INTERNATIONAL
BACCALAURÉAT
BACHILLERATO

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BACCALAUREATE
INTERNATIONAL
INTERNACIONAL

MARKSCHEME

NOVEMBER 2000

ENVIRONMENTAL SYSTEMS

Standard Level

Paper 3

1. *Matrix should be ticked (checked) with the ecosystem the candidate has studied. No marks given for this (or removed if not completed), but candidates must answer in relation to system indicated. If no system indicated, make very sure answers are consistent.*

(a) (i) (3a) F; (3b) E; (4a) C; (4b) D; (5a) B; (5b) A
0–3 correct, *[0]*; 4 or 5 correct, *[1]*; 6 correct *[2]* **[2]**

(ii) Scale/size; allow colour/texture/hairiness/other relevant anatomical detail or habitat. **[1]**

(b) (i) Name and description. Must have clearly recognisable name and/or some detail. 'Pond' will not do. **[1]**

(ii) The heterogeneity of an area with regard to its species composition, taking account of the number of species and their relative abundance. *OWTTE*.

(Note that the concept of 'relative to area' or 'per unit area' must be given. 'Number of species' will not do.) **[1]**

(iii) Demarcate area *[1]*; count species *[1]*; for animals uniformity of effort (manpower/time)/apply index *[1]*.
(Or appropriate methodology and reasoning.) **[3]**

(iv) For example, for freshwater: any three of: minerals/turbidity/current depth/ pH/oxygen *[1]*;
(Factors must be distinct from each other for credit)

For littoral: salinity/tidal range/time exposed to air *[1]*;
Links such as current and depth *[1]*; oxygen/tidal range $\rightarrow$ exposure to air *[1]*.
Give full credit for either a brief discussion of several interrelationships or a full discussion of one. (Not more than [2] just for a list of 3 links.) **[4]**

(v) Name of activity and nature of effect.
(Must be appropriate to ecosystem selected.) **[1]**

(vi) Appropriate example of how humans affect a biotic factor, or how changes in an abiotic factor might affect a biotic factor *[1]*; reasoning *[1]*. **[2]**

2.　(a)　(i)　Argentina and Uruguay.　*[1]*

　　　　(ii)　Europe.　*[1]*

　　　　(iii)　More people in regions/more people in world as a whole; more need for food *[1]*;
　　　　　　Technology allows marginal area to be cultivated/irrigation/dry farming/ race element deficiency cured *[1]*;
　　　　　　Improved transport (rail, road, shipping) allows products to be moved *[1]*.
　　　　　　(Any reasonable argument.)

　　　　　　Differences: Europe/China had most good areas cultivated by 1870 *[1]*;
　　　　　　Expansion highest in 'new lands' especially Australia, Argentina and Uruguay *[1]*;
　　　　　　Physical environment a factor in Japan (mountains), China (mountains/ aridity) *[1]*.
　　　　　　"Some countries much larger in area than others, so more land availble" *OWTTE [1]*;
　　　　　　Some countries have slower / faster population growth *[1]*;　*max [4]*

　　　　(iv)　*Any two of:*
　　　　　　Population continues to increase → more food needed → cultivated area increases *[1]*;
　　　　　　Population stabilises or declines → less food needed → cult area declines *[1]*;
　　　　　　Climatic change → arid areas become more humid → cult area increases *[1]*;
　　　　　　Climatic change → humid areas become more arid → cult area declines *[1]*.
　　　　　　Technological advances allow food to be produced using less arable land so cropland area remains same/decreases *[1]*;
　　　　　　Cropland area decreases because of flooding due to global warming *[1]*;
　　　　　　(Any reasonable argument.)　*max [2]*

　　(b)　Name of farming system *[1]*. Effects *[3]*.
　　　　For example, for intensive cattle rearing *[1]*; → trampling soil *[1]*; N in run-off *[1]*; → eutrophication of waterways *[1]*; overgrazing *[1]*.　*[4]*

　　(c)　The land (and water) area that would be required to support a defined human population at a defined material standard indefinitely *[1]*. *OWTTE.*
　　　　Footprint probably has increased *[1]*; due to rise in population, increased rates of consumption, expansion of technology *[1]*.　*[3]*

