Student Number .....

Barker College

2013

TRIAL
HIGHER SCHOOL
CERTIFICATE

Earth and Environmental Science

PM TUESDAY 30TH JULY

ANSWER SHEET

77 copies

Section I – Multiple Choice

Choose the best response and fill in the response oval completely

Start Here →

1.	A ○	B ○	C ○	D ○	**11.**	A ○	B ○	C ○	D ○
2.	A ○	B ○	C ○	D ○	**12.**	A ○	B ○	C ○	D ○
3.	A ○	B ○	C ○	D ○	**13.**	A ○	B ○	C ○	D ○
4.	A ○	B ○	C ○	D ○	**14.**	A ○	B ○	C ○	D ○
5.	A ○	B ○	C ○	D ○	**15.**	A ○	B ○	C ○	D ○
6.	A ○	B ○	C ○	D ○	**16.**	A ○	B ○	C ○	D ○
7.	A ○	B ○	C ○	D ○	**17.**	A ○	B ○	C ○	D ○
8.	A ○	B ○	C ○	D ○	**18.**	A ○	B ○	C ○	D ○
9.	A ○	B ○	C ○	D ○	**19.**	A ○	B ○	C ○	D ○
10.	A ○	B ○	C ○	D ○	**20.**	A ○	B ○	C ○	D ○

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Barker College

2013
TRIAL HIGHER SCHOOL CERTIFICATE

Earth and Environmental Science

Staff Involved:

- **CYB***
- **RJC**
- **SWD**

PM TUESDAY 30TH JULY

77 copies

General Instructions

- Reading time – 5 minutes
- Working time – 3 hours (5 min reading)
- Write using blue or black pen
- Board-approved calculators may be used
- Draw diagrams using pencil
- A Geological Time Scale is provided at the back of this paper
- Make sure your Barker Student Number is at the top of the Answer Sheet and all answer pages in Section II

Total marks – 100

Section I Pages 2 - 10

20 marks

- Attempt Questions 1– 20
- Allow about 35 minutes for this section

Section II Pages 11 - 28

80 marks

- Attempt Questions 21–32
- Allow about 2 hours and 25 minutes for this section

Section I

20 marks

Attempt Questions 1 – 20

Allow about 35 minutes for this section

Use the multiple-choice answer sheet

Select the alternative A, B, C or D that best answers the question. Fill in the response oval completely.

Sample 2 + 4 = (A) 2 (B) 6 (C) 8 (D) 9

(A) ⬭ (B) ⬭ (C) ⬭ (D) ⬭

If you think you have made a mistake, put a cross through the incorrect answer and fill in the new answer.

(A) ● (B) ⊗ (C) ⬭ (D) ⬭

If you change your mind and have crossed out what you consider to be the correct answer, then indicate this by writing the word *correct* and drawing an arrow as follows.

correct ↓

(A) ● (B) ⊗ (C) ⬭ (D) ⬭

---

1 What features are likely to be found at the following plate boundaries?

	Divergent	Transform
(A)	Very thin lithosphere	Fissure volcanoes
(B)	Earthquakes to 700 km depth	Potentially violent earthquakes
(C)	Basaltic lava	Shallow focus earthquakes
(D)	Composite volcanoes	Strike-slip faults

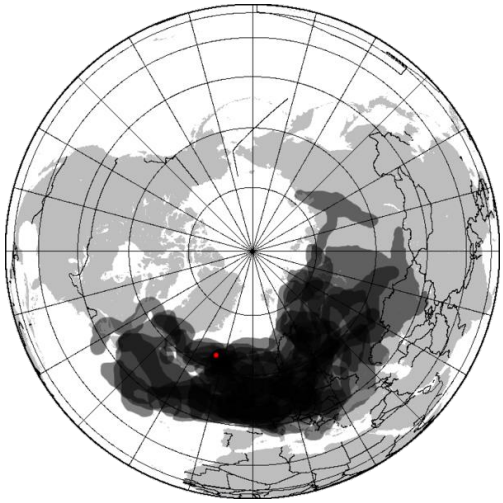
2 In central NSW, the geology consists of north-south trending rock formations consisting of rocks such as andesite and limestone.

Which *tectonic setting* accounts for these features?

(A) The collision of two continental plates
(B) A large transform fault with north-south motion
(C) A rift valley causing the separation of New Zealand from Australia
(D) The east-west collision of oceanic lithosphere with oceanic lithosphere

3 Observe the following image of a volcanic eruption of Eyjafjallajökull, Iceland.

Volcano plume on 17th April 2010



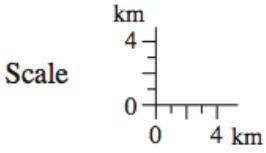
Composite map of the volcanic ash cloud

Which of the following is a *global effect* of a major volcanic eruption?

