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Total marks — 100 marks

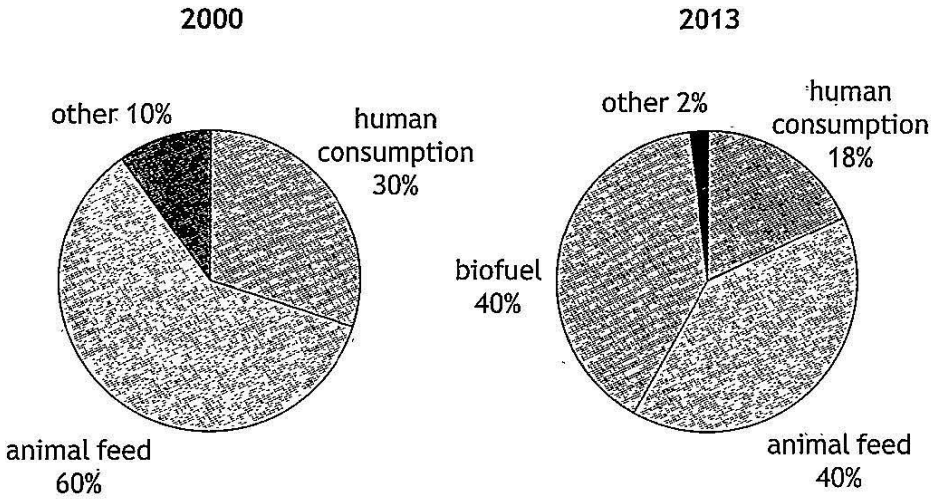
Attempt ALL questions

Questions 10 and 11 each contain a choice

1. Corn, also known as maize, is one of the most widely grown crops on the planet.

   (a) The pie charts show global changes in the percentage uses of corn between 2000 and 2013.

Percentage uses of corn



(i) State what is meant by *biofuel*. 1

A fuel that is used for biological purposes

(ii) Describe fully the changes in the percentage uses of corn between 2000 and 2013. 2

Other uses was at 10% in 2000, it dropped by 8% in 2013 to only 2%

Animal feed dropped 20% from 2000 to 2013

human consumption dropped 12% from 2000 to 2013

animal started at 60% in 2000, then dropped to 40% in 2013

A new use of corn was measured in 2013, biofuel, which starts at 40%

human consumption started at 30% in 2000, then dropped to 18% in 2013

MARKS | DO NOT WRITE IN THIS MARGIN

1. (a) (continued)

(iii) State **one** advantage to the farmer of growing corn for biofuel. 1

Increased income as more people would want to buy corn for biofuels rather than just food.

(iv) State **one** disadvantage to the consumer of corn being grown for biofuel. 1

lack of food as the corn is being used for biofuels rather than consumed.

(b) A biofuel plant in the USA processes the corn into bioethanol:

- Up to 220 truckloads of corn are delivered each day
- Each truckload contains sufficient corn to produce 2800 gallons of bioethanol
- 110 million gallons of bioethanol are produced each year at the plant.

Calculate, to the nearest whole truckload, how many truckloads of corn must be processed to yield 110 million gallons of bioethanol. 1

Space for calculation

1 → 2800

$\frac{110000000}{2800} = 39285.714285$

$= 39288$ truckloads

[Turn over

MARKS | DO NOT WRITE IN THIS MARGIN

1. (continued)

(c) Biofuels produced from crops are often said to be *carbon-neutral*.

The term *carbon-neutral* implies that there is no net release of carbon dioxide into the atmosphere and therefore does not contribute to global warming.

The claim that biofuels are carbon-neutral could be disputed.

Suggest **one** reason for and **one** reason against the claim. 2

For - the production of biofuels are carbon-neutral as the carbon is cancelled out.

Against - When burned, biofuels release CO_2

(d) Describe, using a named example, a legislative role that Government plays in food production. 2

Fishing Seasons - allows fish stocks to recover due to only allowing fish to be caught in certain months of the year.

