2012 Managing Environmental Resources

Higher

Finalised Marking Instructions

Managing Environmental Resources
Higher

Section A

Question 1

(a)	**(i)**	Non renewable – finite resource not replaced in a human lifetime/takes millions of years to replace **(Both)**	**(1)**
	(ii)	Will go to landfill so resource/energy lost forever/takes long time to breakdown or burning releases emissions	**(1)**
	(iii)	Increasing demand for cars/other forms of transport/greater use of airlines for travel **And** More fuel oil required by industry to meet demands/demand from domestic sources has increased **(Both)**	**(1)**
(b)	**(i)**	10,200	**(1)**
	(ii)	Life cycle (analysis)/LCA	**(1)**
(c)	**(i)**	Prevention or minimisation should be mentioned + don't buy product/is there a need to purchase/don't buy goods with excess packaging/don't add on extra packaging	**(1)**
	(ii)	Recycling points/centres/bottle banks/kerbside collections/special uplifts/education/publicity/fines for not recycling **(Any 2)**	**(1)**
	(iii)	Compost waste food/feed to a wormery/food waste bins/use as biomass fuel	**(1)**
	(iv)	Environmental Protection Act 1990/polluter pays/landfill tax	**(1)**
			(9)

Question 2

(a) Land – quarrying/open cast mining/landfill site/industrial site
Air – use of catalytic converters/people use more public transport/car share/park and ride/increase in tax
Water – eutrophication/algal blooms + buffer zones/reduced use/control of use of fertilisers/designation as NVZ or NSA **(2)**

All four = 2 marks
3/2 = 1 mark

(b) **(i)** National **(1)**

(ii) Environment – pro-active in providing environmental protection from pollution to keep our environment clean/employs a range of experts to help protect the environment/monitor pollution/education.

General public – regulates activities that may pollute communities or specific example/responds to reports of pollution incidents/runs floodline

Industry – guidance/advice on best practice/help comply with regulations **(2)**

All three = 2 marks
2/1 = 1 mark

(iii) Higher rainfall as a result of global warming/climate change may cause rivers to swell and flood low lying areas/higher temperatures melting ice as a result of global warming/climate change may result in rising sea levels. **(2)**

(iv) SEPA must be able to respond to/give advice on a wide range of environmental impacts affecting the air/land/water so must have a wide range of specialists to respond to these needs. **(1)**

(c) **(i)** To determine if an activity is having a detrimental effect upon the environment/keeping within the statutory guidelines/improve current practices or give advice **(1)**

(ii) Through legislation/by fining/power to shut down business **(1)**

(10)

Question 3

(a) **(i)** Nuclear – reliable/long lasting/no emissions/high energy output compared to other fuels/cleaner compared to fossil fuels.

(Any two) 1 mark

Wave – not constant/unreliable/low power output compared with alternatives/unsightly if lots needed/negative impact on habitats or wildlife or specific example.

1 mark **(2)**

(ii) ELDC – uses wood/dung/biofuel or specific example on large scale relative to other energy resources

1 mark.

EMDC – uses wood chips/biofuel crops or example – willow, poplar, hemp, miscanthus, sugar cane/crop residue or straw on much smaller scale relative to other energy resources.

1 mark **(2)**

(b) **(i)** Label & scale (0 – 450) on vertical axis **1 mark**
Labels on horizontal axis and complete key **1 mark**
Data added for biofuels only **1 mark** **(3)**

(ii) Increasing apart from dip in hydro generation in 2006 **(1)**

(c) Permission for large scale dams controlled/objections from public to flooding scenic areas/habitats. **(1)**

(d) Scottish Renewables Obligation/SRO **(1)**

(e) Turn down thermostat/showers not baths/provide good insulation/example of good insulation/reduced use/switch off remotes/energy efficient appliances.

