

**MARK SCHEME for the May/June 2009 question paper
for the guidance of teachers**

8291 ENVIRONMENTAL MANAGEMENT

8291/01

Paper 1, maximum raw mark 80

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes must be read in conjunction with the question papers and the report on the examination.

- CIE will not enter into discussions or correspondence in connection with these mark schemes.

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Section A

Answer *all* questions in this section.

- 1 (a) Fig. 1.1 shows the Earth's major tectonic plates and their directions of movement.
- (i) **What is meant by the term *tectonic plate*?**
a structural block or section of the Earth's crust (1) which float like rafts on the underlying asthenosphere (1) or lithosphere (1) [2]
- (ii) **Name the type of plate boundary that occurs at locations A, B and C in Fig. 1.**
A = divergent/constructive (1)
B = convergent/destructive (1)
C = transform/conservative/sliding (1) [3]
- (iii) **Explain why volcanoes are common features at plate boundary A.**
diverging plates produce weaknesses or faults in the crust (1), the release of pressure allows magma to rise, (1), frequent eruptions produce volcanoes (1) [3]
- (b) Fig. 1.2 and Fig. 1.3 contain information relating to the Pakistan earthquake of 2005.
- (i) **Describe the tectonic process that triggered the Pakistan earthquake.**
Subduction of the Indian plate below the Asian plate (1) accept: one plate slips beneath the other.
Friction causes a build up of pressure (plates stick to each other) (1)
The release of pressure due to plate movement causes the earthquake (1) [3]
- (ii) **Explain the pattern of seismic waves shown in Fig. 1.2.**
At the epicentre seismic activity = 7.6 (Richter scale) (1); seismic waves radiate outwards and diminish in severity (1) [2]
- (iii) **Suggest two effects an earthquake could have had on the physical Landscape shown in Fig. 1.3.**
credit two points relating to the mountainous physical environment;
e.g. instability on steep slopes causes landslides (1), blocking of rivers causes floods, sudden changes to the physical landscape (1)
these factors may be expressed in terms of urban devastation. [2]
- (iv) **An estimated 3.3 million people were injured or made homeless, and 1000 hospitals were destroyed by the Pakistan Earthquake. With reference to Fig. 1.2 and Fig. 1.3 assess the difficulties faced by the relief organisations in the period following the earthquake.**
Credit with 2/3 marks two well developed points; max 3 for a non-substantiated list. Points can include: disruption to communications makes rescue, evacuation, relief and medical aid difficult; the scale of destruction to buildings and loss of food etc. in the Himalayan winter environment; likelihood of disease, starvation stretches resources. [5]

[Total: 20]

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2 (a) Fig. 2.1 describes the vertical structure of the atmosphere.

(i) Identify the layers X, Y and Z shown in Fig. 2.1

X = troposphere (1), Y = stratosphere (1), Z = mesosphere (1)

(ii) Briefly describe the characteristics of:

credit two valid points for each:

- layer Y (stratosphere) lies between 15 to 50 km, contains ozone and increases in temperature with altitude.
- layer Z (mesosphere) lies between 50 and 80 km; temperature decrease, contains ice clouds, a zone in which meteors burn up. [4]

(iii) Give two reasons for the decrease in temperature that occurs between 0 and 10 km.

credit two points, each with one mark.

air is thinner and as air expands it cools down (1)

increasing distance from the source of radiated energy (1) [2]

(b) Fig. 2.2 illustrates a process that produces rain.

(i) State the type of rainfall that is produced by the process illustrated in Fig. 2.2.

convectonal (1)

[1]

(ii) Explain how temperature, water vapour and atmospheric pressure work together in the formation of the rainfall shown in Fig. 2.2.

thermal energy from the ground and vegetation (1) causes the overlying to become less dense than the environmental air (1) so it rises (1) with altitude

the air cools (1) and water vapour condenses to form clouds and rain (1)

accept references to evapo-transpiration. [5]

(iii) Describe and explain the effects the removal of the vegetation cover in Fig. 2.2 would have on the climate of the area.

This is a contributor to desertification.

vegetation is a source of water vapour (1) through transpiration (1)

removal of the vegetation cover disrupts the water cycle (1) causing lower atmospheric humidity and lower condensation (1), this continuous drying out of the water cycle leads to desertification (1)

