OCR
Oxford Cambridge and RSA

Monday 23 May 2016 – Morning

AS GCE GEOLOGY

F792/01 Rocks – Processes and Products

Candidates answer on the Question Paper.

OCR supplied materials:
None

Other materials required:
- Ruler (cm/mm)
- Protractor
- Electronic calculator

Duration: 1 hour 45 minutes

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. If additional space is required, you should use the lined page(s) at the end of this booklet. The question number(s) must be clearly shown.
- Do **not** write in the bar codes.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- Where you see this icon you will be awarded a mark for the quality of written communication in your answer.
- You may use an electronic calculator.
- You are advised to show all the steps in any calculations.
- The total number of marks for this paper is **100**.
- This document consists of **20** pages. Any blank pages are indicated.

Answer **all** the questions.

1 **(a)** Sedimentary rocks are classified into clastic and non-clastic rocks.

(i) Describe the term clastic.

.....

..... **[1]**

(ii) Non-clastic sedimentary rocks are divided into two types based on how they form.

State the **two** types of non-clastic rocks.

1 .....

2 ..... **[1]**

(b) **(i)** Complete the classification diagram below by entering the names of the correct clastic sedimentary rocks in boxes **A**, **B**, **C** and **D**.

Grain size	Composition	Grain shape	Rocks
coarse	rock (lithic) fragments quartz cement or matrix	angular	**A**
		rounded	**B**
medium	>90% quartz	well-rounded	**orthoquartzite**
	25% K feldspar 50% quartz 25% rock (lithic) fragments	sub-angular to sub-rounded	**C**
	25% clay matrix 50% rock (lithic) fragments and other minerals 25% quartz	sub-angular to sub-rounded	**D**
fine	90% mineral **E** 10% quartz	too fine to observe	**shale**

[4]

(ii) State the range of sizes used to define medium grains in sedimentary rocks.

..... **[1]**

(iii) Identify mineral **E** that is found in the fine-grained clastic rocks.

..... **[1]**

(iv) Use labelled diagrams to show the difference between angular and rounded grains.

angular	**rounded**

[1]

(c) (i) Describe **three** characteristics of desert sandstone.

1 .....

2 .....

3 .....

[2]

(ii) Describe **three** characteristics of sandstone formed in a fluvio-glacial environment.

1 .....

2 .....

3 .....

[2]

(d) Complete the following sentences by writing the correct terms in the spaces. Choose terms from the list below. Each term should be used only once or not at all.

bioclastic **calcite** **coccoliths** **concentric**

crinoids **quartz** **nucleus** **oolite**

In ..... limestone, 75% of the rock is composed of shell fragments and the rest of the rock is a mineral cement of ..... .

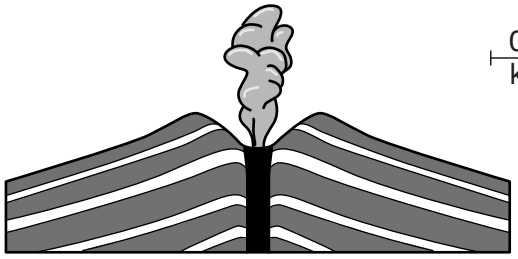
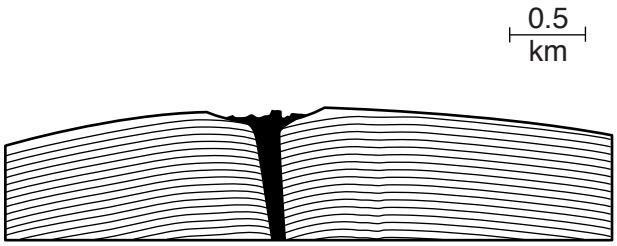
Chalk is composed of ..... .

A limestone formed in shallow seas where tidal action or currents have moved particles is called ..... limestone. It has ..... layers of calcium carbonate around a ..... .

[4]

[Total: 17]

2 The diagrams below show features of three types of volcanic eruptions **F**, **G** and **H**.

Volcanic eruptions	Simplified cross-section of volcanoes	Volcanic products	Tick (✓) if present
F		lava	
		tuff	
		ignimbrite	
G		lava	
		tuff	
		ignimbrite	
H		lava	
		tuff	
		ignimbrite	

(a) (i) Complete the table using ticks (✓) to show which volcanic product or products are formed by each volcanic eruption type. **[3]**

(ii) Identify the point on the VEI scale for each volcanic eruption type **F**, **G** and **H**. Use the information in the table below and the diagrams of the volcanic eruption types above.

Write **F**, **G** and **H** once only in the correct boxes in the last column of the table.

