

Surname	Centre Number	Candidate Number
Other Names		0



**GCSE**

4250/01

**GEOLOGY**

**Theory Paper**

**(Paper version of on-screen assessment)**

A.M. THURSDAY, 16 May 2013

1½ hours

**Suitable for Modified  
Language Candidates**

For Examiner's use only		
Section	Maximum Mark	Candidate Mark
1.	18	
2.	16	
3.	15	
4.	18	
5.	11	
6.	14	
7.	8	
<b>Total</b>	<b>100</b>	

**ADDITIONAL MATERIALS**

In addition to this examination paper you will need a:

- Data Sheet;
- calculator.

**INSTRUCTIONS TO CANDIDATES**

Use black ink or black ball-point pen.

Answer **all** questions.

Write your answers in the spaces provided.

**INFORMATION FOR CANDIDATES**

The number of marks is given in brackets alongside each question.

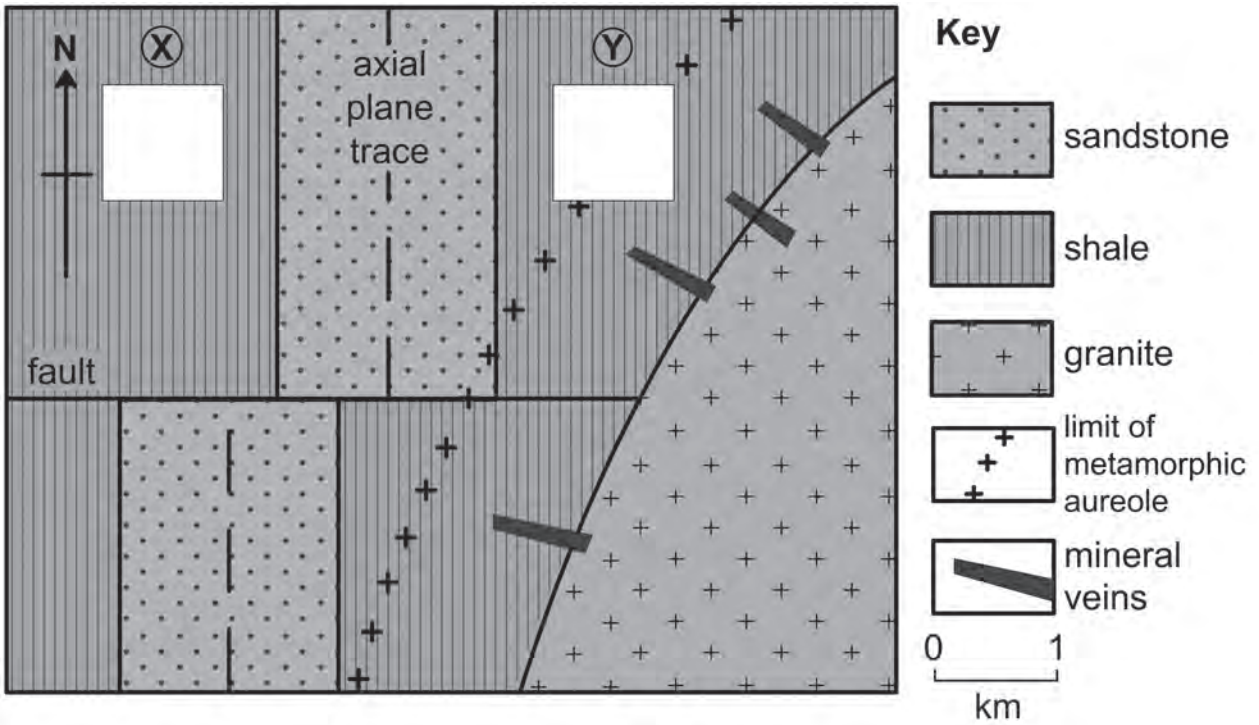
You are reminded that assessment will take into account the quality of written communication (*QWC*) used in your answers to **Section 1 Q10** and **Section 5 Q4**.

Answer **all** questions in each section.

Examiner  
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**Section 1 – answer questions 1-11**

**Figure 1** is a geological map. Sandstone is the **youngest** sedimentary rock on the map.



**Figure 1**

1. Draw arrows in the empty boxes on **Figure 1** to show the dip directions of the beds at locations **X** and **Y**. Select from the choice below. [1]



2. Name the structure formed by the dipping sedimentary rocks between locations **X** and **Y**. Tick (✓) only **one** box. [1]

- unconformity
- anticline
- dyke
- syncline
- parallel dipping beds

3. Identify the type of fault on **Figure 1**. Tick (✓) only **one** box.

[1]

- normal
- reverse
- strike slip
- thrust
- transform

4. Explain how you identified the type of fault.

[2]

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5. Name the main tectonic stress involved in the formation of the fault. Tick (✓) only **one** box.

[1]

- shear
- compression
- tension

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6. List the relative ages of the following features in **Figure 1**. Write each of them in their correct position in **Table 1**. [2]

granite intrusion

structure in the sedimentary rocks

fault

mineral veins

youngest



oldest


**Table 1**

7. Name the most appropriate method which could be used to find out the relative ages of the granite intrusion, the structure in the sedimentary rocks, the fault and mineral veins in **Figure 1**. Tick (✓) only **one** box. [1]