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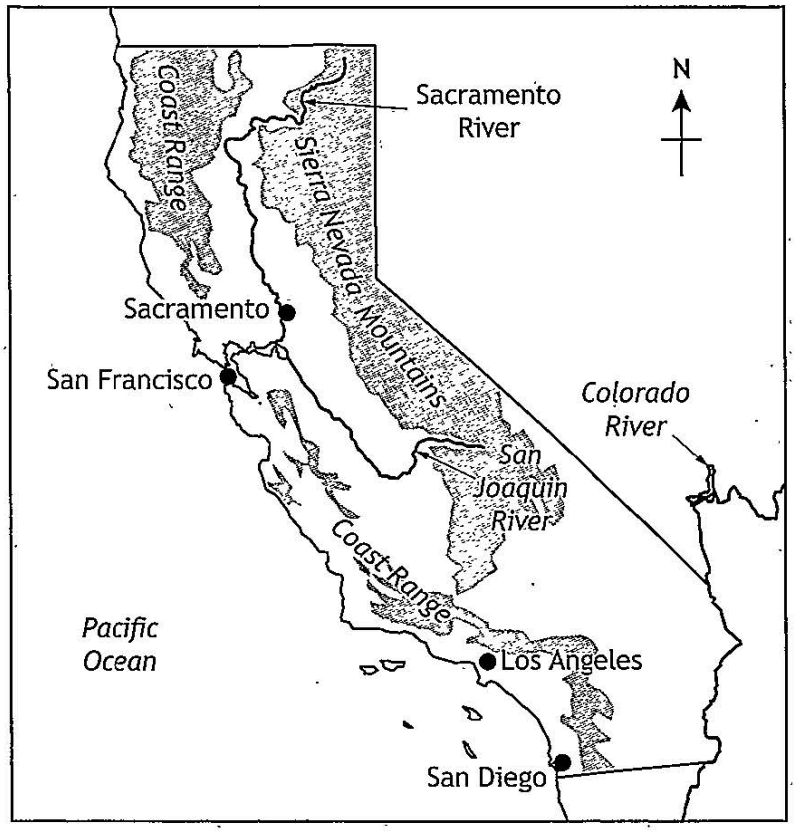
2.



California is the most populated state in the USA. Rain normally falls in California only during the winter and spring months. The coastal urban centres are supplied by a series of pipelines and canals transporting water from snow melt and streams from the Sierra Nevada mountains. This is supplemented by aquifers near the coast.

(a) Suggest a possible impact of global warming on availability of freshwater from the following:

(i) the mountains; 1

Other mountains increases demand for fresh water.

(ii) aquifers near the coast. 1

Melting of land based ice will increase the volume of water in the ocean i.e could flood the aquifers with sea water.

[Turn over

MARKS | DO NOT WRITE IN THIS MARGIN

2. (continued)

(b) The table displays data on water usage in California.

Sector	*Water usage in a normal rainfall year (%)*	*Water usage in a drought year (%)*
Urban	10	14
Agricultural	40	53
Environmental (maintaining river systems and wetlands)	50	33

Explain the changes in the water usage for each sector between normal rainfall and drought years. 3

In Urban sectors, water is used 10% in a normal rainfall year.
In a drought year, this number rises to 14%.

In Agricultural sectors, 40% of water is used in a normal rainfall year.
In a drought year, this number rises to 53%.

In Environmental sectors, 50% of water is used in a normal rainfall year.
In a drought year, this number drops to 33%

MARKS | DO NOT WRITE IN THIS MARGIN

2. (continued)

(c) Agriculture in California is located mainly in the valleys of the Sacramento and San Joaquin rivers and in the south by the Colorado River. California produces an estimated one-third of vegetables and two-thirds of fruit and nuts grown in the USA.

In the period 2011–2014, California experienced continual drought and farmers had to make choices as to which crops were viable.

(i) Suggest whether fruit trees or vegetables should get priority for irrigation during drought years.

Give a reason for your answer. 1

Vegetables, most likely to be sustained as they're easier to grow and have an efficient growth speed.

(ii) Farmers are turning to drilling wells to access water stored in aquifers.

Explain why this could be unsustainable. 2

Water will eventually run out and then the wells will have no purpose ∴ unsustainable.

(iii) Suggest **one** strategy that farmers could adopt to continue food production in areas subject to ongoing drought. 1

