EFFECTS OF EXERCISE

QUESTIONSHEET 1

(a) The table shows the results of an investigation into the effects of a standard exercise on the pulse rate of 5 men of the same age and mass.

Individual	Resting pulse rate beats per minute	Pulse rate after exercise beats per minute	
		Time of standard exercise	
		2 minutes	5 minutes
Peter	76	82	102
Mark	64	70	82
Keith	72	85	110
Paul	79	105	135
Brian	69	89	108

(i) Calculate the mean percentage increase in pulse rate for these men after 5 minutes exercise. Show your working.

Answer: ..... [2]

(ii) Explain why there is an increase in pulse rate as a result of exercise.

.....

.....

.....

[3]

(b) (i) Mark is a professional footballer. Paul writes software for computer games. How could this account for Mark's lower resting pulse rate and smaller increase in pulse rate after exercise?

.....

.....

.....

.....

[3]

(ii) Mark's resting blood pressure is lower than that of all the other men. Explain why this decreases his risk of developing cardio-vascular disease.

.....

.....

[1]

TOTAL / 9

EFFECTS OF EXERCISE

QUESTIONSHEET 2

(a) Suggest explanations for each of the following:

(i) During exercise the volume of oxygen used by the tissues increases.

.....

.....

.....

[2]

(ii) Following exercise the tissues continue to use a greater than usual volume of oxygen.

.....

.....

.....

.....

[3]

(b) State three effects of endurance exercise in muscles.

1. .....

2. .....

3. .....

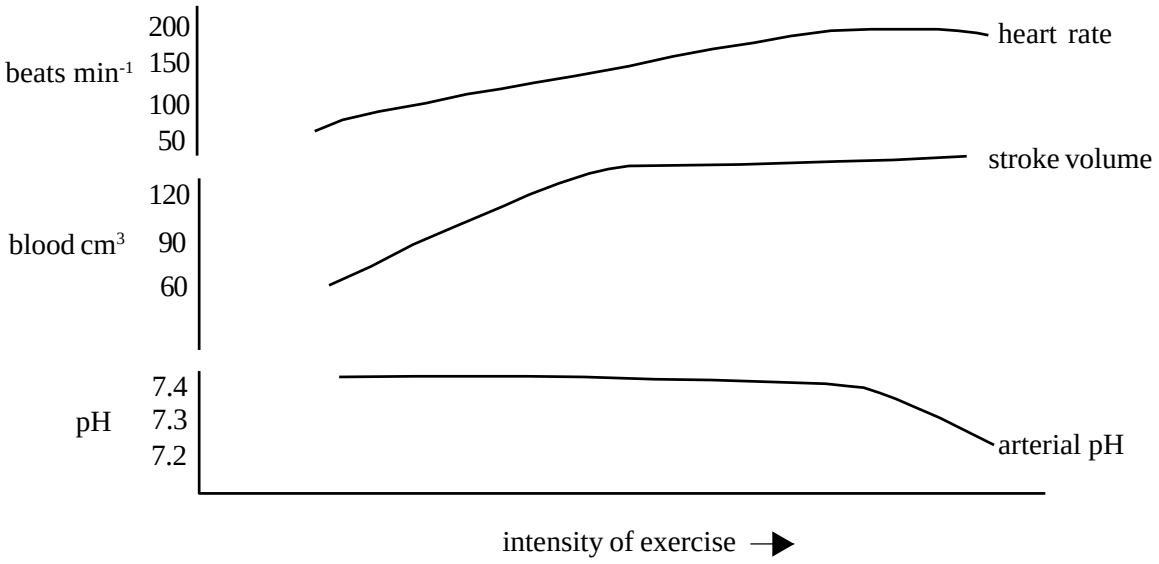
[3]

TOTAL / 8

EFFECTS OF EXERCISE

QUESTIONSHEET 3

The graph shows some of the effects of exercise on the cardiovascular system.