original horizontality

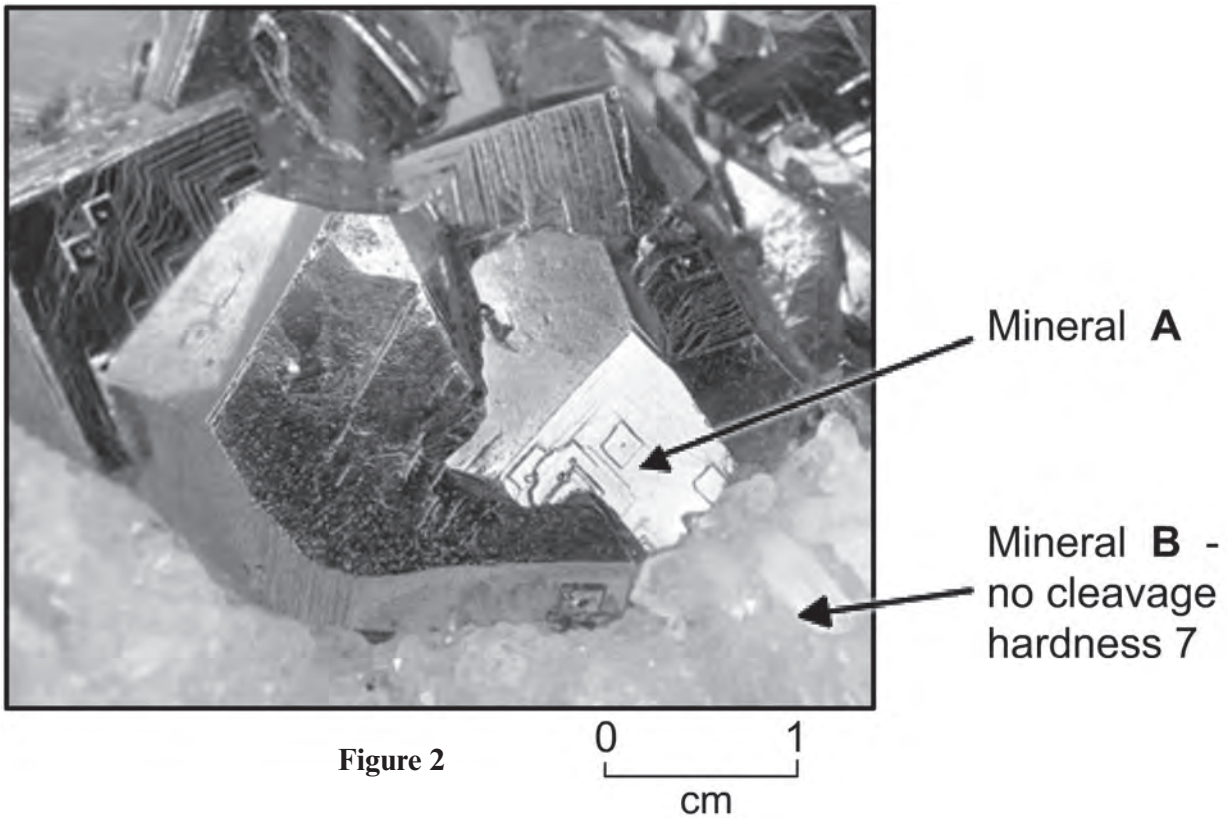
superposition of strata

lateral continuity

included fragments

cross-cutting relationships

**Figure 2** is a photograph of a specimen taken from one of the mineral veins in **Figure 1**. It shows two minerals (**A** and **B**).



8. The mineral veins have been mined for lead (Mineral A). Name the ore mineral in which this metal occurs. Tick (✓) only **one** box. [1]

halite

galena

haematite

diamond

gold

9. Mineral **B** is also found within the vein. Using the **Data Sheet**, identify the white mineral in **Figure 2**. Tick (✓) only **one** box. [1]

- quartz
- feldspar
- mica
- halite
- calcite
- haematite
- galena
- garnet

10. Describe the most likely origin of the mineral veins in **Figures 1** and **2**. *QWC* [4]

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**Table 2** shows methods of prospecting and extraction of valuable reserves.

<b>A</b>	geochemical analysis of soil and underground mining
<b>B</b>	seismic survey and boreholes
<b>C</b>	geological mapping and quarrying
<b>D</b>	geochemical analysis of river sediment and dredging
<b>E</b>	magnetic survey and surface mining

**Table 2**

**11.** Match each reserve with the **most appropriate** method of prospecting/extraction.

[3]

<b>A</b>	geochemical analysis of soil and underground mining	
<b>B</b>	seismic survey and boreholes	concealed iron ore
<b>C</b>	geological mapping and quarrying	limestone
<b>D</b>	geochemical analysis of river sediment and dredging	oil
<b>E</b>	magnetic survey and surface mining	

## Section 2 – answer questions 12-19

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Figure 3 shows the rocks and some of the processes that are linked in the rock cycle.

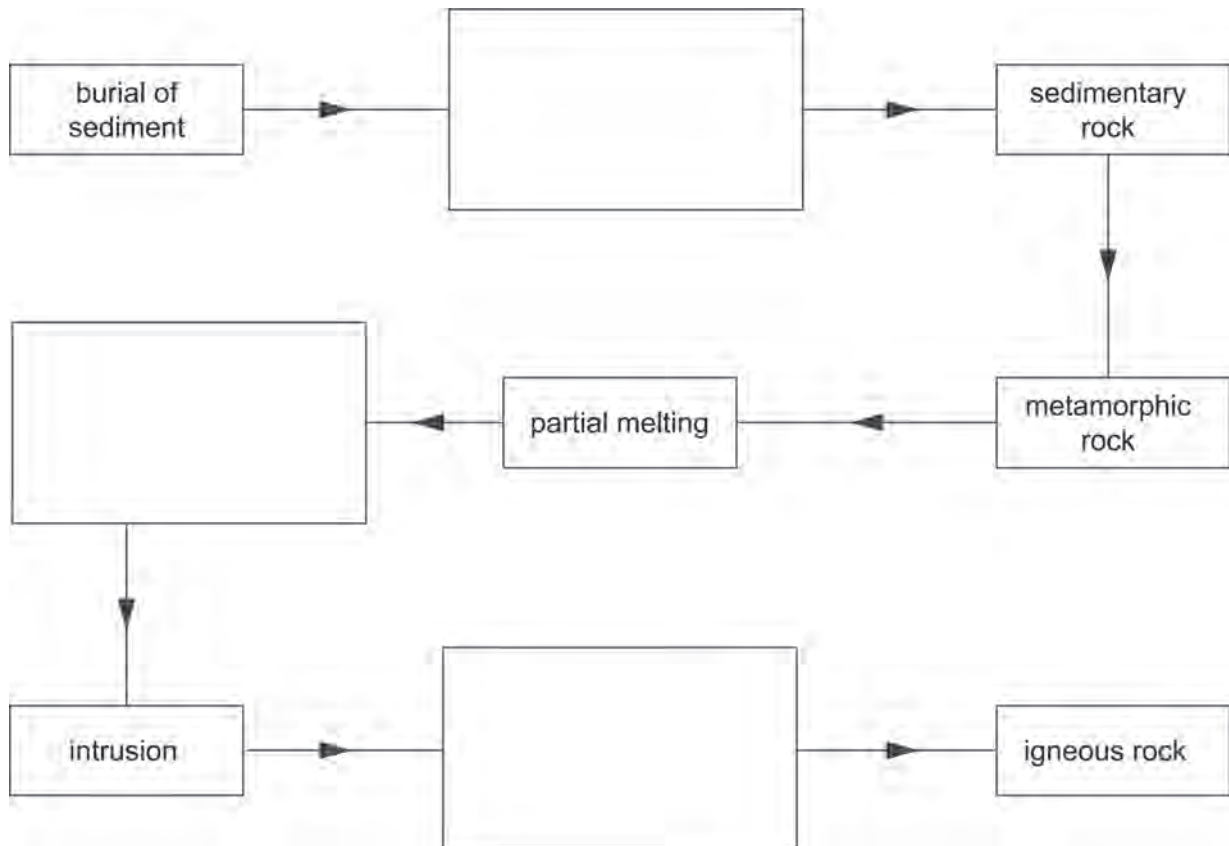


Figure 3

12. Complete the cycle. Choose from the list below. Choose the most suitable process for each empty box in Figure 3. [3]

deposition of sediment

cooling and crystallisation of magma

magma collects

crystallisation as cement from pore waters

weathering and erosion

transport of sediment

recrystallisation



Figure 4 shows different types of sediment transport in a river.