Drip irrigation

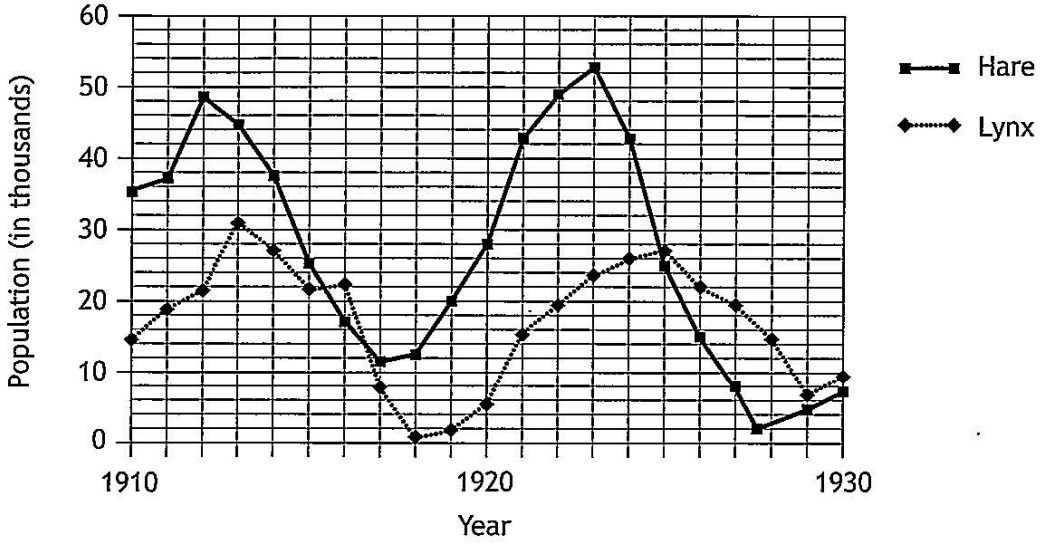
[Turn over

3. The snowshoe hare is a herbivore and is the principal prey of the lynx. MARKS DO NOT WRITE IN THIS MARGIN

Snowshoe hare

Lynx

The graph below shows cycles in the populations of snowshoe hare and lynx in northern Canada over a 20-year period.



(a) Explain how the data in the graph show that lynx predation of the hare is density-dependent. 1

the lynx can only change population levels when the hare is also changing ∴ dependent on the hare's density.

(b) Using information from the graph, explain why the evidence suggests that the hare is not the only food source for the lynx. 2

From the years of 1918 until 1923, both ~~organisms~~ populations increase so this means the lynx has another food source because if it didn't, the hare would decrease as the lynx population increases.

MARKS | DO NOT WRITE IN THIS MARGIN

3. (continued)

(c) Predict the effect that increased hunting of lynx by humans would have on the hare population cycle.

Explain your answer. 2

Increase as there would be less of a threat of predator :. here would survive longer.

(d) Explain what impact a crash in the hare population may have on local biodiversity. 2

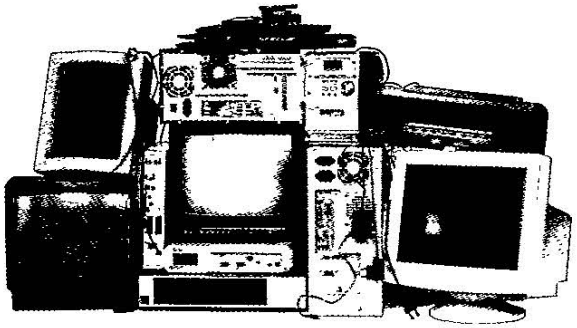
Increase as it is a herbivore so less hares means other organisms whom the hare would out-compete for food, they have the chance to feed and breed.

(e) There are proposals to reintroduce the European lynx into Scotland. Name **one** other previously extinct species that has been reintroduced into Scotland. 1

Beaver

MARKS | DO NOT WRITE IN THIS MARGIN

4. Product obsolescence refers to the time and state in which a piece of technology or a product ceases to be useful, productive or compatible.



There are different categories of obsolescence, including:

- **Technological** — a new technology or product supersedes the old, even if the old technology is still functional
- **Planned** — a product is deliberately designed to have an artificially limited lifespan
- **Psychological** — a consumer is persuaded that they need a new product even when their existing product is working well.

(a) The table shows the types of obsolescence associated with different products.

Product	*Technological obsolescence*	*Planned obsolescence*	*Psychological obsolescence*	*Designed to last*
Light bulb		✓		
Computer software	✓			
Mobile phone	✓		✓	
Luxury car eg Rolls Royce				✓
Printer cartridge		✓		✓

Complete the table to show which category each of the following would be most likely to fit into.

Justify your answers.

(i) Mobile phone 1

people want the latest model to make themselves seem up-to-date

(ii) Printer cartridge 1

the ink in the cartridge will run out eventually

MARKS | DO NOT WRITE IN THIS MARGIN

4. (continued)

(b) A computer manufacturer may use parts that have a lifespan of only a few years but are cheaper to produce than longer lasting parts.

(i) Describe **one** economic, **one** social, and **one** environmental outcome of this type of obsolescence. 3

Economic - Cheaper capital cost so can make more

Social - Need more employees to continue making the parts

Environmental - More parts = more rubbish, could be hard to dispose of these. Disposal of parts could add to global warming.

(ii) Describe a possible sustainable outcome for an obsolete computer. 1

recycle the computer and use the parts for a new model.

[Turn over

MARKS | DO NOT WRITE IN THIS MARGIN

4. (continued)

(c) Waste laptop batteries must be processed according to the EU's Hazardous Waste Directive. Transportation and disposal should only be carried out by a licenced waste carrier.

Other than the Hazardous Waste Directive, name another piece of waste management legislation. 1

Landfill Tax

MARKS | DO NOT WRITE IN THIS MARGIN

5. In 2010 the International Union for the Conservation of Nature (IUCN) identified species in danger of extinction.

The table shows the numbers of species identified in 2010 as being in danger of extinction, as a percentage of the number of species evaluated.

