Question	Answer	Marks
4(a)(i)	*any one from:* hartebeest migrations are shorter; hartebeest move more to the east / wildebeest move more to the north-east;	**1**
4(a)(ii)	200 km;	**1**
4(a)(iii)	to get water from, the river / Molopo OR better pasture near the river;	**1**
4(b)(i)	will be unable to hunt; may have difficulty in gathering the same, fruit / berries; change in diet; lack of resources, e.g. for hunting equipment, wood for fires; unused to monetary economy; will be unable to, hunt / gather food; dependent on others for food; may be language difficulties; cultural differences from other people; lack education / lack skills for farming; unable to, work / make a living; contact with new illnesses; have no immunity to the new illnesses; digestive problems from new foods;	**4**
4(b)(ii)	*any three from:* the health / well-being, of the animals will be cared for; they will be provided with water in droughts; they will be protected from poachers; sustainable increase in numbers will result; the people will be able to obtain, meat / food, from the animals, they could earn an income by taking part in wildlife tourism, one example of work, e.g. ranger / guide / driver etc.; improved standard of living;	**3**

Question	Answer	Marks
5(a)(i)	desert;	1
5(a)(ii)	6(%);	1
5(a)(iii)	38(%);	1

Question	Answer	Marks
5(b)	*any three from:* mainly within the Tropics; near the Equator; north of South America; east of Africa: SE Asia; identification of an exception area; named area or country for example, Amazon Basin;	3
5(c)(i)	January correctly plotted at 380; February correctly plotted at 310;	2
5(c)(ii)	*any two from:* high annual rainfall / 2555 mm; rainfall in every month of the year; maximum is, 380 mm / in January; minimum is, 100 mm / in August and October; dry season from June to October / wet season from Nov to May;	2
5(c)(iii)	August / September;	1
5(c)(iv)	3 (°C);	1
5(d)(i)	**X** emergent layer; **Y** canopy layer / middle canopy;	2
5(d)(ii)	52 / 53 (m);	1

Question	Answer	Marks
5(d)(iii)	*any three buttress roots points with one drip-tip leaves point OR any three drip-tip leaves points with one buttress roots point OR any two buttress roots points with any two drip-tip leaves points:* *buttress roots:* rainforest soils only fertile at top; so rainforest tree roots, are shallow / cover a large area; rainforest trees are very tall; buttress roots are needed for support; *drip-tip leaves:* heavy daily rainfall; leaves shaped to shed rainfall; to maximise, transpiration / photosynthesis / absorb sunlight;	**4**
5(e)	*any three from:* fuelwood; subsistence farming; cash cropping; settlement / urbanisation / factories; logging; grazing; roads; mining;	**3**
5(f)(i)	appropriate scale; accurate plots; labelling of axes;	**3**
5(f)(ii)	11(%);	**1**

Question	Answer	Marks
5(f)(iii)	*any four from:* unemployment; people displaced / forced to move; as source of food disappears; as homeland is developed; loss of land rights; conflict with logging companies; loss of fuelwood; loss of traditional culture / traditional culture dies out / become westernised; loss of medicines; western diseases affect health; job creation; wood available for local industries; better transport; land available for, farming / development; displaced animals threat to humans;	**4**
5(g)	*no mark for saying whether agree or disagree, answer can focus on one or the other or both:* *agree:* only mature trees are taken; so younger trees have chance to grow; forest not clear felled; some trees are left; forest has chance to, repair / regenerate; *disagree:* method is more expensive; difficult to enforce; regular checks required on logging companies; needs investment; not a solution for areas already cleared;	**4**

Question	Answer	Marks
5(h)	*Level of response marked question:* Level 3 [5–6 marks] Developed ideas used to show how two techniques can improve sustainable management of forests. Descriptions follow a logical order and show a clear understanding of the techniques selected. Level 2 [3–4 marks] Developed ideas used to show how one or more techniques can improve sustainable management of forests. Response is less detailed. Level 1 [1–2 marks] Simple ideas used to show how one or more techniques can improve sustainable management of forests. Responses may include some irrelevant or inaccurate information. No response or no creditable response [0]. *Level of response marking indicative content:* Candidates may begin with a definition of the chosen technique. For **agro-forestry** candidates may cover, that trees are retained in production system, it maintains fertility of the soil, some retained trees may provide income, and the benefits of trees (e.g. shade) to the farming system. For **fuelwood planting** candidates may cover coppicing, crop rotation, growing of more productive species, faster growing, that established forests are no longer needed, and that the wood could be sold. For **reforestation** candidates may cover planting trees with the potential for production, allowing succession, that the land is not left bare, and that it maintains biodiversity. For **community forestry** candidates may cover, the fact it provides jobs, the local community feel involved, there is active management and conservation, education, the products and profits are distributed locally, and the opportunities for ecotourism.	**6**