(Any 2) **(1)**

(f) Sulphur dioxide/carbon dioxide/oxides of nitrogen and react with/dissolve in rain water to form weak acid/acid rain **(1)**

(12)

Question 4

(a) **(i)** Mudflats/river/estuary/footpath/trees/river bank/water NOT farmland
(Any 3) **(1)**

(ii) Provision of bird hides/no footpaths in sanctuary
Separation of sanctuary and shooting area **(1)**
(Both)

(iii) Protection provided for wildfowl in the sanctuary area by LNR status/byelaws and provision of area for local shooters of wildfowl for recreation **(1)**

(iv) Ranger service/guided walks/education/use of remote cameras/restricted access during breeding season/maintain footpaths/use of signs. **(1)**
(Any 2)

(b) **(i)** (Plant) plankton **(1)**

(ii) Feeds on plankton/eaten by heron/lives in basin/on the shore **(1)**
(Any 2)

(iii) Plankton – shore crab, lugworm, mud shrimp, mud snail
Lugworm – curlew, redshank
Mudshrimp – curlew, redshank
Mudsnail – redshank, eel, shelduck
Eel – heron, osprey **(1)**
(Any one)

(iv) Pyramid drawn correctly with appropriate example from food web placed at appropriate trophic level
- Plankton-mudsnail-eel-heron/
- Plankton-mudsnail-eel-osprey **(2)**

(c) **(i)** Complete all three statements = **2 marks**
Complete 2/1 statement = **1 mark** **(2)**

1	Ducks below 55cm in body size	go to 2
	Ducks 55cm and above in body size	go to 3
2	**Short stubby beak or chestnut brown head**	**Wigeon**
	Long wide beak or brown/green head	**Teal**
3	Head colour of male dark green	**go to 4**
	Head colour of male black and white	**Eider**
4	**Red beak**	**Shelduck**
	Yellow beak	**Mallard**

Type of feeding not acceptable

(ii) Herbivore only eats vegetation e.g. Wigeon which feeds on eel grass and seaweed.
Omnivore feeds on both plant and animal material e.g. Teal eats seeds, larvae and snails. **(1)**

(d) Species once native to Scotland became extinct here and so have to be replaced by animals from other countries /to increase biodiversity/ to help control populations of other species or named organism. **(1)**

(e) Possibility of bioaccumulation along food chains resulting in the death of carnivores at the top of the food chain.
/herbicides may be non discriminatory and may kill off species on which other organisms depend. **(1)**

(14)

Question 5

(a) **(i)** Lady's bedstraw - $\frac{10}{127} \times 100 = 7{\cdot}9/7{\cdot}87\%$ **(1)**

(ii) Bare ground may result from trampling by walkers (NOT track)/rainfall washing away soil and vegetation/landslip or soil creep resulting in erosion and exposure of bare ground. **(1)**

(iii) Repeat (along the same transect) and take an average. **(1)**

(iv) Wind speed/wind direction/salinity/soil moisture/soil pH/soil temperature/ light intensity. **(1)**

(Any 2)

(v) Slope – the steeper the slope the more likely that heavy rainfall/run off will erode the soil and wash away vegetation creating an unstable ecosystem.

1 mark

Geology – depending on the rock type and how easily it erodes the ecosystem may be more or less stable/ Harder more impermeable rock types would give more stable ecosystem as less likely to erode. **(2)**

1 mark

(b) Use a quadrat thrown at random in the area and count species number or percentage cover in quadrat.
Use a belt transect with sampling points at regular intervals and assess number of species or percentage cover within a quadrat/sample area. **(1)**

(c) Food availability/number of predators (NOT predators)/disease/mates. **(1)**

(Any 2)

(8)

Question 6

(a) **(i)** Sheep farming/beef farming/poultry/pigs/cows/hill/arable. **(1)**

(ii) Wheat/oats/barley/rye/maize/corn.