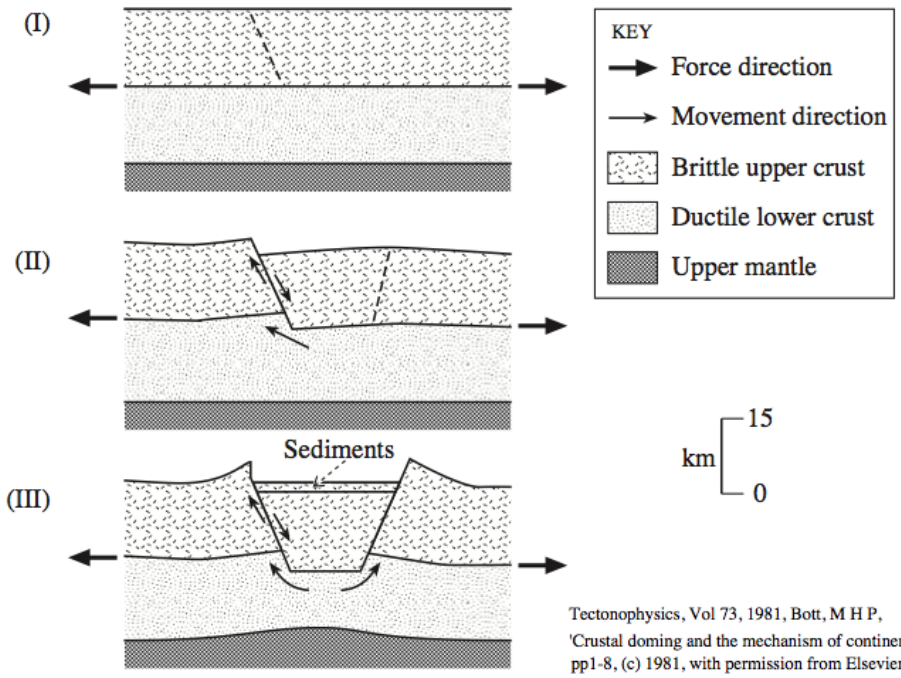
(A) An increase in ash in the troposphere leading to global warming
(B) An increase of carbon dioxide in the stratosphere leading to global cooling
(C) An increase in sulphuric acid aerosols in the stratosphere leading to global cooling
(D) An increase of ash in the troposphere causing ash to cover plants and leading to reduced photosynthesis

4 The diagrams in the table are all drawn to the same scale.
Only one row of information is correct. Which row is correct?

Volcano shape and size	*Composition of lava*	*Type of eruption*	*Typical plate tectonic setting*
A 	Basalt	Explosive	Convergent margin
B 	Rhyolite	Quiet	Continental hot spot
C 	Andesite	Quiet	Divergent margin
D 	Andesite	Explosive	Convergent margin



5 The cross-sections show the formation of a large-scale feature of the Earth's surface.

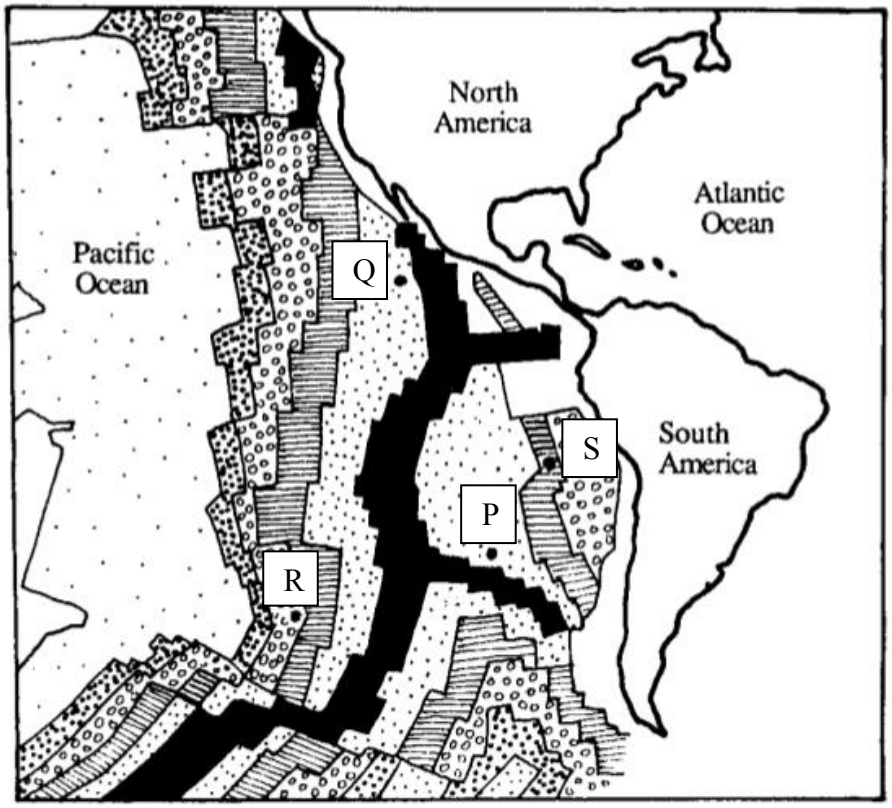


Tectonophysics, Vol 73, 1981, Bott, M H P,
'Crustal doming and the mechanism of continental rifting',
pp1-8, (c) 1981, with permission from Elsevier Science.