(a) (i) Explain how the heart increases its cardiac output during exercise.

.....

.....

.....

..... [3]

(ii) Explain why cardiac output is increased during exercise.

.....

.....

..... [2]

(b) Suggest an explanation for the change in arterial blood pH during exercise.

.....

.....

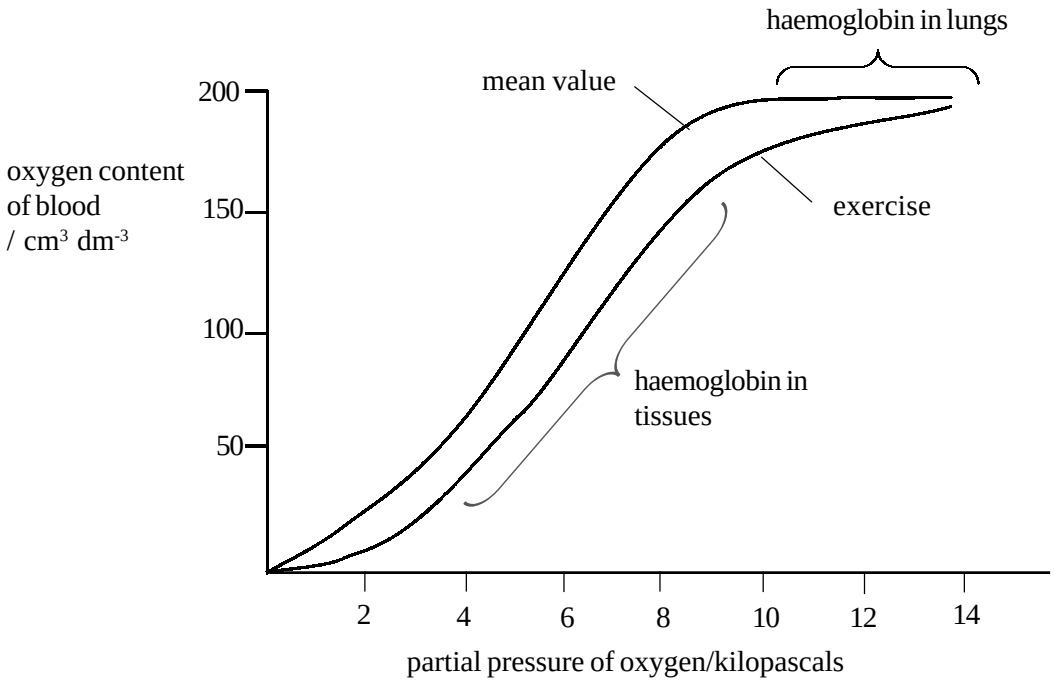
..... [2]

TOTAL / 7

EFFECTS OF EXERCISE

QUESTIONSHEET 4

The graph below shows the effect of exercise on the haemoglobin oxygen dissociation curve of an individual.



(a) Explain how exercise could have caused the change in the oxygen dissociation curve.

.....

.....

.....

[3]

(b) Outline the significance of the change shown.

.....

.....

.....

.....

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[4]

TOTAL / 7

EFFECTS OF EXERCISE

QUESTIONSHEET 5

Do not write in margin

The table below compares aspects of the cardiac efficiency of a highly trained athlete with a non-athlete when running a short race.

	non-athlete	athlete
Cardiac output/$dm^3\ min^{-1}$	13.44	
Pulse rate/beats min^{-1}	120	90
Stroke volume/cm^3	112	109

(a) Define the terms:

(i) stroke volume. .....

..... [1]

(ii) cardiac output. .....

..... [1]

(b)(i) Calculate the cardiac output of the athlete. Show your working.

Answer ..... [2]

(ii) Comment on the relationship between cardiac output and venous return.

.....

..... [2]

(c) Suggest explanations for the differences in cardiac efficiency of the athlete and non-athlete.

.....

.....

.....