(Any 2) **(1)**

(iii) Increasing range of products/service provided from land or
Example = use of land for conservation/leisure & recreation/provision of farm shop/pick your own produce/B & B. **(1)**

(iv) Provision/extension of variety of habitats/buffer zones/beetle banks/set aside land/hedgerows/drystone dykes/woodland/unimproved grassland/ plant woodland/fruit trees/create ponds. **1 mark**

which creates food sources/nesting sites/shelter for a wider range of organisms so increasing biodiversity. **1 mark**

Or

Reduce/control the use of fertilisers/pesticides. **1 mark**

which could impact on certain species but also have 'knock-on' effects which reduce biodiversity. **1 mark** **(2)**

(b) **(i)** 6% /6.03%. **(1)**

(ii) Average herd size is increasing while number of dairy farms has fallen suggesting that it is economically more viable to have a larger herd/that farms with smaller herds are going out of business/more cows are needed to make a profit. **(1)**

(iii) Total milk production fell at the same time as the number of dairy cows fell **(1)**

(c) **(i)** Edaphic factors – soil moisture/soil pH/soil type/organic matter content/ parent rock type/nutrients or specific example/leaching. **(1)**

(ii) Climatic factors – temperature/precipitation (NOT rainfall)/wind speed/direction/humidity/sunshine. **(1)**

(10)

Question 7

(a)	**(i)**	Moorland or forest to energy resource/windfarm.	**(1)**
	(ii)	Building windfarm causes damage to the ecosystem **1 mark** land disturbance would disturb peatbog habitats/food resources/shelter/ drive species away/encourage erosion	**(2)**
	(iii)	Receipt of payment for having windfarm on their land/improved access/ bring in tourists.	**(1)**
	(iv)	More roads built/improvement to existing roads/car parks provided.	**(1)**
(b)		Glaciation/deforestation/afforestation/building of reservoir/grouse moor/ peat cutting .	**(1)**
(c)	**(i)**	Town & Country planning Act.	**(1)**
	(ii)	Allows for objections/views of the community or LAs to be raised/support to be gauged to the projected land use change.	**(1)**
	(iii)	RSPB/SWT/NFU/NTS/Gamekeepers Association/FoE/Greenpeace.	**(1)**
	(iv)	Social – increased leisure & recreation opportunities/local jobs created during/beyond construction/cheaper electricity for local community. Aesthetic – loss of scenic value/improvement in appeal of the area. Ethical – good for the environment as provides a renewable source of energy/destruction of moorland/natural habitats unacceptable/potential harm to certain species unacceptable/improved education on renewables. **(All three = 2marks)** **(2/1 = 1mark)**	**(2)**
	(v)	Solar panels/use of sustainably resourced building materials/use of renewable technology/triple glazing/powered by wind turbines/recycling bins/sell or use local/organic produce.	**(1)**
	(vi)	Public still wary of renewable technology and need to see benefits before they accept/invest in it so that future generations benefit/have access to same resources as at present.	**(1)**
(d)		Conflict must mention two groups and the issue. Resolution must be appropriate to the issue.	**(1)** **(1)**
(e)	**(i)**	215 turbines producing 593 MW = 2.76 or 2.8 MW.	**(1)**
	(ii)	Less oil and gas being used up/burned/in line with Scottish government policies supporting renewables and reducing dependency on fossil fuels.	**(1)**
			(17)
		Total	**80**

Section B

Question 8A

Describe the energy conversion and transfer processes occurring in ecosystems under the following headings:

(a) Photosynthesis; **5**
(b) Energy efficiency in food chains; **5**
(c) Decomposition. **5**
(15)

(a) Photosynthesis

- Is the conversion of light energy into chemical energy.
- Word or chemical equation
  e.g. $CO_2 + H_2O$(+light energy + chlorophyll) $\rightarrow C_6H_{12}O_6 + O_2$
  Carbon Dioxide + water (+light energy + chlorophyll) $\rightarrow$
  Carbohydrates/sugar/glucose + oxygen

  (All correct =2 marks)
- Takes place in autotrophs/green plants containing the green pigment chlorophyll,
- chlorophyll is able to trap light energy.
- Photosynthetic plants and algae capture only approx 1% of available solar energy.
- Is the conversion of carbon dioxide into organic compounds or examples such as glucose/sugars/starch which store energy.
- Photosynthetic plants and algae are autotrophs i.e. they can produce their own food for storage/respiration or pass on to non-photosynthesising organisms/heterotrophs.
- Carbohydrates are broken down to release energy through respiration process.