Which feature is shown?

(A) A rift valley, an example of which could be found in eastern Africa
(B) A mid-ocean ridge, an example of which could be found in the Atlantic Ocean
(C) A transform fault, an example of which could be found in western USA
(D) A trench, an example of which could be found in the Pacific Ocean

6 The map below shows the distribution of oceanic crust according to age. The map was compiled from available information about the magnetic-anomaly pattern on the ocean floor. Each of the shaded regions represents oceanic crust having a specific age-range.



The oldest oceanic crust would occur at location

(A) *P*
(B) *Q*
(C) *R*
(D) *S*

7 Which global issue did the Montreal Protocol address?

(A) Acid rain
(B) Global warming
(C) Ozone depletion
(D) Use of the pesticide DDT

8 Observe the following image of a landfill site in NSW.

Which of the following are geological features that must be considered when selecting areas for waste dumps or landfill?

(A) Rock type, climate, wind speed
(B) Lack of ground water, rock type, unfractured bedrock
(C) Humidity, unfractured bedrock, rainfall
(D) Lack of ground water, climate, rock type

9 Which process in waste water treatment would be best for removing dissolved nutrients?

(A) Skimming
(B) Settling
(C) UV treatment
(D) Artificial wetlands

10 The following data was collected for the Colo River and its tributaries. Also shown are the guidelines for each set of data.

Site	*Colo Meroo*	*Upper Colo*	*Colo Upstream Wheeny*	*Wheeny Near Colo*	*Wheeny Creek*	*Lower Colo*	*Whatleys Creek*
Date	25/09	02/10	27/09	27/09	27/09	27/09	27/09
Time	12.30	2.30	7.00	7.00	12.00	3.30	11.30
Tidal influence	N/A	N/A	mid/out	mid/out	low	Low/out	N/A
Rain last 7 days	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Temperature (^{o}C)	18	16.5	16.5	15.5	20	19	16
Dissolved oxygen(mg/L)	9.0	7.6	6.7	4.9	9.0	6.5	6.4
Dissolved oxygen (%)	95	80	67	49	99	70	65
pH	7	7	6.5	5	5.5	7	6.5
Electrical conductivity(µS/cm)	110	1130	150	180	170	140	390
Available Phosphate	0.01	0.00	0.04	0.01	0.04	0.02	0.00
Turbidity	<10	<10	<10	<10	<10	<10	<10

Test	*ANZECC Guidelines Range*
Temperature (^{o}C)	Non applicable
Dissolved oxygen (%)	85-110%
pH	6.5-8.5 pH units
Electrical conductivity(µS/cm)	200-300 µS/cm
Available phosphate	<0.0612mg/L
Turbidity	<50NTU

Based on this data which of the following statements is correct?

(A) All pH readings were either neutral or slightly basic.
(B) Only two locations were in the range indicated in the guidelines for dissolved oxygen.
(C) None of the locations were in the range indicated in the guidelines for available phosphate.
(D) All but two locations were in the range indicated in the guidelines for electrical conductivity.

11 The table shows the results of a study measuring the depth to the water table for an area in inland NSW.

Year	Depth to Water Table (m)
1975	3.8
1985	2.9
1995	2.2
2005	1.8

What is a likely cause of the trend shown in the table?

(A) Lack of vegetation due to drought
(B) Excessive pumping of groundwater
(C) Soil compaction due to trampling by livestock
(D) Replacement of perennial native vegetation with annual crops

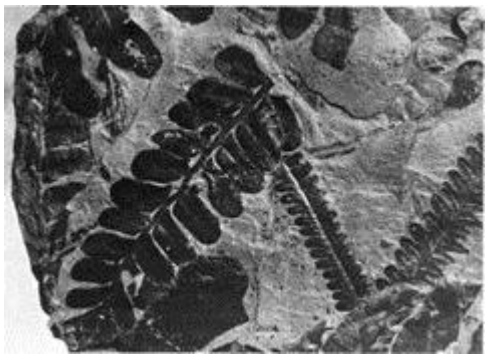
12 Which of the following represents only gases thought to contribute to *global warming*?