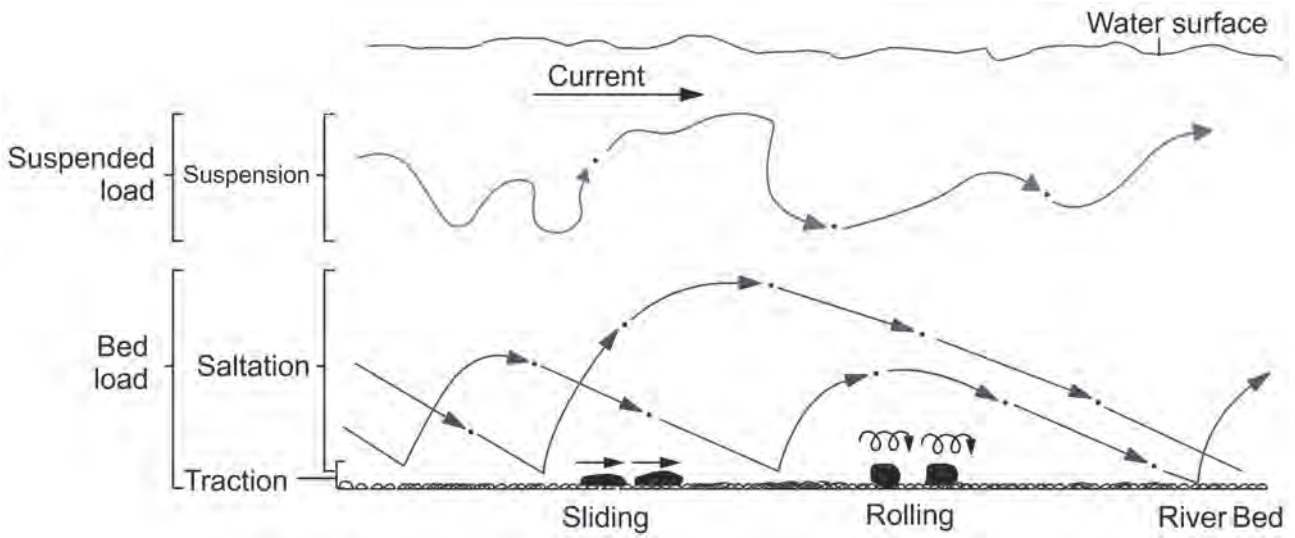


Figure 4

13. Use Figure 4 to identify **one** incorrect statement. Tick (✓) only **one** box. [1]

- saltation is the transport of material by bouncing
- bed load consists of the smallest grains moved by traction
- dissolved material transported in solution is invisible
- the suspended load does not touch the river bed during transport
- traction causes abrasion of the river bed

14. Describe and explain **one** difference between sediment transported by ice and by water. [3]

*Difference* .....

*Explanation* .....

.....

.....

Figure 5 shows microscopic views of two rocks (C and D) linked by processes in the rock cycle.

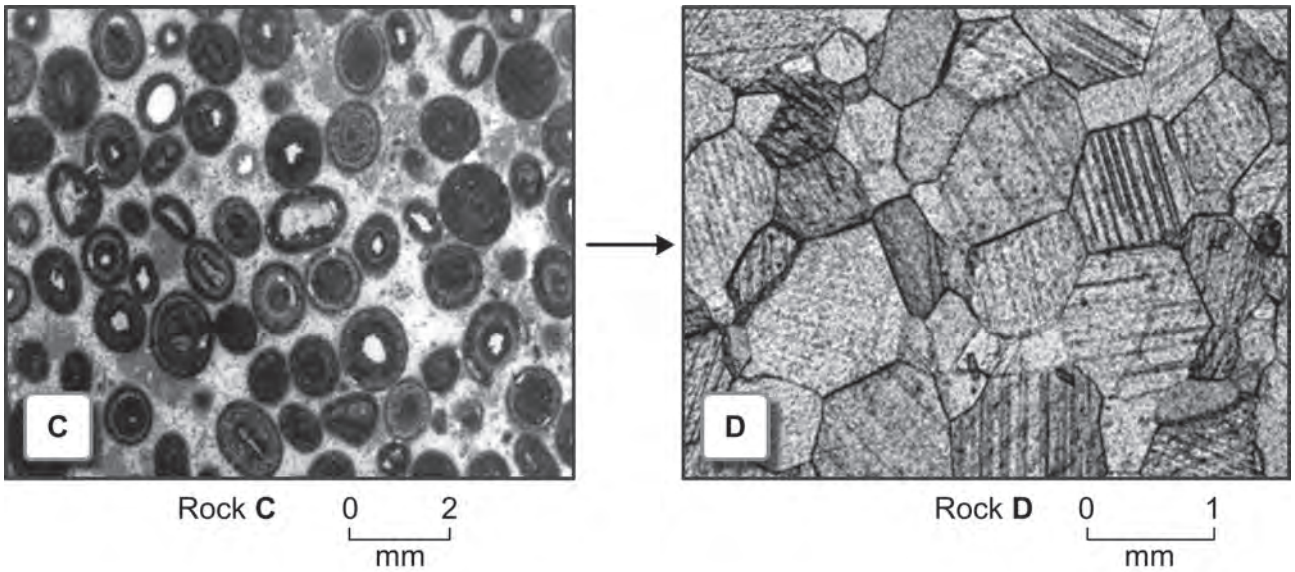


Figure 5

15. Describe the grains of rock C. Tick (✓) only **two** boxes.

[2]

- fine-grained
- rounded
- crystalline
- medium-grained
- angular
- poorly sorted

[2]

