Section A

Question	Answer	Marks
1(a)(i)	*any three of:* low; flat; valley / valley floor; foot of slope / bottom of hill; grass / shrubs / bushes / trees; (semi) desert / bare soil;	**3**
1(a)(ii)	*any two of:* they are on low(er) ground / in a valley /are usually on high(est) ground / hill / not on high(est) ground / hill; winds stronger on higher ground; mountains / hills block wind;	**2**
1(a)(iii)	*any two advantages plus one disadvantage OR any two disadvantages plus one advantage:* *advantages:* away from population / remote / isolated / empty area; poor quality land / cheap land / large area; railway to bring raw materials; *disadvantages:* no nearby, market / industries / settlements / lengthy transmission lines / remote; no water for cooling; no nearby labour force;	**3**
1(b)	*any two of:* high / good rainfall; rain, throughout the year / well distributed; temperatures above freezing point / warm / mild winters; little evaporation;	**2**

Question	Answer	Marks
1(a)(i)	52;	1
1(a)(ii)	*any two from:* use in industry increased whereas use for electricity, decreased / remained same; industry large(r) change / electricity small(er) change; industry more fluctuating / electricity more stable; correct use of data to express a comparison;	2
1(a)(iii)	*any two from:* concern about global warming; because carbon dioxide is emitted when oil is combusted; increase in the use of alternative fuels / other methods of electricity generation; expense;	2
1(a)(iv)	*any one from:* more people own cars; more flights; increase in, shipping / trade;	1
1(b)(i)	*any two from:* millions of years ago; from, dead / decomposed, plant / animal / plankton / sea creatures / organic matter; (fell to bottom of sea) and were covered by mud / sediment; increased the temperature and pressure;	2
1(b)(ii)	*any two from:* geological survey; use of sonar / seismic tests, to find out about rocks below the ground surface; geologist identifies, rock structures / upfold / anticline / salt dome / fault where oil is likely to be found; geologist identifies cap rock; examination of rocks from core samples (drilled); well is drilled;	2

Question	Answer	Marks
7(a)	*any three from:* millions of years ago; plants / animals / plankton, died, fell to bottom of sea; covered by (layers of) mud or sediment; this increased the heat and pressure; this changed the animal and plant remains into crude oil; requires anaerobic conditions;	**3**
7(b)	*both advantages and disadvantages must be covered for maximum credit:* *maximum three from, advantages:* (as a liquid oil) can be easily, pumped / transported / piped; (oil is) versatile in use (e.g. fuel for heating, cars, commercial vehicles, planes, ships, generating electricity); *idea of* ease of current use; *idea of* energy dense fuel; oil is widely available; *maximum three from, disadvantages:* (oil is) non-renewable; releases carbon dioxide when burned, which causes, enhanced greenhouse effect / global warming; releases, oxides of nitrogen / sulfur oxides when burned, which causes acid rain; oil spills very damaging to, habitats / wildlife; need to refine oil;	**4**
7(c)(i)	Africa;	**1**
7(c)(ii)	North America;	**1**

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Question	Answer	Marks
7(c)(iii)	*any three from:* availability of oil explained (some countries have more oil than others); wealth / some countries can afford more; higher use of, vehicles / electrical appliances / dishwashers / fridge / freezer / TV; technological, advances / development, so more industry in developed countries; to generate (more) electricity (for, industry / households); greater need for heating in cold countries; greater need for air conditioning in hot countries; some countries don't need oil because they have alternatives readily available (e.g. geothermal in Iceland); price of oil varies between countries;	**3**
7(d)(i)	*any three from:* most in southern North Sea; in a line from, Belgium / north France to, Denmark / Norway; greatest concentration off, Belgium / Netherlands coast; scattered in, (northern) North Sea / off coast of Norway; (line through) the English Channel; cluster, off the North West coast of France / west of English Channel; along major shipping routes;	**3**
7(d)(ii)	*any three from:* booms (to trap oil); detergents (to break up oil); skimmers (to remove oil from the surface); burning the oil on the sea surface; manual / mechanical, collection of oil washed up on beaches;	**3**

Question	Answer	Marks
5(a)	*any four from:* uranium (fuel); (uranium) decays / chain reaction / (nuclear) fission; water pumped into reactor; reactor heats water / conversion to thermal energy; turns it to, steam / vapour; (steam) turns a turbine; (turbine) turns the generator (generating electricity);	**4**
5(b)	*any three from:* no CO_2 emissions; (so) reduced impact on, enhanced greenhouse effect / global warming / climate change; no sulfur / SO_2 emissions; (so) no acid rain production; environmental impact of acid rain explained; lower volume of waste materials;	**3**