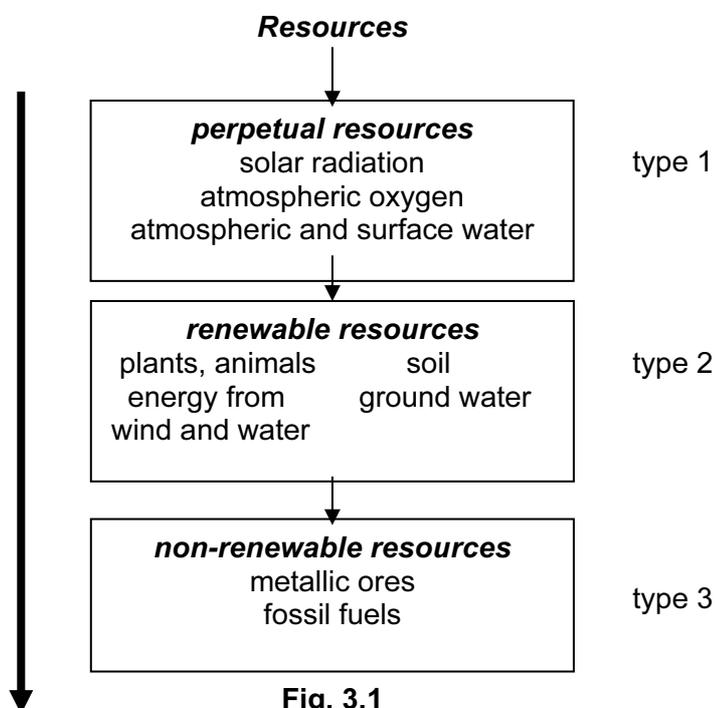
[5]

[Total: 20]

Section B

Choose *one* question from this section.

- 3 Fig. 3.1 shows how resources may be classified into three types according to how long it takes to replace them.



- (a) Describe the three types of resources shown in Fig. 3.1. Explain why the replacement period provides a useful method of classification. [10]

perpetual resources are those constantly supplied with the shortest replacement period

renewable resources (either generally or specifically) occur as a flow in nature but the renewal period is variable

non-renewable resources once used cannot be replaced within the foreseeable human time scale, includes coal oil.

the time scale is an important feature of this chart

8 to 10 marks answers should contain references to the three components of Fig. 3.1 with accurate reference to the time scale. Some effective use of examples

4 to 7 marks weak reference to three or two components with little use of examples and vague about the time scale.

1 to 3 marks expect brief/vague answers with little use of examples and the time scale.

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(b) With reference to examples you have studied, assess the extent to which developing nations (LEDCs) or developed nations (MEDCs) can seek to maintain or increase their consumption of fossil fuels.

Although in past examinations this has proven to be a popular topic this question has a less open ended content. Here the emphasis is more concerned with the continued use of fossil fuels.

Candidates need to select **either** MEDCs **or** LEDCs.

MEDCs and LEDCs in maintaining their consumption of fossil fuels might consider:

- existing reserves of oil, gas, coal
- current domestic and industrial dependence on fossil fuels
- current technology utilises fossil fuels; change can be expensive
- thermal power stations have comparatively large output, gas and oil have quick start-up times
- alternatives such as wind, solar, wave have low output, are less reliable, and expensive to set up.

Increasing usage of fossil fuel would relate to:

- new discoveries e.g. Arctic, Falklands etc.
- limited technology and financial resources (LEDCs)
- economic dependence
- political factors

The question of extent involves priorities:

- the viability of alternatives
- internal and external economic and political pressures

Band 1 answers will have an appropriate emphasis, use examples and consider at least four reasons. Evaluation will feature strongly. (25–30)

Band 3 answers will consider at least two reasons. Examples may have general coverage and evaluative statements will either be brief or one-sided. (13–18)

Band 4 answers will consider at least one reason but have brief coverage. Examples will be poorly developed or implicit and there will be very little evaluation. (6–12)

[Total: 40]

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- 4 (a) Burning fossil fuels can lead to the emission of acid gases. The quantities can be reduced by taking action at any, or all, of the three stages in the combustion process.
- before combustion
 - during combustion
 - after combustion

Using examples, briefly describe why such actions might be more effective than managing the effects of acid deposition. [10]

Notionally award 3 marks for reference to acid deposition, three marks for reference to the three stages and 4 marks for description, and then use the band descriptors.

Acid deposition affects lakes, vegetation, buildings and is produced by burning fossil fuels, particularly SO_2 and NO_x . Management reduces the effects but not the cause.

Pre-combustion mainly involves switching to cleaner fuels (high sulfur to low sulfur, petrol to hybrid or biofuels; coal washing, coal gasification).

During combustion. Lime injection (multistage burning) reduces SO_2 and NO_x .

Post combustion includes flue gas desulphurisation and catalytic systems are the most effective.

8 to 10 marks answers should contain reference to acid deposition and accurate reference to each of the three stages. Quality will be expressed through the level of understanding.

4 to 7 marks answers may contain reference to each part of the answer but lack understanding on probably the combustion stages. Expect some moderately reasoned but unbalanced answers in which one component is either good or only one dealt with.

1 to 3 marks answers will be very weak in the three combustion stages and contain limited reference to acid rain. The discussion in the question is not understood nor developed.

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- (b) For the purpose of this question you are to assume the rôle of an environmental planning officer responsible for either a named agricultural or named urban area with which you are familiar.

