Surname	Centre Number	Candidate Number
Other Names		2

GCE AS – NEW

B480U20-1

S19-B480U20-1-R1

GEOLOGY – AS component 2
Foundation Geology

FRIDAY, 17 MAY 2019 – AFTERNOON

1 hour 30 minutes

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**14**	
2.	**14**	
3.	**18**	
4.	**15**	
5.	**15**	
6.	**14**	
Total	**90**	

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ADDITIONAL MATERIALS

In addition to this examination paper, you will need:
the Mineral Data Sheet
a calculator
a protractor

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.
Write your name, centre number and candidate number in the spaces at the top of this page.
Answer **all** questions.
Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.
The assessment of the quality of extended response (QER) will take place in questions **2** and **4**.

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

1. **Figure 1** shows two Palaeozoic fossils **W** and **Y**.

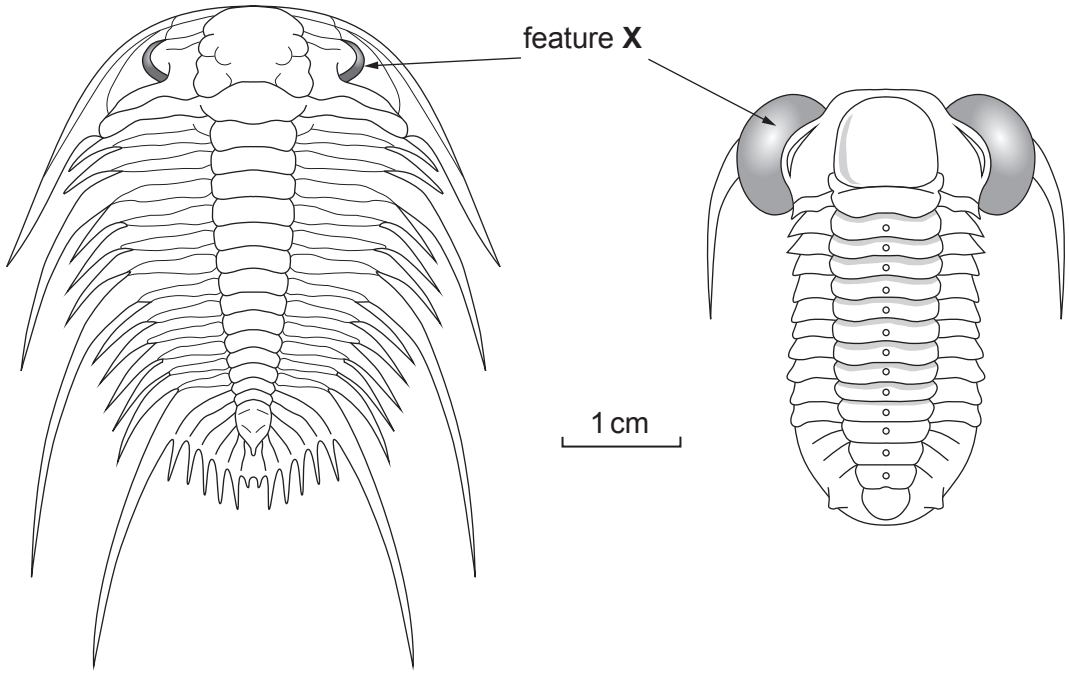

Figure 1

Refer to **Figure 1**.

(a) State the fossil group to which fossils **W** and **Y** belong. [1]

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(b) (i) Name feature **X**. [1]

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(ii) State **two** ways in which feature **X** differs between fossils **W** and **Y**. [2]

1. .....

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2. .....

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(iii) Using evidence from **Figure 1**, suggest the most likely mode of life of **either** fossil **W** or fossil **Y**. Explain the evidence for your answer. [4]

Fossil (**W** or **Y**) ☐

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(c) Fossil **W** and fossil **Y** were found in a black shale. Describe the palaeo-environmental conditions under which the sediment was deposited. [2]

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(d) The fossils shown in **Figure 1** lived during the Palaeozoic era. Explain why the fossil record may not show a true representation of life during this time. [4]

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2. **Figure 2a** is a cross-section showing a sequence of horizontal beds. **Figure 2b** shows fossil **H** collected from the limestone bed in **Figure 2a**.

