GCE A Level – LEGACY

1215/02

GEOLOGY – GL5

Thematic Unit 2

Geology of Natural Resources

THURSDAY, 7 JUNE 2018 – MORNING

ONE of TWO units to be completed in 2 hours plus your additional time allowance

Surname _____

Other Names _____

Centre Number _____

Candidate Number 2 _____

	For Examiner's use only		
	Question	Maximum Mark	Mark Awarded
Section A	1.	15	
Section B	2.	25	
	3.		
	4.		
	Total	40	

ADDITIONAL MATERIALS

In addition to this and one other examination paper, you will need a calculator.

INSTRUCTIONS TO CANDIDATES

Use black ink, black ball-point pen or your usual method.

Write your name, centre number and candidate number in the spaces provided on the front cover.

Answer QUESTION 1 in Section A (15 marks) and ONE question from Section B (25 marks).

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the necessity for good English and orderly presentation in your answers.

FIGURE 1A

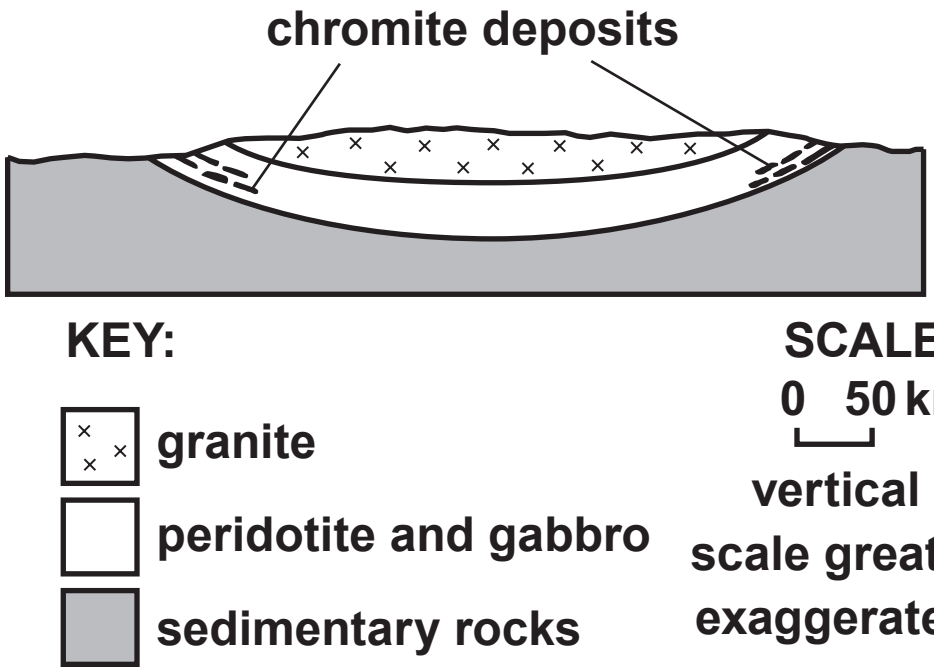
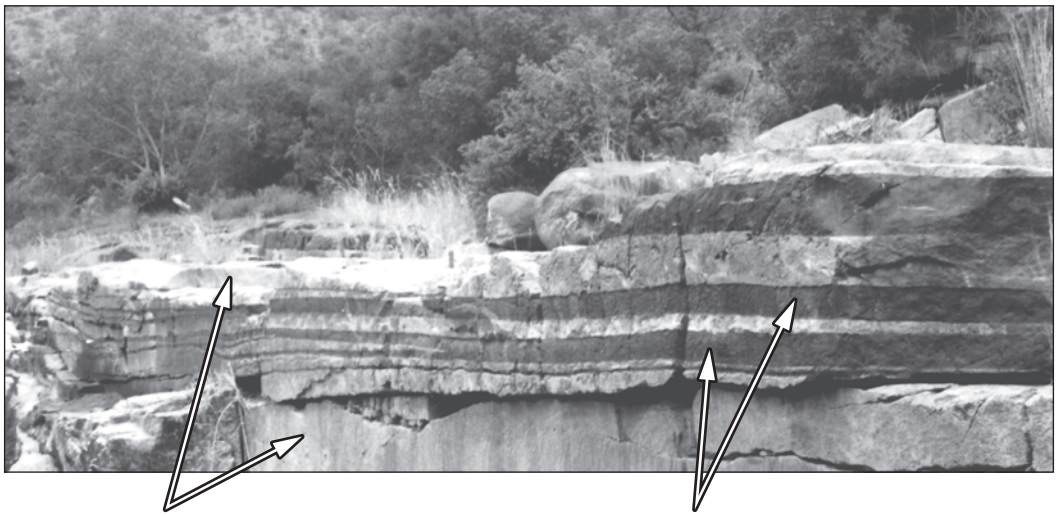


