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Total marks — 100 marks

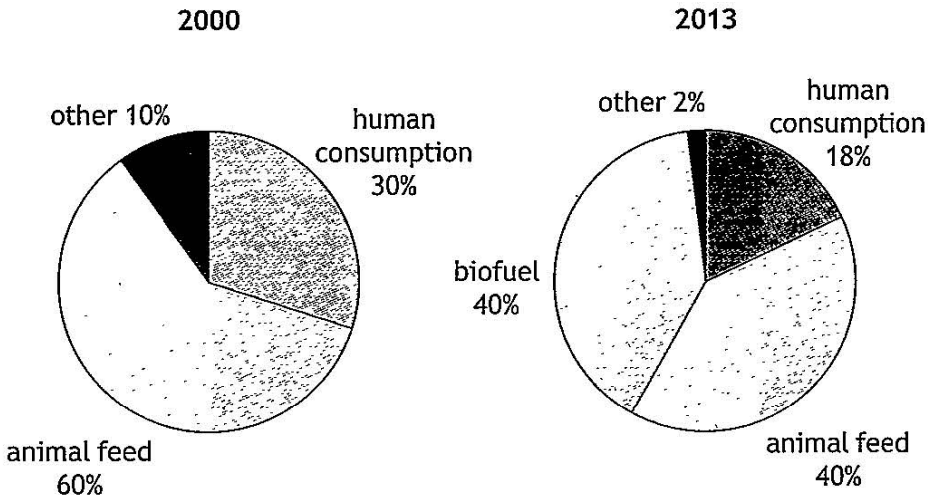
Attempt ALL questions

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 bio fuel is a fuel which is made from plants / biological matter and is renewable if replanted

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

In 2000 the use of corn is mainly in animal feed 60% and human consumption 30% and other uses 10%
where as in 2013 the amount consumed by humans drops by 12% the amount used for animal feed drops by 20% and 40% of the corn is used in Bio fuel

MARKS | DO NOT WRITE IN THIS MARGIN

1. (a) (continued)

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

It means he is diversifying his crops therefore making more money

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

It could mean the price of corn goes up as ~~customers~~ consumers have less of the percentage we

(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

$$\frac{110,000,000}{2800} = 39,286 \text{ truck loads}$$

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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

- Bio fuels could be considered carbon neutral as the carbon burned when using them ~~[illegible]~~ is offset by the replanting of crops which take in the same amount of carbon
- Bio fuels do still release greenhouse gases and if crops not replanted carbon not recycled meaning Biofuel not carbon neutral

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

In the Common Agricultural policy of europe or CAP the government helps farms by helping farmers through subsidising their work and by investing in rural areas.

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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

global warming will decrease the amount of fresh water in the mountains as there will be less snow melt and mountain glaciers will get smaller and smaller

(ii) aquifers near the coast. 1

fresh water at the coast will decrease because over use by farmers and the people in large cities. Global warming will also increase the evaporation of aquifers.

[Turn over

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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

- Urban use of water increases by 4% in a drought year compared to normal rainfall year because their is less water
- Agricultural use of water increases by 13% in a drought year compared to a year of normal rainfall because their is less water
- Water usage in the Environmental (maintaining river systems and wetlands) decreases by 17% in a drought year compared to a normal rainfall year, this is because most the water is being used for urban and agriculture.

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

Fruit trees would need priority irrigation as they need more water to survive than vegetables.

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

Explain why this could be unsustainable. 2

- If you take water out of aquifers it can become empty and takes a long time to be replaced
- ~~If there is no water in the ground to be~~ ~~evaporated~~ If you keep using aquifers water it can cause a build up of salt in the soil and can lead to desertification.

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

Use drought resistant crops such as Barley.