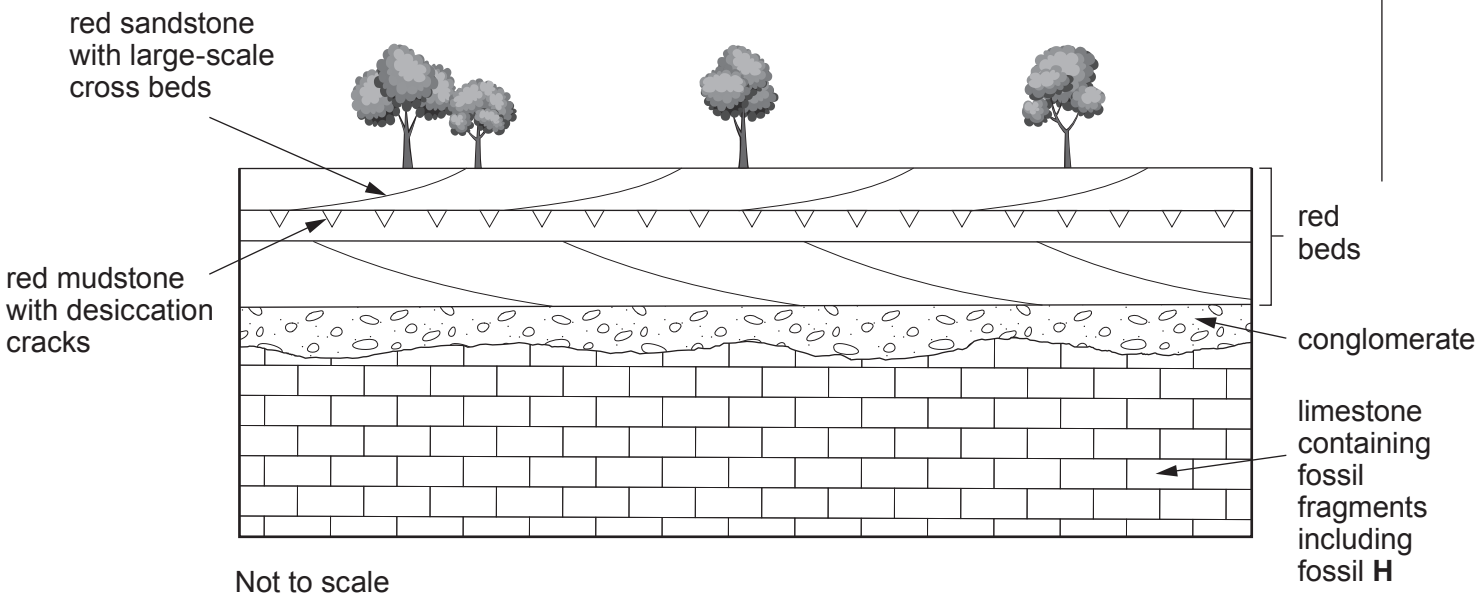

Figure 2a

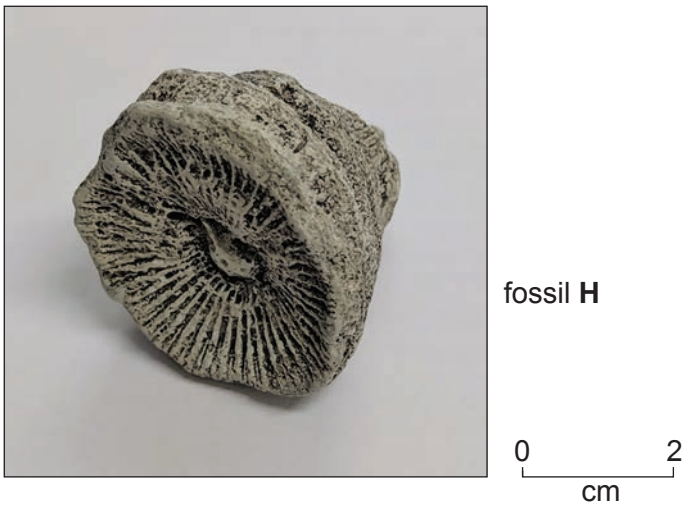

Figure 2b

(a) State the fossil group to which fossil **H** in **Figure 2b** belongs. [1]

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(b) (i) Describe the most likely environment of deposition for the limestone bed. Give reasons for your answer. [4]

(ii) State the name of the youngest bed shown in **Figure 2a**. Give reasons for your answer. [3]

Youngest bed .....

Reasons .....

(c) Using the information in **Figure 2a**:

- describe the variation of energy levels of the environment over time
- give reasons for your answer. [6 QER]

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3. **Figure 3a** is a model showing the relationship between stress and strain within the Earth. Line **P** models deformation at a depth of 5 km. Line **Q** models deformation at a depth of 40 km.