16. Describe the texture of rock **D**. Tick (✓) only **two** boxes.

crystalline

foliated

non-foliated

well sorted

fragmental (clastic)

schistose texture

17. Rocks **C** and **D** in **Figure 5** are both composed of the same mineral which effervesces with dilute hydrochloric acid. Name this mineral. Tick (✓) only **one** box. [1]

galena

halite

calcite

quartz

feldspar

18. Which process in the rock cycle links rocks **C** and **D** in **Figure 5**. Tick (✓) only **one** box. [1]

erosion

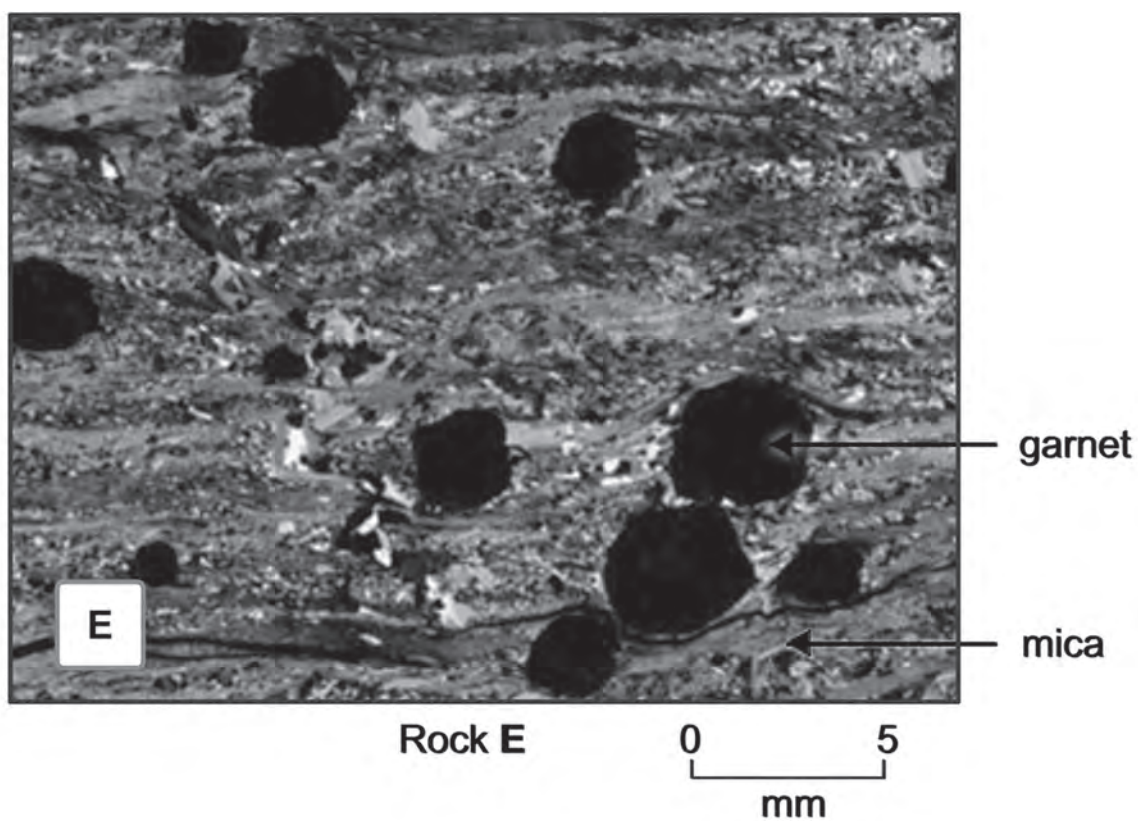
melting

deposition

metamorphism

uplift

**Figure 6** shows a microscopic view of metamorphic rock **E**.



**Figure 6**

Figure 7 shows four different temperature and pressure conditions (1-4).

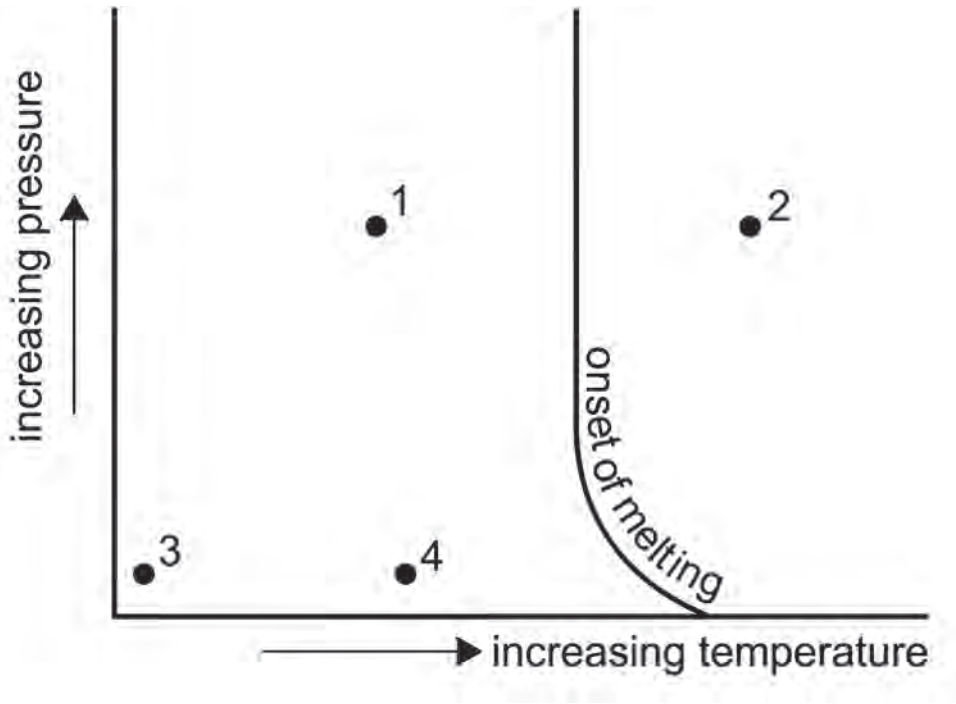


Figure 7

19. Select which pressure and temperature conditions (1-4) are likely to have affected rock E. Explain your answer. [3]

Circle your answer.

1                      2                      3                      4

*Explanation* .....

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Section 3 – answer questions 1-5

Figure 8 is a sedimentary log of a cliff face sketched by a student.