Group	*Number of recorded species*	*Number of species evaluated*	*Number of evaluated species in danger of extinction*	*Evaluated species in danger of extinction (%)*
Amphibians	6433	6351	2236	35
Birds	9998	9865	1381	
Fish	31 300	8814	1851	21
Invertebrates	1 305 300	9526	2858	30
Mammals	5501	5491	1131	21
Reptiles	9084	2829	594	21
Flowering plants	281 821	12 914	8781	68

(a) (i) Calculate the percentage of evaluated bird species estimated to be in danger of extinction. 1

Space for calculation

$\frac{1381}{9865} \times 100 = 14\%$

(ii) Suggest a reason why so few of the invertebrate species have been evaluated. 1

They are small so it would be hard to catch them to evaluate them.

[Turn over

MARKS | DO NOT WRITE IN THIS MARGIN

5. (continued)

(b) Flowering plants is the group with the highest percentage of species in danger of extinction.

State **two** ways in which intensive agriculture might have contributed to the endangered status of some flowering plants. 2

Intensive agriculture prioritises the plants wished to grow by the farmer so the others, especially the flowering plants will not receive nutrients or not as much needed to survive.
More space may be needed for intensive agriculture. This leads to destruction of habitat so will deplete flowering plants numbers leading them to become endangered.

(c) Scotland is home to six species of amphibian: three newts, two toads and one frog.

All these amphibians begin life as eggs laid in ponds and ditches, which hatch into tadpoles that initially feed on algae and invertebrates. Over a period of 4 to 18 months, the tadpoles metamorphose into adults. They then leave the water and become active terrestrial carnivores, feeding mainly on insects, slugs and worms. During winter they are found inactive in damp sheltered places under rocks and logs, or in mud at the bottom of ponds. They become sexually mature between the ages of three to five years, returning in early spring to breed in the pond where they hatched.

(i) Explain how the over-use of fertilisers could decrease amphibian populations. 2

Over-use of fertilisers could cause Eutrophication.
This is when fertilisers in the soil get rained on then the fertilisers run off and into a nearby river. The substance causes a reaction with the water :- causing Algal Bloom, this is a mass of Algae on the top of the water. They need a lot of O_2 to survive :- amphibians would decrease due to competition for oxygen.

MARKS | DO NOT WRITE IN THIS MARGIN

5. (c) (continued)

(ii) State **one** role of each of the following in the conservation of amphibians.

(A) SEPA 1

to educate the public on matters relating to the conservation of amphibians.

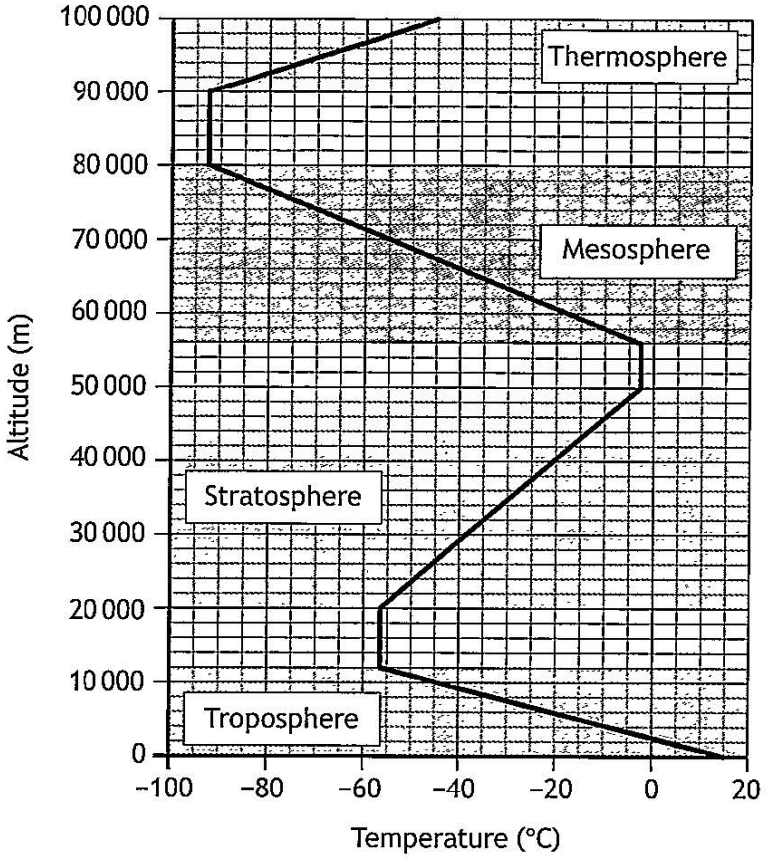
(B) SSSIs 1

Create a site which is illegal to harm in any way so it is left to grow naturally.

