Question	Answer	Marks
5(a)	*any three from:* millions of years ago; (coal is formed from) the remains of, trees / plants; (when the plants died,) they settled to the bottom of swamps; forms peat; covered by, sediments / mud / sand; pressure and heat (over millions of years turned plant remains to coal);	3
5(b)	*both advantages and disadvantages must be covered for maximum credit:* *maximum three from, advantages:* plenty of supplies / readily available / near surface; cheapest fossil fuel / cheap method of extraction (open-pit mechanical); coal-fired power stations relatively, easy / cheap to build; constant supply of energy as can be burned 24:7 / reliable energy resource; high-energy fuel; easy to, store / use; *maximum three from, disadvantages:* non-renewable; cannot be pumped or piped (unlike gas or oil) / difficulty and cost of transporting solid coal; (high carbon content means) emits CO_2 leading to, (enhanced) greenhouse effect / global warming; emits, sulfur dioxide / oxides of nitrogen leading to acid rain; dangerous to, mine / extract;	4
5(c)(i)	all four plots correct ;; (*allow one mark for 2–3 plots correct* [1]);	2
5(c)(ii)	Asia and Oceania;	1
5(c)(iii)	Europe;	1

Question	Answer	Marks
1(a)	*any two from:* maps a large area; will show, topography / relief; geological characteristics / colour of, rocks / soils; reaches inaccessible areas; shows types of vegetation;	2
1(b)	*any one from:* geological / local surveys; taking soil or rock samples / drilling test boreholes / prospecting / re-working old deposits; geophysics / seismic waves / satellites / named sensors, e.g. gravity sensors, magnatronic sensors;	1
1(c)(i)	antimony;	1
1(c)(ii)	gold **AND** copper;	1

Question	Answer	Marks
1(a)	*any two from:* land cut into, flat surfaces / steps / reduces slope / gradient; speed of (surface) run-off is reduced; soil held back (by terraces); water held by bunds;	2
1(b)	*any two from:* contour ploughing; windbreaks; maintain vegetation cover; afforestation / mixed cropping / intercropping / crop rotation; increasing drainage; adding organic matter; bunds;	2

Question	Answer	Marks
9(a)	*any two advantages of surface mining:* easier to access; cheaper to extract; less risk of injury; quicker; *any two disadvantages of surface mining:* visual pollution; uses a lot of (farming) land / destroys habitats / reduces biodiversity; noisy; dusty; cost of remedial work after completion; larger waste heaps;	4

Question	Answer	Marks
9(b)	**type of rock** **igneous** / **metamorphic** / **sedimentary** basalt / slate / limestone granite / sandstone shale ;;; *all 6 correct [3]* *3-5 correct [2]* *1–2 correct [1]*	3
9(c)	*any three from:* created from existing rocks; heat; pressure; rock changes structure;	3

Question	Answer	Marks
9(d)	*Level of response marked question:* Level 3 [5–6 marks] A descriptive response, well argued, covering and linking both viewpoints of the debate. Response must provide a conclusion. Response will include specific examples or development to support the statements made. Factually accurate and well laid out. Level 2 [3–4 marks] A well-argued response but containing broad descriptions and lacking the support of relevant examples or development. The links between the environmental and the economic impact of mining may not be clear within the response. Or A one-sided response covered in depth and supported by relevant examples or development of the statements made. Typically factually correct but may contain some errors or vague detail. Level 1 [1–2 marks] The response may be lacking in depth, or may be in the form of a list. Some information may be inaccurate. The response may describe generalisations and lack technical language. No response or no creditable response [0]. *Level of response indicative content:* Candidates may agree that the extraction of minerals is necessary for the economy of the country, covering the need for income to feed / clothe the population and the need for minerals. Minerals are needed for many purposes and candidates may identify that minerals are important for foreign exchange and imports / exports. Some candidates will consider that mining may have more relative importance to the economy of a LEDC. Candidates may suggest there are plenty of other countryside areas that are not being mined and that minerals may be in short supply. They might also discuss restoring an area after mineral extraction, more efficient use of minerals and recycling. Candidates may agree that preservation is important but state that we need minerals too. Environmental factors might include deforestation, rare habitats, risk of extinction, disruption of food webs and that the effect of mining on these environmental factors is difficult to measure. Candidates may also cite the impact of noise, air or water pollution with their sources and / or impact. Candidates may also cover the time it takes to restore an area and consider only allowing mining in certain areas. Responses may also identify the impact of mining developments on tourism.	**6**

Question	Answer	Marks
5(a)(i)	opencast;	**1**
5(a)(ii)	*any four from:* over-burden removed; stored for mine restoration; cut away in, sections / benches; use of machinery; use of explosives; rock taken away for processing;	**4**
5(b)(i)	1500 million tonnes ÷ 20 million tonnes = 75 (years); (2008 + 75 years =) 2083;	**2**
5(b)(ii)	*any three from:* landfill; lake for fishing / water storage; parkland / recreation; nature reserve; afforestation / agriculture;	**3**

Question	Answer	Marks
5(c)	*any three from:* abundant coal reserves locally; lack of other resources locally; other sources / technologies, expensive / (coal) technology already in place; large economic benefit (exports / employment) from coal industry; (some countries) do not think the pollution issue is a priority;	**3**
5(d)	oil / gas / nuclear;	**1**