[Turn over

3. The snowshoe hare is a herbivore and is the principal prey of the lynx.

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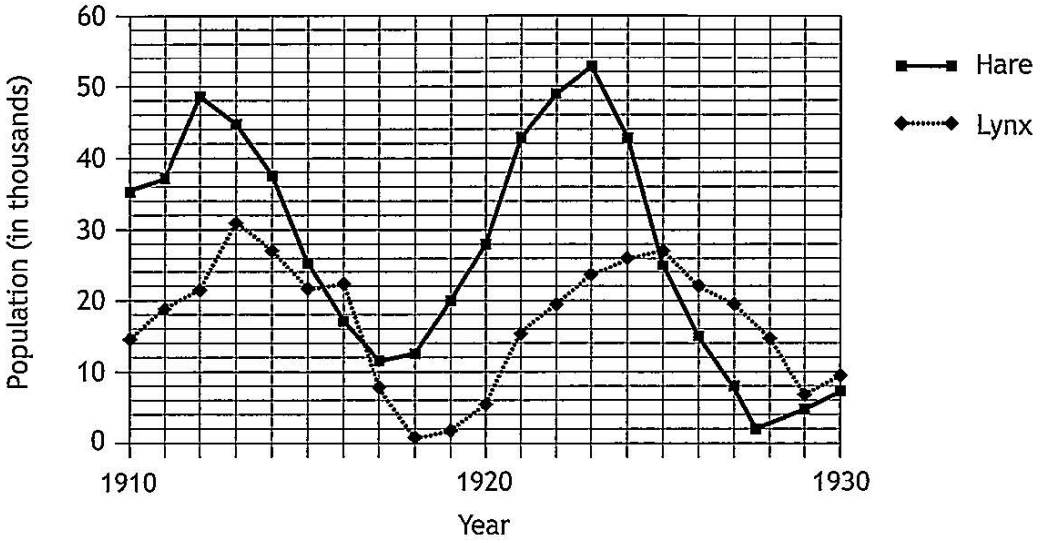
Snowshoe hare

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

You can see in the graph as the population of hare goes up it is closely followed by the lynx population it is the same when the hare population goes down

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

- The line which references the population of lynx will sometimes go up when the hare one does not like in 1915 - 28 the lynx pop goes up the hare goes down
- The lynx population sometimes decreases at a lesser rate than the hare like in 1926 - 28

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

Hunting of Lynx would increase the amount of hare and their would be less of a cycle more of just an upward trend this is because the lynx controls the numbers of hare and if their are less lynx their will be more hare.

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

A crash in the hare population would have a detrimental effect on biodiversity and it would decrease. because their are predators which rely on the hare for food which means the number of predators would fall like the lynx

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

The eurasian Beaver.

[Turn over

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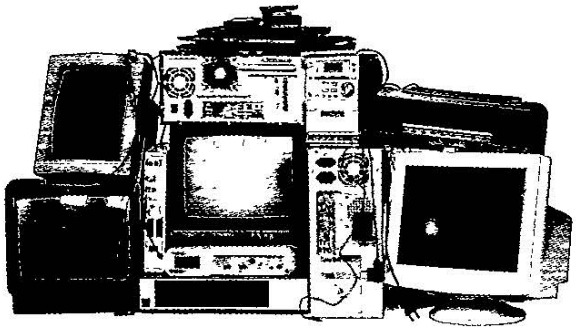
4. Product obsolescence refers to the time and state in which a piece of technology or a product ceases to be useful, productive or compatible.



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

(ii) Printer cartridge 1

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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

- An economic impact is that the computer will be cheaper to make therefore cheaper to buy for consumers
- A social impact is that the computer will not last long so someone will have to make a new computer in a few years leading to more jobs at the computer manufacturer
- An environmental effect is that the shorter something lasts the more things are going to landfill after a few years and it going to take more energy and materials to build new ones leading to CO^2 emissions and climate change.

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

It can be broken down into its constituent parts and recycled as different metals and plastics

[Turn over

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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

Charges companies for putting things into landfills.