[Turn over

MARKS | DO NOT WRITE IN THIS MARGIN

6. The graph below shows altitude and temperature changes associated with the layers in the Earth's atmosphere.



(a) (i) Name the layer where most weather events take place. 1

Troposphere

(ii) After take-off, some aircraft climb rapidly to above 10 000 m.
Explain an environmental advantage in doing this. 2

less air resistance so less fuel is burned ∴ lower global warming.

MARKS | DO NOT WRITE IN THIS MARGIN

6. (a) (continued)

(iii) The Earth's atmosphere contains a high abundance of oxygen compared with other planets. This allows for the formation of ozone (O_3).

State where in the atmosphere the highest concentration of ozone is found. 1

Stratosphere

(b) Ozone is an example of a natural greenhouse gas.

(i) Name an anthropogenic greenhouse gas. 1

methane

(ii) Explain the contribution of this anthropogenic greenhouse gas to the enhanced greenhouse effect. 3

Methane is often a by-product ~~to~~ many industrial processes. Loads of industries do not know how to correctly dispose of this gas so they just release it. This adds to the greenhouse effect and can contribute to global warming.

MARKS | DO NOT WRITE IN THIS MARGIN

7. The proportion of a country's population living in either urban or rural locations changes over time.

(a) Scotland saw considerable urban growth during the 18th and 19th centuries.

State **two** factors that contributed to this change. 2

Social - more chance of work and a better lifestyle

economical - more wealthy people were located in cerben areas.

(b) Between 2001 and 2010, the rural population of Scotland increased by approximately 10% and the urban population increased by 1·7%.

Suggest **two** reasons why the rural population has increased at a greater rate than the urban population. 2

less ~~[illegible]~~ housing in urban areas so people would live rurally than commute to their work.

Rural living is more healthier due to the fumes and gases or industry in urban areas.

(c) Suggest an environmental advantage of urban living, in terms of:

(i) waste; 1

easy to get rid of, more landfills nearby.

(ii) domestic energy. 1

~~[illegible]~~

higher rate of energy as there are more energy plants in urban areas.

MARKS | DO NOT WRITE IN THIS MARGIN

7. (continued)

(d) Explain the impacts that the development of road transport links has on biodiversity. 3

Decreases as room has to be built for these links so it will usually be greenfields. Destruction of ~~of~~ organisms' habitats will decrease biodiversity as they will not have a home and could die during the destruction process.

Having no nest means they're more susceptible to predators which also decreases biodiversity.

The prey or the predator will soon run out then they die out leaving no biodiversity at all.

(e) Changes in land use, such as developing new transport links, requires environmental assessment.

(i) State the purpose of environmental assessment. 1

to ensure minimal damage is done environmentally in the ~~to~~ ~~use~~ change of land use.

(ii) Describe the difference between an EIA and SEA. 1

The EIA covers environmental assessments whereas SEA covers social.

[Turn over

MARKS | DO NOT WRITE IN THIS MARGIN

8. India has the world's second largest population, with over 1·3 billion citizens. This is currently increasing by 1·41% per year. Since the 1960s, the country has introduced a range of strategies to improve crop yields and improve food security.

(a) Name a global strategy used for increasing land-based food production and another strategy used for increasing aquatic food production. 2