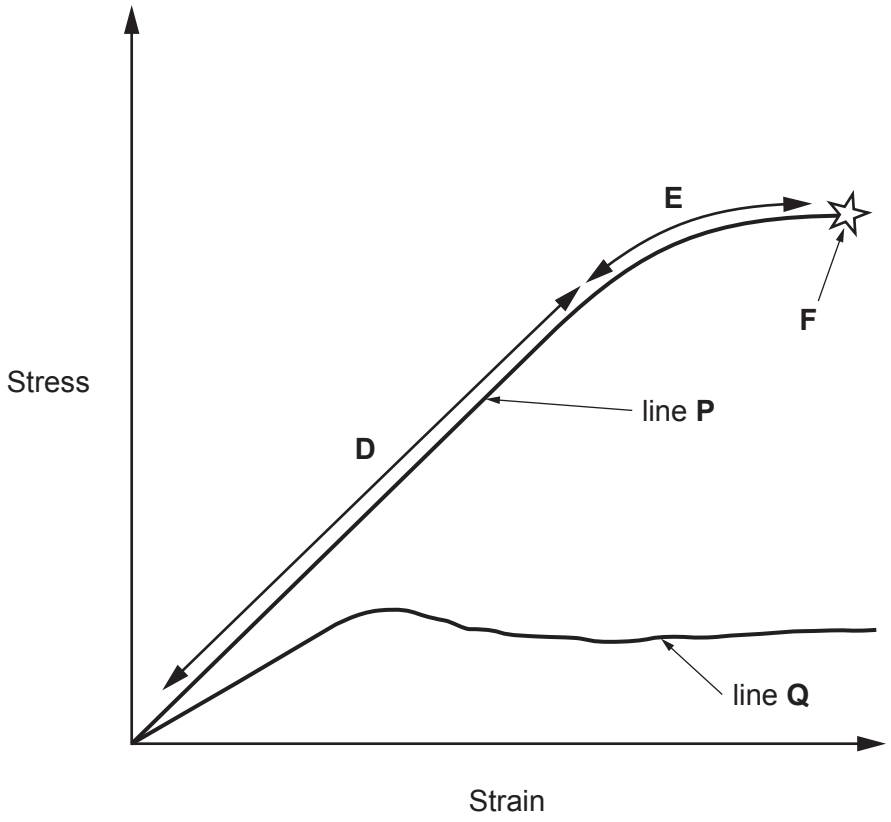

Figure 3a

Refer to **Figure 3a.**

(a) (i) State the type of deformation that occurs at **D**, **E** and **F**. [3]

D ..... **E** ..... **F** .....

(ii) Describe the difference in deformation of rocks at 5 km depth (line **P**) and 40 km depth (line **Q**). [2]

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(iii) Explain the apparent role of temperature in the deformation shown in **Figure 3a**. [1]

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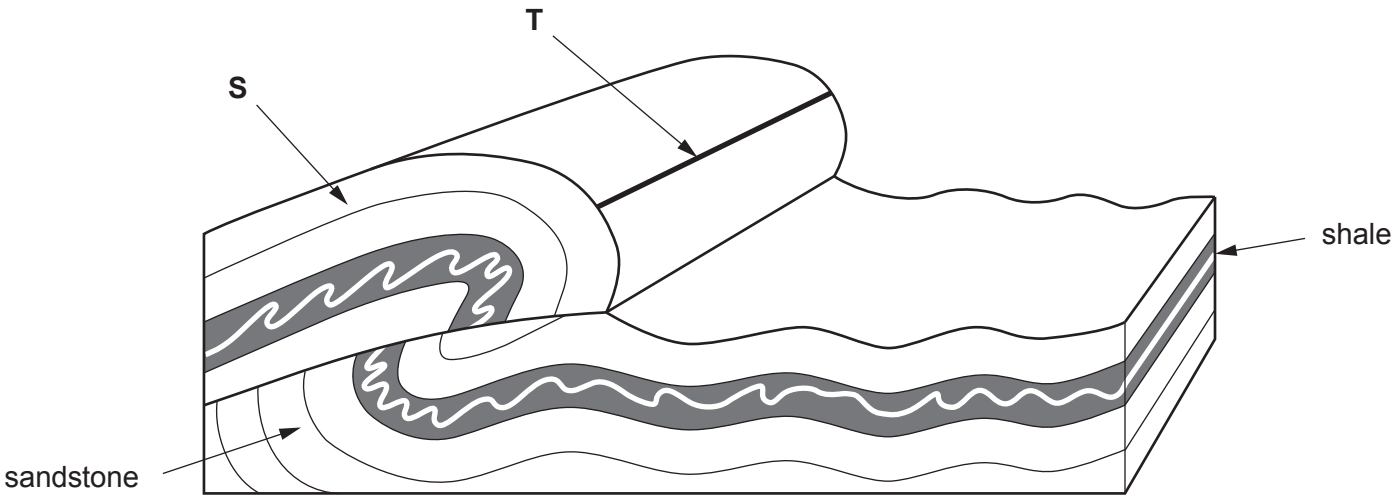
(b) **Figure 3b** shows a sequence of rocks that have undergone several phases of deformation.