VEI scale	Ejecta volume (km^3)	Description		Cloud column height (km)	Frequency	Volcanic eruption type
0	< 0.0001	effusive	effusive	< 0.1	constant	
1	> 0.0001	effusive	gentle	0.1–1	daily	
2	> 0.001	explosive	severe	1–5	weekly	
3	> 0.01	explosive	violent	3–15	few months	
4	> 0.1	explosive	cataclysmic	10–25	⩾ 1 yr	
5	> 1	explosive	paroxysmal	20–35	⩾ 10 yrs	
6	> 10	explosive	colossal	> 30	⩾ 100 yrs	
7	> 100	explosive	mega-colossal	> 40	⩾ 1 000 yrs	
8	> 1000	explosive	apocalyptic	> 50	⩾ 10 000 yrs	

[2]

(b) (i) Describe how an ignimbrite forms.

.....

.....

.....

..... **[2]**

(ii) Describe how an agglomerate forms.

.....

.....

.....

..... **[2]**

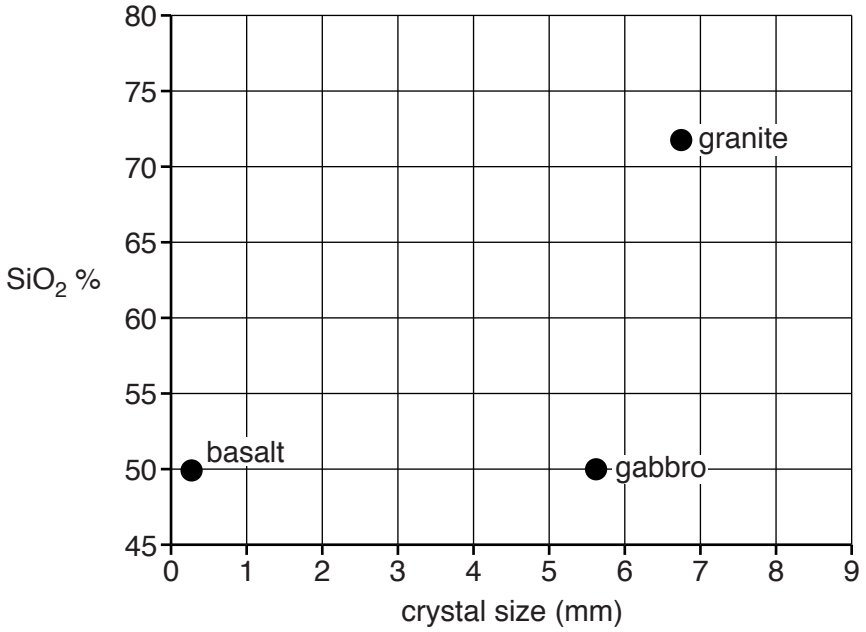
(c) Describe the stages of caldera formation during and after final eruption. You should use labelled diagrams.

Labelled diagrams	**Description**
During final eruption	....
After final eruption	....

[4]

[Total: 13]

3 The graph below shows the crystal size and silica percentage for three igneous rocks.



(a) (i) On the graph, clearly plot and label the rocks andesite and dolerite. **[2]**

(ii) State the minerals found in the rocks gabbro and granite that are used to classify them.

gabbro .....

granite .....
[2]

(iii) Describe the relationship between the rock colour and mineral content of gabbro and of granite.

gabbro .....

.....

granite .....

.....
[2]

(iv) Explain why silica composition is not used to identify igneous rocks **in the field**.

.....

..... **[1]**

(b) Indicate whether the following statements apply to lava flows or sills or both. Use ticks (✓) in the correct column(s). The first statement has been completed for you.

Feature seen	lava flow	sill
forms a concordant feature	✓	✓
crystal size is 1 to 5 mm		
crystallisation has taken place more than 1 km below the surface		
has two baked margins		
may have a weathered surface		
the rate of cooling is measured in days or weeks		

[4]

(c) **(i)** Draw a fully labelled diagram to show vesicular texture in basalt.
Show an appropriate scale in mm.

[2]

(ii) Describe how porphyritic texture forms in granite.

.....

.....

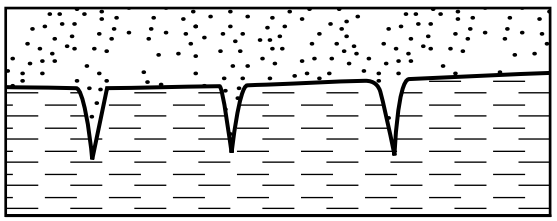
.....