(A) CFC's, oxygen, methane
(B) Carbon dioxide, methane, nitrous oxide
(C) Carbon dioxide, sulfur dioxide, methane
(D) Nitrous oxide, carbon dioxide, sulfur dioxide

13 According to evolutionary theory, in which order did *vertebrates* evolve?

(A) Bony fish, reptiles, amphibians, birds
(B) Mammals, reptiles, amphibians, birds
(C) Fish, amphibians, birds, reptiles
(D) Fish, amphibians, reptiles, birds

14 What type of fossilization process is shown in this picture?



(A) Casting
(B) Moulding
(C) Petrification
(D) Carbonisation

15 What are *cyanobacteria*?

(A) Simple single-celled organisms that derive energy from chemosynthesis
(B) Complex multi-cellular organisms that caused infections in pre-historic animals
(C) Complex single-celled organisms that are found in the digestive tracts of animals
(D) Simple single-celled organisms that derive energy from photosynthesis

16 How old are the rocks that contain *stable isotope evidence* of the first presence of life?

(A) 3.8 million years old
(B) 3.8×10^9 years old
(C) 3.8×10^{10} years old
(D) 38 million years old

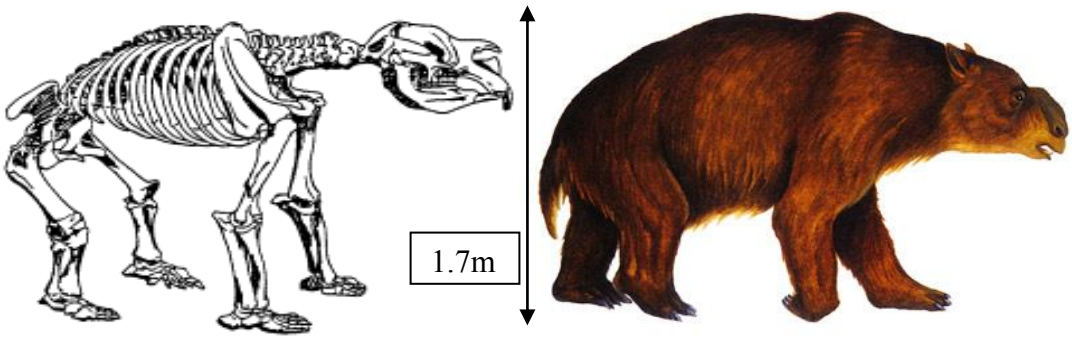
17 What advantages did the *terrestrial environment* offer the first land animals and plants?

(A) Abundant food supplies, fewer predators, less competition for space
(B) Fewer predators, fresh water, increased buoyancy
(C) Fresh water, abundant food supply, less temperature variation
(D) Oxygen, fewer predators, decreased buoyancy

18 Which of the following correctly matches each characteristic of life with the appropriate *eon* in which it occurred?

	Hadean	**Archaean**	**Proterozoic**	**Phanerozoic**
(A)	No evidence of life	First prokaryotic life	First multicellular animals	First animals with hard parts
(B)	First chemical evidence of life	First fossil evidence of life	First eukaryotic life	First vertebrates
(C)	First stromatolites	First bacteria	Ediacaran metazoans	Burgess Shale fauna
(D)	No evidence of life	Cyanobacteria	'Explosion' of life	Life comes onto land

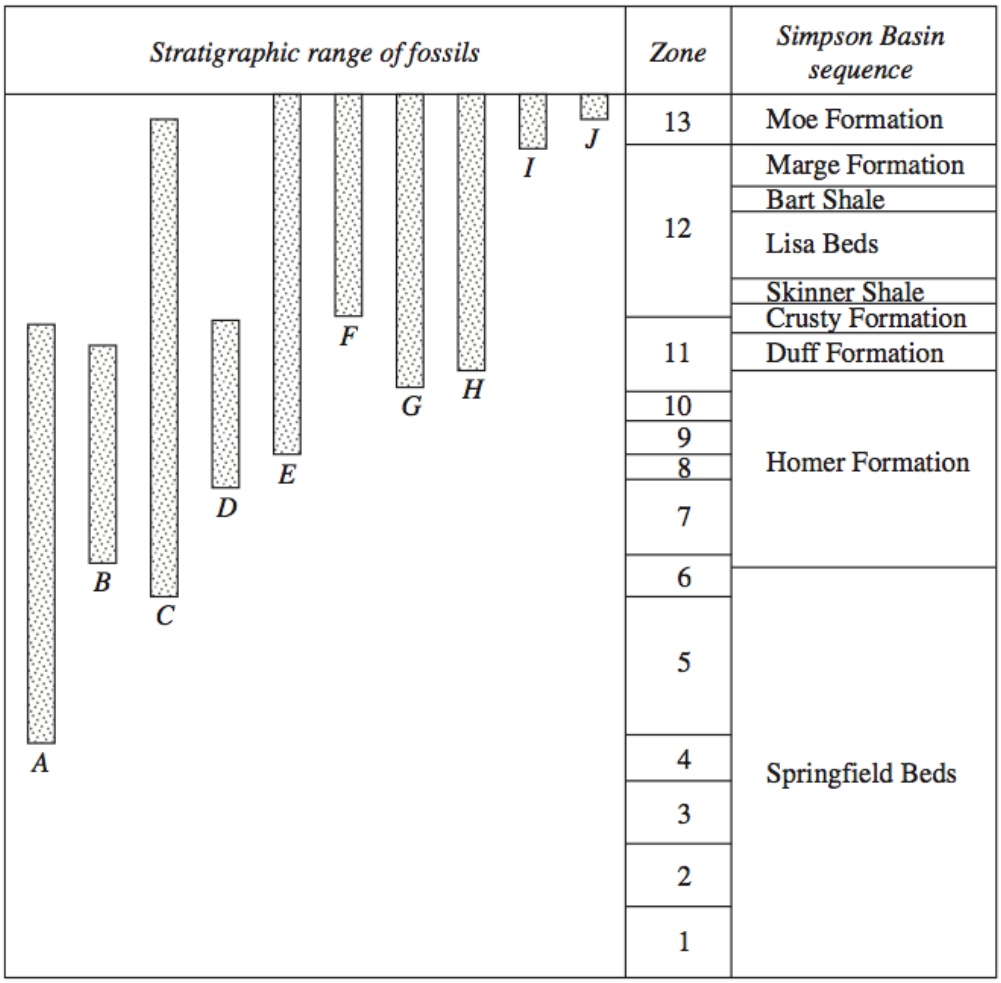
19 Observe the following image of Diprotodon, an example of extinct Australian megafauna.