Question	Answer	Marks
6(a)	*any three from:* (steep) increase from 1990–1994 to 1995–1999 / peak at 1995–1999; decrease from 1995–1999 / (sharp) fall to 2000–2004; gradual decline until 2010–2014; use of data to support the change described;	3
6(b)(i)	all segments correctly plotted ;; shaded as per key;	3
6(b)(ii)	*commercial agriculture* – the production of, crops / animals for sale; *subsistence agriculture* – farming that provides enough food for the farmer and their family;	2
6(b)(iii)	*any one from:* roads / transport; settlements / urbanisation; rock and mineral extraction; industry; fuel-wood;	1
6(b)(iv)	*any four from:* forests / trees, act as carbon stores / carbon sinks / less photosynthesis; loss of habitats; increase in CO_2 from, burning / decomposition; (increase in CO_2) contributes to, (enhanced) greenhouse effect / global warming / climate change; effect on water cycle; increased, soil erosion / flooding (due to lack of, tree cover / roots); visual pollution; source of food / source of (potential) medicine; loss of tree species / reduces biodiversity / causes extinctions / food chains or food webs, disrupted;	4
6(c)(i)	*producer* algae **AND** *tertiary consumer* large fish;	1

Question	Answer	Marks
6(c)(ii)	decreasing bar width; centered bars **AND** labels;	2
6(c)(iii)	leaves absorb / use, energy from sunlight **AND** by means of chloroplasts / chlorophyll; to convert water and CO_2 **AND** into glucose and oxygen;	2
6(d)	*any two from:* both increased and then decreased; inland highest in 1975–1990, coastal highest in 1941–1974; inland lowest in 1991–2010, costal lowest in 1900–1940; correct comparison of the inland and coastal wetlands within a time period;	2

Question	Answer	Marks
7(a)(i)	penguin / leopard seal / squid / cod;	1
7(a)(ii)	phytoplankton; *(krill given)* penguin / cod **and** killer whale / leopard seal (in correct sequence);	2
7(a)(iii)	*any four from:* increase in phytoplankton; increase in krill (as more food available / less predation); increase in zooplankton (as more food available / less predation); increase in penguins (as more krill to eat); leopard seals will eat more penguins and squid (as no cod to eat);	4
7(a)(iv)	*energy lost by:* movement; respiration; reproduction; incomplete digestion of prey; excretion;	2
7(b)	*any four from:* restriction of net types; restriction on mesh sizes; fishing quotas; closed seasons; no-fishing zones; encourage fish farming;	4

Question	Answer	Marks
1(a)	*clockwise, from top:* carbon dioxide, sunlight, oxygen, water 2 correct; 4 correct;	2
1(b)	chlorophyll;	1
1(c)	respiration;	1
1(d)	*one mark for named factor, one mark for linked explanation:* controlled environment; so optimum conditions (can be provided); higher temperatures; so the rate of photosynthesis will be higher; adding carbon dioxide; for optimum concentration to favour photosynthesis; managed water (supply); so the correct amount is available for plant processes; control of pests; so energy is retained by the producer / not lost to the consumer / less competition; supply of nutrients; so plants have access to optimum levels;	2

Question	Answer	Marks
3(a)(i)	transport and travel;	1
3(a)(ii)	20 (tonnes);	1
3(a)(iii)	14;	1

Question	Answer	Marks
3(b)	*any two from:* change to a more vegetarian diet; reduce travel in cars / use public transport / cycling / walking / car pools; insulate houses; use energy-efficient appliances; switch off devices when not in use; use electric cars; AVP;	2

Question	Answer	Marks
6(a)	*any four from:* lionfish are inedible; therefore nothing will feed on them (no predators); eat large quantities; impact on food web; decrease in populations of small fish; introduced/invasive species (to the Atlantic Ocean); means competition to other (native) organisms; lay large quantities of eggs; large population increase;	4
6(b)	*any three from:* around coastal regions/area; of (South) East USA / named country; west of Atlantic Ocean / Eastern / Atlantic coast; Caribbean Islands; Caribbean Sea / Gulf of Mexico; description of extremities of range;	3
6(c)	targeted catch / only lionfish are killed / no bycatch; less/no damage to corals / seabed;	2

Question	Answer	Marks
8(a)(i)	30;	1
8(a)(ii)	correct labelling of axes; suitable linear scale such that data occupy over half of grid; correct bars plotted; bars of equal width;	4

Question	Answer	Marks
8(a)(iii)	*any two from:* captive population too small; limited gene pool; animals released into wild do not survive; poaching / hunting, still continues in wild; unsuitable conditions in captivity for breeding; low reproduction rate; habitat, change / loss, in wild; AVP, e.g. only one sex remaining;	2

