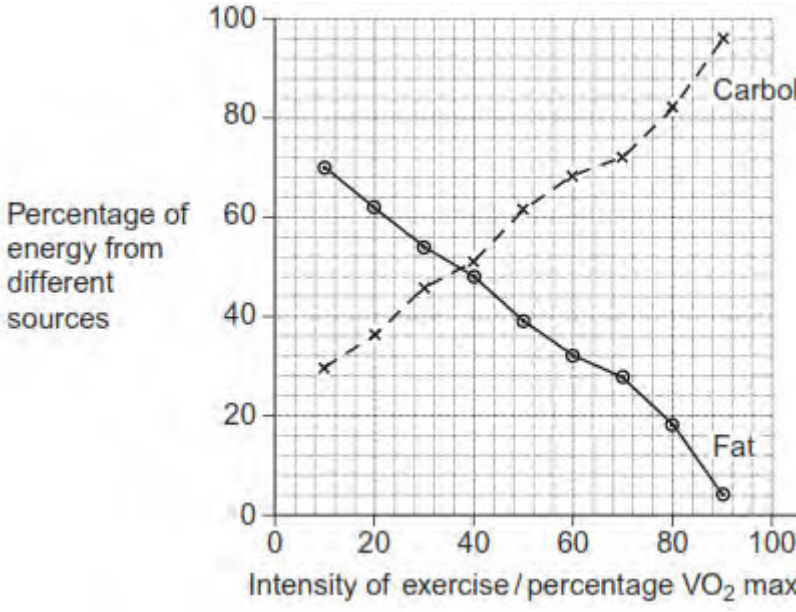
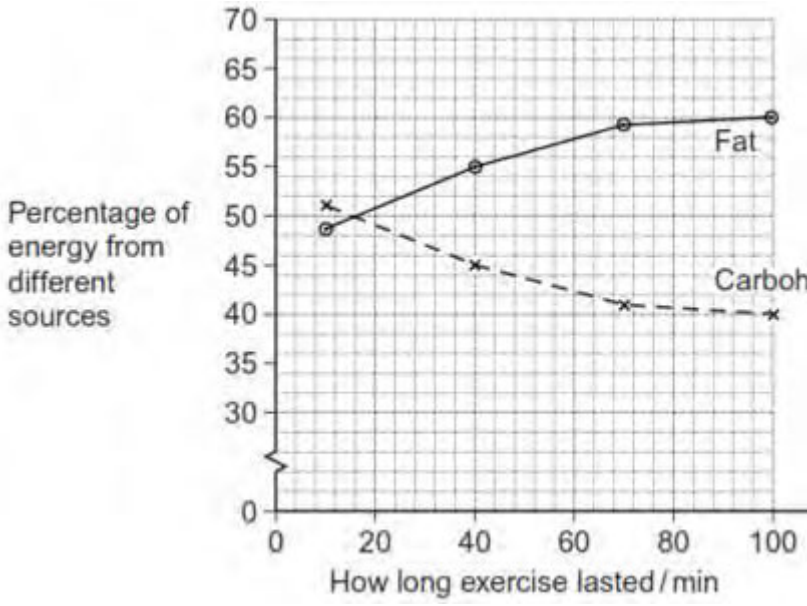


Figure 2



(i) Calculate the ratio of the percentage of energy from carbohydrate to the percentage of energy from fat when the intensity of exercise is 70% VO_2 max. Show your working.

Answer .....

(2)

(ii) A person wishes to lose some body fat by exercising. What sort of exercise would be most effective? Use the information in **Figures 1** and **2** to explain your answer.

.....

.....

.....

.....

.....

.....

(*Extra space*) .....

.....

.....

(3)
(Total 6 marks)