

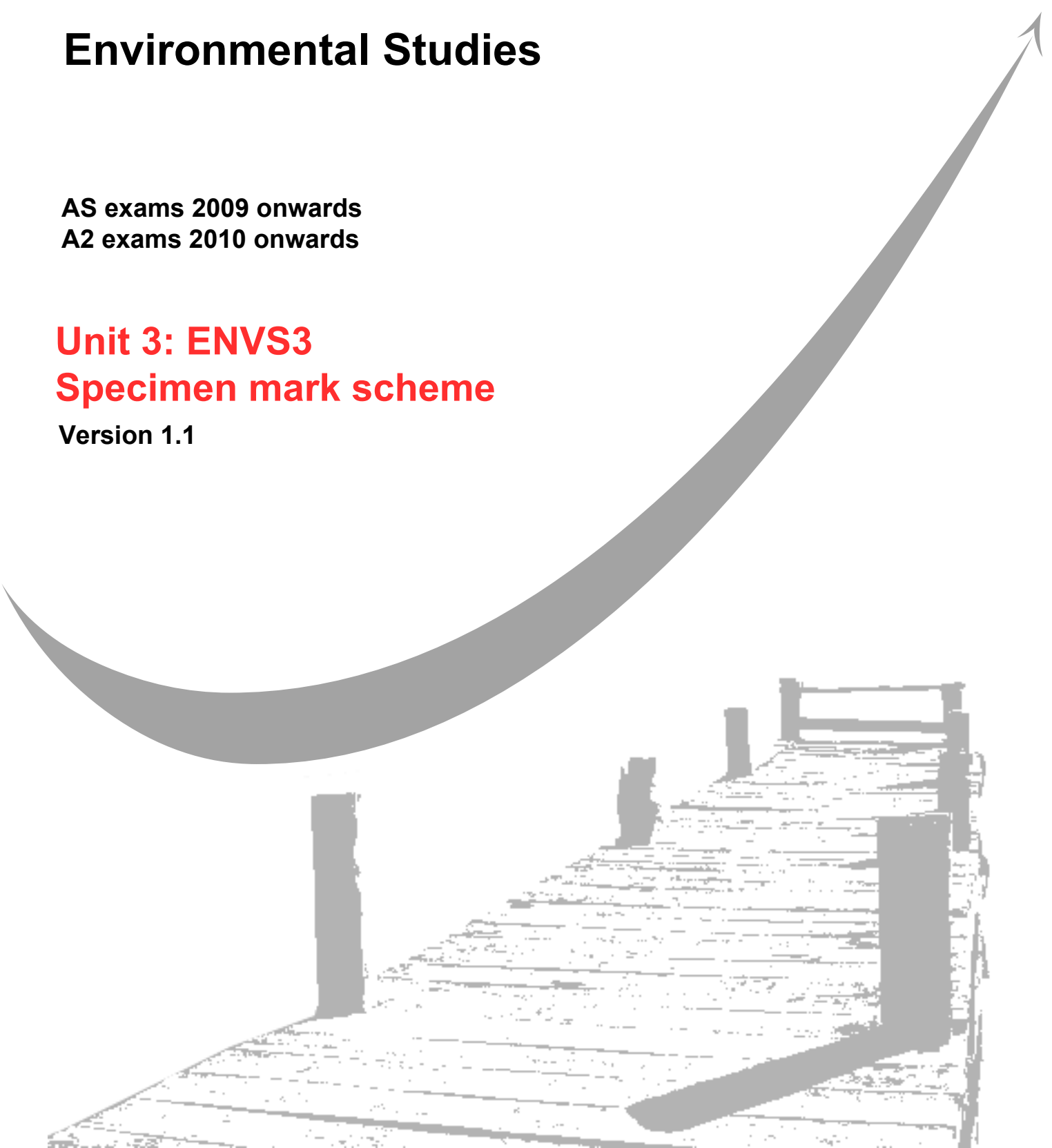
GCE
AS and A Level

Environmental Studies

AS exams 2009 onwards
A2 exams 2010 onwards

Unit 3: ENV3 **Specimen mark scheme**

Version 1.1





ASSESSMENT and
QUALIFICATIONS
ALLIANCE

General Certificate of Education

Environmental Studies

**Energy Resources and
Environmental Pollution**

ENVS3

Specimen Mark Scheme

for 2010 examination

The specimen assessment materials are provided to give centres a reasonable idea of the general shape and character of the planned question papers and mark schemes in advance of the first operational exams.