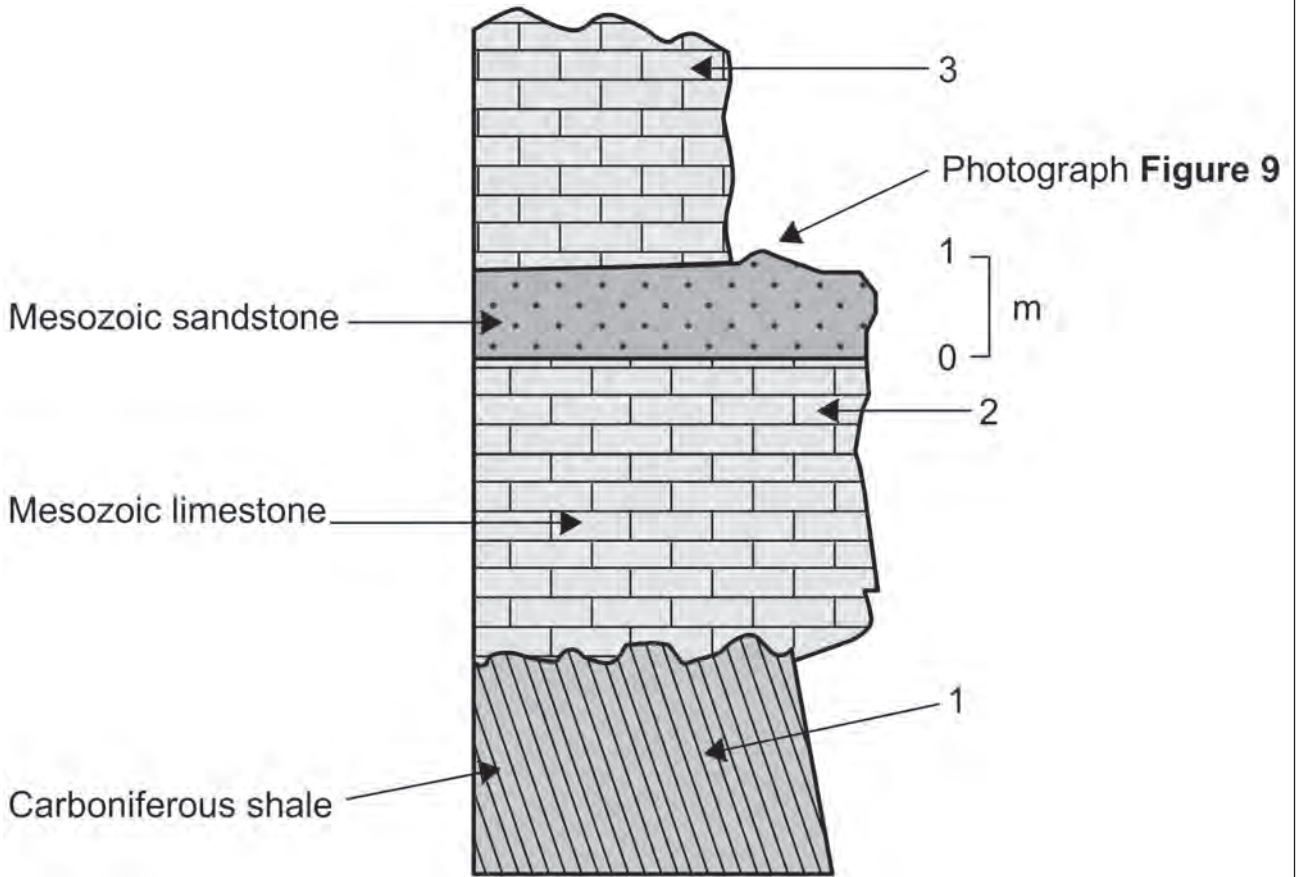


Figure 8



**Figure 9** is a photograph taken at the location shown on **Figure 8**.



0 1  
m

**Figure 9**

1. Identify the features on the bedding plane surface in **Figure 9**. Tick (✓) only **two** boxes. [2]

trace fossils

cross bedding

ripple marks

burrows

plants

desiccation cracks

2. Use **Figure 9**. Suggest an environment of deposition for the sedimentary rocks at this location. Give your reasons. [3]

*Environment* .....

*Reasons* .....

.....  
.....

**Figure 10** shows three cephalopods **F**, **G** and **H** collected from the cliff in **Figure 8**.



Scale all  $\times 1$

**Figure 10**

3. Which of the cephalopods (**F**, **G** or **H**) is an **ammonite**? Give a reason for your answer. [3]

Circle your answer.

**F**                      **G**                      **H**

*Reason* .....

.....  
.....



4. Draw a line between each fossil (**F**, **G** and **H**) in **Figure 10** and its most likely location (**1**, **2** or **3**) on **Figure 8**. Give a reason for your answer. [5]

<b>F</b>	<b>1</b>
<b>G</b>	<b>2</b>
<b>H</b>	<b>3</b>

*Reason* .....

.....

.....

5. Explain how **one** fossil group can be used to indicate that Britain was located at or close to the equator during the Upper Palaeozoic. [2]

*Fossil group* .....

*Explanation* .....

.....

Section 4 – answer questions 6-11

Figure 11 is a cross section through part of the Indian Ocean.

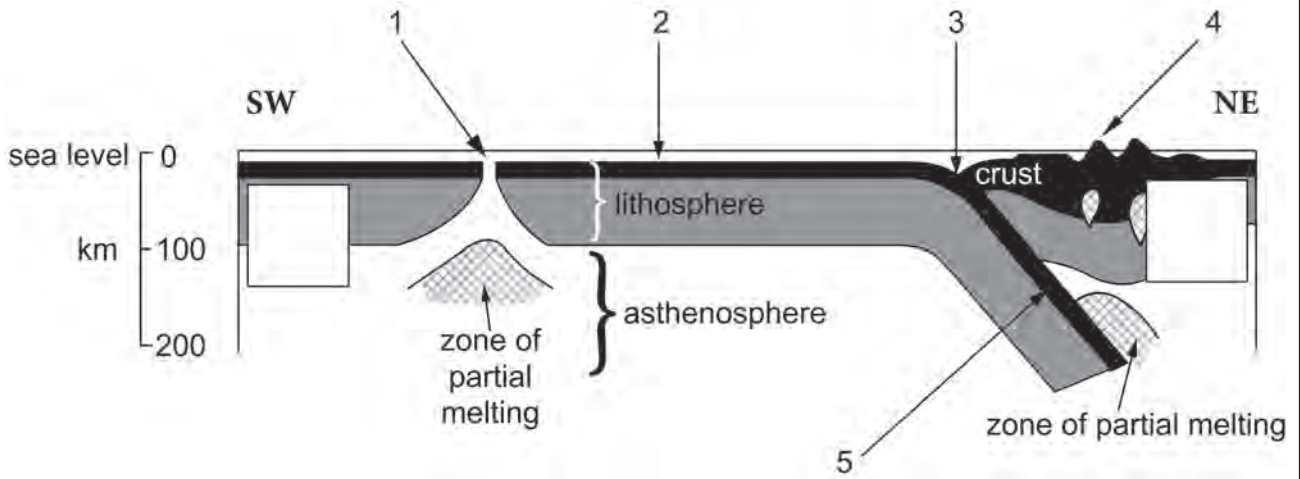


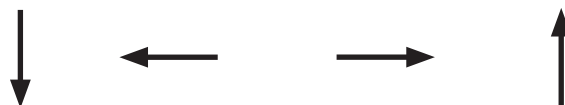
Figure 11

6. Complete Table 3. Match the location numbers in Figure 11 with the correct descriptions. [5]

Description	Location number
volcanic island arc	
subduction zone/ Benioff zone	
constructive plate margin	
ocean trench	
abyssal plain	