Which of the following describes the extinction of the Diprotodon?

(A) It was a mass extinction, probably caused by climate change and predators.
(B) It was a small-scale extinction, probably caused by climate change and hunting.
(C) It was a mass extinction, probably caused by disease introduced by humans.
(D) It was a small-scale extinction, probably caused by the Pleistocene ice-age.

20 The diagram shows the stratigraphic range of fossils (*A* to *J*) in the Simpson Basin sequence.



A sedimentary rock sample contains fossils *B*, *D* and *H*. From which zone and Simpson Basin sequence was the sample taken?

(A) 11 and Crusty Formation
(B) 11 and Duff Formation
(C) 10 and Duff Formation
(D) 10 and Homer Formation

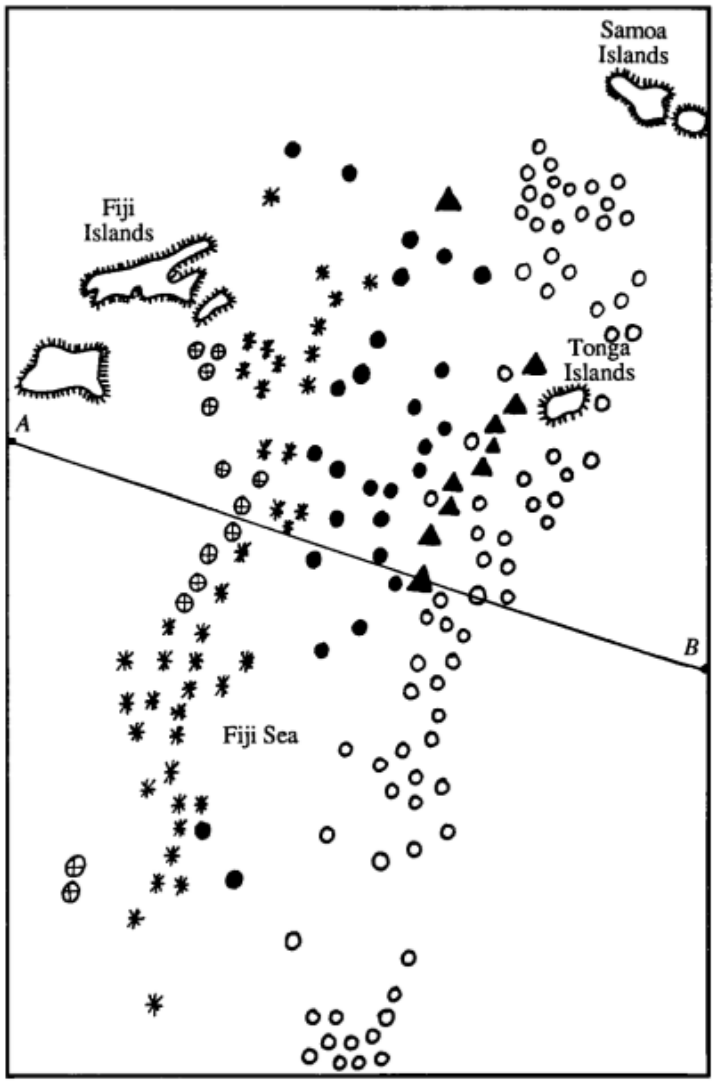
End of Section I

Section II — 80 marks

Written Responses
Attempt Questions 21 - 36
Allow about 2 hours and 25 minutes for this section
Answer this section in the spaces provided on the paper.

Question 21 (8 marks) **Marks**

The map below shows the distribution of active volcanoes and earthquakes in a region of the Pacific Ocean.



Question 21 continues on the next page.