3.   (a)   Long-term increase/period of stability for several hundred million years/ equilibrium?/major decline around 200 million/several smaller extinction periods *[1]*; possibly due to catastrophic events/changes in environment causing mass extinctions *[1]*; long-term increase possibly due to increase in diversity of environment, *e.g.* as land colonised by plants *[1]*.   *max [2]*

  (b)   (i)   Mammals   *[1]*

        (ii)   The highest proportion of extinctions in relation to total number of species. (Allow an answer such as mammals are often large, conspicuous and sometimes hunted. Some require large area to support individual or pair.)   *max [1]*

  (c)   It is caused by human activities *[1]*; it has been over a much shorter period/ earlier extinctions over longer period (millions of years) due to natural causes (meteoritic impact/competition as new groups evolve/environmental change) *[1]*.   *max [2]*

  (d)   *Any two of:* Small numbers/end-member of food chain/complex migration pattern/complex breeding cycle/restricted distribution/slow rate of reproduction/of value for some portion of its anatomy/hunted/large and conspicuous / specialised habitat/low genetic diversity/destruction of habitat.   *max [2]*

  (e)   *Any two of:* Aesthetic (no longer able to see tigers, elephants)/may be important ecologically/may be important economically (might be useful for food/ fibre/ drugs/biological control/medical research)/good effect, *e.g.* extinction of smallpox/ people/stock less likely to be attacked by top predators/greater area or less competition for food for humans/ any reasonable answer.   *max [2]*

  (f)   *Any three of:* Breeding programmes in zoos (panda)/protected areas and habitats (Orang-Utan in Sabah and Sumatra)/international agreements (CITES, Whaling Convention)/gene banks (Herbarium at Kew).
        (Any reasonable alternative must have an example to get the mark.)   *max [3]*

  (g)   *Any reasonable example: e.g.* Dodo on Mauritius *[1]*: unafraid of humans, confined to island, flightless, killed for food by visiting seamen *[1]*.   *[2]*

4.   (a)   A is petrol (gasoline): less black smoke/more CO/more unburnt hydrocarbons.   *[1]*
Need reason for the mark.

(b)   Reduces oxygen carrying capacity of blood /forms carboxyhaemoglobin /relevant symptoms such as headaches and dizziness (which are due to formation of carboxyhaemaglobin /can cause explosions.   *max [1]*

(c)   Contributes to photochemical smog /adds to the Greenhouse effect.   *[1]*

(d)   Pollution from a single site, *e.g.* a factory chimney or sewage outfall.   *[1]*

(e)   (i)   *Any two of:*
$$\text{Hydrocarbons} \rightarrow H_2O + CO_2$$
$$CO \rightarrow CO_2$$
$$NO_x \rightarrow N_2 + O_2$$

(2 gases, *[1]*; 2 gases + one product, *[2]*; 2 gases + 2 products, *[3]*).   *max [3]*

(ii)   *Any two of:* not effective when engine is cold/cannot be used with leaded fuel/not suitable for diesel/produce greenhouse gases/expensive/require maintenance.   *max [2]*

(f) (i) Developed country   *[1]*

(ii) Large amount of paper/plastic/glass/ these products often recycled in developing country *[1]*; large percentage of organic waste would be composted or not wasted in developing country *[1]*.
Any reasonable answer.   *[2]*

(iii) Name two of: landfill/incineration/reuse/composting/recycling/dumping at sea/burial underground (old mines *etc.*) *[1]*.

Evaluates. For *[2]* should have advantages and disadvantages appropriate to methods selected. *[1]* if only advantage or disadvantage.

Landfill: Advantages: can be combined with reclamation/methane production;
Disadvantages: expensive/scavenging rats, gulls, cockroaches *etc.*, before covering;

Recycling: Advantages: sound use of resources, especially non-renewable resources;
Disadvantages: effort/energy/cost can outweigh return;

Dumping at sea: Advantages: cheap;
Disadvantage: pollution of seas, which can be difficult to manage.

Incineration: Advantages: generates heat which can be used for heat and/or power;
reduces volume of waste;
reduces problem of pests and diseases;
Disadvantages: expensive;
air pollution from chimney

Reuse: Advantages: reduces energy/raw materials/transport costs;
Disadvantages: health and hygiene risks;
costs of cleaning/sterilising;

Composting: Advantages: improves soil structure;
nutrients returned to soil for food production;
can be carried out on small or large scale;
Disadvantages: attracts pests;
only suitable for organic material;

Or any reasonable alternatives with appropriate argument.   *[3]*