



General Certificate of Education  
Advanced Subsidiary Examination  
June 2012

**Biology**

**BIO3X/TN**

**Unit 3X AS Externally Marked Practical Assignment**

**Teachers' Notes**

**Confidential**

**To be given immediately to the teacher(s) responsible for GCE Biology**

**Open on receipt**

**Estimated Entries must be submitted to AQA in order for centres to receive hard copies of materials to be used for candidates.**

---

**Teachers' Notes****CONFIDENTIAL**

These notes must be read in conjunction with *Instructions for the Administration of the Externally Marked Practical Assignment: GCE Biology* published on the AQA Website.

**The effect of exercise on pulse rate****Materials****Task 1**

Each candidate needs

- a stop-watch or timer

Laboratory equipment or facilities are not required for this task.

**Task 2**

Each candidate needs

- a stop watch or timer

**Managing the investigation**

If you have any queries about the EMPA practical please contact your Assessment Adviser. Contact details can be obtained by emailing your centre name and number to [biology-gce@aqa.org.uk](mailto:biology-gce@aqa.org.uk). Please do not contact suppliers for advice.

This investigation is in two parts.

**Task 1**

Candidates are required to count the pulse in the radial artery over different periods of time. You may help candidates to find their pulse but you must **not** give any other help.

**Task 2**

Candidates are required to determine resting pulse rate, exercise, and then find the pulse rate over the next 5 minutes.

The exercise should be based on repeatedly squatting while holding the edge of a table or laboratory bench. Alternative arrangements should be made for candidates who are physically unable to carry out this exercise. These arrangements must be discussed with your Assessment Adviser before implementation.

Candidates must decide for themselves how to standardise the exercise. You must **not** give candidates any information about this or other aspects of the task.

**The tasks must be trialled before use.**

Candidates must **not** be given information about the EMPA until one week before Task 1. One week before Task 1, teachers may give their candidates the following information.

You will investigate the effect of exercise on heart rate.

There must be **no** further discussion and candidates must **not** be provided with any further resources to prepare for the assessment.

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use
Total Task 1



General Certificate of Education  
Advanced Subsidiary Examination  
June 2012

## Biology

## BIO3X/PM1

Unit 3X AS Externally Marked Practical Assignment  
Task Sheet 1

To be completed before Task Sheet 2.

For submission by 15 May 2012

**For this paper you must have:**

- a ruler with millimetre measurements
- a calculator.

## Task 1

### Introduction

In this task you will investigate measuring pulse rate.

### Materials

You are provided with

- a stopwatch or timer.

You may ask your teacher for any other apparatus you need.

### Method

**Read the following instructions carefully before you start your investigation.**

1. Sit down for 5 minutes.
2. While you are sitting down, find the pulse in your wrist by putting the tip of your first finger on the inside of your wrist as shown in the photograph. If you cannot find your pulse, you may ask your teacher for help.



3. Take your pulse for 10 seconds and record the number of beats in the table.

Time interval over which pulse taken / s	Number of beats					Mean number of beats per trial	Standard deviation	Mean pulse rate / beats per minute
	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5			
10								
20								
30								
60								

4. Repeat step 3 four times so you have a total of five readings. Record the additional results in the table.
5. Repeat steps 3 and 4, this time take your pulse for 20 seconds, for 30 seconds and for 60 seconds. Record the results in the table.
6. Complete the table by writing in for each time interval
- the mean number of beats per trial
  - the standard deviation
  - the mean pulse rate.

### Questions on Task 1

- 1 You were told to sit down for 5 minutes before you took your pulse (step 1). This was so that you took your resting pulse. How could you find out if 5 minutes was long enough to give your resting pulse?
- 2 What information does standard deviation give about the measurements you took over a particular time interval?
- 3 In **Task 2**, you will measure pulse rate after a period of exercise. You are advised to measure the pulse for 20 seconds.
- 3 (a) Measuring pulse for much shorter than 20 seconds will give unreliable results. Suggest why.
- 3 (b) Measuring pulse for much longer than 20 seconds will give unreliable results. Suggest why.

**END OF TASK 1**

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use
Total Task 2



General Certificate of Education  
Advanced Subsidiary Examination  
June 2012

## Biology

## BIO3X/PM2

Unit 3X AS Externally Marked Practical Assignment  
Task Sheet 2

To be completed before the EMPA Written Test.