Not to scale

Figure 3b

(i) State which letter (**D**, **E** or **F**) on **Figure 3a** is most likely to represent the deformation that has caused: [2]

- the folding on **Figure 3b**
- the faulting on **Figure 3b**.

Folding: ..... Faulting: .....

(ii) State the relative age of the deformation seen in **Figure 3b**. Give a reason for your answer. [2]

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(c) (i) Identify the fold elements labelled **S** and **T** on **Figure 3b**. [2]

S: ..... **T**: .....

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(ii) **Figure 3c** shows small-scale folding.

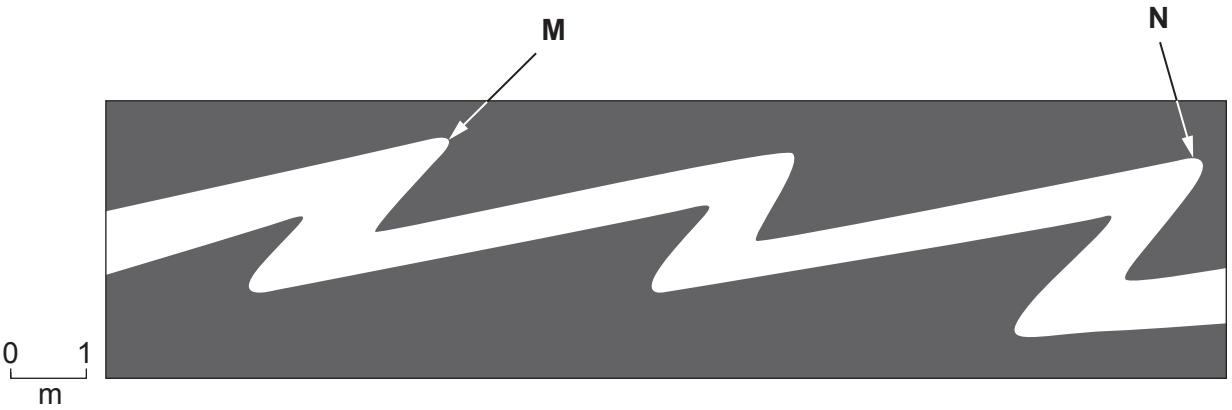

Figure 3c

Calculate the percentage of crustal shortening shown by the small-scale folds between points **M** and **N** in **Figure 3c**.

$$\% \text{ of crustal shortening} = \frac{P - Q}{P} \times 100$$

Where:
P = length along the bed from **M** to **N**
Q = straight line distance from **M** to **N**

Show your working. Give your answer to 3 significant figures. [3]

..... %

(d) A student said that the sequence of rocks shown in **Figure 3b** had undergone deformation due to crustal shortening forming a normal fault. Critically evaluate this statement. [3]

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4. **Figure 4a** is a cross-section through the lithosphere showing a number of different plate tectonic settings.