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Question	Answer	Marks
5(c)	*any three from:* education (on energy consumption); increase efficiency of existing energy sources; reduce energy consumption (of buildings) with, better building insulation / having more windows to improve, light / ventilation; use more energy efficient machines; examples of action, e.g. turn thermostat down / shower for less time; transport policy / named example of transport policy;	**3**
5(d)(i)	27;	**1**
5(d)(ii)	6.7(2) billion ;; (*if answer incorrect allow one mark for,* (12 + 12 + 16 + 8 =) 48% or 0.48 [1]);	**2**
5(d)(iii)	1 116 000;	**1**

Question	Answer	Marks
7(a)(i)	bar plotted at 18 first (large oil spills); bar plotted at 28 second **and** correctly shaded (small oil spills);	**2**
7(a)(ii)	1979;	**1**
7(a)(iii)	11;	**1**
7(a)(iv)	*any three from:* overall reduction in number of small oil spills / use of relevant data for small oil spills, e.g. 67 in 1976 decreased to 4 in 2016; overall reduction in number of large oil spills / use of relevant data for large oil spills, e.g. 26 in 1976 decreased to 1 in 2016; overall reduction in the total number of oil spills / use of relevant data for total oil spills, e.g. 93 in 1976 decreased to 5 in 2016; number of small oil spills (almost) always greater than large oil spills; fluctuations / use of relevant data to show fluctuations;	**3**

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Question	Answer	Marks
7(a)(v)	*any two from:* increased use of, navigational technology / GPS; use of double-hulled ships; MARPOL / legislation; development of more clearly defined shipping routes; better training of oil tanker crews;	**2**
7(b)	*any three from:* (oil) toxic (causing death); damage to feeding areas; reduces gas exchange between sea and air so less oxygen in water; oil on marine organisms, covers bird's feathers, affects flight / blocks gills of fish / other named example; cuts out light for, marine plants / photosynthesis; impact on (marine) food webs; damage to, habitats / coral reefs / mangroves;	**3**
7(c)	*any one from:* run-off from, land / industry; transferring oil between transport methods; leaks from, oil wells / oil rigs / pipelines;	**1**

Question	Answer	Marks
1(a)	*any three from:* idea of water, stored / contained / held, in reservoir / by dam wall; water moves (down) through, (sluice) gate / pipe; water, rotates / turns, turbine; turbine, rotates / turns / activates, generator (which generates electricity);	**3**
1(b)	*(list rule applied)* *any one from:* loss of land / loss of habitat / deforestation; additional localised flooding; shortage of water further down river; affects fish, migration / breeding; visual / noise, pollution; reduction in CO_2 emissions if switching from fossil fuels;	**1**
1(c)	*any two from:* no water source; climate is not suitable / little rainfall / water frozen; unable to fund; have abundance of other fuel sources, e.g. fossil fuels / solar power; geology / terrain, not suitable;	**2**

Question	Answer	Marks
7(a)(i)	1 245 000;	**1**
7(a)(ii)	48.2(%);	**1**
7(a)(iii)	difficult to identify source / ocean current moves oil around / reference to difficulty measuring exact amount / AVP;	**1**
7(a)(iv)	*y*-axis correctly labelled with unit; *x*-axis correctly labelled; three correct plots AND labelled;	**3**
7(b)	*any four from:* oil is toxic (if ingested); blocks gills of marine animals; coats feathers / prevents flight, of birds; blocks out sunlight for marine organisms; prevents photosynthesis; impacts food, web / chain;	**4**
7(c)	*any three from:* follow MARPOL agreement; impact described, e.g. less discharge of oil waste; use double-hulled oil tankers; both hulls must be damaged for spill to occur; use satellite navigation to guide ships; use defined shipping routes; reduces risk of collision; use of oil pipelines rather than ships; reduces ocean traffic; oil does not be transferred to ships whilst in port;	**3**

Question	Answer	Marks
8(a)(i)	45;	1
8(a)(ii)	diesel;	1
8(a)(iii)	*y*-axis: CO_2 in arbitrary units; *x*-axis: engine type AND four labels; sensible linear scale for *y*-axis using at least half the graph paper; 4 bars plotted;	4
8(b)	*any three from:* transport policies e.g. congestion charge; taxation (of other vehicle types); subsidies / incentives to purchase electric vehicles; subsidies / incentives to use electric vehicles; preferential right of way or access; increase availability of electricity charging points; raise awareness; AVP;	3
8(c)	*any four from:* emissions cause climate change / global warming; which affects <u>all</u> countries / populations; idea that carbon dioxide crosses international boundaries; example of climate change effect e.g. melting of ice sheets, glaciers and permafrost, rise of sea level, flooding; causes loss of land / forced migration; requires international cooperation to address; climate change causing changes in biodiversity;	4