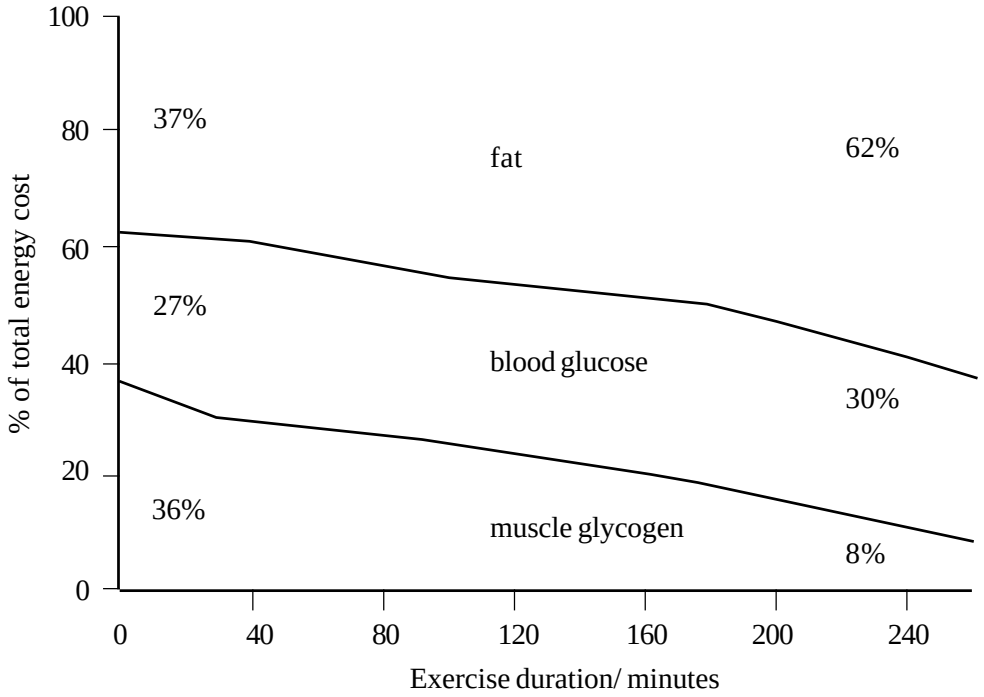
..... [3]

TOTAL / 9

EFFECTS OF EXERCISE

QUESTIONSHEET 6

The graph below shows changes in the relative contribution of different sources of energy during a period of exercise.



(a) What is the greatest source of muscle energy after 20 minutes exercise?

..... [1]

(b) (i) Where in the body are glycogen stores found?

.....

..... [2]

(ii) Explain why glycogen is an efficient source of rapidly required energy.

.....

.....

..... [3]

(c) Suggest why:

(i) prolonged exercise may help an individual lose weight.

..... [1]

(ii) fat is a more concentrated energy source then glycogen.

.....

..... [2]

TOTAL / 9

EFFECTS OF EXERCISE

QUESTIONSHEET 7

The statements below are basic recommendations for maintaining health and fitness. Explain the underlying rationale (reasons) for each statement.

(a) Maintain a healthy body weight by adjusting food intake and exercise levels.

.....

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..... [4]

(b) Eat less fat, especially less saturated fats, for example, the fats found in many animal products.

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..... [4]

(c) Increase complex carbohydrate intake at expense of simple sugars.

.....

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..... [4]

