

Name of the Student: _____

Max. Marks : 18 Marks

Time : 18 Minutes

Q1.

- (a) Describe how you would use cell fractionation and ultracentrifugation to obtain a sample of mitochondria from muscle tissue.

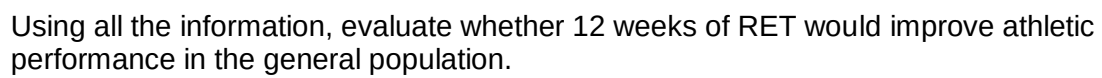
(4)

- (b) Mitochondrial respiratory capacity is a measure of maximum ATP production in a mitochondrion. Scientists investigated the effect of a resistance exercise training (RET) programme on the respiratory capacity of mitochondria in skeletal muscle tissue. RET develops muscle strength.

The scientists:

- took samples of muscle tissue from 11 young males before and after a 12-week RET programme
- recorded the respiratory capacity of the mitochondria in the samples of muscle tissue.

The error bars represent ± 2 standard deviations from the mean, which includes over 95% of the data.

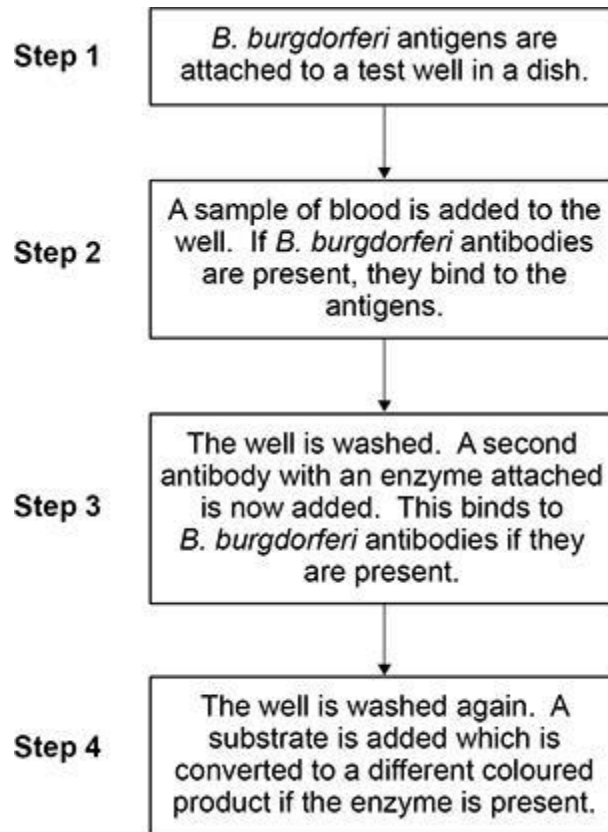
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Q2.

Lyme disease is most frequently caused by the bacterium *Borrelia burgdorferi*. Lyme disease can be difficult to diagnose.

The figure below shows an ELISA test that is used to find out if a person has antibodies to *B. burgdorferi*.



A false positive in this test is a result which incorrectly indicates that antibodies to *B. burgdorferi* are present.

- (a) Failure to thoroughly wash the well in **Step 4** can result in a false positive.

Explain why.

(2)

- (b) A false positive can be produced if a person has been infected by another bacterium that causes a disease called syphilis.

Suggest why.

(1)

- (c) A false **negative** in this test is often produced if a person is tested within 2 weeks of being infected with *B. burgdorferi*.

Explain why.

(2)

- (d) Sometimes, symptoms of Lyme disease can persist for 6 months following antibiotic treatment. This condition is known as Post-Treatment Lyme Disease Syndrome (PTLDS).

Scientists investigated the symptoms experienced by a large number of PTLDS patients and a control group. During a 2-week period, they asked all the participants:

- if they had experienced symptoms of PTLDS
- to record the intensity of these symptoms.

The scientists used a statistical test to determine if there was a difference in the intensity of symptoms of PTLDS between these two groups.

The table below shows some of the scientists' results, including the probability (P) values obtained using the statistical test.

Symptom	Percentage of PTLDS group experiencing symptom	Percentage of control group experiencing symptom	P value for difference in the intensity of symptoms
Fatigue	100	57	<0.001
Joint pain	96	32	<0.001
Depression	40	4	<0.005
Fever	35	3	<0.005
Muscle pain	86	62	<0.001

The scientists concluded that more PTLDS patients than the control group experienced:

- symptoms
- greater intensity of symptoms.

Evaluate the scientists' conclusions.

[illegible]

(4)

(Total 9 marks)