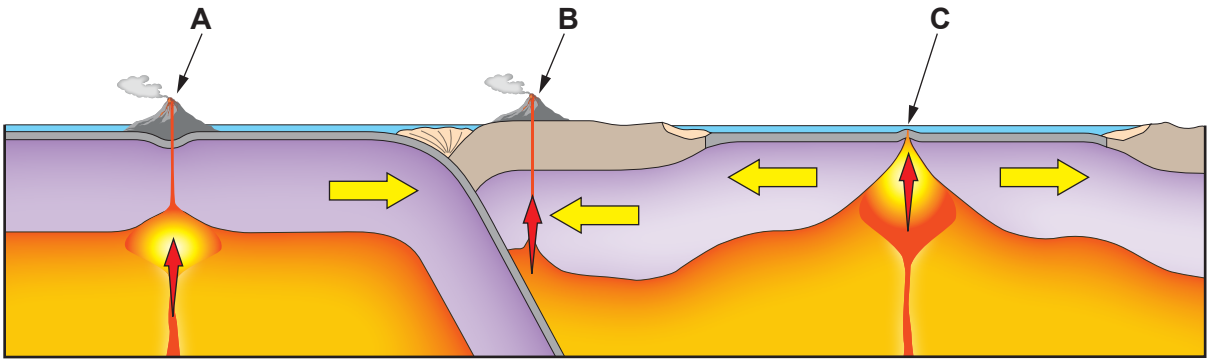

Figure 4a

Refer to **Figure 4a.**

(a) (i) State the composition of lava (e.g. basaltic, andesitic, silicic) most likely to be erupted at locations **A**, **B** and **C**. [2]

A ..... **B** ..... **C** .....

(ii) Explain how magma is generated at location **C**. [3]

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Figure 4b shows structures formed in igneous rocks.

Figure 4b

(b) (i) State **one** location in **Figure 4a** (**A**, **B** or **C**) at which the igneous structure in **Figure 4b** may have formed. [1]

Location

(ii) Explain how these structures formed. You may wish to use a diagram in your answer. [3]

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(c) Volcanoes at locations **A** and **B** on **Figure 4a** produce a wide range of hazards. Choosing either location **A** or **B** explain how the hazards are linked to the composition of the magma generated. [6 QER]

Location **A** or **B** ☐

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5. **Figure 5a** is a geological map.

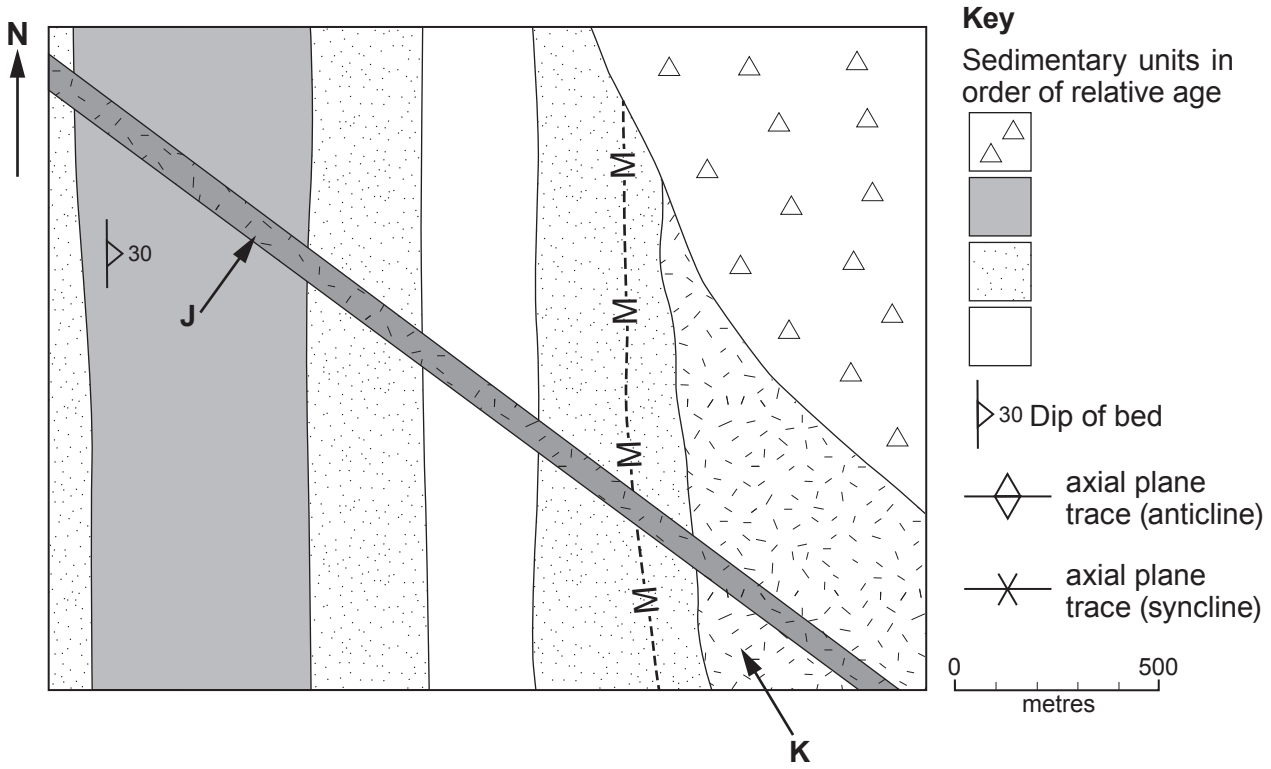

Figure 5a

Refer to **Figure 5a.**

(a) Draw on **Figure 5a** the axial planar trace of either an anticline or a syncline. Use the key provided. [1]

(b) State the type of igneous body labelled **J**. Give reasons for your answer. [3]

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(c) Gabbro at location **K** consists of:

- feldspar phenocrysts with a mean length of 7 mm
- groundmass with a mean size of 3 mm.