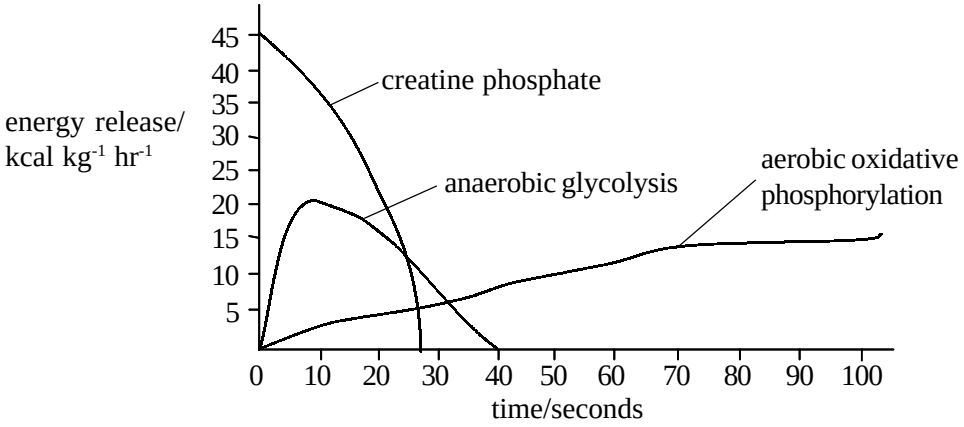
TOTAL / 12

EFFECTS OF EXERCISE

QUESTIONSHEET 8

Do not write in margin

The graph below shows the sources of energy in a contracting muscle, the levels of energy released, and their duration from the start of contraction.



(a) Describe the pattern of energy production in the contracting muscle shown on the graph.

.....

.....

.....

..... [4]

(b) Outline the process of ATP production by:

(i) creatine phosphate. .....

.....

..... [2]

(ii) anaerobic glycolysis. .....

.....

.....

..... [3]

(iii) aerobic oxidative phophorylation. .....

.....

.....

..... [3]

(c) If the muscle was to go on working for a longer period a state of oxygen debt might occur. Explain what is meant by 'oxygen debt'.

.....

.....

.....

..... [4]

TOTAL / 16

EFFECTS OF EXERCISE

QUESTIONSHEET 9

The following statements refer to changes that occur in the body during a period of sustained strenuous exercise. State whether each statement is true or false and in each case explain your answer:

(a) the concentration of creatine in muscle would rise.

.....

.....

..... [2]

(b) blood pH would fall.

.....

.....

.....

..... [3]

(c) oxygen consumption by muscles would keep increasing.

.....

.....

..... [2]

(d) muscle glycogen would be supplemented by taking glycogen from the liver.

.....

.....

..... [2]

(e) at the end of the exercise, increased blood hydrogen carbonate ion tension will stimulate increased ventilation and cardiac output.

.....

.....

.....

..... [3]

TOTAL / 12 _____

EFFECTS OF EXERCISE

QUESTIONSHEET 10

Read through the following passage about the contraction mechanism of skeletal muscle and then complete it by filling in the spaces with the most appropriate word or words.

When a nerve impulse reaches the neuromuscular junction, the transmitter substance ..... is released and attaches to the muscle membrane. This stimulates the release of ..... ions from the ..... reticulum into the muscle fibre. The transmitter substance is then removed from the muscle membrane by the secretion of the enzyme ..... .

The presence of these ions allows the interaction of the two main contractile muscle proteins ..... and ..... . In the resting muscle, two other proteins, ... and ..... form a complex between the main contractile proteins preventing them from interacting. The presence of the ions changes the shape of this blocking complex and enables the contractile proteins to interact.

The contraction is caused by a ..... mechanism operating between the two contractile proteins whereby swinging heads on the ..... molecules join with binding sites on the ..... molecules pulling the ..... threads into the spaces between the ..... threads. ..... is required as an energy supply for this.

