| CANDIDATE NAME | |
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| CENTRE NUMBER | | CANDIDATE NUMBER | |
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**GEOGRAPHY** **0460/42**

Paper 4 Alternative to Coursework **October/November 2013**

**1 hour 30 minutes**

Candidates answer on the Question Paper.

Additional Materials: Ruler
Calculator

## READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name in the spaces provided.
Write in dark blue or black pen.
You may use a soft pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE ON ANY BARCODES.

Answer **all** questions.

The Insert contains Fig. 1, Table 1 and Photograph A for Question 1, and Figs 5 and 6 and Table 3 for Question 2.
The Insert is **not** required by the Examiner.
Sketch maps and diagrams should be drawn whenever they serve to illustrate an answer.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

| For Examiner's Use | |
|---|---|
| **Q1** | |
| **Q2** | |
| **Total** | |

This document consists of **14** printed pages, **2** blank pages and **1** Insert.

**[Turn over**

**2**

**BLANK PAGE**

**1** Students from Santiago, Chile, were studying how the characteristics of a river change downstream. They wanted to investigate possible changes in velocity (speed of flow) downstream.

They decided to test the following hypotheses:

**Hypothesis 1:** *Velocity increases downstream.*

**Hypothesis 2:** *Velocity increases as the hydraulic radius of the river channel increases.*

Hydraulic radius is a measurement which indicates how much friction there is between the river channel and the flow of the river.

**(a) (i)** The students carried out their fieldwork at five sites along the river.
Suggest **three** factors the students should have considered in choosing their fieldwork sites.

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**(ii)** Suggest why it was important that they made all of their measurements on one day.

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**(iii)** In preparation for their fieldwork the students visited a local stream to do a trial (pilot) study. Give **two** advantages of doing a trial (pilot) study.

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**(b) (i)** Fig. 1 (Insert) is a student sketch which shows their method of measuring velocity. Describe the method shown.

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**(ii)** Another way to measure velocity is by using a flowmeter. Describe how this is done.

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**(iii)** The results which the students obtained at the five sampling sites are shown in Table 1 (Insert). Use these results to complete Fig. 2, below, to show how average velocity changes downstream. [2]
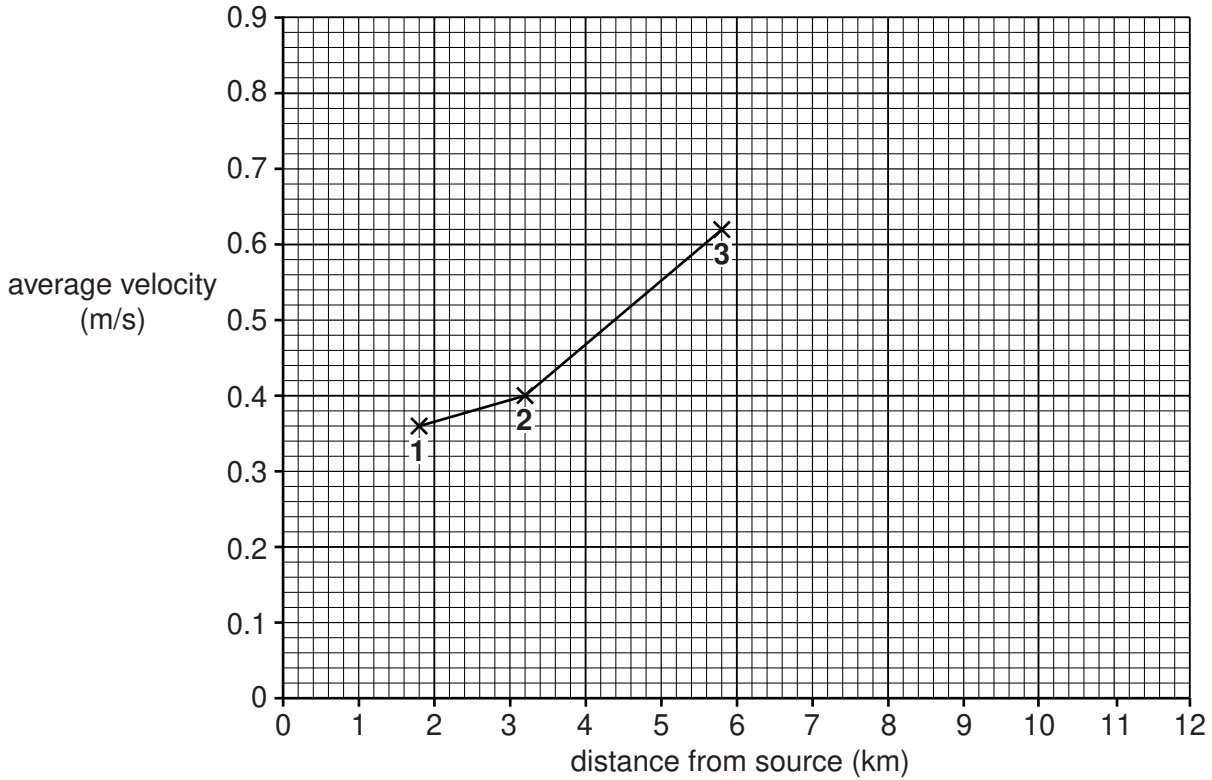
**Changes in average velocity downstream**



**Fig. 2**

**(iv)** What conclusion could the students make about **Hypothesis 1:** *Velocity increases downstream*? Support the conclusion with evidence from Fig. 2 and Table 1.