For either the agricultural or the urban region you have chosen, write a report that highlights the pollution issues and addresses their management.

Your report should:

- assess current pollution issues
- consider public concerns
- propose a strategy or strategies that target reducing levels of pollution. [30]

As the choice is up to the candidate the mark scheme is generic.

Notionally there should be a balance of 12 marks for current pollution issues

6 marks for public concerns and 12 marks for strategies

Pollution issues should divide into sources, type and effect.

Public concerns include health and expressed opinion.

Strategies must directly relate to the first two sections and target reduction.

Band 1 answers will contain a balance of the three elements and directly address the issues affecting the area chosen. The answer will contain evaluations of the effects of the pollution and the related strategies. (25–30)

Band 3 answers although relevant may lack balance or contain brief descriptions of each element. Evaluations may be confined to brief statements. Max band 3 if an example is not used. (13–18)

Band 4 answers may be very brief and general, comprise listed statements. There may well be a lack of balance with one or two elements of the report omitted. (6–12)

[Total: 40]

5 (a) Outline *three* factors that may have contributed to the landslips shown in Fig. 5.1



Fig. 5.1

Answers should refer to: the cliff, its free face, the talus with fine material at the top and large at the base. Notionally credit 2 marks to the recognition of the features shown in the photograph and 8 to the contributing factors: (4, 2, 2)

Removal of vegetation, weathering e.g. frost action involving temperature fluctuation, water and the effects of freeze-thaw. Other physical processes are less likely but if they lead to landslips then credit appropriately.

For the talus slope the accumulation of debris on slope with some mentioning of momentum and gravity in reference to debris on the talus slope.

For each of the **three** factors award 3 marks; one for a correct located process and 2 for its elaboration. There is one floating mark.

8 to 10 marks answers will contain good and well balanced reference to 3 factors. Weathering process and slope mechanisms will be mentioned.

4 to 7 marks answers will either be poorly balanced with 1 or 2 processes well developed or lack detail in each of three.

1 to 3 marks answers will lack development and understanding of slope processes.

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- (b) With reference to examples of where human activity has contributed to slope instability:
- describe the causes and effects of the slope instability
 - assess the measures that could be adopted to achieve a sustainable use of sloping land in the areas you have selected. [30]

The two parts to this question should have equal weighting to achieve the correct balance. Although the emphasis is on human activity its relevance is in the exposure of, steepening and disruption to slopes that enables physical processes to operate. Hopefully candidates will select examples with which they are either familiar and/or have studied.

Causes include: quarrying, building, deforestation, agriculture.

Effects are usually exposure to weathering, steepening and drainage. To be seen in landslips, building collapse, gullyng and in general loss of land.

Strategies include: reforestation, terracing, slope reinforcement (gabions), building restrictions, multiple cropping. These permit continued use of the slope whilst reducing the likelihood of slope failure.

Band 1 answers must contain a good balance of both elements and be clear about the effects of human activity and the sustainable use of slopes. There should be effective assessment of the strategies. (25–30)

Band 3 answers may be stronger in one element, lack clarity on sustainability and contain limited assessment. (13–18)

Band 4 answers although relevant will tend to be brief and non-evaluative. (6–12)

[Total: 40]

Band 3	The candidate demonstrates the following abilities where appropriate to:	
A	<ul style="list-style-type: none"> select and use some accurate and relevant knowledge; integrate knowledge from a limited range of areas; show an adequate understanding of the concepts involved; demonstrate a limited range of awareness of personally derived and studied knowledge; 	
B	<ul style="list-style-type: none"> select and use a form and style of writing appropriate to purpose and subject matter; communicate the ideas clearly and in a logical way; 	
C	<ul style="list-style-type: none"> undertake some analysis of issues and problems and make a superficial evaluation; develop arguments and draw conclusions; 	
Band 4	The candidate demonstrates the following abilities where appropriate to:	6–12
A	<ul style="list-style-type: none"> select a limited range of accurate and relevant knowledge; integrate knowledge from a very limited range of areas; show a modest understanding of the concepts involved; 	
B	<ul style="list-style-type: none"> select and use a limited style of writing, appropriate to purpose and subject matter; communicate ideas with limited clarity; 	
C	<ul style="list-style-type: none"> demonstrate limited analysis of issues and problems with limited evaluation; develop limited arguments and draw limited conclusions; 	
Band 5	The candidate demonstrates the following abilities where appropriate to:	1–5
A	<ul style="list-style-type: none"> select and use some relevant knowledge; integrate knowledge from a very limited area; show a restricted understanding of the concepts involved; 	
B	<p>When producing written communication:</p> <ul style="list-style-type: none"> select and use a very limited style of writing appropriate to purpose and subject matter; communicate with limited clarity; 	
C	<ul style="list-style-type: none"> undertake a very limited analysis of issues, problems and evaluation; recognise some arguments and conclusions. 	