

MARK SCHEME for the October/November 2008 question paper

8291 ENVIRONMENTAL MANAGEMENT

8291/01

Paper 1, maximum raw mark 80

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All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

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

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Section A

Answer all questions in this section.

1 (a) (i) State the type of atmospheric pollutant commonly caused by:

- **carbon dioxide and methane**

greenhouse gases; accept global warming

- **particulates**

dry acid deposition, photochemical smog

[2]

(ii) Describe how acid rain might affect the terrestrial and aquatic environments shown in Fig. 1.1.

For 6 marks there should be three marks for each of terrestrial and aquatic environments.

For terrestrial environments: reduced growth rates, crown dieback, premature loss of leaves and needles, abnormal cell development, increase acidity in soils and lower soil fertility.

For aquatic environments: declining fish population, low levels of calcium and magnesium, reduced pH, reduced bacterial activity, changing fish population, food chain disruption.

[6]

(b) Suggest two reasons for the distribution of atmospheric acidity as shown in the map of the USA shown in Fig. 1.2.

Award marks on the basis of 1/2 or 2/1 for description and explanation.

Higher pH towards the west and central USA with low pH to the East and NE; lower pH close to urban industrial areas with in the NE winds spreading air to the SW; good answers will also refer to the generally high levels of acidity across the USA.

[3]

(c) Explain how each of the methods shown in Fig. 1.3 can assist in reducing the effects of acid rain.

Award marks for single points in each case (3 marks for each).

Wind farms offer alternative energy using wind (= 1), reducing the use of fossil fuels (= 1), the burning of which releases sulphur (= 1).

Lake spraying of lime which is alkaline (= 1) neutralises the acids in lakes (= 1) thereby raising the pH values (= 1).

Scrubbing. Smoke and particulates are released from chimneys (= 1), scrubbing prevents smoke from entering the atmosphere (= 1); this can involve flue gas desulphurisation (= 1).

[9]

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2 (a) Fig. 2.1 shows a seismograph record of a shallow focus earthquake.

(i) What is meant by the terms *shallow focus earthquake* and *seismic waves*?

A shallow focus earthquake has its focus (not epicentre) close to the surface of the earth. The depth of the focus from the epicentre, 0 to 70km (= 1).

Seismic waves are shock waves generated or triggered by a surface or underground disturbance (= 1). [2]

(ii) State *three* factors that distinguish between P waves and S waves.

Award one mark for each difference.

P waves travel faster than S waves and arrive earlier (= 1).

P waves are compressional and vibrate in the direction of propagation whereas S waves are transverse (= 1).

P waves pass through solids and liquids whereas S waves will not pass through liquids (= 1). [3]

(iii) Explain how seismograph recordings can be used to locate the focus of an earthquake. You may wish to use a diagram to illustrate your answer.

Answers should relate how by plotting the direction of waves from three stations a point of intersection is found; this is the focus of the earthquake.

Candidates can illustrate this answer. [3]

(b) Fig. 2.2 shows a seismograph recorded near a volcano in the period preceding an eruption.

(i) State the name of this form of seismic wave activity and explain this pattern.

Harmonic tremor (= 1) is associated with the movement of magma within a volcano which produces many small earthquakes in the fabric of the volcano and the surrounding area.

The vibrations are continuous, of a single frequency and of low amplitude. [3]

(ii) Describe how the pattern of seismic waves would change at the onset and during the volcanic eruption.

The period preceding the volcanic eruption may produce harmonic tremor (= 1); the eruption will have the same effect as an earthquake i.e. a sudden shock (= 1) that releases P, S and L waves (= 1). [3]

(c) Fig. 2.3 is a photograph showing the damage caused to an urban area by a severe earthquake.

With reference to Fig. 2.3, describe and justify three urban planning strategies that could be adopted to prevent loss of life in future earthquakes.

The six marks should divide into 2 marks for each of three developed points that identify the strategy (= 1) and provided an elaboration (= 1).

The photograph shows a densely populated urban area devastated by an earthquake. Careful urban planning could ensure that buildings are widely spaced, buildings have simple design, deep foundations, structures are flexible. Where possible avoid fault zones and soft ground.

Key services need to be strategically positioned to enable rescue and help. [6]

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Section B

Choose *one* question from this section.

- 3 (a) Outline *three* effects on the environment of the opencast method of rock extraction shown in Fig. 3.1. [10]

Award three marks for each effect with one floating mark; identifying the effect (= 1); two marks for an elaboration containing two linked points and one mark for a single briefly stated point.

Likely effects upon the environment include: spoil tips, pit excavation making restoration difficult, dust/dirt/pollution, heavy lorries, noise etc.

7 to 10 mark answers should contain three developed effects or two with limited expansion of the third

4 to 6 mark answers should contain 2 developed points or one with limited expansion of the second and/or the third.

1 to 3 mark answers will have either one developed point or three identifications without development..

- (b) Using examples with which you are familiar, describe and evaluate the strategies that have been adopted to limit the impact of economic development on land. [30]

The question is concerned with land as a sustainable resource. For full marks reference can be made to either urban or non-urban areas or both.

Candidates should structure their answers so that the strategies are applied to either an existing problem or potential problem.