For operational papers, mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. The mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis on one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this Mark Scheme are available to download from the AQA Website: www.aqa.org.uk

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Environmental Studies

**Specimen Unit
Mark Scheme**

ENVS3

Instructions: ; = 1 mark / = alternative response A = accept R = reject

Question 1

- A** hot/thermal pollution/organic matter/eg of organic pollutant/any reducing pollutant
eg sulfide/iron;
- B** smoke/suspended particles/PM10/SPM/smog/dust/soot;
- C** acid pollutants/eg of acid/acidic gas eg SO_x/HCl;
[R acid rain]
- D** lead/mercury/cadmium/other heavy metal/named neurotoxin eg
organophosphate/insecticide;
- E** CFCs/NO_x; 5

Total marks = 5

Question 2

- 2** (a) Named financial penalty/incentive/aggregate tax/landfill tax/Agenda 21/
waste minimisation targets/method to encourage recycling; 1
- 2** (b) Name of method and waste;
detail of process;
eg
incineration of domestic waste/crop waste/straw/biofuel
release of heat/steam generation
or
digestion of sewage/manure/landfill waste
anaerobic bacteria/methane production/use for electricity production
[R uses of energy] MAX 2 + MAX 2 MAX 4

Total marks = 5

Question 3

- 3 (a) (i) Positive correlation; 1
- 3 (a) (ii) Climate difference requiring more energy use;
climate difference requiring less energy use;
level of industrialisation;
type of industry using industry;
material bulk transport of materials using energy;
distances requiring transport energy use;
low energy cost encouraging waste;
social conservation ethic;
indigenous supplies encouraging waste;
relevant use of country to illustrate; MAX 4
- 3 (b) Relative shortage increases prices;
hence inability to afford energy in less wealthy countries;
which restricts fuel choice to cheaper ones;
eg wood/dung;
causing deforestation/soil erosion;
and less money available for development projects;
eg agricultural/educational/health projects;
or energy for development;
eg transport systems/drilling boreholes/industrial development;
purchase of energy resources from less to more wealthy countries;
transfers money to less wealthy countries;
use for named development/environmental project;
- use of energy in more wealthy countries causes named pollution problem;
causing named development problem; MAX 5

Total marks = 10

Question 4

- 4 (a) Deep
worse undermining/subsidence;
more spoil;
both require drainage;
land use/habitat loss less;
[**R** economic issues]
[**R** health and safety issues]
- Open cast
more noise;
more dust;
more spoil before reclamation;
changed use after restoration;
more disturbance due to air blast/vibration; MAX 4
[**A** converse statements – must include comparative comments eg more... less...]
- 4 (b) Reduced food supply due to toxic oil;
reduced food due to deoxygenation (by oil barrier on surface)
malnutrition due to digestion problems;
reduced thermal insulation causing hypothermia;
reduced feeding while cleaning, causes increased chick mortality; MAX 2
- 4 (c) Secondary recovery;
artificial/maintenance of pressure;
injection well/natural gas/water pumped down; MAX 2
- Tertiary recovery;
reduced viscosity;
use of solvents/steam/bacteria/detergents; MAX 2
- MAX 2 + MAX 2 4
- Total marks = 10**

Question 5

- 5 (a) Water sampling preparation
 water collected in sealed container;
 dilution series;
 samples divided for measurement before/after;
 containers with no air space; MAX 1
- Storage procedure
 bacteria added if required;
 stored in dark;
 5 days;
 20 °C; MAX 1
- Named method of measuring DO/Winkler titration/electronic meter; 1 3
- 5 (b) Up to 3 aspects of standardised sampling techniques;;;
 up to 2 ways that techniques produce fair test;;
- eg
 same time of day
 ref to fluctuations in DO level
OR
 minimal water disturbance
 prevent additional oxygen dissolving
OR
 no substrate disturbance
 prevent inclusion of extra organic matter
OR
 constant depth
 ref to closeness to substrate/air
OR
 tubes rinsed in river water
 remove residual chemicals
OR
 no air bottles
 prevent oxygen dissolving MAX 4
- 5 (c) Source in urban area/between 3 and 4/not food processing plant; 1
- 5 (d) Higher temperature in summer/less dilution;
 faster decay/more rapid deoxygenation/DO lower already; 2

Total marks = 10

Question 6

- 6 (a) Same number of seeds in each tray;
 same pH/use buffer;
 use more seeds;
 use replicate trays;
 check germination each day/day 6 missed;
 extended period of experiment;
 use medium to surround seeds with solution; MAX 3

- 6 (b) Mixture had lowest germination;
 insufficient data for confidence; 2

- 6 (c) Direct effects
 named tissue/organism affected;
 cell membrane/protein/enzyme;
 cuticle/skin/exoskeleton;
 gill/respiratory tissue/lung; MAX 2

- Detail of damage/effect
 denatured/inactivated/inhibited/dissolved;
 reduced gaseous exchange/photosynthesis;
 reduced breeding success/seed viability;
 crown dieback/reduced growth/disease resistance/survival;
 reduced water/nutrient uptake; MAX 2

- Indirect effects
 named effect;
 description of effect;
 eg
 death/reduced population of named taxon (by direct effects)
 loss of food/pollination/seed dispersal
OR
 leaching of nutrients/named nutrients/ Ca^{++} , Mg^{++}
 reduced growth
OR
 increased solubility/mobility of Pb^+ / Al^{+++}
 toxic to named taxon/tissue/roots/fish/gills MAX 2 MAX 5