FIGURE 1B



plagioclase-rich layer

chromite-rich layer (concentration factor of chromite is 2,250)

SECTION A

1. FIGURE 1A opposite is a cross-section through the Bushveld Complex in South Africa, a significant source of chromite ore ($FeCr_2O_4$). FIGURE 1B opposite is a photograph of part of the chromite-rich ore body. TABLE 1 is a table of properties of some of the minerals found within the Bushveld Complex.

TABLE 1

MINERAL	RELATIVE DENSITY	APPROXIMATE CRYSTALLISATION TEMPERATURE	AVERAGE CONCENTRATION IN CRUST (PARTS PER MILLION)
chromite	4.5-4.8	1400 – 1200°C	160
plagioclase feldspar	2.62-2.75	1550 – 1275°C	N/A

1(a) Refer to FIGURE 1A. Describe the size and shape of the peridotite and gabbro igneous intrusion in the Bushveld Complex. [2]

(b) Using FIGURE 1B and TABLE 1:

$$\text{Concentration factor} = \frac{\text{concentration of ore in deposit (ppm)}}{\text{concentration of ore in crust (ppm)}}$$

(i) Use the formula above. Calculate the concentration of chromite in the chromite-rich layers in parts per million (ppm). [2]
SHOW YOUR WORKING.

_____ ppm

1(b) (ii) Explain the geological processes that have concentrated chromite in the chromite-rich deposits. [3]

(iii) Explain ONE possible reason for the occurrence of several chromite-rich layers in FIGURE 1B. [2]

1(c) For ONE named environmental problem that might be caused by the extraction of chromite from the Bushveld Complex, suggest a suitable planning control that could be used to limit the adverse effects of THIS problem. [2]

environmental problem:

planning control:

1(d) Refer to FIGURES 1A, 1B and TABLE 1.
Explain how the properties of chromite deposits enable them to be detected by TWO different geophysical prospecting techniques. [4]

1. _____

_____

_____

_____

_____

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2. _____

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15

SECTION B

Answer ONE question only.

WRITE YOUR ANSWER IN THE REMAINING PAGES OF THIS BOOKLET.

2. Evaluate the use of GEOPHYSICAL surveying techniques in prospecting for:

(i) non-metalliferous mineral resources

(ii) hydrocarbon resources. [25]

3. Evaluate the role of water in the processes of formation of TWO of the following:

(i) china clay

(ii) hydrothermal minerals

(iii) SEDIMENTARY metalliferous ores [25]

4. **“The formation of economic deposits of hydrocarbons and coals solely results from the thermal alteration of organic material.”**

Evaluate this statement with reference to geological processes. [25]

END OF PAPER

ACKNOWLEDGEMENTS

FIGURE 1A: S268 Physical Resources and Environment – Metals 1 Ore Deposits. The Open University, 1995.

FIGURE 1B: "Chromitite Bushveld South Africa" by kevinzim / Kevin Walsh – originally posted to Flickr as xBushveld_Chromite1 http://www.flickr.com/photos/86624586@N00/85262560/. Licensed under CC BY 2.0 via Commons – https://commons.wikimedia.org/wiki/File:Chromitite_Bushveld_South_Africa.jpg#/media/File:Chromitite_Bushveld_South_Africa.jpg