AQA

ASSESSMENT and
QUALIFICATIONS
ALLIANCE

Mark scheme
January 2004

GCE

Environmental Science

Unit ESC1

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

Question 1

(a)   Temperatures:
        High specific heat capacity of water/warms up/cools down slowly/retains heat;
        reduced temperature extremes/more stable/temperatures moderated;
        cooler when normally hot e.g. day/summer;
        warmer when normally cold e.g. night/winter;
        reduced temperature due to increased cloud cover/increased albedo/reflection;
        cooler due to increased winds/wind chill/wind creates increased temperature gradient;
        [**R** reservoir reflects sunlight]   MAX 2

(b)   Wind speed:
        Reduced friction of water surface/reduced turbulence;
        increased wind speed;   2

(c)   Insolation:
        Increased evaporation/increased cloud cover;
        reduced insolation/greater albedo;   2

                                                                                    Total marks = 6
_____

Question 2

(a)   Layer **A**:   Stratosphere;
        Boundary **B**:   Tropopause;   2

(b)   Negative correlation/pressure drops as altitude increases;   1

(c)   Energy/UV/electromagnetic radiation from above/sunlight;
        absorbed by ozone/chemical reactions;   2

                                                                                    Total marks = 5
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Question 3

(a) $380 = (420 + 70) - 110$;

   OR

   $380 = 420 - (35 + 5)$;   1
   [calculation not required for mark to be awarded]

(b) $\dfrac{140\ 000}{420} = 3333$ years / 3.333×10^3 years   1

   [**A** alternative stated time periods]
   [**A** answer without years]

(c)   Limestone/chalk/sandstone;   1

(d)   (Dissolved) salts/chemicals/pollutants;
   (osmotic) dehydration/salinization/specific e.g. of damage;
   access problems – depth; drilling/pumping costs
                      hardrock; drilling/pumping costs
   aquifer non recharge;
   depletion;   2
   [**A** seawater (in groundwater)]
   [**R** not sterile/clean/pH/lack nutrients]

(e)   Change in:
           evaporation/runoff/transpiration/percolation/infiltration/other process;
   linked to
   change in:
           water table/soil moisture/river water/atmospheric water vapour/biota/other reservoir;
                                                                                                        MAX 1

                                                                                      Total marks = 6

Question 4

(a)   (i)   400 ;   1

        (ii)   140 ± 20 ;   1

(b)   Both increase;
biomass at even rate/slower rate;
solar/wind at increasing rate/faster rate;
solar-wind > biomass;
biomass increasing slower/solar-wind increasing faster;
accurate figures for both;   MAX 2

(c)   Resource depletion/exhaustion/used up; non renewable/finite/slow replacement;
reserve fragmentation; and explanation; related to mining problems;
reserve depth; related to mining problems;
reserve thin deposits; related to mining problems;
pollutant control/effect; e.g. of pollutant;
habitat damage; and ref. to unacceptable damage;
named less damaging alternative; and explanation of why it is better;
[**A** other valid alternative]
                                    2 + 2   MAX 4

(d)   Any two suitable examples:
coppiced willow/hazel/wood;
sugar cane;
sugar beet;
Miscanthus/pampas grass/elephant grass;
cassava/manioc;
vegetable oils/oilseed rape/sunflower/other e.g.;   MAX 2
[**R** hay/grass/manure/general crops/straw]

(e)   Energy density/intensity;
many are liquids/gases;
can be stored;
controllable supply/no fluctuations;
chemical energy – similar to existing fuels;
predictable supply;
similar engines/technology;   MAX 2

(f)   Increasingly uncompetitive financially;
reactor safety concerns;
public opposition;
development of viable alternatives;
waste disposal problems/time scale/e.g. of health problems;
a complicated technology/infrastructure;   MAX 2
[**R** large waste quantity]

Total marks = 14

Question 5

(a)   Nitrogen;
        20 – 21%;
        0.025 – 0.04%;
        [**A** ppm equivalents]
        O_3;   4

(b)   Water vapour:
        variable rates of evaporation/evapotranspiration/condensation/variable saturation;
        affected by (changes in) temp/other specific climatic factor;   1

        Ozone:
        varying rates of formation/destruction/varying sunlight/UV/pollution/dust/seasonal
        change/ice crystals/CFCs/NO_x/altitude/latitude;   1

                                                                    Total marks = 6

Question 6

(a)   (i)   Turbines:
                absorb/convert kinetic energy of steam/high pressure of steam;
                (to KE of) generator;   2

        (ii)   Condenser:
                convert steam to water;
                by absorbing heat/cools down steam;
                so it can be re-used/recycled/not wasted;   MAX 2

(b)   Pumped storage HEP;
        potential energy;
        2 way flow of water/pumped up and flows down;
        OR
        Hydrogen;
        electrolysis of water;
        chemical energy;   MAX 2
        [**R** batteries/steam storage/waste gas storage]

(c)   Solvent/dissolves materials/neutral pH;
        good radiation absorption/heat absorption/high heat capacity;
        change of state/BPC;
        high heat capacity/ability to absorb heat/high latent heat of vap;   1 + 1

                                                                    Total marks = 8

Question 7

(a)   Carbon dioxide;
methane;
CFCs;
ozone;
oxides of nitrogen;   MAX 2
[**A** formulae]

(b)   Absorb terrestrial/infra-red radiation/longwave radiation;
convert to heat;
does not escape to space/reduced rate of escape;   2
[**R** ozone depletion answers]

(c)   Warming of oceans/seawater/water;
expansion of oceans;
melting of land-ice/glaciers/icebergs;
flows into sea/addition of extra water (from land);   MAX 3

(d)   Changes in up to 3 named processes:
melting/evaporation/transpiration/infiltration/percolation/precipitation/atmospheric
transport/condensation/other named process;;;

changes in up to 3 named storage reservoirs;;;

changed residence time;
changes transfer/movement rates;
dynamic equilibrium;
kinetic theory;
hydrogen bonding;   MAX 8

Total marks = 15