Total marks = 10

Question 7

- 7 (a) Repetitive small doses;
liposoluble/passes through (phospholipid) cell membranes;
stored in fatty tissue/lipid droplets;
bioaccumulation;
concentration increases as biomass reduces along food chain;
biomagnification; MAX 4
- 7 (b) Effectiveness reduced;
pests selected for resistance/increased production of enzymes to break down
pesticide; 2
- 7 (c) (i) One quarter; 1
- 7 (c) (ii) Degradation
degradation within organisms/enzymes action/bacterial action;
effect of pH;
effect of temperature;
effect of light/UV/photodissociation;
presence of water;
presence of other named chemical;
- Dispersal
leaching from soil;
absorption into organisms;
dispersal with migration/movement;
excretion elsewhere; MAX 3

Total marks = 10

Question 8

EITHER 8 (a) Energy technology site location
reduced habitat damage
aesthetics
power station/barrage/reservoir/windfarm

Energy transport
power line/pipelines
aesthetics
oil pollution
road/rail construction

Resource extraction damage
mining – habitat loss
dust
noise
aesthetics
leachate
turbid drainage water
spoil disposal
equipment manufacture

Energy use pollution
noise
aesthetics
smoke/PM10/smogs
carbon dioxide/Global Climate Change
acid rain
photochemical smogs
radioactive waste

OR 8 (b) Educational
small cars
'Switch if off!'
refuse, reuse, recycle
waste disposal options

Legal
Montreal Protocol
Kyoto Protocol
Clean Air Act
Dumping at Sea Convention
COPA
packaging regulations
hazardous waste laws

Economic
Landfill tax
Aggregates tax
carbon credits
differential petrol pricing
cost:benefit analysis

Technological
flue-gas desulphurisation
scrubbers
bag filters
cyclone separators
catalytic converters
activated carbon filters
carbon sequestration
fluidised bed combustion

OR

8 (c) Industrial safety procedures
absorbing materials
ref to radiation penetration – alpha, beta, gamma, neutron
lead, concrete, glass, Perspex

Distance from source
ref to inverse square law
distance unless essential

Duration of exposure
as short as possible – modify working practices

Open/closed sources
distinction between exposure and contamination
protective clothing

Control of critical mass
ref to chain reaction

Descriptions of named procedures related to safety
medical X rays, cancer treatment, industrial testing, nuclear fuel
fabrication, power station operation, waste disposal

Worker monitoring
film badges, inhalation monitors, personal monitors, contamination
detection, health checks

Public monitoring
Critical Group Monitoring

Environmental monitoring
Critical Pathway Analysis
sampling of dust, grass, soil, water, milk, meat etc

Total marks = 20

Essay Questions

The essay questions are marked using the following marking criteria.

Scientific content (maximum 14 marks)

Category	Mark	Descriptor
	14	
Good	12	Most of the material of a high standard reflecting a comprehensive understanding of the principles involved and a knowledge of factual detail fully in keeping with a programme of A Level study. Some material, however, may be a little superficial. Material is accurate and free from fundamental errors but there may be minor errors which detract from the overall accuracy.
	10	
	9	
Average	7	A significant amount of the content is of an appropriate depth, reflecting the depth of treatment expected from a programme of A Level study. Generally accurate with few, if any fundamental errors. Shows a sound understanding of most of the principles involved.
	5	
	4	
Poor	2	Material presented is largely superficial and fails to reflect the depth of treatment expected from a programme of A Level study. If greater depth of knowledge is demonstrated, then there are many fundamental errors.
	0	

Breadth of Knowledge (maximum 2 marks)

Mark	Descriptor
2	A balanced account making reference to most if not all areas that might realistically be covered by an A Level course of study.
1	A number of aspects covered but a lack of balance. Some topics essential to an understanding at this level not covered.
0	Unbalanced account with all or almost all material based on a single aspect.

Relevance

(maximum 2 marks)

Mark	Descriptor
2	All material present is clearly relevant to the title. Allowance should be made for judicious use of introductory material.
1	Material generally selected in support of title but some of the main content of the essay is of only marginal relevance.
0	Some attempt made to relate material to the title but considerable amounts largely irrelevant.

Quality of Written Communication

(maximum 2 marks)

Mark	Descriptor
2	All material is logically presented in clear, scientific English and continuous prose. Technical terminology has been used effectively and accurately throughout. At least half a page of material is presented.
1	Account is logical and generally presented in clear, scientific English. Technical terminology has been used effectively and is usually accurate. Some minor errors. At least half a page of material is presented.
0	The account is generally poorly constructed and often fails to use an appropriate scientific style to express ideas.

Total marks = 20

Assessment grids

Specification Section	Question number								Total
	1	2	3	4	5	6	7	8	
3.5.1		4	10	8				10-20	32-42
3.5.2	5	1		2	10	10	10	0-10	38-48
Total	5	5	10	10	10	10	10	20	80

Specification Section	Question number								Total
	1	2	3	4	5	6	7	8	
AO1 Knowledge with understanding		2	0	8		5	2	10	27
AO2 Application, analysis and evaluation	5	3	9	2	2	2	7	10	40
AO3 Experiment and investigation			1		8	3	1		13
Total	5	5	10	10	10	10	10	20	80