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

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

Such a few number of invertebrates have been evaluated as their are so many of them over 1.3 million and it takes a long time to evaluate such a small organism.

[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

- Agriculture clears land of all life for the crop or cattle it is rearing so takes away habitat from flowering plants
- Intensive Agriculture also uses pesticid, herbicides and funghicide which can get into other ecosystems and kill flowering plants.

(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

The overuse of fertilizers can ruin water ecosystems by putting to much nutrients in it. So creating an algal bloom when the algae dies the decomposers in the water ~~bac~~ can become so plentiful they take all the oxygen out the water causing ~~eutrophication and suffocate tadpoles.~~

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

SEPA has a role in the testing and maintaining water cleanliness and level of pollutants. Some amphibians do not like polluted water therefor clean water is essential

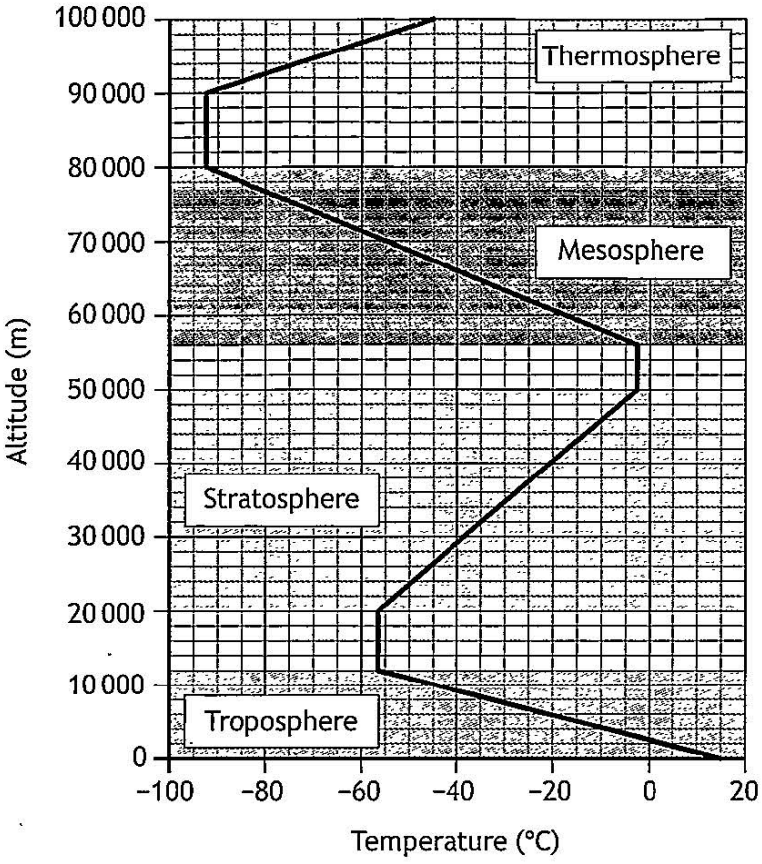
(B) SSSIs 1

SSSI's protect by law the damage of any geological or hydrological features with in a SSSI so as protecting any ~~species~~ amphibians species which may be in the site of special scientific interest

[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

- At 10,000 m you can pick up on jet stream and glide in them wing less fuel meaning less greenhouse gas emissions.
- At 10,000 metres the emissions from the aircraft will not pollute the ground air and could go into the stratosphere.

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

The highest amount of O-zone will be found in the stratosphere

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

(i) Name an anthropogenic greenhouse gas. 1

Carbon dioxide

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

- Carbon dioxide is usually balanced in the planet through the carbon cycle but as we are putting more CO^2 in the atmosphere by burning fossil fuels it is creating imbalance
- CO^2 when in the atmosphere traps the same heat with in the atmosphere making more energy causing more storms and increased temperature
- Usually trees take in a lot of CO^2 in the carbon cycle but we are taking down a lot of trees in deforestation so not as much CO^2 getting recycled

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

- Highland clearances, people moving off crofting land ~~into~~ in the north to move to big cities in central belt
- The industrial revolution brought lots of people to big cities for work in the big shipping and other industries.