..... **[2]**

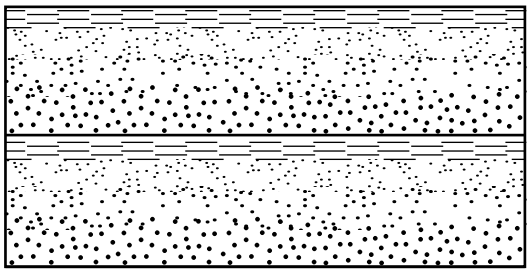
[Total: 15]

4 **(a)** The diagrams below show cross-sections of two sedimentary structures **J** and **K**.

sedimentary structure J



sedimentary structure K



(i) Identify structure **J** and explain how it forms.

identification .....

formation .....

.....

.....

[2]

(ii) Identify structure **K** and explain how it forms.

identification .....

formation .....

.....

.....

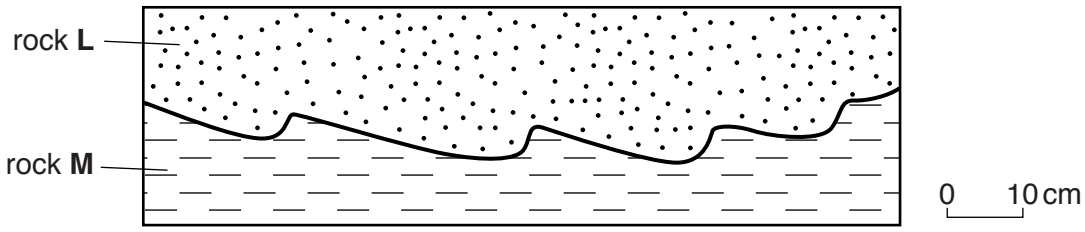
[2]

(b) In the space below, draw a labelled cross-section to show imbricate structure.
Draw an arrow to show the direction of the current that formed the imbricate structure that you have drawn.

imbricate structure

[2]

(c) The cross-section diagram below shows sedimentary structures that were formed by turbidity currents on the deep sea floor.



(i) Identify these sedimentary structures.

..... **[1]**

(ii) Describe how these sedimentary structures form.

.....

.....

.....

..... **[2]**

(iii) Name the **two** rocks **L** and **M** that are shown on the diagram.

rock **L** .....

rock **M** .....

[2]

(d) Explain how an alternating sequence of rocks **L** and **M** forms.

.....

.....

.....

.....

.....

..... **[3]**

(e) Calcareous ooze forms on the deep sea floor. Describe how it forms.

.....

.....

.....

..... **[2]**

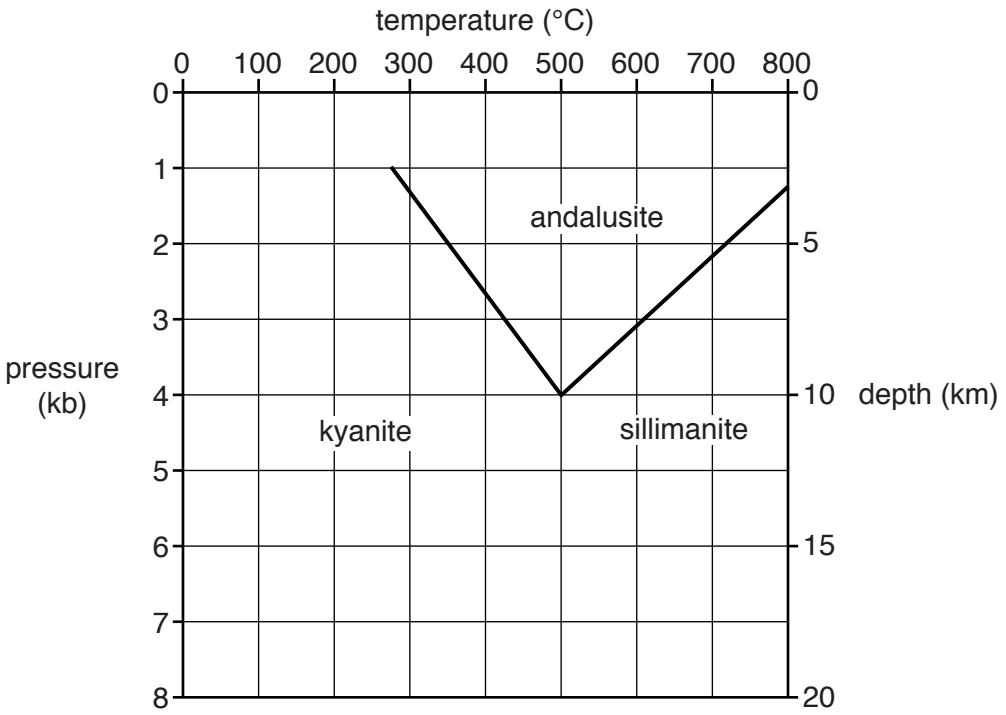
[Total: 16]

5 **(a)** State the meaning of the term polymorph.