Question	Answer	Marks
8(b)	*Level of response marked question:* Level 3 [5–6 marks] **A coherent response is given that develops and supports the candidate's conclusion using relevant details and examples.** Indicative content and subject-specific vocabulary are generally used precisely and accurately. Good responses are likely to present a balanced evaluation of the statement. Level 2 [3–4 marks] **Development and support of the conclusion is evident, though the response may lack some coherence and/or detail. Irrelevant detail may be present.** Indicative content and subject-specific vocabulary are used but may lack some precision and/or accuracy. Responses contain evaluation of the statement, but this may not be balanced. Level 1 [1–2 marks] **The response may be limited in development and/or support.** Contradictions and/or irrelevant detail may be present. Indicative content and subject-specific vocabulary may be limited or absent. Responses may lack structure or be in the form of a list. Evaluation may be limited or absent. No response or no creditable response [0 marks] *Indicative content for :* Protecting living organisms is more important than exploiting the planet for natural resources. *protecting living organisms is more important:* some are endangered once extinct it is not possible to get species back alternative resources available in other areas technology could be used to find alternatives to the resource – examples of resource extraction affects a whole, habitat / ecosystem opportunities to, recycle / re-use existing resources or sustainable resources exist, e.g. sustainable forestry plantations we need some species in order to survive, e.g. bees for pollination, medicinal plants, gene engineering (unforeseen) wider effect on food web of species going extinct	**6**

Question	Answer	Marks
8(b)	*exploiting the planet is more important:* the use of these resources creates an income to afford conservation wildlife reserves / captive breeding can then be afforded possible to relocate animals and plants resources needed to keep people, alive / healthy land may be needed for, housing / food production any type of extraction affects habitats – it is impossible to stop all resource use world population increasing so more resources needed extinction an effect of natural selection fuels are essential as an energy supply	

Question	Answer	Marks
3(a)	land clearance / harvest of wood / slash and burn / trees cut down ;	1
3(b)	*any two from*: no vegetation to protect soil / less interception; so more rain hits soil surface; increased run off; fewer roots to bind the soil; increased wind erosion / fewer wind breaks;	2
3(c)	*any two from*: as a carbon, sink / store; maintain biodiversity; plants may be source of medicinal drugs / eq ; for sustainability of supply of forest products / food;	2

Question	Answer	Marks
8(a)(i)	58333;	1
8(a)(ii)	labelled axes; use of a suitable linear scale, data using at least half the grid; accurately plotted bars; bars of equal width;	4
8(a)(iii)	*Two from:* pest / disease; (competition from) non-native species; climate change / extreme weather; water extraction; acid rain;	2

Question	Answer	Marks
8(b)	*Extractive reserves:* prevents development in the area; only locals permitted to harvest in the area; harvesting / use of trees is sustainable; investment to maintain the security of the forest; *Seed Banks:* (wide range of) genetic material held; stored until suitable conditions are available; can be used in future plant breeding / increase genetic diversity; safe storage in case wild population destroyed;	4

Question	Answer	Marks
8(c)	*Level of response marked question:* Level 3 [5–6 marks] **A coherent response is given that develops and supports the candidate's conclusion using relevant details and examples.** Indicative content and subject-specific vocabulary are generally used precisely and accurately. Good responses are likely to present a balanced evaluation of the statement. Level 2 [3–4 marks] **Development and support of the conclusion is evident, though the response may lack some coherence and / or detail.** Irrelevant detail may be present. Indicative content and subject-specific vocabulary are used but may lack some precision and / or accuracy. Responses contain evaluation of the statement, but this may not be balanced. Level 1 [1–2 marks] **The response may be limited in development and / or support.** Contradictions and / or irrelevant detail may be present. Indicative content and subject-specific vocabulary may be limited or absent. Responses may lack structure or be in the form of a list. Evaluation may be limited or absent. No response or no creditable response [0 marks] *Indicative content for:* 'Commercial forests often grow only one species of tree. Growing only one species of tree is bad for wildlife. This type of forest should be banned." *agree:* one species of tree does not support a diverse range of species reduced biodiversity extinction of species examples – e.g. orangutangs and palm oil plantations trees are genetically similar increasing risk of pest or disease less likely to deal with a change in weather conditions tree species may not be native to the area	**6**

Question	Answer	Marks
8(c)	*disagree:* demand for timber / crops is large forests are efficient way of producing crops therefore take up less land – leaving other land undisturbed without forests, sourcing materials would damage larger areas of forest – affecting habitats natural forest does not grow as efficiently as commercial forests forests provide employment and help the country's economy	