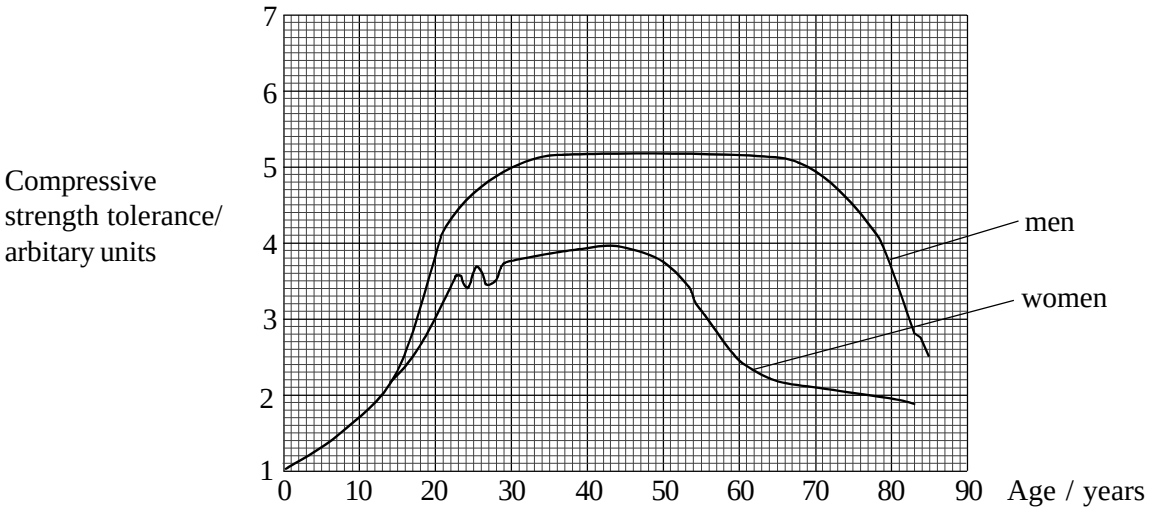
TOTAL / 14

EFFECTS OF EXERCISE

QUESTIONSHEET 11

Do not write in margin

The graph below shows the compressive strength (in arbitary units) which can be applied to human femur without causing bending, at different ages.



(a) (i) Suggest why it is important for bones to be able to withstand compression.

..... [1]

(ii) Why was the femur selected for this test rather than a humerus?

.....

..... [1]

(iii) Express the compressive strength that can be withstood by a woman's femur as a percentage of that of a man, at the age of 40 years. Show your working.

Answer ..... [2]

(*Contniued...*)

Do not write in margin

(b) (i) Compare the pattern of compressive strength tolerance changes with age in men with that of women.

.....

.....

.....

..... [4]

(ii) What two main components of the bone matrix endow the bone with compressive strength?

Component 1 ..... [1]

Component 2. ..... [1]

(iii) Suggest reasons for:

1. The fluctuations in women in the 20 to 30 year age group.

.....

..... [2]

2. The sharp decrease in compressive strength tolerance shown by women in the 45 to 55 year age group.

.....

..... [2]

(iv) Name a bone disease, more commonly shown in elderly women than in men, in which the ability to withstand bone stresses is reduced.

..... [1]

TOTAL / 15

EFFECTS OF EXERCISE

QUESTIONSHEET 12

Do not write in margin

Maximum oxygen consumption (VO_{2max}) is a very good fitness index for the measure of human performance.It is measured in cm^3 O_2 consumed per kg body weight per minute.
Its value for an individual depends on three main factors:

1. the oxygen carrying capacity of the blood.
2. the cardiac output.
3. the amount of exercising skeletal muscle and its ability to use oxygen.

(a) Explain how the three factors listed above could affect the value of $VO_{2max.}$

(i) the oxygen carrying capacity of the blood.

.....

.....

.....

..... [4]

(ii) the cardiac output.

.....

.....

.....

..... [4]

(iii) the amount of exercising skeletal muscle and its ability to use oxygen.

.....

.....

.....

..... [4]

(b) Suggest explanations for each of the following observations:

(i) adult females tend to have VO_{2max} values about 5 cm^3 kg min^{-1} less than males of the same age and state of physical fitness.

.....

.....

..... [2]

(ii) a fit endurance athlete may have a VO_{2max} value about 90 cm^3 kg min^{-1} compared to a non –exercising male of similar age who's VO_{2max} value would be about 40 cm^3 kg min^{-1} .

.....

.....

..... [2]

TOTAL / 16