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ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Education

Environmental Science 5441

ESC1 Energy, Atmosphere and Hydrosphere

Mark Scheme

2009 examination – January series

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Environmental Science

January 2009 **ESC1**

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

Question 1

1	Solar (power)/solar panel/sun**;** wave (power)**;** yes**;** yes**;** nuclear fission/radioactive decay (in mantle)**;** [**A** volcanic activity] [**R** heat]	5

Total marks = 5

Question 2

2	(a)	(12000/6=) 2000**;**		1
2	(b)	Rocks**:** calcium carbonate**;**		1
		Oceans**:** named hydrogen carbonate/hydrogen carbonate(ion)/carbonic acid/ dissolved CO_2**;**		1
2	(c)	(i)	Transparent to visible light/shortwave radiation**;** [**R** UV] ref to IR/longwave radiation**;** radiated from the earth**;** [**R** reflected] IR absorbed/converted to heat**;**	MAX 3
2	(c)	(ii)	Ozone/oxides of nitrogen/water vapour**;**	1
2	(d)	Stated change in rate of named process**;;;** eg rate of decay/respiration rate of photosynthesis reduced solubility of carbon dioxide reduced combustion for heating increased escape of CO_2 from oceans due to turbulence increased methane release increased release from ice melting		MAX 3

Total marks = 10

Question 3

3	(a)	Two processes named or described**;** which balance/amount of O_3 constant**;**	2
3	(b)	Absorbtion of UV/less UV reaches surface/UV blocked/O_3 layer protects from UV**;** prevents skin cancer/eye damage/other named damage**;**	2
3	(c)	CFCs**;** named activity using CFCs**;** chlorine released (from CFCs)**;** (chlorine) reaction with O/O_3**;** reduced ozone concentration/O_3 depletion**;** **OR** NO_x/water vapour**;** release from aircraft**;** O_3 depletion**;**	MAX 3
3	(d)	Montreal protocol**;** reduce/ban manufacture use of CFCs**;** use of named alternative material**;;** alternative activity**;;**	MAX 3

Total marks = 10

Question 4

4	(a)	A F C D	2 for 1 mark, 4 for 2 marks	2
4	(b)	Problem; Expansion; eg lowered water table; drying of surface; named surface feature/river/lake/marsh; **OR** saline incursions; water non potable/not drinkable/unsuitable for irrigation; **OR** subsidence; named effect on surface features;		MAX 2
4	(c)	No reservoir; causing surface disruption/cost of dam construction/causing low flow; **OR** less pollution/low turbidity/low microbe level; less exposure to pollution at surface; natural filtration/less treatment (costs); **OR** underground store; reduced evaporation/less losses;		MAX 2
4	(d)	Low rate of exchange/long residence time/flow rate/dispersal;		1
4	(e)	Process; Description;; reverse osmosis; high pressure; partially permeable membrane; filtration; separates salt from water; **OR** distillation; heating; reduced pressure; evaporation/boiling; vapour collection/condensation; separates salt from water;		MAX 3

Total marks = 10

Question 5

5	(a)	Screening**;** anaerobic/sludge digestion**;**		2
5	(b)	(i)	Static/slow flow**;** separation/removal of organic solids**;** [**R** sediments/inorganic]	2
5	(b)	(ii)	Removal of phosphates**;** addition of iron sulphate**;** Disinfection/removal of bacteria/pathogens**;** microstraining/UV/chlorine/O_3**;** Reedbeds**;** nutrient absorbtion**;** [**A** process + description or 2 processes]	MAX 2
5	(c)	Up to 2 for named methods**;;** up to 2 for advantages**;;** up to 2 for disadvantages**;;**		MAX 4

eg dumping at sea
incineration
landfill
use as fertiliser

named pollution risk (including health risks and odours)
energy use
energy produced
cost
biofuel/food production
bulk/volume reduction

Total marks = 10

Question 6

6 (a) Advantage with correct comments related to offshore/onshore windfarms**;;;**

eg wind speed
wind reliability
noise
aesthetics
ecological impact
named cost
access/maintenance/construction
land use conflict MAX 3

6 (b) Differential solar heating of atmosphere/surface**;**
pressure differences**;**
balancing air movements/convection currents**;** MAX 2

6 (c) Up to 6 features of energy resources**;;;;;;**
up to 4 resources to illustrate features**;;;;**

reliability
intermittency/predictability
other local geographical constraints
energy density
energy form
level of technological development
ease of storage
ease of transport
cost of infrastructure
public opinion/difficulty of changing public attitudes
environmental impacts
land use conflicts MAX 8 + 2

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