(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

- People working from home a lot more so moving somewhere their is quiet
- Better transport routes to get to big cities by road, train or public transport.

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

(i) waste; 1

Bin men can pick up everyones waste in the same place not having to go to individual homes regular pickups

(ii) domestic energy. 1

As people live in smaller houses in urban areas their energy use will be lower and their is less wiring to go around housing because of proximity

MARKS | DO NOT WRITE IN THIS MARGIN

7. (continued)

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

- Biodiversity decreased as habitat is taken up and destroyed by new roads
- Cars run down animals like fox, squirrels and badgers leading to a lack of biodiversity as their are smaller populations
- Cars exhaust emit harmful toxins like CO^2 and Sulphites leading to air pollution which can damage some plant life like lichen leading to decrease in biodiversity

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

(i) State the purpose of environmental assessment. 1

To be sure a change of land use will not effect habitat of species ~~the~~ or harm endangered species or effect the natural beauty of an area.

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

An EIA is taken before a land change taker place to see the impact will be
A SEA is taken after the land change has happened to see the ~~impact~~ ~~after~~ what the impact has been.

[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

- Increased use of GMO's is a strategy for increasing the amount of land based food production
- Increased subsidies from the U.N in aquaculture is helping fish farms produce more food.

MARKS | DO NOT WRITE IN THIS MARGIN

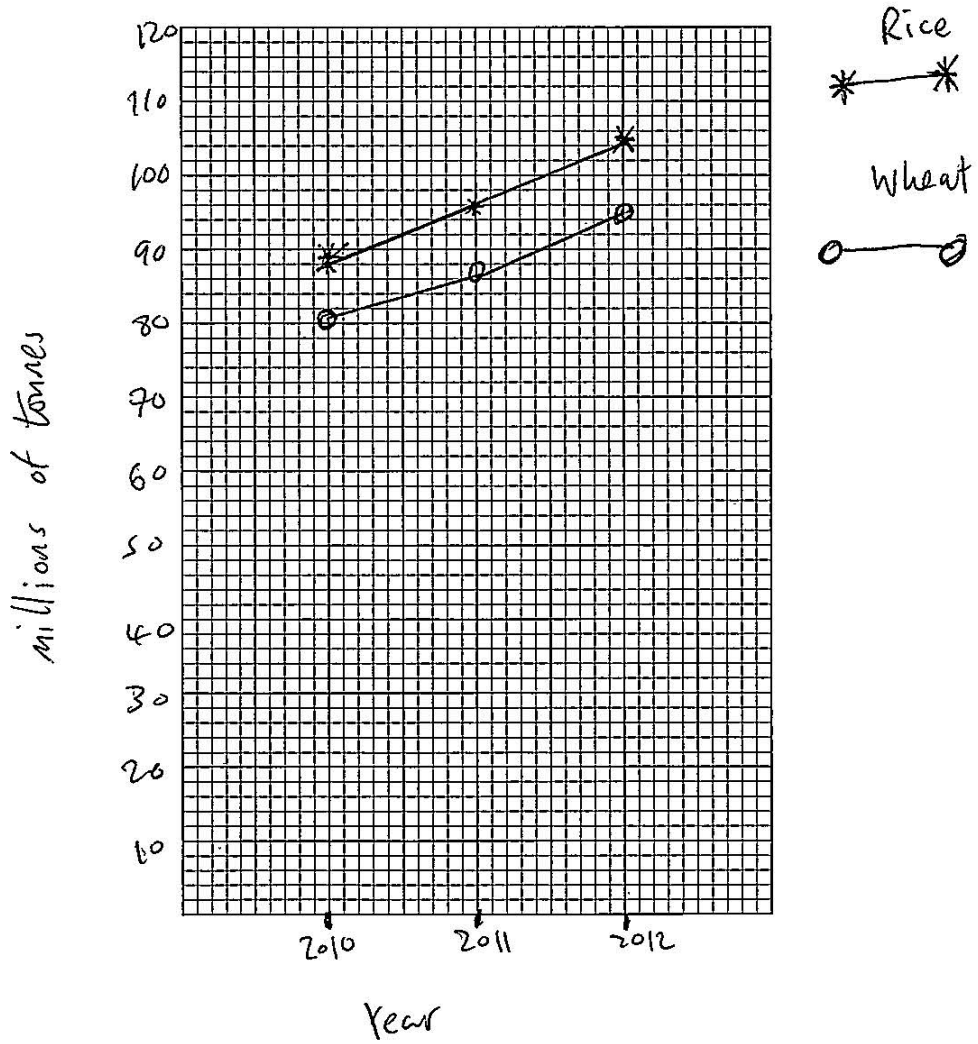
8. (continued)