G.M Crops - Land

High Density Cages - Aquaculture

MARKS | DO NOT WRITE IN THIS MARGIN

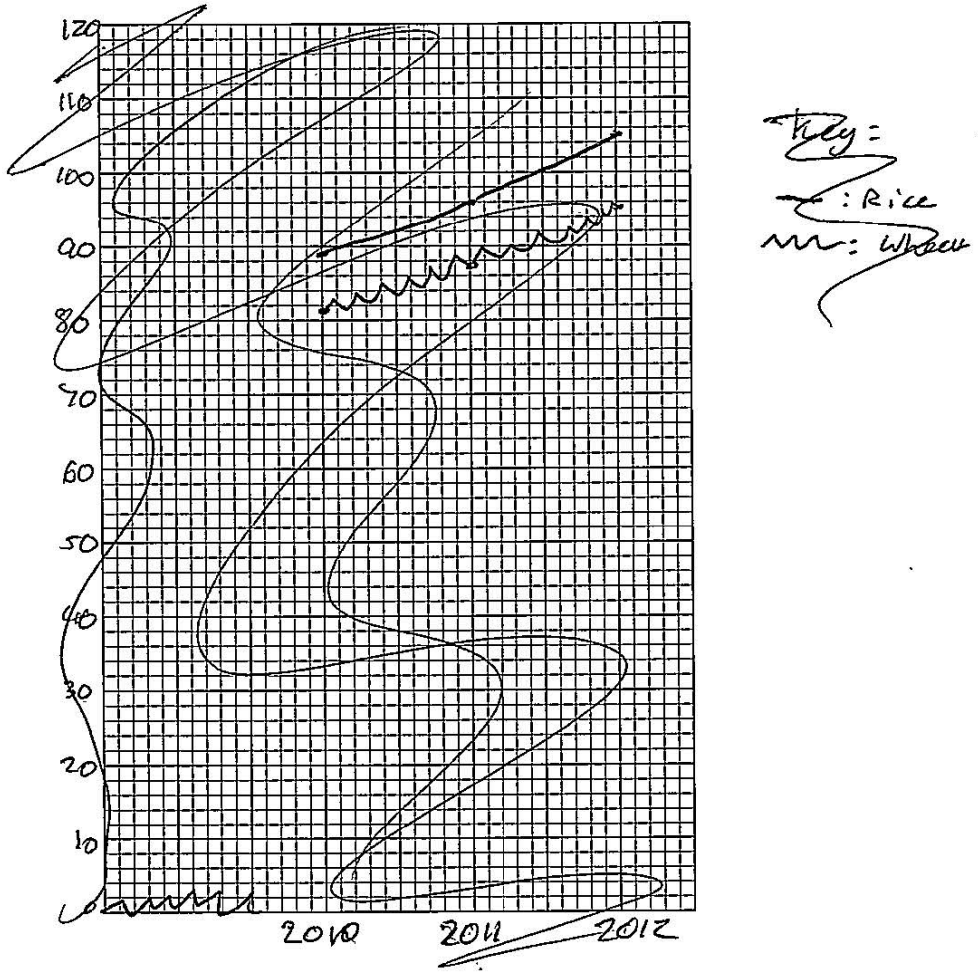
8. (continued)

(b) The data in the table below refer to cereal production in India between 2010 and 2012.

Crop	*Area* (million hectares)			*Production* (million tonnes)			*Yield* (tonnes/hectare)		
	2010	*2011*	*2012*	*2010*	*2011*	*2012*	*2010*	*2011*	*2012*
Rice	42	43	44	89	96	105	2·12	2·23	2·39
Wheat	29	29	30	81	87	95	2·79	3·00	3·17

Draw a line graph to show the production of rice and wheat between 2010 and 2012. 3

(Additional graph paper, if required, can be found on *Page 33*)



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MARKS | DO NOT WRITE IN THIS MARGIN

8. (continued)

(c) Crop production is reliant on the conversion of light energy into chemical energy.

Net productivity = gross productivity – respiration

Explain what is meant by *gross productivity*. 2

gross productivity is the total biomass and biodiversity.

(d) Increasing affluence has resulted in an increase in meat consumption in many places.

Explain why an increase in meat consumption may **not** be sustainable. 2

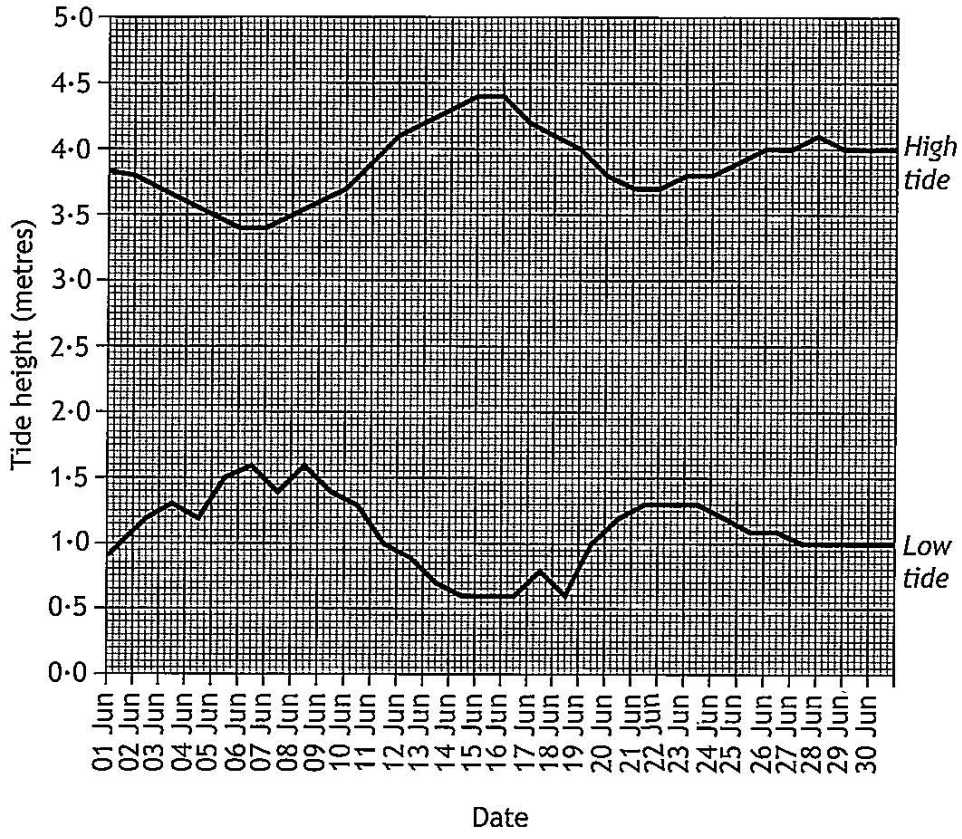
It takes a while to acquire meat so higher consumption = higher demand. The production of meat cannot be very fast so it won't be sustainable.