5

(b) Energy efficiency in food chains

- A food chain shows the energy links at each trophic level/between autotrophs and heterotrophs/between producers, primary and secondary consumers.
- Example of a food chain + arrows show energy flow
- Autotrophs capture only a small percentage (approx 1%) of available solar energy.
- Around 90% of available energy is 'lost' at each link in a food chain,
- Energy lost through heat loss, movement and indigestible waste.
- Only around 10% of available energy for use by a heterotroph.
- Heterotrophs have to eat large numbers of producers/prey to gather sufficient energy to survive and thrive or pyramid used to show this
- Most food chains have a maximum 3-4 links (occasionally 5) before the energy obtained from the autotroph (the primary productivity) runs out.
- Feeding on lower trophic layers or autotrophs increases energy efficiency/ a herbivore or an omnivore will have access to more energy than a top carnivore.

5

(c) Decomposition

- Decomposition is the process whereby organic matter is broken down into simpler compounds
- to recycle its nutrients/chemicals/energy or example of nutrient cycling.
- It is carried out by a range of decomposers: scavengers, detritivores and saprophytes
- which use the energy to fuel respiration/respiration equation.
- Scavengers break dead animal matter (carrion) into smaller fragments and include larger organisms such as hyenas, buzzards and crows and also certain types of flies.
- Detritivores eat dead plant matter and include millipedes, woodlice, slugs, earthworms etc.
- Bacteria and fungi are main decomposers
- Organisms which absorb nutrients rather than actively consume them are known as saprophytes and include fungi and bacteria. **5**

Question 8B

Describe population dynamics under the following headings:

(a) Density dependant factors; **5**
(b) Natural environmental regulation; **5**
(c) Succession. **5**

(15)

(a) Density dependent factors

- Includes disease/parasites; predation/predator/prey dynamics;/food availability; /food supply; competition for space; /human intervention.

. **must give at least three for 2 marks.**

- The higher the population, the more likelihood that density dependant factors have an impact
- Examples of impact on population size -

e.g. Disease – more likely cause losses in high density population/can cause severe weakening or loss of populations. May take years to recover.
e.g. Parasites – need a host to feed on. Do not usually kill the host but can severely weaken it, often allowing disease to take hold and kill so reducing population.
e.g. Predator-prey dynamics – predator breeding cycle closely related to prey availability e.g. snowshoe hare, coyote (generalist feeder) and lynx (specialist feeder, primarily snowshoe hare) and the population decrease will not be so dramatic as the lynx/diagram to show this.
e.g. Human intervention – pressures can cause habitat fragmentation. Populations in isolated patches may struggle to find sufficient food. Over time, gene pool may be severely restricted, resulting in inbreeding/possible extinction.

2 marks for each description from examples above **5**

(b) Natural environmental regulation

- Populations increase until they reach their carrying capacity
- Carrying capacity is the number of organisms the available resources in an area can support.
- Homeostasis -usually populations stabilise with only small fluctuations in numbers/diagram to show this.
- Density independent factors/natural disasters/example of disaster may result in a population crash.
- Where food supply is short competition can result in a drop in population numbers.
- The density of the population affects population size/a higher number of prey will be killed in dense population compared to one where the prey is widespread.
- When a population increases there is more competition for resources/space/territory/prey which results in a reduction in population size to what the resources can support

5

(c) Succession.