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**(c)** Hydraulic radius is a measurement which indicates how much friction there is between the river channel and the flow of the river. Hydraulic radius is calculated by the following formula:

$$\frac{\text{cross-sectional area}}{\text{wetted perimeter}}$$

**(i)** In order to calculate the cross-sectional area the students measured the width of the river channel and the depth of the river at points across the channel. What equipment would the students use and how would they make their measurements?

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**(ii)** The results of sample measurements made at site 3 are shown in Table 2, below.

**Table 2**

**Sample measurements made at site 3**

| Distance across channel (m) | 0.5 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 |
|---|---|---|---|---|---|---|---|
| Depth of river (m) | 0.15 | 0.21 | 0.29 | 0.26 | 0.24 | 0.20 | 0.19 |

Calculate the average depth of the sample measurements at this site.

Average depth = .....................................m [1]

**(iii)** The students measured the width of the river at site 4 as 8.2 m.
They calculated that the average depth at site 4 was 0.31 m.
Using this data calculate the cross-sectional area at site 4 below.

Cross-sectional area = width of river (m) × average depth of river (m)

Answer .......................................sq.m. [1]

**(iv)** Next the students measured the wetted perimeter. The wetted perimeter is the part of the channel cross-section which the river touches. Photograph A (Insert) shows a way to measure the wetted perimeter.
This method is described in Fig. 3, below, which is part of a student's fieldwork notebook.

**Fieldwork notebook**

<u>Measuring the wetted perimeter</u>
The tape was placed across the bed of the river, starting and finishing at water level on both banks.
To make the method more accurate a student walked along the tape across the river.

**Fig. 3**

Suggest **two** disadvantages of this method in a large river.

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**(d)** The students then calculated the hydraulic radius of each site using the following formula:

$$\frac{\text{cross-sectional area}}{\text{wetted perimeter}}$$

The results of their calculations are shown in Table 1 (Insert).

**(i)** Complete the scatter graph, Fig. 4, below, by plotting the data for Site 5.     [1]
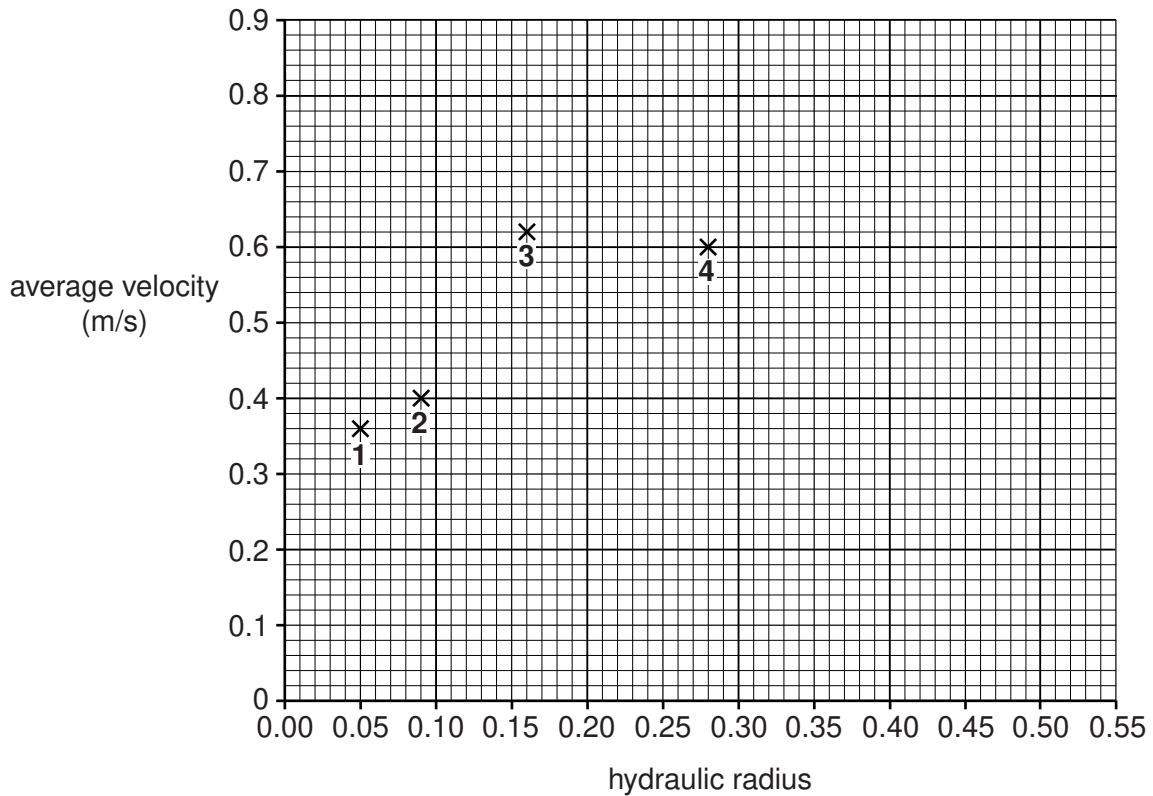
**Scatter graph of hydraulic radius and velocity**