MARKS | DO NOT WRITE IN THIS MARGIN

9. Oceanic currents can move water both horizontally and vertically, and occur at both local and global scale.

(a) The graph below shows minimum and maximum tide heights recorded for Aberdeen during June 2014.

Tide graph for Aberdeen during June 2014 (daily min and max heights)



(i) Describe the trends shown in the graph. 2

High Tide - decreases until 6th June by 0·6m, increases until 15th June by 1m. Decreases slightly again until 22nd June by 0·3m. Increases until the end of the month by 0·3m and finishes at 1m.

The trends show a patterned decrease followed by an increase then so on

MARKS | DO NOT WRITE IN THIS MARGIN

9. (a) (continued)

(ii) The daily tidal range is the difference between the high and low tide heights.

A "spring tide" occurs when the daily tidal range is at its maximum.

A "neap tide" occurs at the point where there is least change.

Calculate the range for the neap tide shown in the graph. 1

Space for calculation

8th June - 8th June

= 3 days.

(iii) Identify the dates on which the spring tide occurred. 1

15th, 16th June – High Tide

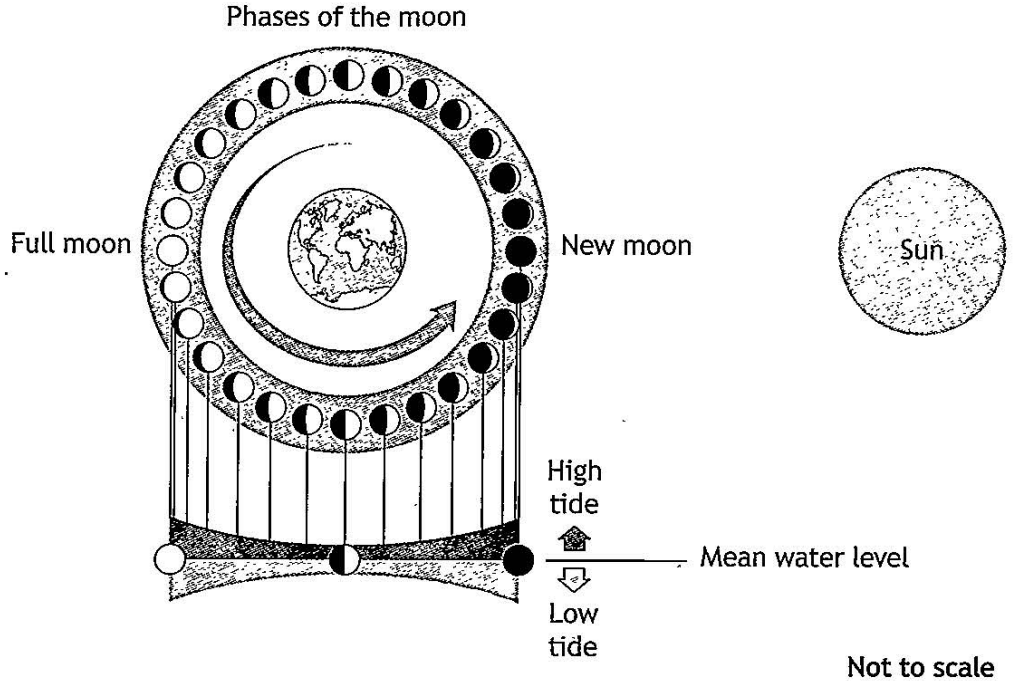
6th, 8th June – Low tide

[Turn over

MARKS | DO NOT WRITE IN THIS MARGIN

9. (continued)

(b) The diagram below shows the impact of phases of the moon on tidal range.



Describe the relationship between phases of the moon and the spring and neap tides. 2

When there is a Full moon, there are an increased amount of ~~neap~~ spring tides.

When there is a new moon, there are an increased amount of neap tides.