- Relates to changes in type of vegetation/number of species and number of each species over time in an ecosystem.
- Overall, change from predominantly bare ground to mature vegetation as soil structure develops.
- Pioneer species or specific examples named are first to invade bare ground
- Climax community forms the final stage in succession
- Example of succession e.g. woodland succession: colonisers (mosses, lichens) → pioneers (grasses, ruderals) → herbs → shrubs → trees (climax community).
- The population size of each species will vary with the existing conditions/abiotic factors in the habitat.
- Soil fertility and depth of soil improve water content, drainage, aeration and pH which can cause certain plant populations to increase/example
- Climax community has high biodiversity, high biomass, stable community.
- Succession can be primary or secondary/may be interrupted eg by farming. **5**

Question 9A

Scottish Forestry

- Forestry Commission is agency responsible for national forests.
- FC Scotland is a statutory agency/acts on behalf of the Scottish Government.
- FC promotes the use of timber as renewable energy source and sustainable construction material.
- FC promotes conservation/recreation/education
- Defination of sustainability
- Scotland has 47% of UK total of forestry and woodland.
- More coniferous than deciduous
- Coniferous mainly fast growing non-native species/examples.
- Trend towards more planting of native species as forest is cut and replaced.
- Forests located throughout Scotland, both small and large depending on location.
- Locations often remote/on land unsuitable for other uses.
- Historically massive deforestation to meet needs of war/industry/buildings etc.
- Forestry industry based on wood processing, forest management, wood haulage, associated industries (paper products, sawn wood, wood panels etc).
- Trends towards opening up FC areas for access by public/use in recreational activities.
- Examples – hiking, biking, horse riding, orienteering, motor sports etc.
- Provision of amenities to support recreation.
- Promotes the protection/maintenance of Scotland's native Scot's Pine forest.
- Scottish forestry strategy: Scottish Governments plan for next 50 years.
- Key themes: climate change, timber, community development, environmental quality, business development, access and health, bio-diversity.
- Certification schemes: UK Woodland Insurance scheme – reflects requirements of both UK forestry standard and Forest Stewardship Counsel.
- Timber carrying FSC certificate/logo supports sustainability/is guaranteed to be from responsive harvested and verified sources.
- Scottish Forestry Grant Scheme, Woodland Grant Scheme, Forrest Plan all now closed and replaced by Scottish Rural Development Program (SRDP).
- Grants relating to woodland creation, sustainable management, improvement of existing woodlands, management of ancient woodlands, improving economic value of woodland, short-term coppicing (biomass crops).

(15)

Question 9B

Scottish Industry

Historical aspects up to 4 marks

- Was once widespread throughout Scotland but now mainly small scale.
- No longer much traditional heavy industry in Scotland.
- Dependence upon coal as an energy source
- Examples of heavy industries (local or national) giving location and products e.g. coal industry, iron and steel manufacture, cotton mills.
- Has been decimated by cheaper imports.

- Examples in changes in industry e.g. diminishing fishing industry and specialisation, open cast mining.
- Increase in industrial estates close to towns/areas of denser population e.g. Central belt/relocation of industries/changes in manpower.
- Traditional industries adapting e.g. whisky production/forestry/fishing/agriculture

- Examples of current industries up to 4 marks.
  - Chemicals, pharmaceuticals, plastics.
  - Biotechnology.
  - Building products, paint, ink, coatings, glass, print.
  - Fashion, textiles.
  - Food.
  - Drink.
  - Service industry.
  - Science and engineering – aerospace, cars, bioscience, electrical, electronics, marine, mechanical, metals, engineered metal products.
  - Energy related industry – oil and gas based; renewables.

  Marks awarded for detailed descriptions of industries from the local area

- Current practices up to 7 marks

  - Definition of sustainability
  - Reduction of impacts on pollution/greenhouse gas emissions/global warming
  - Polluter pays.
  - Duty of care.
  - Energy management planning.
  - Modification of production processes/use of scrubbers/pollution checks.
  - Control of emissions/effluents/SEPA.
  - Eco-management and Audit Schemes (EMAS).
  - Examples of sustainable practices – recycling/less packaging/effective use of waste products/sourcing energy from renewables.
  - Waste disposal.
  - Research
  - Buy out/take over to improve efficiency **(15)**

End of Section B

Total 30

[END OF MARKING INSTRUCTIONS]