For submission by 15 May 2012

For this paper you must have:

- a ruler with millimetre measurements
- a calculator.

## Task 2

### Introduction

In this part of the investigation you will look at the effect of exercise on pulse rate.

### Materials

You are provided with

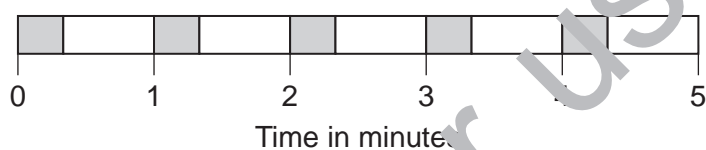
- a stopwatch or timer.

You may ask your teacher for any other apparatus you need.

### Method

Read the following instructions carefully before you start your investigation.

1. Sit down and rest for 10 minutes. You can use this time to draw the table in which you will record your results.
2. Take your pulse for 20 seconds at 1 minute intervals for 5 minutes. The sequence of events is shown in the diagram.



Key

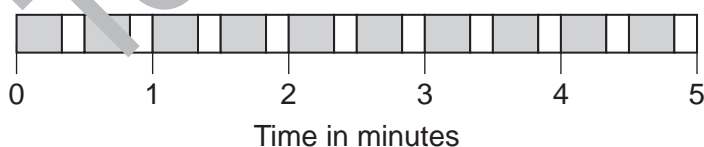


Take pulse



Record pulse  
and get ready to  
take pulse again

3. Exercise by holding the edge of a table or laboratory bench and repeatedly squatting down then standing up again. You must decide for yourself for how long to continue exercising but it should not be for longer than 5 minutes.
4. Immediately after you have stopped exercising, take your pulse for 20 seconds at 30 second intervals for 5 minutes. The sequence of events is shown in the diagram.



Key



Take pulse



Record pulse  
and get ready to  
take pulse again

### You must decide for yourself

- how to standardise the exercise so that you or another person may repeat the investigation in exactly the same way.

**Presenting your data**

- 4 Record the results of your investigation in an appropriate table in the space below.
- 5 You may be awarded 1 mark for the quality of your practical work.
- 6 Use the graph paper to plot an appropriate graph or graphs of the data you collected in **Task 2**.

**END OF TASK 2**

Teacher use only



Centre Number						Candidate Number				
Surname						Other Names				
<b>Notice to Candidate.</b> The work you submit for assessment must be your own. If you copy from someone else or allow another candidate to copy from you, or if you cheat in any other way, you may be disqualified.										
<b>Candidate Declaration.</b> I have read and understood the Notice to Candidate and can confirm that I have produced the attached work without assistance other than that which is acceptable under the scheme of assessment.										
Candidate Signature						Date				

For Examiner's Use Total EMPA mark	
Examiner's Initials	
Section	Mark
Task 1	
Task 2	
Section A	
Section B	
TOTAL EMPA MARK	



General Certificate of Education  
Advanced Subsidiary Examination  
June 2012

## Biology

## BIO3X

### Unit 3X AS Externally Marked Practical Assignment Written Test

For submission by 15 May 2012

<p><b>For this paper you must have:</b></p> <ul style="list-style-type: none"> <li>the Task Sheet 2, your results and your graph</li> <li>a ruler with millimetre measurements</li> <li>a calculator.</li> </ul>	<p><b>Time allowed</b></p> <ul style="list-style-type: none"> <li>1 hour 15 minutes</li> </ul>
<p><b>Instructions:</b></p> <ul style="list-style-type: none"> <li>Use black ink or black ball-point pen.</li> <li>Fill in the boxes at the top of this page.</li> <li>Answer <b>all</b> questions.</li> <li>You must answer the questions in the space provided. Do not write outside the box around each page or on blank pages.</li> <li>Do all rough work in this book. Cross through any work you do not want to be marked.</li> </ul>	<p><b>Information</b></p> <ul style="list-style-type: none"> <li>The marks for questions are shown in brackets.</li> <li>The maximum mark for this paper is 30.</li> <li>You will be marked on your ability to: <ul style="list-style-type: none"> <li>use good English</li> <li>organise information clearly</li> <li>use scientific terminology accurately.</li> </ul> </li> </ul>

**Details of additional assistance (if any).** Did the candidate receive any help or information in the production of this work? If you answer yes give the details below or on a separate page.