Sketch the texture of the gabbro on **Figure 5b**. [4]

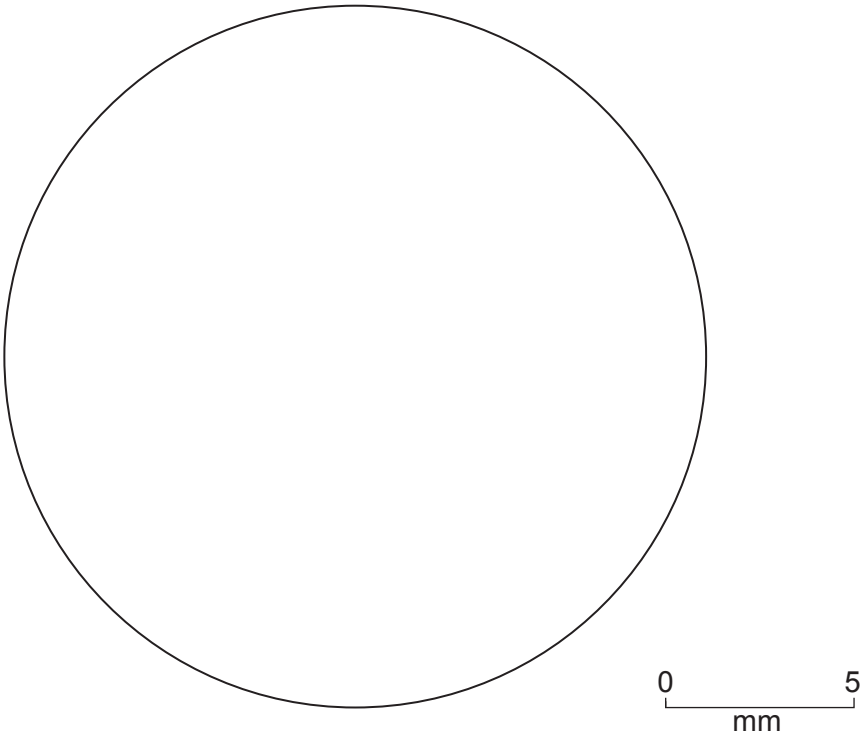

Figure 5b

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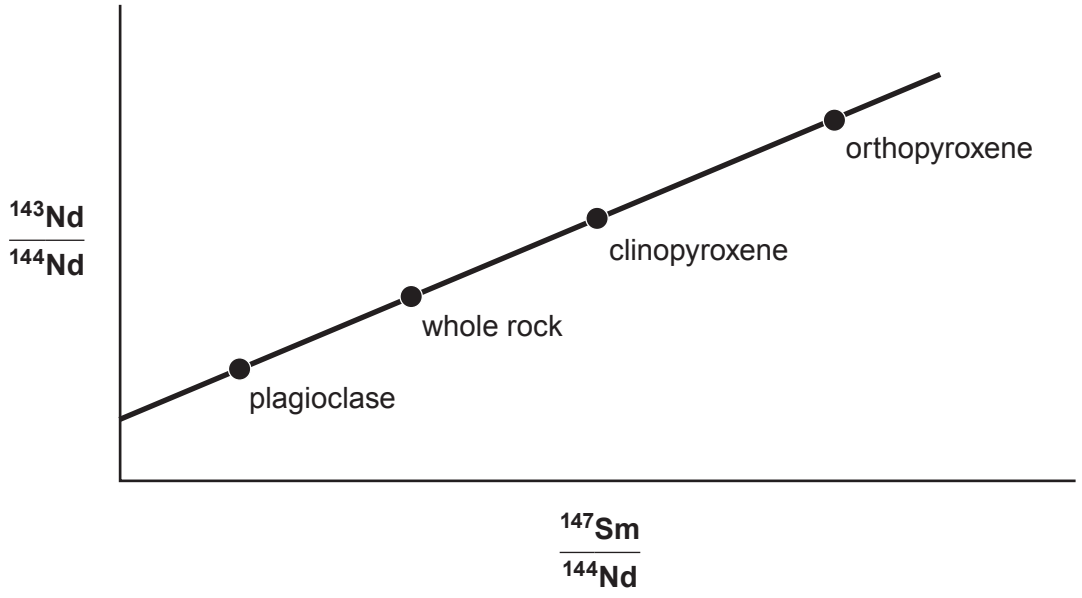
(d) **Figure 5c** shows the samarium-neodymium isochron for the igneous body at location **K**.