Question 21 continued. **Marks**

(a) Identify this type of plate boundary and name the most common igneous rock formed in this tectonic setting. **2**

_____

_____

(b) Describe **two** characteristics of the lithospheric plates found at this plate margin. **2**

_____

_____

_____

_____

(c) In the space below, draw a fully labeled cross-section from *A* to *B*. Show the major tectonic, topographic, and geological features that are responsible for the distribution of volcanoes and earthquakes in this region. **4**

Question 22 (5 marks) **Marks**

FINANCIAL TIMES

Italian seismologists on trial over L'Aquila* quake

September 20, 2011 10:53 am By Guy Dinmore in Rome

Seven Italian officials and leading seismologists have gone on trial in the city of L'Aquila charged with manslaughter for failing to warn of the possible dangers of a devastating earthquake in 2009 that killed 309 people.

The unprecedented and controversial trial – where the defence is set to argue that earthquakes cannot be predicted with certainty – has drawn media attention from around the world, with television crews sent from Japan.

Officials of Italy's emergency "risks commission" met in the central city of L'Aquila on March 30, a week before the devastating quake but during a series of tremors that had already raised alarm bells among residents well aware of the mountainous region's history of such tragedies. The commission was reported to have issued "reassuring signals" after its meeting.

The local city government is also seeking damages of €50m in the case. The medieval centre of the city was extensively damaged, as well as surrounding villages. More than 65,000 people were left homeless. *a city in the Italian Alps

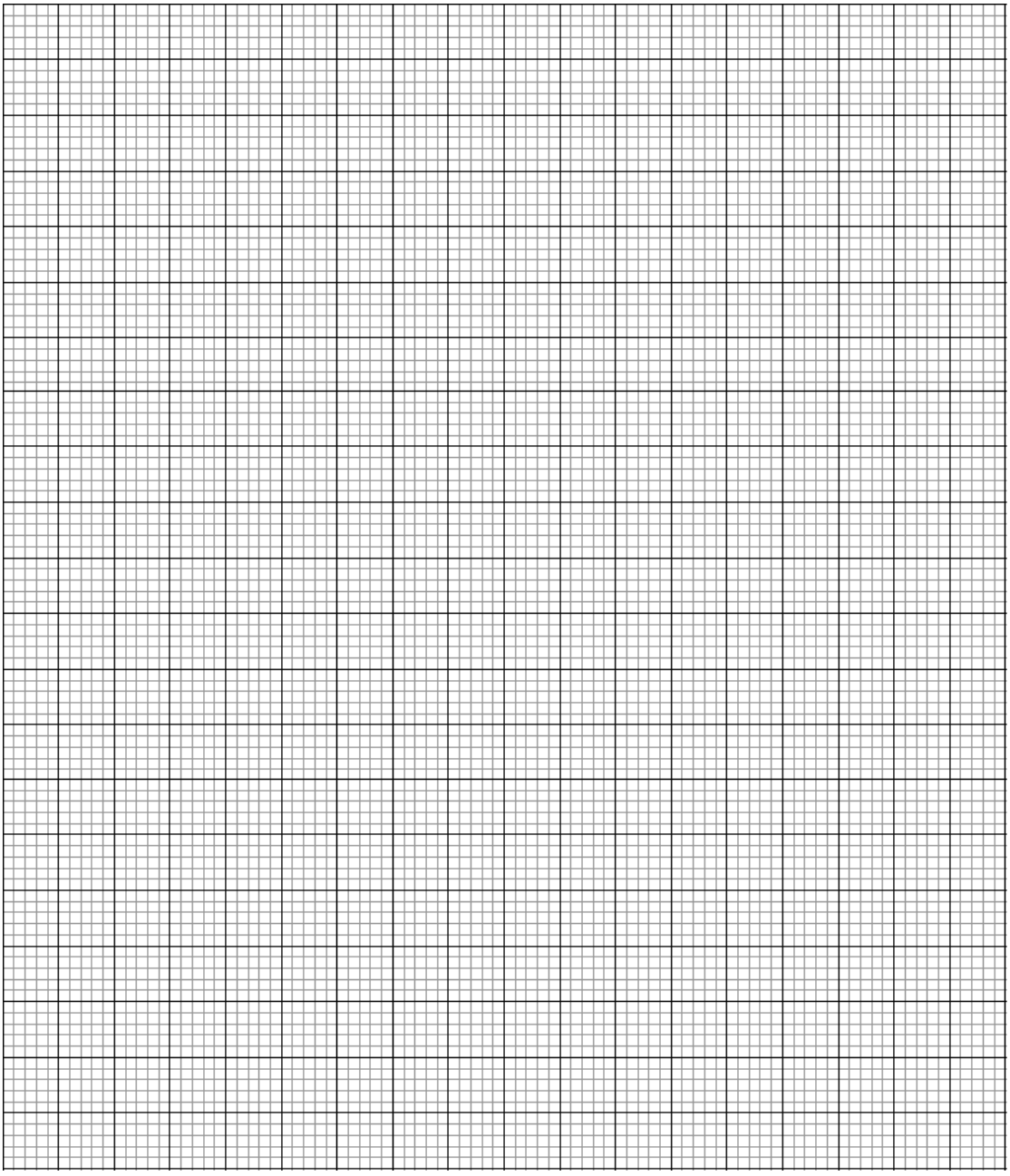
Referring to the article above and your knowledge of plate tectonics and earthquake prediction, examine the issues that seismologists could provide in their defense. **5**