(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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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 what is produced after everything else is added up it is the the net – the respiration of the crop or what it ~~takes~~ emits out after photosynthesis

(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

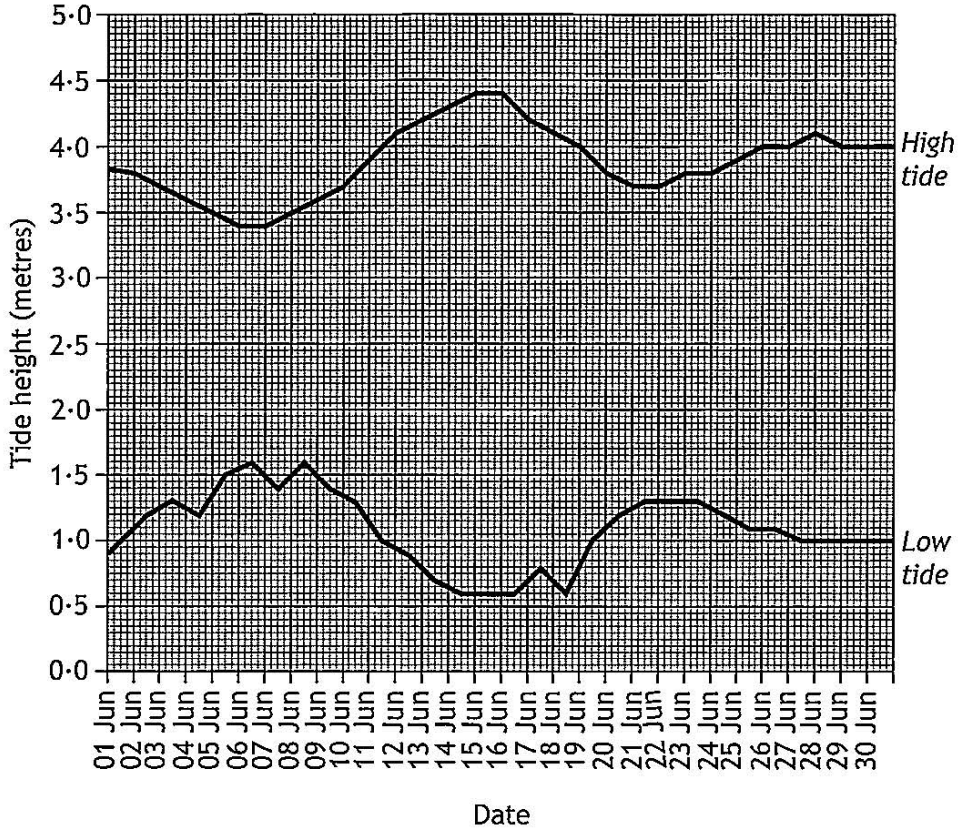
- Meat consumption espicailly cattle takes up lots of space. Which means people are deforesting the amazon destroying habitat and the trees we need to take in CO^2 to rear animals which is unsustainable
- Also more animals means more greenhouse gas emissions through the releasing of methane from especially cows and other cattle which is unsustainable.