Clinopyroxene and orthopyroxene are minerals

Nd (neodymium)
Sm (samarium)

Figure 5c

(i) Draw onto **Figure 5c** a possible position for the samarium-neodymium isochron of igneous body **J**. Give reasons for your answer. [4]

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(ii) Complete **Table 5** to show the relative concentrations of neodymium isotopes for a present-day lava flow. [3]

	Plagioclase	Whole Rock	Clinopyroxene	Orthopyroxene
^{143}Nd	2	•	•	5
^{144}Nd	•	3	9	15

Table 5

Turn over.

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6. **Figure 6a** shows P and S wave velocities through the Earth.

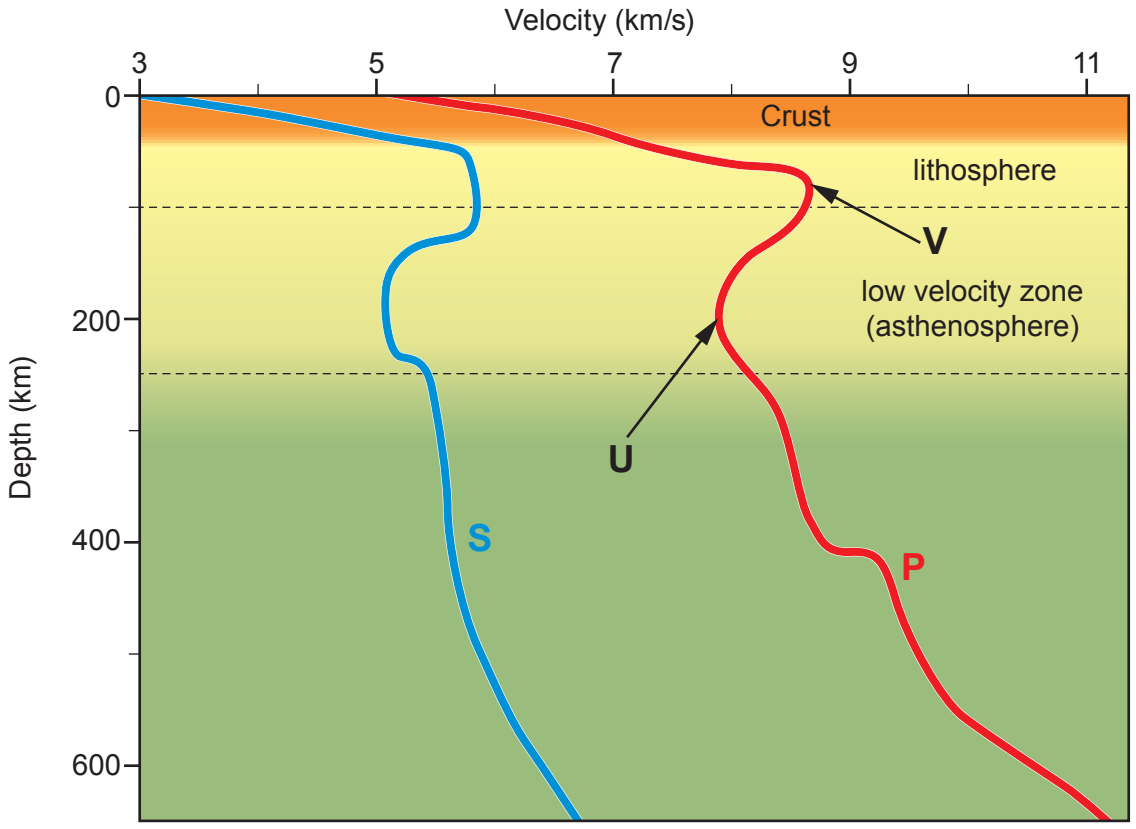

Figure 6a

(a) (i) Using **Figure 6a** calculate the percentage change in P wave velocity between points **V** and **U**. Give your answer to 3 significant figures. [3]

..... %

(ii) Explain why seismic velocity decreases between points **V** and **U** on **Figure 6a**. [2]

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(b) Explain the importance of the asthenosphere in plate movement. [2]

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(c) **Figure 6b** shows a cross-section through two plate boundaries.

