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ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Education

Environmental Science 5441

ESC1 Energy, Atmosphere and Hydrosphere

Mark Scheme

2008 examination – January series

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Environmental Science

January 2008 **ESC1**

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

Question 1

Feature	Source of water for public supply			
	Upland reservoir water	**Groundwater**	**Lowland river water**	
Most likely to be saline		✓		;
Least likely to be turbid		✓		;
			×	
Least likely to have a high calcium content	✓			;
Most likely to contain *E. coli*			✓	;
Least likely to have a low dissolved oxygen level	✓			;

Total marks = 5

Question 2

(a) (i) Large volume/space for stored oil; 1

(ii) Traps/prevents escape (upwards) of oil; 1
[**R** downwards movement]

(iii) Reduce viscosity/less thick; 1
[**R** pressure]

(b) Timescale of reformation renewable quick, non-renewable slow;
crude oil non renewable/solar power renewable/relative timescale; 2

(c) Named specific cause for decline in use;;
Explanation;;
technical
geological
political
legislative
economic
environmental impact/pollution
environmental protection/designated areas
social/public preference MAX 3

(d) Wave – winds/solar energy;
tidal – gravitational attraction of moon/sun; 2

Total marks = 10

Question 3

(a) Chlorine (monoxide) causes ozone depletion;
related chemical reaction; 2
[**R** descriptions of correlation]

(b) (From) CFCs/named use (of CFCs);
chlorine released (from CFCs);
reaction with ozone/monatomic oxygen; 2

(c) Increased UV;
DNA damage/mutations/skin damage/skin cancer/sunburn/cataracts/reduced photosynthesis/
other named health effect of exposure to UV; 2

(d) Alternative materials for named use;
named examples/propane/butane/HCFCs/HFCs;;
named alternative activity/pump action sprays/trigger sprays;
reduce/ban use of CFCs/HCFCs/halons;
Montreal Protocol;
CFC destruction/waste disposal/named item containing CFCs;
description of method/incineration; MAX 4

Total marks = 10

Question 4

(a) (i) Increased temperature;
increased evaporation;
increased condensation nuclei/cloud cover; 2
[**R** reference to wind (not in table)]

(ii) (More) cloud cover;
traps/prevents escape of heat/IR/long wavelength;

reduced humidity;
lower heat capacity of drier air;

reduced albedo;
more energy absorbed; 2

[**A** smog = fog]
[**R** holds heat/specific heat capacity (not in table)]

(b) Energy conservation effect;; Max 2
eg
reduced heat release/generation/named energy conservation method;
less soot/smoke;
reduced evaporation from hot effluent water;

effect on data;;;
eg Max 3
reduced temperature;
changed frosts/snow/fog/cloud cover;
fewer condensation nuclei;
reduced precipitation/fewer days with precipitation MAX 4
[**R** GHG effects]

(c) Frost formation;
cold air under warm;
density difference;
less buoyant;
reduced wind velocity;
fog/mist formation;
increased albedo;
reduced temperature; MAX 2

Total marks = 10

Question 5

(a) (i) Correct area shaded; 1

(ii) Francis; 1

(iii) Turgo and Kaplan; 1

(b) Sunlight absorbed and converted to heat;
evaporation;
potential energy;
pressure differences produce winds; MAX 2
[**R** water cycle driven by the sun (need processes)]

(c) Surplus electricity/low (energy) demand allows water to be pumped up/ moved from bottom to top reservoir;
high (energy) demand, water flows down/potential energy transformed; 2

(d) (i) Lower energy density of named renewable energy resources/ high energy density of fossil fuels;
storage/weight/transport difficulties/quantity needed of named renewable energy resource; MAX 1

(ii) Mismatch to demand from named (intermittent) renewable energy resource/ fossil fuels always available; MAX 1

(iii) Named required energy <u>type</u> not available from <u>named</u> renewable energy resource; MAX 1

Total marks = 10

Question 6

(a) Chlorofluorcarbons/CFCs;
<u>nitrate</u> fertiliser use/named high temperature combustion process/ use of named equipment;
landfill sites/padi fields/coalmine ventilation/natural gas use(leakage)/ livestock farming; 3

(b) Increased evaporation (and subsequent precipitation)/changed wind patterns/ changed ocean current; 1

(c) Contracts on melting/expands on freezing/displaces liquid volume; 1

(d) *Quality of Written Communication is assessed in this answer.*

Impact of changed factors;;;;
- extinction/changed geographical range
- migration patterns
- range of tolerance
- enzyme inhibition
- named adaptations/lack of adaptation/speed of adaptation

Max 4

Factors changed by GCC
- named abiotic factor;;
  - eg water supply, fires, temperature extremes, increased storm damage, flooding, erosion, melting of ice/permafrost/salinity/nutrients

Max 2

- named biotic factors;;
  - changed food supply
  - changed habitat
  - changed breeding sites
  - changed competition
  - changed inter-species relationship
    - eg pollination, seed dispersal, decomposition/nutrient release

Max 2

Taxa;;;;
- appropriate named taxonomic examples used to illustrate

Max 4

MAX 8

Quality of Written Communication

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.

MAX 2

Total marks = 15