Question 23 (7 marks) **Marks**

A geologist devised two methods of estimating tectonic plate movement.
She measured the deflection of a light beam. The results are as follows:

Plate Movement (cm)		0	1	2	3	4	5	6	7	8	9
Light Deflection (cm)	Method # 1	0	3.5	7.0	10.5	14.0	17.5	21.0	24.5	28	31.5
	Method # 2	0	0.2	0.4	0.8	1.6	3.2	6.4	12.8	25.6	51.2

(a) Graph these results on the grid below. **4**



Question 23 continues on the next page.

Question 23 continued. **Marks**

(b) Compare the accuracy of the two methods in measuring plate movements. **1**

(c) Describe how one OTHER technology is used to identify crustal movements at a collision boundary. **2**

Question 24 (7 marks) **Marks**

Observe the following image.

(a) Outline the processes AND environmental conditions responsible for the depositing of *banded iron* formations. **4**

(b) Explain the chemical relationship between oxygen gas and ozone gas in the earth's atmosphere and the importance of the ozone layer for life on earth. **3**

Question 25 (6 marks) **Marks**

The table below contains raw data obtained using bore cores and geological field study maps.

Age (Ma)	Rock Type	Thickness (m)
350	Mootee Siltstone	3
400	Mount Walla Rhyolite	1
300	Elizabeth Coal Seam	5
260	Nemjii Sandstone	12
270	Wallace Siltstone	6
320	Rocky Road Conglomerate	8

(a) In the space below draw a stratigraphic column to scale of the raw data in the table above. **3**

Question 25 continues on the next page.

Question 25 continued. **Marks**

(b) Identify the rock type that is most likely to contain fossil fish. **1**
Give a reason for your answer.

_____

_____

(c) Identify the rock type that is most unlikely to contain any fossils. **1**
Give a reason for your answer.

_____

_____

(d) Identify the rock type that is most likely to contain terrestrial plants. **1**
Give a reason for your answer.

_____

_____

Question 26 (6 marks) **Marks**

(a) In terms of fossil preservation contrast Ediacaran metazoans and new life forms that evolved in the Cambrian **2**

_____

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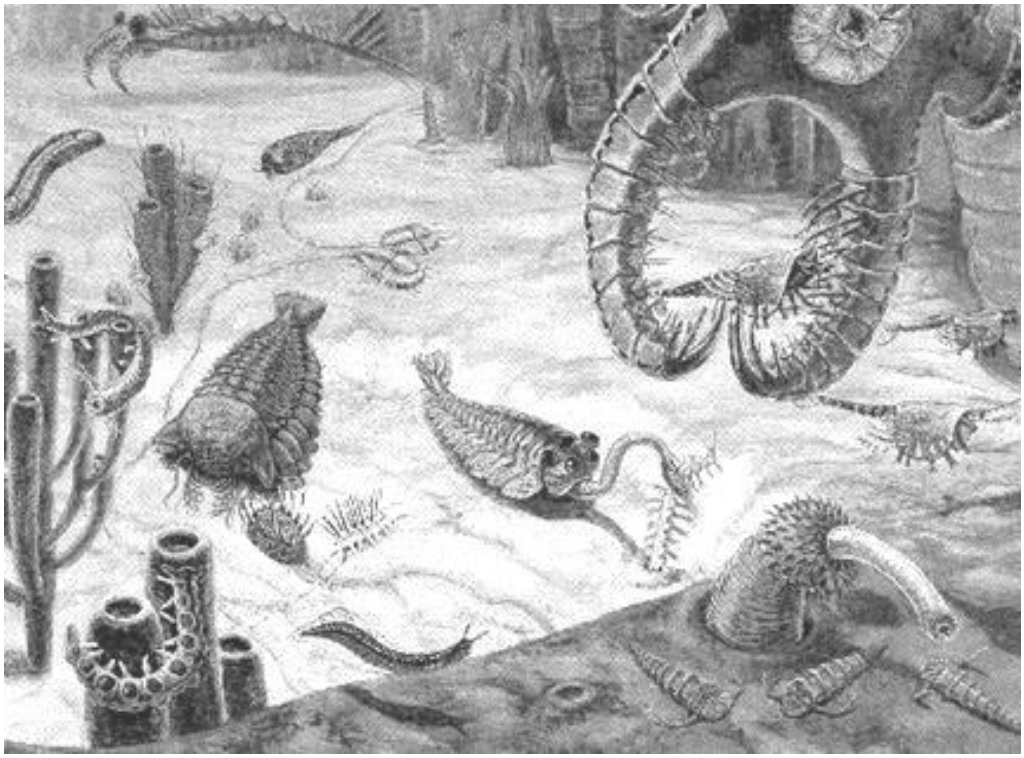
Consider the following image showing an artist's impression of new life forms that evolved in the Cambrian.