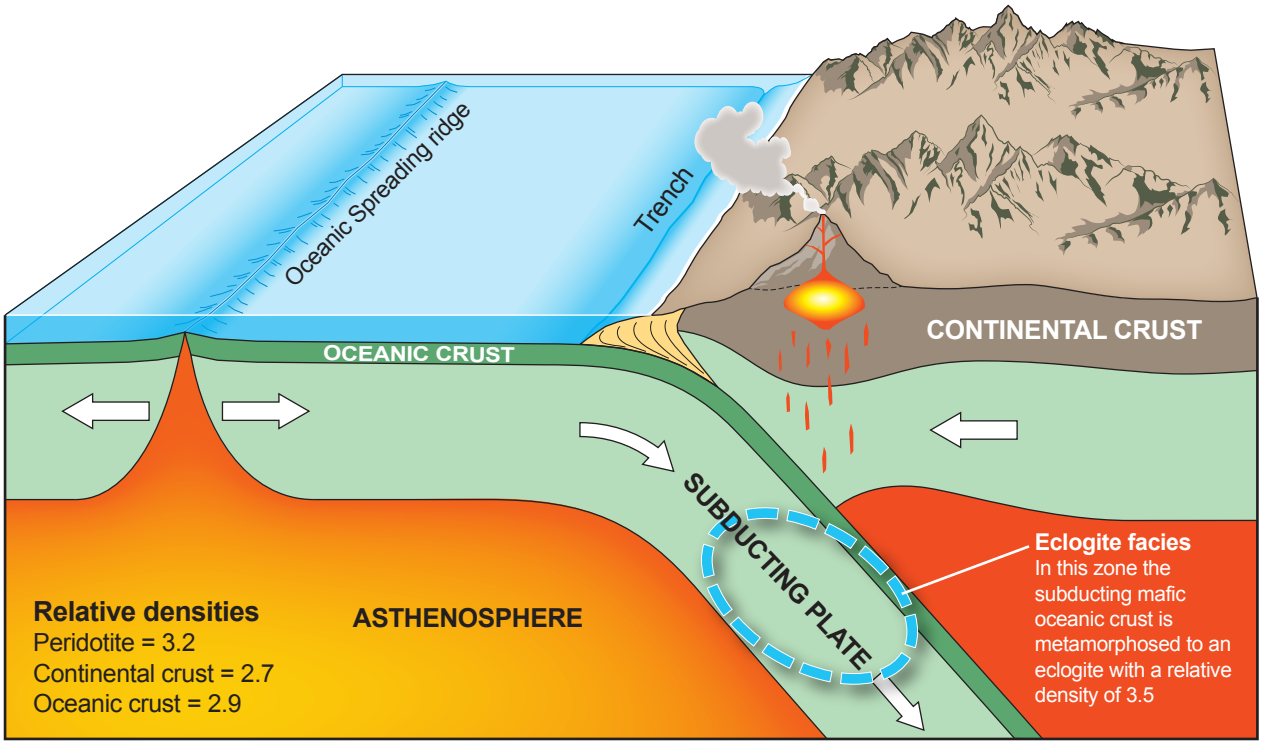

Figure 6b

(i) Slab pull is now thought to be the main mechanism driving plate tectonic movement. Using **Figure 6b**, describe and explain the process of slab pull. [4]

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(ii) The forces driving plate motion are still a matter of debate. Describe **one** other mechanism thought to contribute to plate motion. [3]

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END OF PAPER

Acknowledgements

Figure 3a adapted from https://www.geol.umd.edu/~jmerck/geol212/lectures/08.html
Figure 3b adapted from https://www.pinterest.com/pin/405183297696832429/
Figure 4a adapted from geologylearn.blogspot.co.uk/2015/10/plate-tectonics-activity.html
Figure 4b https://commons.wikimedia.org/wiki/
Figure 5a section from 2014 GL2a
Figure 5c adapted from P. Loader
Figure 6a https://geo.libretexts.org/Textmaps/Map%3A_Physical_Geology_(Earle)/09%3A_Earth%E2%80%99s_Interior/9.1%3A_Understanding_Earth_through_Seismology
Figure 6b adapted from http://www.terrapsych.com/ecology.html

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