



Rewarding Learning

ADVANCED

General Certificate of Education

20XX

Environmental Technology

Unit AS1: The earth's capacity to support human activity
– an introduction to sustainable technologies

Time allowed 1 hr 30 min hours

Please answer all questions

Q1(a). List 4 uses of fossil fuels in modern day life.

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.....[4]

(b) Discuss 2 pieces of evidence presented by the global scientific community linking the combustion of fossil fuels with global warming and climate change

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.....[6]

[10]

Q5 (a) Identify the renewable energy sources illustrated in figure 6.1 and 6.2 below.



www.zeroemissionproject.com/blog/article/40/do-ph...
www.bing.com/images/search?q=%E2%80%A2%09oscilating+wave+surge+converter&qo=&form+QBIR&gs+n&sk+&sc+1-34

Fig 6.1 Source 1

Fig 6.2 Source 2

Source 1
.....[1]

Source 2
.....[1]

(b) (i) Explain what is meant by the law of Conservation of Energy
.....
.....[2]

(ii) With reference to the energy changes involved, describe how electricity is generated from one of the above sources.
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.....
.....[2]

[6]

Q6 (a) Identify the two main areas of pollution difficulties associated with the use of plastics derived from fossil fuels

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.....[2]

(b) Photodegradable plastic is used in Northern Ireland Agriculture. Give **two** applications for photodegradable plastic and for each state the advantages to the crop and to the environment?

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.....[4]

(c) Describe in outline only how Bioderived polyethylene (BPE) is produced?

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.....
.....[3]

Mark Scheme

Q1(a) Any 4 from

Power [1]

Transport [1]

Plastics [1]

Pharmaceuticals [1]

Fibres [1]

[4 marks]

(b) Any 2 from

Weather patterns; Floods; Increased storms; famines; Sea temperature rises; Ecology changes; Polar ice caps melting; Rise in sea levels

2 x [3 marks]

Some elaboration expected, e.g. description of trends over a period of time, type of scientific evidence collected, evidence verified by a variety sources

Total 10 marks

Q2 Any 2 from Brazil [1], India [1], China [1], Russia [1]

[2 marks]

Reference to, increased energy use for transportation, industrial growth, increased standard of living will drive up fuel demands.

Effects – increased emissions/pollution, increased fuel demands will drive up prices and put pressure on existing supplies, potential for political destabilisation, pressure to locate new resources in protected/inaccessible areas, environmental impact of accessing reserves e.g. impact of deep sea drilling, fracking, pressure on countries to secure fuel supplies

[2 x 4 marks]

Total 10 marks

Q3

Answer must make reference to the diagram and include the following;

(i) The grid power system is managed by computer networks, [1] All devices from power station down to the plug in a house is online and controlled and monitored.[2]. All major plants are monitored and controlled as to what role they carry out i.e. sending power to meet actual demand rather than predicted demand [1].

(ii) The grid power system is managed by computer networks which deliver power to each point as required allowing for intermittent renewable power sources into the grid network [1]. As intermittent renewable energy sources come online to the grid network, the Smartgrid computers manage the fossil fuelled power sets [1] and distribute energy in exact quantities [1] to wherever there required hence reductions in fossil fuel use is curtailed and pollutant limits are reduced [1].

[8 marks]

Total 8 marks

Q4

Pumped hydro storage [1 mark]

Explanation of how it works to include

It utilises renewable energy to pump water up to the high dam/reservoir [2]

It uses the gravity fed [1] water supply to turn the turbines [1] whenever there is a lull in renewable power [1] [5 marks]

Total 6 marks

Q5

(a) Source 1 PV solar [1] Source 2 wave [1] [2 marks]

(b) (i) Law of Conservation of Energy

Energy cannot be created or destroyed but it can be transferred or transformed from one form to another [2 marks]

(ii)

PV Solar

Direct solar (light) energy strikes solar panel and generates an electrical current [2 marks]

or

Wave energy

Wind creates waves on ocean, the moving (kinetic) energy of the waves is converted to electrical energy through a generator built into the wave device [2 marks]

Total 6 marks

Q6

(a) cannot be broken down by micro organisms [1], incineration produces toxic materials [1] [2 marks]

(b) Applications (1 mark each), advantages (1 mark each)

- plastic baling twine [1] – if eaten will degrade in the dung, will also degrade if not collected [1]
- plastic mulch used as growth promoter for saplings in forestry of poor land [1] – allow soil to be stabilised whilst sapling takes root in otherwise unstable soil [1]
- coatings for slow release fertiliser/pesticide pellets [1] – controlled release of active agent, particularly where risk of leaching/run-off is high [1]
- germination enhancing in Maize [1] – where soil temperature is raised above the ambient seasonal temperatures, thereby speeding up germination rate [1]
- solarisation [1]– where plastic over film builds up heat up to temperatures harmful to soil pathogens. [1] [4 marks]

(c) Ethanol is made from fermentation of crop biomass, e.g. sugar cane or corn [1]

Ethanol then converted to ethylene by hydration using phosphoric acid [1]

Ethylene is then polymerised by addition polymerisation under high temperature and

pressure conditions [1]

[3 marks]

(d) Stage 1: d₂w additive is included in the basic polymer resin during the manufacturing process [1]

Stage 2: d₂w breaks the molecular chains so that at the end of its predetermined service life the plastic starts degrading in the presence of oxygen by a process of oxidation, which is accelerated by light, heat and stress [1]

Stage 3: bio-degradation is completed by micro-organisms [1]

[3 marks]

Total 12 marks