Table 3

7. Draw arrows in the empty boxes on Figure 11 to show the direction of plate movement at those locations. Select from the choice below. [1]



8. At which location are turbidites most likely to be deposited on Figure 11? Tick (✓) only one box. [1]

1     
  2     
  3     
  4     
  5

9. The ocean crust is made up of different rock types and structures. Draw a line between the rock type or structure and the process that forms it. [4]

pillow lavas of basalt	slow crystallisation of magma
black shale	volcanic eruption on the sea floor
gabbro	intrusion along vertical cracks in the crust
dykes of medium-grained rock	deposition of organic mud

10. Which of the following statements correctly describes the **lithosphere**? Tick (✓) only **two** boxes. [2]

crust and upper mantle	<input type="checkbox"/>
convection currents present	<input type="checkbox"/>
only mantle rock	<input type="checkbox"/>
weak solid	<input type="checkbox"/>
rigid solid	<input type="checkbox"/>
partially molten	<input type="checkbox"/>

11. Partial melting at the two zones shown on **Figure 11** results in magmas of different compositions. State the compositions of the magmas and explain why they are different. [5]

*Magma below location 1* .....

*Magma below location 4* .....

*Explanation* .....

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.....  
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## Section 5 – answer questions 1-4

Figure 12 illustrates some volcanic hazards.

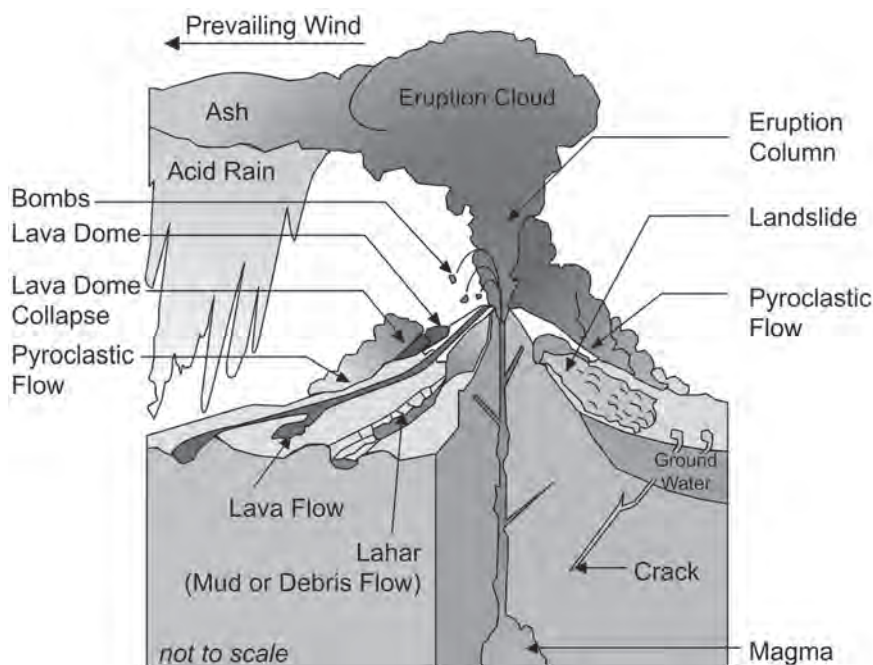


Figure 12

1. Select from the list below, the volcanic hazards that match the descriptions in Table 4. [5]

lava flow      pyroclastic flow      ash      lahar (mud or debris flow)  
 landslide      eruption column      acid rain

fast moving slurries of rock, mud and water that flow down river valleys burying people and destroying buildings in their path	
small fragments blasted into the air which can collect on roofs of houses leading to collapse and cause death by choking	
molten flows which bury and burn everything in their path, deaths are uncommon because most move slowly enough that people can move out of the way easily	
downhill movements of rock which can bury and destroy buildings in their path	
high speed avalanches of hot rock, gas and ash which are lethal, burying, burning and suffocating everything in their path	

Table 4

**Figure 13** is a photograph of a volcanic eruption.



**Figure 13**

2. Use **Figure 12** and **Table 4**. Identify the volcanic hazard in **Figure 13**. Tick (✓) only **one** box.

[1]

lava flow

pyroclastic flow

ash

lahar (mud or debris flow)

landslide

eruption column

acid rain

3. Which of the following factors **increases** the risk from a geological hazard? Tick (✓) only **one** box. [1]

advanced education system

efficient communications

developed economy

high population density

advanced building regulations

4. Describe **two** types of monitoring which are useful for the short term prediction of volcanic eruptions. *QWC* [4]

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## Section 6 – answer questions 5-14

**Figure 14** is a graph showing the number of forms of life (families) preserved in the fossil record and five major extinctions (L-Q) in the past 550 Ma.