Question	Answer	Marks
7(a)	*any two from:* idea of existing rock; (is subjected to) high temperature **AND** pressure; to change (physical / chemical) structure / rock crystals;	**2**
7(b)(i)	40 100 bar line;	**1**
7(b)(ii)	(54 500 ÷ 89 900 × 100 =) 60.6 (%);	**1**

Question	Answer	Marks
7(b)(iii)	*any two from:* more mechanisation; fewer mines / mines closed / low coal price / poor profitability; concern over danger of working in mines; less demand for coal; cheaper imports available; non-renewable resource / finite reserves / running out; switched to other forms of energy resources; named environmental concern, e.g. climate change, acid rain; government policy;	**2**
7(c)(i)	*any three from:* development of infrastructure; improved, transport links / roads; improved, internet / communications services; improved local economy; increased commerce, e.g. services, shops, hotels; increased tax revenue which could be spent locally; improved, standard of living / quality of life / income; greater access to coal;	**3**
7(c)(ii)	*any two from:* landfill site; nature reserve / public space / park; flood to make a, lake / reservoir; visitor attraction / museum / science centre; other recreational area, e.g. race track, dry ski slope, zip wire; land restoration;	**2**
7(d)	*any three from:* have large reserves (of coal); infrastructure / mines, already in place; industry employs a large number of people in the country; lack of finance for, investment / research in alternatives; cheap imports of coal available; lack of other energy resources, e.g. nuclear, wind, solar;	**3**

Question	Answer	Marks
3(a)	<table><tr><th colspan="3">rock type</th></tr><tr><th>igneous</th><th>metamorphic</th><th>sedimentary</th></tr><tr><td>basalt</td><td>marble</td><td>limestone</td></tr><tr><td>granite</td><td>slate</td><td>shale</td></tr></table> 2 correct; 4 correct; 6 correct;	3
3(b)	*any three from:* sediments come from, existing / eroded / weathered, rock; transported by, water / rivers / wind / ice; deposited in layers / sedimentation; compaction (of sediments); (crystals of different salts causes) cementation;	3

Question	Answer	Marks
3(c)	*any two from:* loss of topsoil; loss of vegetation / destruction of habitat; impact on food chain; air pollution from trucks / vehicles; noise pollution;	2

Question	Answer	Marks
5(a)(i)	surface / opencast / open-pit / open-cut;	1
5(a)(ii)	*any three from:* air pollution due to transport; noise pollution due to transport / blasting; habitat loss due to land clearance; loss of biodiversity due to land clearance; dust pollution due to extraction; water pollution due to leaching / run-off;	3
5(a)(iii)	limestone is a sedimentary rock / formed by sedimentation; formed by the accumulation of shell (material); by compaction / weight of overlying sediment; over a long time period;	2
5(a)(iv)	*any three from:* availability / ease of extraction / cost of extraction; accessibility / ease of transportation; environmental impact assessment / away from settlements / protected areas / local opinion; supply and demand / profitability / economic factors; supply of labour; AVP;	3
5(b)(i)	2016;	1
5(b)(ii)	consumption is increasing; relevant quoted data, e.g. from 244 to 296 million tonnes / 21% increase;	2
5(b)(iii)	4.5% of 298 / 13.41; (298 + 13.41 =) 311.41 / 311 / 311.4;	2

Question	Answer	Marks
1(a)	*any one from:* loss of habitat; water pollution; air pollution / dust; loss of (agricultural) land; erosion; noise pollution; visual pollution; loss of vegetation;	**1**
1(b)	*any two from:* employment / jobs, in mine; employment / jobs, in associated service industry; improves economy (by bringing in business); improved, infrastructure / roads / rail; use / availability of materials used locally;	**2**
1(c)	*any two from*: land has been filled; lake / pond, has been made; car park / new road has been built; (top)soil added: trees / vegetation has been planted; area has been landscaped; park created;	**2**

Question	Answer	Marks
1(a)(i)	China;	1
1(a)(ii)	294;	1
1(b)	*any two from:* financial reason qualified; inaccessible area; negative environmental impact assessment / EIA; supply and demand decision; sustainability decision; use other options / resources;	2
1(c)	*any one from:* soil improvement; bioremediation; tree planting; making lakes; making nature reserves; using as landfill sites;	1

Question	Answer	Marks
2(a)	(1880 – 1800 =) 80;	1
2(b)	1985–1990;	1
2(c)	*any three from:* increase in world population; more release from agriculture; named example / more cattle / more rice paddies; increase in industrial releases;	3

Question	Answer	Marks
2(a)(i)	66 years;	1
2(a)(ii)	*Two 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

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

Question	Answer	Marks
4(a)	separate into types of metal (owtte);	1
4b(i)	shaft mining / deep mining / subsurface mining;	1
4(b)(ii)	*Any two from:* Less land needed for mining more materials / less land clearance / less loss of habitat; Less air / water / noise / pollution (due to mineral extraction); More energy efficient to recycle; Metals are finite / mining is not sustainable;	2
4(c)(i)	Correct plotting at: 340 000 and 800 000; width and key;	2
4(c)(ii)	*Two from:* general increase; fluctuates; data comparison e.g.340 000 (1000) to 700 000 (1000) / 360 000 (1000) increase / reducing proportion;	2
4(c)(iii)	42.5 (%);	1
4(d)	*Three from:* legislation / limit extraction / quotas; Increase recycling points for metals; Sorting facilities at refuse sites; Tariffs / taxation / grants; education / raise awareness; pay / reward for recycling;	3