Question 26 continues on the next page.

Question 26 continued. **Marks**

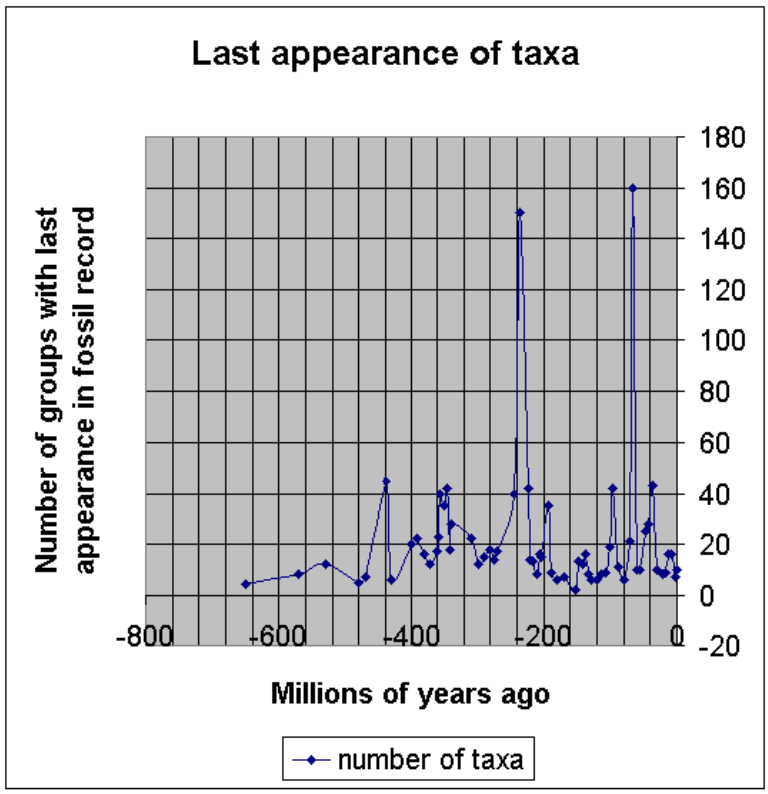
(b) Describe changes in life form that evolved during the Cambrian and explain the evolutionary advantages that these new adaptations provided. **4**

Question 27 (3 marks)

(a) Outline the evidence that suggests present-day organisms have developed from different organisms in the distant past. **3**

Question 28 (10 marks) **Marks**

(a) Consider the following graph showing the last appearance of taxa in the fossil record.



Identify the relationship between the data presented in this graph and the divisions of the geological time scale **2**

_____

_____

_____

_____

Question 28 continues on the next page.

Question 28 continued. **Marks**

(b) Assess the *bolide impact theory* against one other accepted theory as the cause of the End Cretaceous mass extinctions. Include geological evidence in your answer. **5**

(c) Compare models of *explosive* and *gradual* adaptations.

In your answer refer to *radiations* of new *genera* following *mass extinction events.* **3**

Question 29 (6 marks) **Marks**

During this course you have studied a salt-affected area that has been rehabilitated.

(a) Identify the type of salinity in your area studied. **1**

_____

(b) Identify ONE impact salinity has on the biotic environment. **1**

_____

(c) Explain the rehabilitation strategy employed and the scientific basis for this strategy. **4**

_____

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Question 30 (6 marks) **Marks**

The pesticide DDT (dichlorodiphenyltrichloroethane) was regarded as such an effective pesticide that it was used worldwide by the 1950's.

Research produced the following data following an application of DDT.

Concentration of DDT in the Environment									
Years from application	0	15	30	45	60	75	90	105	120
Amount of DDT remaining (kg)	100.00	50.00	25.00	12.50	6.25	3.13	1.56	0.78	0.39

(a) Identify an issue with using DDT that is highlighted by this data. **1**

_____

_____

(b) Discuss why pesticides such as DDT cause environmental problems. **3**

_____

_____

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_____

Question 30 continues on the next page.

Question 30 continued. **Marks**

(c) Farmers markets selling pesticide-free 'organic' fruit and vegetable produce are becoming more common. **2**

Describe a method that farmers could use to succesfully grow 'organic' produce.

Question 31 (6 marks)

(a) Evaluate the effectiveness of methods currently used for the management of solid waste. **6**

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OPTION – OCEANOGRAPHY

Question 32 (10 marks) **Marks**

(a) Construct a flow chart illustrating the movement of water, carbon and oxygen between the oceans and the atmosphere **3**

(b) Describe how the oxygen supply on the ocean floor is renewed **2**

(c) Assess the impact of improved technological developments on the types of evidence that support our understanding of the age of the sea floor. **5**

End of Paper

Geological Time Scale