Non-urban areas are threatened with: reduction in size, inappropriate agricultural activities, mining and quarrying, deforestation.

Urban areas are threatened with: poor construction, pollution, traffic congestion, sprawl or uncontrolled expansion, physical hazard (e.g. Japanese earthquake precautions).

The issue the answer identifies should relate to the area being used in the future, thus strategies involve sustaining this usage:

deforestation requires various forms of forestation as well as planned cutting of trees.

traffic congestion and pollution relates to road widening, park and ride, restricted areas etc.

Band 1 answers should select at least three examples and clearly describe the problems and strategies. Answers at this level should provide an evaluation of strategies that have been adopted or an estimation of their potential. [25 to 30]

Band 3 answers should develop at least one issue and make brief reference to 2 others. The element of sustainability may be unclear and the answer lack specific evaluations. [13 to 18]

Band 4 answers although relevant will contain three poorly described problems, strategies and lack evaluation. [6 to 12]

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4 (a) Outline *three* ways in which short term changes to the weather can be monitored.

Award one mark for identifying the method and two marks for the elaboration which combine: a description of the method or equipment (= 1) followed by how it is used to make weather forecasts (= 1).

This can include: satellite water vapour, satellite infrared, weather observations (sea and land), meteorological charts, using specific instruments e.g. thermometer, anemometer etc.

7 to 10 mark answers need three methods, two of which may be better developed than the third.

4 to 6 mark answers need at least one well developed method with one or two only outlined or stated.

1 to 3 marks answers will contain one developed point and nothing else or three/two headings with no elaboration.

(b) Using recent evidence, assess the extent to which human activity has had a damaging effect upon the Earth's atmosphere. [30]

Although human activity has mainly had a damaging effect upon the atmosphere, it is not all bad news! The time scale for evidence can be interpreted fairly flexibly particularly as most of the evidence has been gathered in recent years. Topics for discussion can include:

Global warming/greenhouse gases with rising temperatures, rising sea levels, weather and climatic change, accelerated changes.

Acid rain with evidence drawn from forests, lakes soils and buildings.

Ozone depletion via the ozone holes, increases in uv radiation.

Urban pollution with reference to public health, smogs, photochemical smog.

Evaluations can include:

Some physical processes also make a contribution; cfc's from volcanoes, methane and carbon sinks, natural climatic cycles.

Recent strategies to clean up the Earth's atmosphere have met with success e.g. ozone hole reduction, nations signing up to protocols, local schemes (traffic in towns, alternative energy).

Band 1 answers need to be evaluative and although detrimental effects of human activity may dominate the answer there should be some reference to natural contributions. [25 to 30]

Band 3 answers may be poorly balance by concentrating upon detrimental effects. Evaluation and reference to natural effects may be brief or more likely absent. [13 to 18]

Band 4 answers may only deal with one or two detrimental effects and are likely to be very brief. Expect one sided answers. [6 to 12]

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5 (a) Fig. 5.1 shows how some sloping ground has been developed. Briefly outline how this development might lead to slope instability.

The original slope profile is shown and former stability is disrupted by:

- the cutting of benches that produce small cliffs; the absence of vegetation means that weathered material will slide down these cliffs.
- the weight of building exerts pressure on the unstable edge to each bench.
- the stability of the original slope depended on slow removal at the base of the slope.
- drainage diversion ditches encourage gullying on the slope.

7 to 10 marks answers should review the whole of the former slope and the impact of the benches, non-vegetated cliffs and buildings.

4 to 6 marks answers will contain a more superficial coverage and focus upon the benches rather than the whole slope.

1 to 3 marks answers will contain simple headings and be unclear about the potential instability of the slope.

(b) The three different events mentioned in Fig. 5.2 each refer to slope instability.

<p>“An estimated 20,000 slopes in Hong Kong are dangerous, many of them have not been examined and another landslip disaster could strike any day”</p> <p>“One person was killed and 31 injured when two passenger trains collided after a landslip caused by heavy rain in the Lake District”</p> <p>“A mountain village in SW Colombia was yesterday reported to have been swept away in a landslide of rocks, ice and mud, following an earthquake”</p>
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Fig. 5.2

Assess the techniques that can be used to limit the damaging effects of landslips and landslides. Illustrate your answer with suitable examples. [30]

Answers should recognise that slope instability is the result of a number of factors both natural and by human activity. The movement of material on the slope or cliff is frequently results of triggering by natural elements e.g. sea cliffs or tectonic activity.

Mitigation includes:

- forestation,
- terracing,
- upgrading sub standard, reinforcement (gabions, revetments),
- slope angle reduction,
- improved drainage,
- compaction,
- land registry where landowners report the condition of slopes,
- population migrations and warning rescue systems.

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- Band 1 answers should review actual examples and mention at least four techniques to mitigate against the damaging effects of slope movement. Answers at this level should contain some assessment. [25 to 30]
- Band 3 answers will contain less assessment and make superficial use of examples. Mitigation should contain two well developed techniques. [13 to 18]
- Band 4 answers should be relevant but have little on actual case studies. Any assessment will be confined to brief statements probably not related to an actual example. [6 to 12]

[Total: 40]