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 takes a 1 metre rise between 6th June and 15th June and then plateaus around the 4 metre mark
- low tide drops by 1 metre between 8th of June and the 15th June then raises a little and plateaus at about 1 metre

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

$1 \cdot 6 - 3 \cdot 4 =$

1·8 metres

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

The spring tide occurred on the 15th and 16th of June

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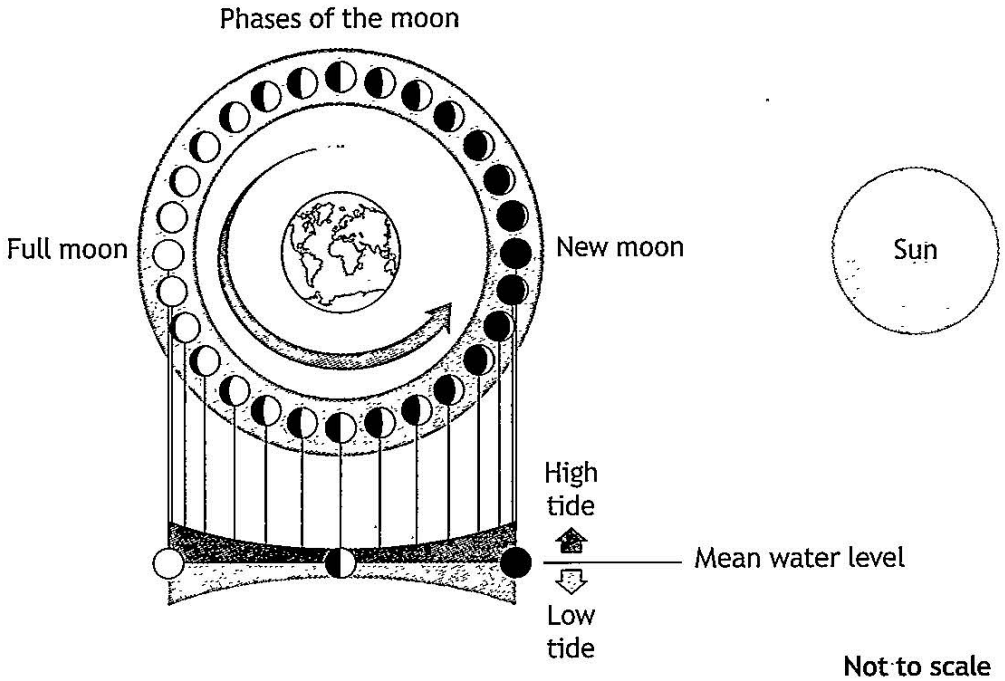
9. (continued)

(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

- The moon brings the spring ~~neap~~ tide twice in its cycle at the full moon and the new moon
- The neap tide ~~is~~ comes when the moon is a half moon

MARKS | DO NOT WRITE IN THIS MARGIN

9. (continued)

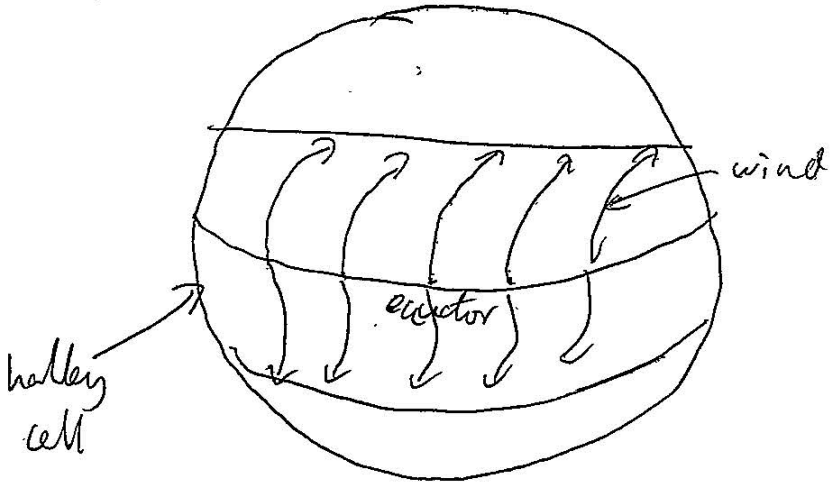
(c) The Coriolis effect plays a role in both oceanic and atmospheric circulation.