Yes  No

#### Teacher Declaration:

I confirm that the candidate has met the requirements of the practical skills verification (PSV) in accordance with the instructions and criteria in section 3.8 of the specification.

<b>Practical Skills Verification</b>	Yes <input type="checkbox"/>
--------------------------------------	------------------------------

Signature of teacher ..... Date .....

As part of AQA's commitment to assist students, AQA may make your coursework available on a strictly anonymous basis to teachers, examining staff and students in paper form or electronically, through the Internet or other means, for the purpose of indicating a typical mark or for other educational purposes. In the unlikely event that your coursework is made available for the purposes stated above, you may object to this at any time and we will remove the work on reasonable notice. If you have any concerns please contact AQA.

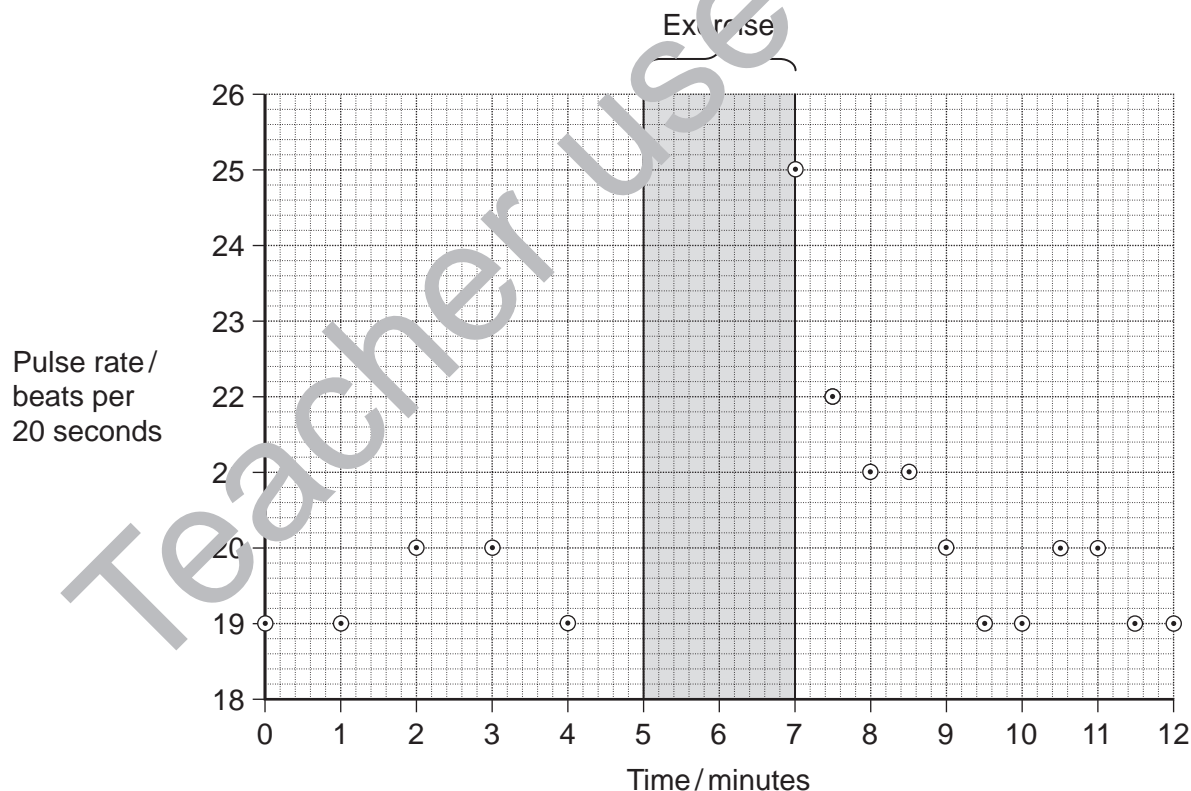
To see how AQA complies with the Data Protection Act 1988 please see our Privacy Statement at [aqa.org.uk](http://aqa.org.uk).

### Section A

These questions are about your investigation into the effect of exercise on pulse rate. Use your copy of Task Sheet 2, your results and your graph to answer them.