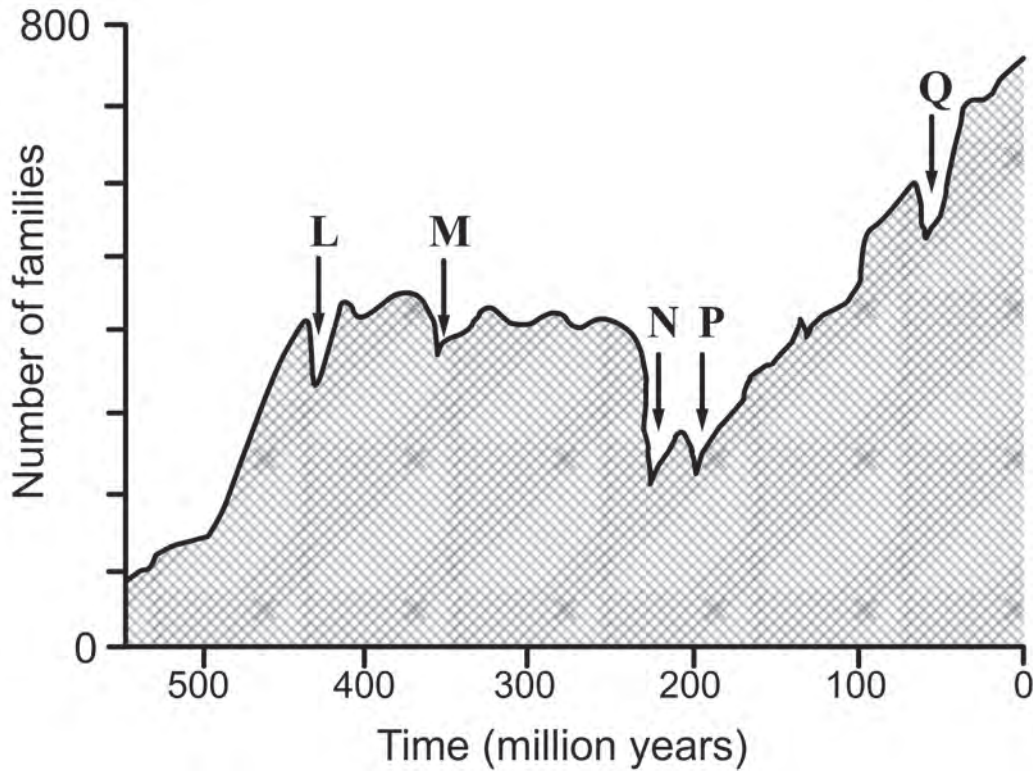


Figure 14

5. At which major extinction event did the greatest number of families become extinct? Tick (✓) only **one** box. [1]

L  M  N  P  Q

6. Use the **Data Sheet** and **Figure 14**. Name the boundary at which the greatest number of families became extinct. Tick (✓) only **one** box. [1]

Triassic-Jurassic

Cretaceous-Palaeogene

Permo-Triassic

Ordovician-Silurian

Late Devonian



7. Which of the mass extinctions in **Figure 14** is known as the K/T mass extinction?  
Tick (✓) only **one** box. [1]

L       M       N       P       Q

8. Use your knowledge and the **Data Sheet**. Name **two** fossil groups that became extinct at the K/T boundary. Tick (✓) only **two** boxes. [2]

graptolites

ammonites

dinosaurs

birds

corals

mammals

9. Describe **one** possible cause of a mass extinction event. [2]

.....

.....

.....

10. Give an approximate age for the origin of life on Earth. Tick (✓) only **one** box. [1]

2 500 Ma

4 500 Ma

3 500 Ma

5 000 years

500 Ma

11. Describe **one** scientific theory for the origin of life on Earth.

[2]

.....

.....

.....

**Figure 15** is an article describing the Burgess Shale.

The **Burgess Shale Formation**, a fine-grained black shale located in Canada, is one of the world's most famous fossil finds. At 505 million years old it is one of the earliest fossil beds containing the imprints of soft parts. The animal life preserved in the Burgess Shale is important as it preserves an abundance of soft-bodied life forms (that is, animals lacking shells) that represent an explosion of evolutionary activity early in the history of life on Earth. Prior to this 'explosion', the world's seas were inhabited by simple life-forms, such as jellyfish and sponges. But around the time of the Burgess Shale, an abundance of new, bigger and more complex life forms appeared. Given its importance for the history of life on Earth, the Burgess Shale quarry has been designated a World Heritage Site.

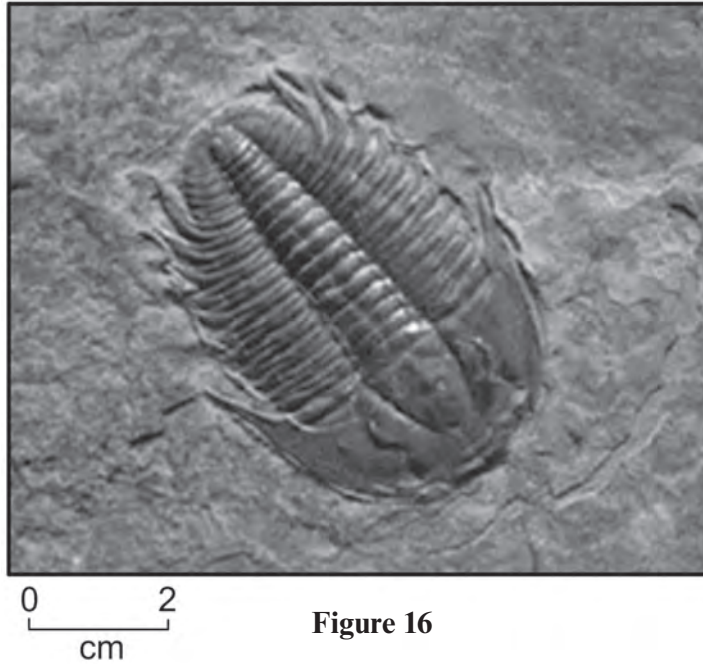
**Figure 15**

12. Use **Figure 15** and the **Data Sheet**. State the **period** of the 'explosive evolution'. Tick (✓) only **one** box.

[1]

Silurian	<input type="checkbox"/>
Palaeogene	<input type="checkbox"/>
Palaeozoic	<input type="checkbox"/>
Cambrian	<input type="checkbox"/>
Ordovician	<input type="checkbox"/>

**Figure 16** shows one of the most abundant (frequently found) fossils found in the Burgess Shale.



**Figure 16**

**13.** Name the group to which this fossil belongs. Tick (✓) only **one** box.

[1]