**Fig. 4**

**(ii)** The students reached the conclusion that **Hypothesis 2:** *Velocity increases as the hydraulic radius of the river channel increases* was correct. What evidence from Fig. 4 and Table 1 supports their conclusion?

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**(e)** Whilst doing the fieldwork one student noticed how the river valley was different at the five sites. How could the student record these differences during fieldwork?

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[Total: 30 marks]

**2** Students from Auckland, New Zealand, were studying land-use in urban areas. One textbook model of land-use is shown in Fig. 5 (Insert). They decided to do some fieldwork to investigate land-use patterns in the city where they lived.

**(a)** Give **two** reasons why there are different types of land-use in different parts of a city.

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The students investigated the following hypotheses:

**Hypothesis 1:** *Different types of land-use are located in different areas of the city.*

**Hypothesis 2:** *There is a relationship between the main type of land-use and the height of buildings.*

**(b)** To collect fieldwork data the students decided to follow three transects from the Central Business District (CBD) to the edge of the city.

**(i)** Give **three** characteristics of the CBD of a city.

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**(ii)** The students decided to do their data collection at 10 sites along each transect. These are shown on Fig. 6 (Insert).
Describe **one** way they could have chosen these sites.

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**(c)** At each sampling site the students recorded the ground-floor land-use of five buildings on each side of the road. Their results from one site are shown in Fig. 7 below.

**Ground-floor land-use**

| Transect A  site 3 | |
|---|---|
| Left side of road | Right side of road |
| House | House |
| Apartments | House |
| Newsagents | Apartments |
| Tourist information office | Apartments |
| Insurance office | Food shop |

**Fig. 7**

**(i)** Use this information to complete the following building classification which the students used. [2]
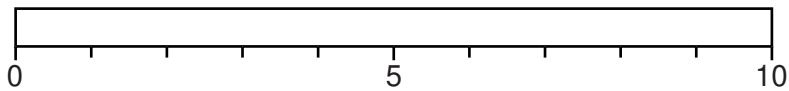
| Use of building | Number of buildings at the site |
|---|---|
| Residential | |
| Offices | |
| Shops | |
| Industry | 0 |

**(ii)** Use the data below for **site 4 on transect C** to complete the divided bar graph for the site. [2]

| Transect C  site 4 | |
|---|---|
| Use of building | Number of buildings at the site |
| Residential | 2 |
| Offices | 0 |
| Shops | 1 |
| Industry | 7 |

**Divided bar graph of ground floor land-use at site 4 on transect C**

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│                                                  │
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0                      5                      10
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**Key**

residential
offices
shops
industry

**(iii)** The students decided to show only the main type of land-use at each survey site on their map of the city (Fig. 6 Insert). For site 4 on transect C, above, this was industry. Do you agree with their decision to show only the main type of land-use? Circle your choice below.

Agree                          Disagree

Explain why you agree or disagree.

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**(iv)** Fig. 6 (Insert) shows the results of the students' fieldwork. The students decided that **Hypothesis 1:** *Different types of land-use are located in different areas of the city* was correct. Support this decision with evidence from Fig. 6.

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**(d)** To investigate **Hypothesis 2:** *There is a relationship between the main type of land-use and the height of buildings*, the students counted the number of storeys of each building when they recorded its ground floor use.