.....

..... **[1]**

(b) The graph below shows the stability fields of the Al_2SiO_5 polymorphs.



(i) Plot the kyanite/sillimanite boundary line using the data that at 8 kb pressure the temperature will be 600 °C. **[1]**

(ii) State which of the minerals will be found in high-grade regional metamorphic rocks.

..... **[1]**

(iii) State the polymorph that will form at 15 km depth if the geothermal gradient is 30 °C/km.

..... **[1]**

(c) Explain how paired metamorphic belts form by regional metamorphism at a convergent plate boundary where subduction is taking place.

.....

.....

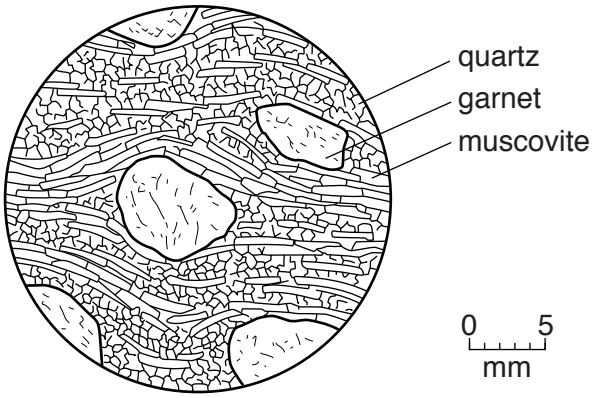
.....

..... **[2]**

(d) The thin section diagrams below show rocks **N** and **P** produced by regional metamorphism.

(i) Identify and describe the texture of rock **N** and explain how this texture formed.

Rock N



texture identification .....

texture description .....

.....

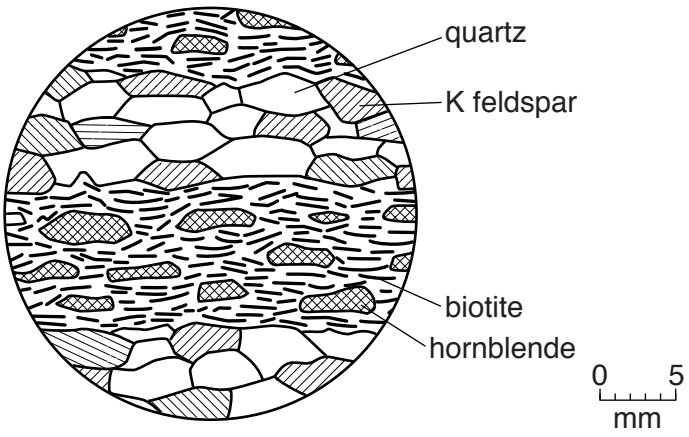
texture formation .....

.....

[3]

(ii) Identify and describe the texture of rock **P** and explain how this texture formed.

Rock P



texture identification .....

texture description .....

.....

texture formation .....

.....

[3]

[Total: 12]

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6 (a) (i) Describe the division of the geological column into **eras** and **systems**.
You may use examples in your answer.

era .....

.....

system .....

.....
[2]

(ii) State the **two** principles of dating that are used to construct the geological column.

1 ……..... 2 ..... **[1]**

(b) The table below shows historic eruption data from the Icelandic volcano Hekla.

Date of historic eruption	Silica % of lava	Time from previous eruption (years)
1510	63	121
1597	61	87
1636	58	39
1693	58	57
1766	60	73
1845	60	79
1947	63	102
1970	55	23
1991	54	21
2000		9

(i) Estimate a possible silica % value for the eruption in 2000.

..... **[1]**

(ii) Calculate the average silica % of all the lavas erupted from 1510 to 1991.

..... **[1]**

(iii) Use data from the table and your knowledge of the process of magmatic differentiation to explain why eruptions of Hekla vary in silica % over time.

.....

.....

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..... **[2]**

[Total: 7]

7 Describe the main processes of the rock cycle operating at and just below the surface to a maximum depth of 500 m.

Diagrams are not required in your answer.

In your answer you must describe the effects of named processes of the rock cycle and use technical terms where appropriate.

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..... **[10]**

[Total: 10]

8 Describe the effects of contact metamorphism produced by a granite batholith on surrounding beds of shale and limestone.

You may use diagrams to illustrate your answer.

In your answer you should describe the characteristics and distribution of the rocks around the granite batholith formed by contact metamorphism at different grades.

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.....

.....

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.....

.....

..... **[10]**

[Total: 10]

END OF QUESTION PAPER

ADDITIONAL ANSWER SPACE

If additional space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margin(s).