MARKS | DO NOT WRITE IN THIS MARGIN

9. (continued)

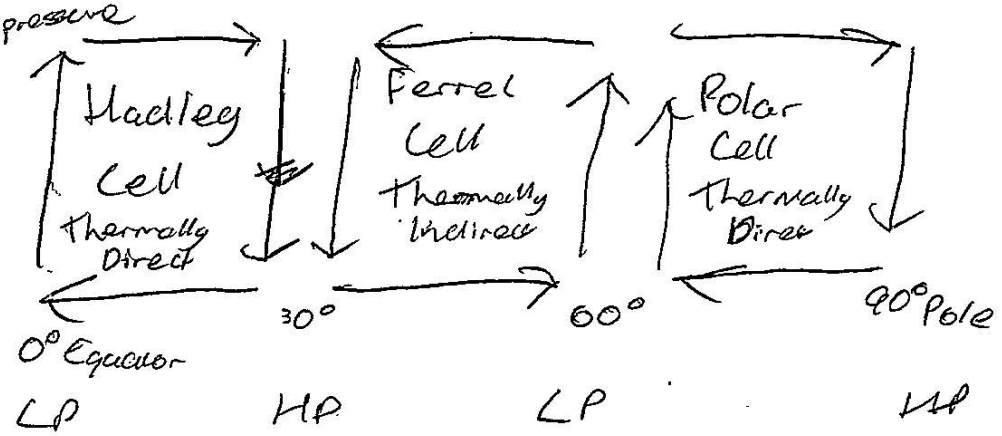
(c) The Coriolis effect plays a role in both oceanic and atmospheric circulation.

Explain the differing impact of the Coriolis effect on **atmospheric circulation** at the equator compared with its effect in the northern and southern hemispheres. 4

You may wish to include a diagram as part of your answer.

LP = Low pressure

HP = high pressure



The eastward passage of associated jet streams defer any ferrel cell due of recognition.

Warm air rises at 30° N and S, travels and sinks ~~at~~ it. This creates the Hadley cell.

MARKS | DO NOT WRITE IN THIS MARGIN

For questions 10 and 11 choose to answer **either** A or B. Write your answers on the following pages. Diagrams may be used where appropriate.

10. A Water footprinting is a method used for assessing the direct and indirect use of water during the manufacture of a product.

Water footprinting is defined as "the total volume of freshwater that is used to produce the goods and services consumed by the individual or community or produced by the business" (Water Footprint Network, 2014).

Discuss the potential water footprint of the following industries:

(a) Brewing

(b) Papermaking **10**

OR

B The "hydrogen economy" refers to a vision whereby hydrogen could be used as an energy carrier for the future, reducing our reliance on fossil fuels for powering industry, transportation and domestic needs.

Discuss the hydrogen economy under the following headings:

(a) The benefits of using hydrogen as a fuel

(b) The challenges of using hydrogen as a fuel **10**

11. A Give an account of the qualitative and quantitative techniques used for sampling named plant and animal groups or species found in terrestrial ecosystems. **10**

OR

B Give an account of the impact of climate change on terrestrial biodiversity and species distribution. **10**

MARKS | DO NOT WRITE IN THIS MARGIN

SPACE FOR ANSWERS

10. B.

Hydrogen economy is the process of gaining energy from Hydrogen.

To maintain this energy, you need to electrolyse water. This will give you Hydrogen gas.

a. The benefits of using hydrogen as a fuel has a number of benefits:

- renewable, the hydrogen can be remade in a human's lifetime as there is a plentiful supply of water to electrolyse.
- It can lead to a decrease of global warming as it is seen as an alternative to fossil fuels.
- The hydrogen is multi-purpose. It can be used in a range of ways domestically and industrially.

b. The challenges of using Hydrogen as a fuel also have a number of reasons:

- High capital cost, the equipment used to electrolyse water in a large scale proportions needed be very high

MARKS | DO NOT WRITE IN THIS MARGIN

SPACE FOR ANSWERS (continued)

- In comparison to fossil fuels, Hydrogen doesn't produce as much energy when used as a fuel so it isn't really cost effective.

11. A

To measure the population of a plant group. Daisies, in this instance. Use a quadrat.

To use this correctly, you must throw the quadrat randomly and then count how many daisies are in each square. Repeat this another few times to get an average. Taking an average gives a true representation of the given area.

Quantitative data gives information on numbers and densities, it can be counted or measured.

Qualitative data gives descriptive data. Such as a species list or characteristics.

To gain a species list of a given area, use a Camera Trap. This is a camera set up with a sensor that takes a photo when an organism flies past or through the sensor. This is the most environmentally friendly

MARKS | DO NOT WRITE IN THIS MARGIN

SPACE FOR ANSWERS (continued)

way of measuring species as it does not harm or distress the organism in any way.

This sampling technique is a qualitative technique as - looking at the photographs, you can conduct a species list or view characteristics on the given species such as a Robin.

MARKS | DO NOT WRITE IN THIS MARGIN

ADDITIONAL GRAPH PAPER FOR QUESTION 8 (b)