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.

The coriolis effect is the spinning of the earth effecting weather and ocean currents

On the equator the coriolis effect is negligible as the sun heat comes in at the equator and sends hot air in the hadley cell upwards pushing wind currents upwards towards the ferrel cell where it meets cold air drops and the cycle begin again here is a diagram of this happening



In the southern equator the wind is forced in the other direction and the same process happens. In the polar regions the hot air and cold air meeting and mixing with the coriolis effect can cause Rossby waves and Jet streams.

[Turn over

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)

(a) Hydrogen has many pluses as a fuel source it is firstly in plentiful supply in the earth as part of water and also in the universe where it is the most plentiful element, hydrogen also has a much higher energy to weight output than fossil fuels it also gives off no greenhouse gases which lead to climate change the only by product is water which humans need anyway. It would also mean humans will be using and drilling for less oil meaning less spills and pollution. The technology is still in its infancy so lots of advances can be made to make it cheaper. Could also bring lots of jobs to a new sector.

(b) Hydrogen fuel at the moment is still in its early development stage so still very expensive to create fuel cells. The acquisition of hydrogen is still very costly, it can only be done through industrial processes like electrolysis of water to release the hydrogen. These processes use a lot

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SPACE FOR ANSWERS (continued)

of energy and greenhouse gases leading to climate change. Their is massive amounts of infrastructure and change needed to make hydrogen a viable fuel source meaning changing the design of all cars and power plants. Their could also be a lot of jobs lost in the oil and gas industry if the hydrogen economy is expanded.

MARKS | DO NOT WRITE IN THIS MARGIN

SPACE FOR ANSWERS (continued)

11. A.

The importance of sampling animals to check on their numbers is ~~[illegible]~~ to check if any species ~~are~~ is endangered or invasive species are taking over or population density of a species could lead to disease.

In the ~~base~~ case of flowers like the scottish blue bell which is under threat from the invasive Spanish ~~Scottish~~ bluebell. To measure the amount of bluebells in an area one could use a quadrat or a transect and count the amount of flowers either along the transect or inside the quadrat. To give ~~the~~ a more qualitive result the test should be repeated by the same person at the same time on multiple occasions to ensure the reliability of an ~~[illegible]~~ average taken.

In the case of soil biota a tullgren funnel can be used to study which organisms are in the soil like a nematode worm to check the soil health it works by heating with a lamp ~~[illegible]~~ a small amount of soil and letting the organisms move down the funnel to be counted in water underneath the funnel

MARKS | DO NOT WRITE IN THIS MARGIN

SPACE FOR ANSWERS (continued)

This study should be repeated multiple times to ensure a reliable average

To study small mammals like the red squirrel a longworth trap is used with a peice of bait inside. The squirrels can then be tagged to better determine their numbers. for bigger mammals and birds they can be caught and tagged or they can set up motion capture cameras to better understand nubers of the newly introduced beavers or the endangered capercailie.

Pit fall traps can also be set up to count invertebrates like woodlice. They work by capturing inverteborates which fall into it. They can then be counted after a certain time to make this study more reliable one can set up multiple pit fall traps and have the same amount of time before counting each. So as to get a the more reliable average of invertebrates

[END OF QUESTION PAPER]