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Question	Answer	Marks
6(a)(i)	5 (million tonnes of oil equivalent);	1
6(a)(ii)	*any two from:* renewable; reduces carbon footprint / carbon neutral; lower level of air pollution / cleaner; reduces dependency on, other energy sources / foreign oil; helps to conserve fossil fuels;	2

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Question	Answer	Marks
6(a)(iii)	*any one from:* production of biofuels replaces food crops; deforestation due to clearing land for biofuel crops; loss of biodiversity / monoculture; may lead to soil degradation; named pollution from processing/ production;	1
6(a)(iv)	observation that gasoline production / consumption is much higher than biofuels; *plus any two marks for supported conclusion:* *no:* very large increase in production required; fuel (oil) is cheap in US; familiar with use of gasolene and unlikely to swap; still produces CO_2 (when combusted); agreement needed (from all suppliers) for change to happen; *yes:* gasoline is finite resource and will, run out / become expensive; can be done with government incentive; Can be used in existing technology / vehicles;	3
6(b)(i)	column or row headings: (type of) vehicle, number (of vehicles); 5 categories listed correctly; 5 sets of numbers recorded correctly;	3
6(b)(ii)	*any four from:* people's environmental concerns / no CO2 emissions; consumer demand; competitive purchase prices / low maintenance; improvements in, range / battery technology / performance; availability of charging infrastructure; rising cost of traditional fuel sources / cheaper to run; government incentives, e.g. emissions charges, reduced road tax, scrappage schemes, free parking/ subsidies;	4

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Question	Answer	Marks
5(a)(i)	both points plotted correctly; 3 lines drawn to complete line graph;	2
5(a)(ii)	*any two from:* (almost constant) increase in energy consumption; slight dip in 2009; from 1700 (in 1985) to 3150 kW h (in 2015);	2
5(a)(iii)	*any four from:* different mean temperature / climate; different light levels / light intensity; availability of electricity supply / infrastructure; affordability of electricity / electrical appliances; level of industrial development; number of electrical devices in countries; availability of alternatives to electricity;	4
5(b)	*any four from:* use more energy-efficient devices; reduce use of (energy-consuming) devices; do not leave equipment on 'standby' / switch off when not used; use double/triple glazing / use better insulation; use windows to allow ventilation (rather than using air-conditioning); add windows to increase light levels;	4

Question	Answer	Marks
2(a)(i)	2.0 (km);	1
2(a)(ii)	tourism; ocean current will take oil to sandy beaches; 1 mark for industry 1 mark for valid reason for the industry stated	2
2(b)	booms: stop oil from spreading; detergent sprays: break down oil / disperse oil; skimmers: remove oil from water surface;	3

Question	Answer	Marks
6(a)(i)	1979;	1
6(a)(ii)	*any three from:* overall decrease; for both large and small spills; peak number of spills in, 1974 / 1975; greater decrease in smaller spills; number of spills levelled off after 2007; supporting quoted data if relating to trend of number of spills;	3

Question	Answer	Marks
6(b)(i)	*any three from*: oil is toxic; marine animals / birds / mammals / corals, killed; beaches / animals / corals, covered in oil; fishing disrupted; coats, feathers / fur affected; impacts food chain; (prevents light from reaching)plants / phytoplankton photosynthesis; oil prevents oxygen reaching water; bioaccumulation;	3
6(b)(ii)	*any four from*: small-scale; cannot collect all the oil; only suitable for calm seas / weather-dependent; cannot use, near coast / in shallow water; only works on, oils that float / low-density oils; cheap; simple technology; does not pollute water further; quick to use; stops the oil from spreading;	4
6(c)(i)	*any three from*: drill down to shale layer / rock; (pump down) liquid / chemical / sand /water (under pressure); cracks in rock formed; oil / gas, released from rock; oil / gas rises (due to pressure);	3

Question	Answer	Marks
6(c)(ii)	*any three from:* pollution of (local) water sources; risk of earthquakes / tremors; contribution to, global warming / climate change; uses large quantities of water; risk of fire (from methane) / explosion;	3

Question	Answer	Marks
2(a)(i)	66 years;	1
2(a)(ii)	T*wo from:* demand might increase / change; increase in industrialisation; urbanisation; increase in population; shortage of other sources; increase in living standards / activity; some sources are too environmentally damaging to extract;	2
2(b)	dead plants are buried; (intense) heat and pressure; over millions of years;	3

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Question	Answer	Marks
2(c)	*Any two for 1 mark:* tidal; wave; water / hydro-electric; wind; sun / solar; geothermal; biofuels / bioethanol / biogas / wood;	1