- 7 Give **two** things you did to standardise the way in which you exercised that would have allowed you or another person to repeat the investigation in exactly the same way.
- 8 At rest, you measured your pulse every minute. After exercise, you measured your pulse every 30 seconds (step 4). Explain the advantage of measuring your pulse every 30 seconds.
- 9 You were told to draw a graph (Question 6). You may have decided to join your points with straight lines or to draw a curve of best fit. When should you join the points with straight lines?
- 10 A student wanted to analyse the results from the whole class. She decided to calculate the percentage increase in pulse rate with exercise for each student. Do you think this was a good idea? Explain your answer.

The graph shows the results collected by another student.



- 11 Use the graph to calculate the student's **resting** pulse rate in beats per minute. Show your working.
- 12 The pulse rate changed between the start and finish of exercise. Explain the advantage of this change in pulse rate to the muscles involved in the exercise.

## Resource Sheet

### Resource A

An electrocardiogram is made by attaching recording electrodes to a person's chest. It shows the electrical changes that take place in a person's heart each time it beats. A sports physiologist produced electrocardiograms for a fit adult male.

Chart X shows an electrocardiogram from this man after 10 minutes of complete rest. A cardiac cycle consists of the filling time and the contraction time. The filling time and the contraction time for one cardiac cycle are shown on this chart.

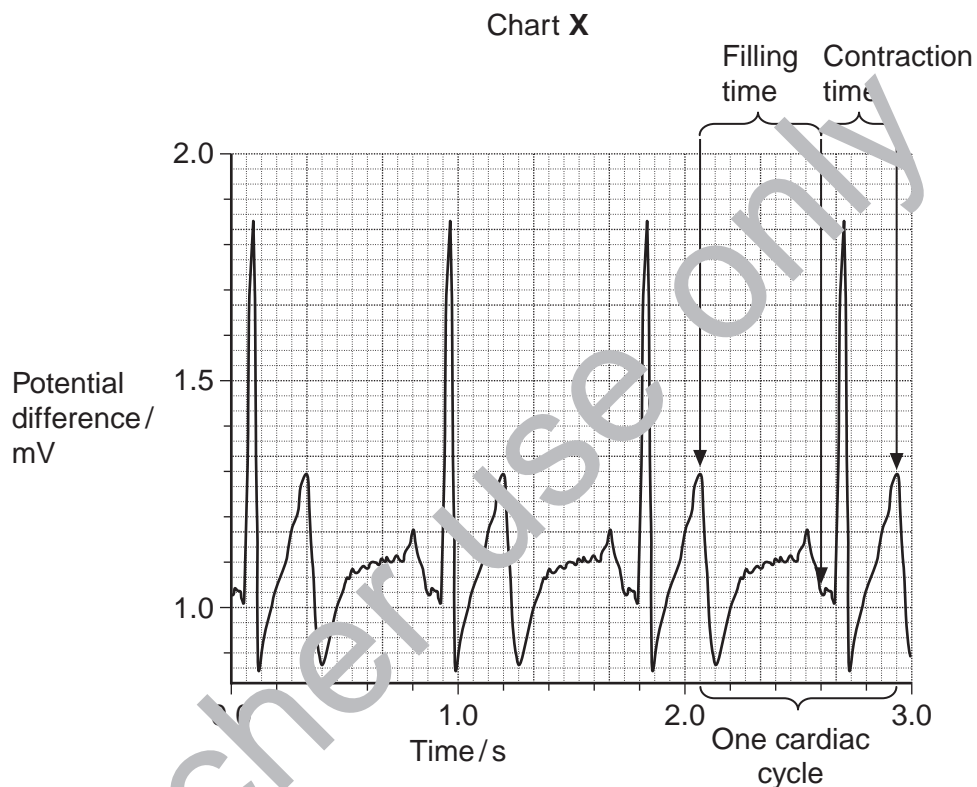
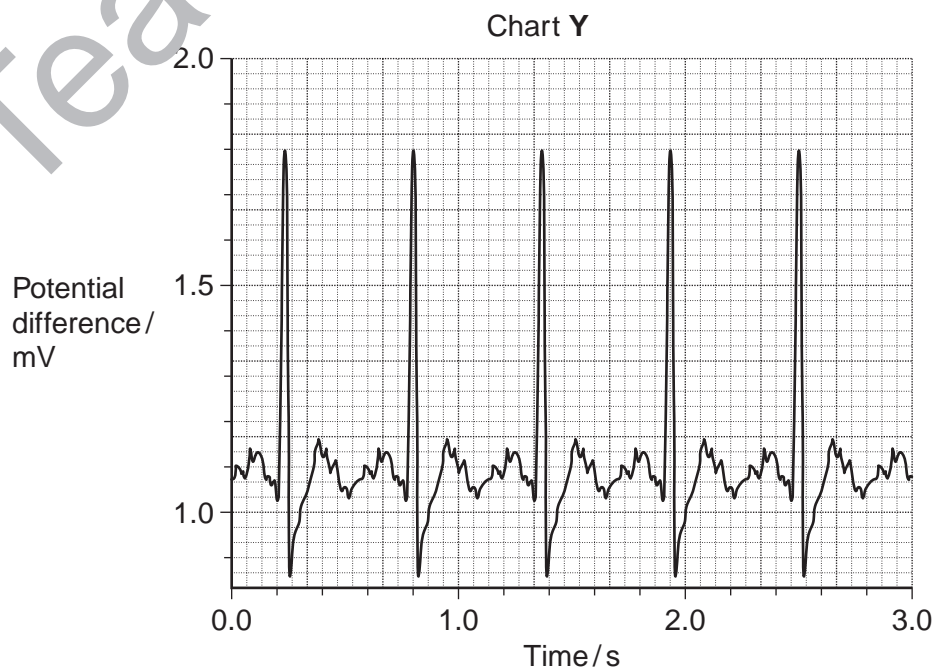