- trilobite
- graptolite
- coral
- vertebrate
- trace fossil

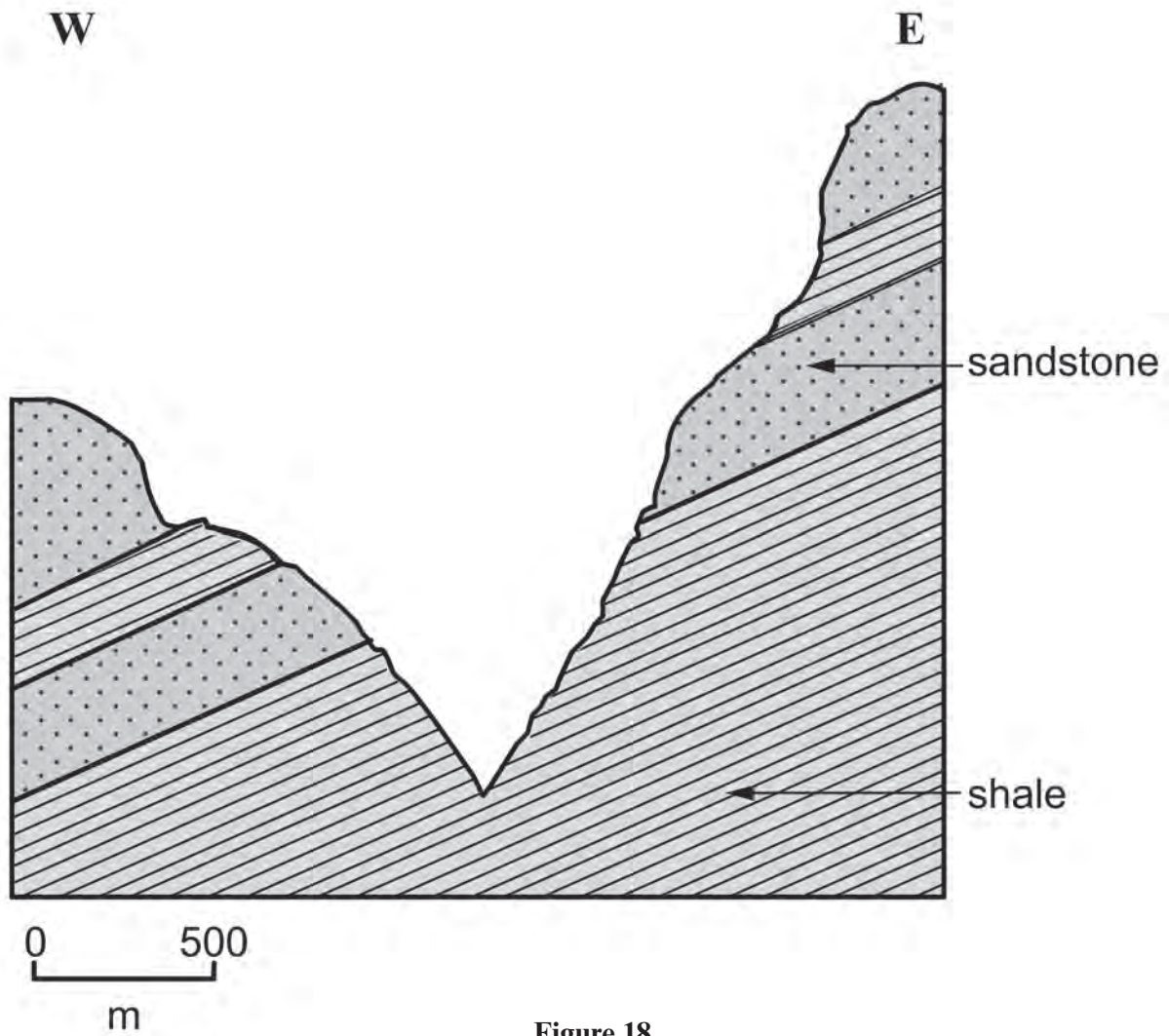
**14.** Suggest **two** reasons why the fossils of the Burgess Shale are so well preserved.

[2]

1. ....  
.....
2. ....  
.....

**Section 7 – answer questions 1-3**

**Figure 18** is a geological cross section showing the proposed site for a reservoir.



**Figure 18**

1. Which of the following statements about the site are **false**? Tick (✓) only **two** boxes. [2]

sandstone is permeable allowing water to pass through

the v-shaped valley has been formed by glaciation

sandstone has a high porosity

shale is impermeable and has a low porosity

shale is a suitable base rock for the reservoir

jointing decreases the permeability of a rock

the v-shaped valley forms an ideal site for a reservoir

2. Which of the following statements about possible landslides in the area of the reservoir are **false**? Tick (✓) only **two** boxes. [2]

a landslide is more likely on the west side of the reservoir

alternating layers of shale and sandstone make a landslide more likely

a landslide is more likely on the east side of the reservoir

water may collect at the top of a shale layer causing a landslide

a long period of drought decreases the risk of a landslide

the steep angle of dip of the beds makes a landslide less likely

Figure 19 shows different methods of stabilising a road cutting.

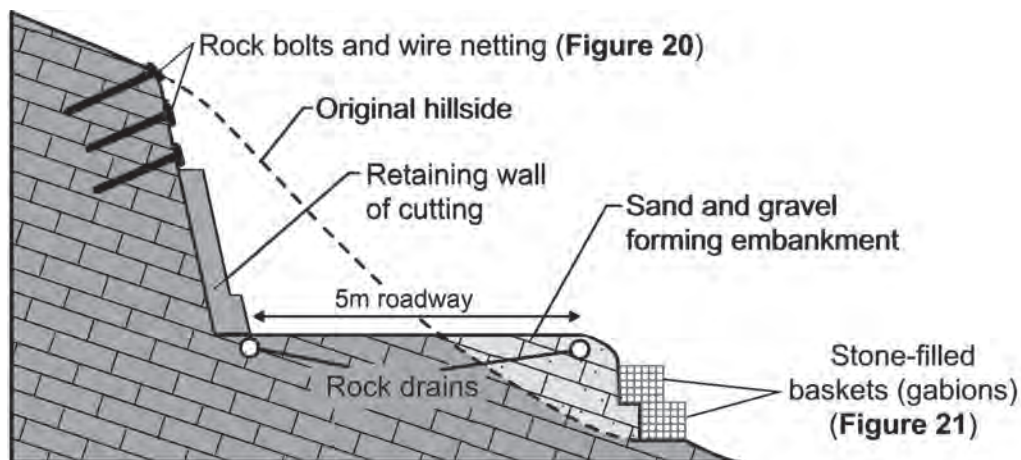


Figure 19

Figures 20 and 21 are photographs of the rock bolts and wire netting and stone-filled baskets (gabions).

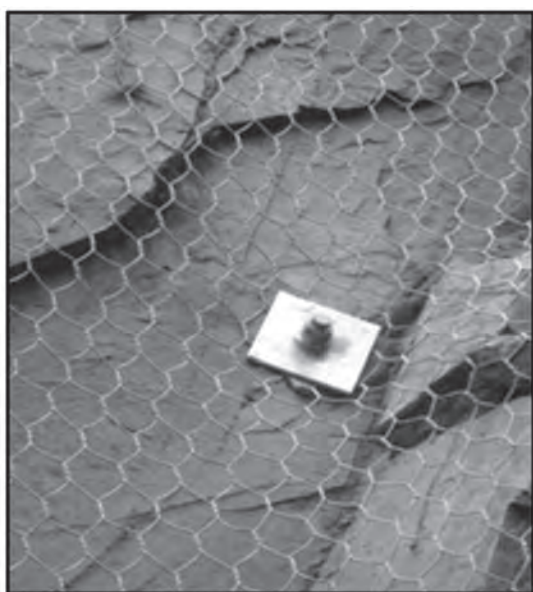


Figure 20 - rock bolts and wire netting



Figure 21 - stone-filled baskets (gabions)

3. Explain the use of the rock bolts and wire netting and stone-filled baskets (gabions) in the situation shown in Figure 19. [4]

*Rock bolts and wire netting* .....

.....

*Stone-filled baskets (gabions)* .....

.....

.....

**END OF PAPER**