**(i)** Suggest why this is an appropriate method of measuring the height of buildings.

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Then they calculated the average number of storeys at each site as shown in an example below.

| Transect A  Site 3 | | | |
|---|---|---|---|
| Left side of road | Number of storeys | Right side of road | Number of storeys |
| House | 3 | House | 2 |
| Apartments | 4 | House | 2 |
| Newsagents | 2 | Apartments | 6 |
| Tourist information office | 1 | Apartments | 6 |
| Insurance office | 1 | Food shop | 3 |

Average number of storeys per building = 30/10 = 3

**(ii)** The results from all the sites on the three transects are shown in Table 3 (Insert). Use the data in Table 3 to complete Fig. 8 on page 14 (overleaf). You should plot sites 3 and 4 on transect C. [2]

**Average number of storeys and main type of land-use at each site**

**Transect A**



average number
of storeys

site

**Transect B**



average number
of storeys

site

**Transect C**



average number
of storeys

site

**Key**

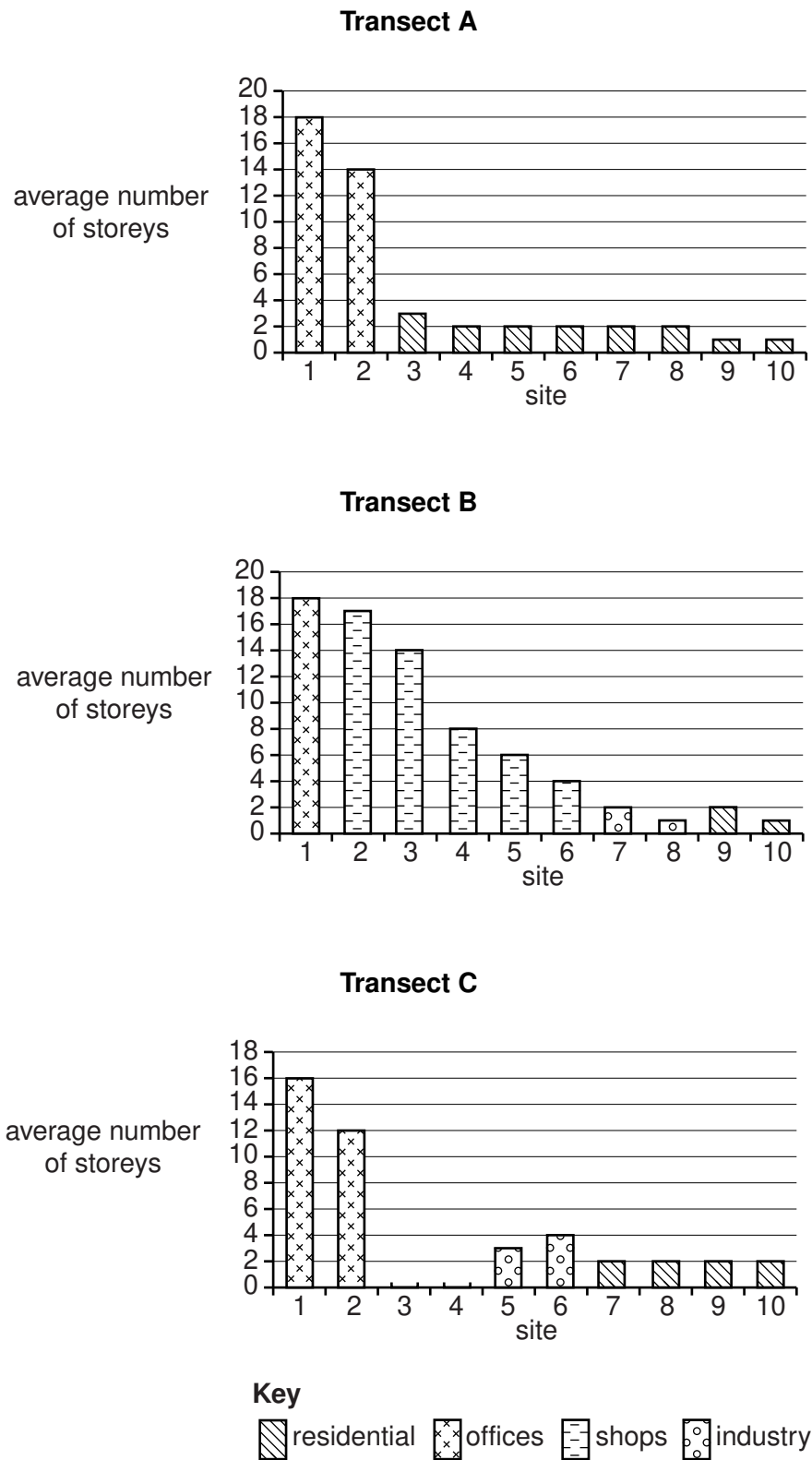residential    offices    shops    industry

**Fig. 8**

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**(iii)** What conclusion would the students make about **Hypothesis 2:** *There is a relationship between the main type of land-use and the height of buildings*? Support your answer with evidence from Table 3 and Fig. 8.

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**(iv)** Explain why there are buildings of different heights in a city.

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**(v)** A common weakness of studies of urban land-use is that data is only recorded for the ground floor level. Suggest why this is a weakness.

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**(e)** One student wanted to extend her study by comparing the quality of the environment in different parts of the city. Describe how she could do this.

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[Total: 30 marks]

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