Chart Y shows an electrocardiogram from the same man immediately after a period of exercise.



## Resource B

Doctors investigated the relationship between resting heart rate and the probability of dying from coronary heart disease.

- They carried out a trial on a total of 24 913 patients. These patients had just been diagnosed with coronary heart disease.
- They adjusted their data to take into account other risk factors. These factors included age, sex and blood pressure.

Their adjusted results are shown in the table.

Time after first being diagnosed with coronary heart disease /years	Percentage of patients still surviving with initial resting heart rate of	
	< 62 beats per minute	> 83 beats per minute
0	100	100
5	92	90
10	83	77
15	71	62
18	62	51

## Resource C

Ivabradine is a drug that slows heart rate. It is taken as a pill. Doctors investigated its value in reducing the resting heart rate of patients with coronary heart disease.

- They described their investigation as a large-scale, controlled trial. It was also carried out on people living in different areas.
- The results of the trial showed that ivabradine slowed heart rate.
- Angina is a pain in the chest. It results when insufficient oxygen is brought to the heart muscle during exercise. The doctors found that ivabradine reduced angina.

**Section B**

Use the information in the **Resource Sheet** and your own knowledge to answer the questions.

Answer **all** questions in the spaces provided.

Use **Resource A** to answer **Questions 13 to 16**.

- 13** Give **one** way in which an electrocardiogram could have produced more reliable results than counting the pulse.
- 14 (a)** Chart **X** shows that the man's resting heart rate was 67 beats per minute. What was his pulse rate? Explain your answer.
- 14 (b)** Use chart **Y** to calculate the man's heart rate after the period of exercise. Show your working.
- 15** Use charts **X** and **Y** to describe how exercise affected filling time.
- 16** The physiologist used electrocardiograms to investigate the effect of increasing heart rate on filling time. Describe how she could have modified the method of exercising you used to produce a range of increases in heart rate.

Use **Resource B** to answer **Question 17**.

- 17** The doctors who investigated the link between resting heart rate and the probability of dying from coronary heart disease concluded that a high resting heart rate was a strong predictor of likely death from coronary heart disease. Evaluate this conclusion.

Use **Resource C** to answer **Questions 18 to 20**.

- 18** The results of the ivabradine trial were reliable.
- 18 (a)** Explain the importance of the ivabradine investigation being a large-scale trial.
- 18 (b)** Explain the importance of the ivabradine investigation being carried out on people living in different areas.
- 19** The ivabradine investigation was a controlled trial. Suggest how the control group would have been treated.
- 20** Ivabradine slows heart rate.
- 20 (a)** Use information from **Resource A** to explain why ivabradine increases the volume of blood entering the heart during a cardiac cycle.
- 20 (b)** Ivabradine reduces angina. Suggest how an increase in the volume of blood entering the heart reduces angina.

**END OF QUESTIONS**

Copyright © 2012 AQA and its licensors. All rights reserved.