Answers

Chapter 1

1. Niger 3.64%, Ukraine -0.61%.
2. 1 = Afghanistan in 1950, 2 = Niger (2011 est.), 3 = India (2011 est.), 4 = USA (2011 est.), 5 = Ukraine (2011 est.).
3. | Stage | Birth rate | Death rate | Population total |
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>high and fluctuating</td>
<td>high and fluctuating</td>
<td>low and stationary</td>
</tr>
<tr>
<td>2</td>
<td>high and stationary</td>
<td>falling rapidly</td>
<td>slowly growing at first then rising rapidly</td>
</tr>
<tr>
<td>3</td>
<td>falling rapidly</td>
<td>falling slowly</td>
<td>rising rapidly</td>
</tr>
<tr>
<td>4</td>
<td>low and fluctuating</td>
<td>low and stationary</td>
<td>high and stationary</td>
</tr>
<tr>
<td>5</td>
<td>falling slowly</td>
<td>rising slowly</td>
<td>falling slowly</td>
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</table>
4. A - cultural, social and religious: children give prestige to a man; desire for a son to carry on the family name; contraception is forbidden or discouraged; early marriage; polygamy; low status of women.
   B - demographic: a large number in the childbearing ages; a high proportion of females in the population.
   C - economic: children provide labour for family farms and income to support parents; illiteracy and ignorance because of lack of education; poverty of government and citizens so little contraception provided; to ensure some children survive because of high infant mortality rates. (This is partly social.)
5. 1: Family planning clinics provide contraception.
   2: Better education and greater literacy enables people to understand and read about the benefits of smaller families.
   3: Fewer children die because of better health care and improved water supplies and sanitation.
   4: Better employment prospects decrease poverty and allow more to buy contraception.
   5: Later marriages reduce childbearing years.
   6: Migration to cities where the status of women is higher, there is more access to media, contraceptive clinics, better medical care and better jobs.
7: Education and careers for women reduce their childbearing.
8: More people desire to have better living standards and material possessions so have fewer children, as children are an expense.
6. Better sanitation, clean water supplies, better medical care, improved diets, vaccinations and medicines, greater knowledge.

Chapter 2

1. c, b, c
2. Australia 2.85 per km², Bangladesh 1071 per km².
3. a) Stage 1 concave sides
   Stage 2 triangular
   Stage 3 straight sides (thins slowly from the base upwards)
   Stage 4 slightly convex sides
   Stage 5 very convex sides, rapidly narrows from 15 years to the base
b) i) 5  vii) 5
   ii) 2  viii) 1 or 2
   iii) 1  ix) 5
   iv) and (v) 5  x) 1
   vi) 2  xi) 4
4. 59.8 people are supported on average by every 100 workers.
5. Urbanisation means that people no longer need children to work on their farms, have better access to family planning provision and to media from which to learn about it. Women in towns are more likely to receive an education, have careers, marry later and be able to share in making the decision about the number of children to have. Urban living is expensive, so people wishing to keep their standards of living have few children.
6. | Age group | Kenya | Italy |
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>0 – 14</td>
<td>Large</td>
<td>Small</td>
</tr>
<tr>
<td>65 and over</td>
<td>Very small</td>
<td>Large</td>
</tr>
<tr>
<td>15 – 64</td>
<td>Medium and increasing</td>
<td>Medium but decreasing</td>
</tr>
</tbody>
</table>
7. Physical reasons for high density: gently sloping, low relief, temperatures without extremes, adequate reliable rainfall/water supplies, fertile soils, natural resources (especially mineral deposits).

Human and economic reasons: good transport routes, mines, industries, energy sources.

Chapter 3

1. a) before leaving: difficulty of getting a visa, affording the cost of travel.
   b) in destination country: unable to get a job, only low paid or unpleasant work available, resentment from the unemployed locals if given work, language difficulties, friction between peoples with different cultures and religions.

2. a) benefits for the host country: provides labour, especially to do the jobs the local people do not want to do, often at lower rates of pay. Some migrants are skilled e.g. doctors and dentists.
   b) possible problems for the host country: tension between the locals and immigrants, pressure on social services and housing (leading to squatter settlements and slums), unemployment, language problems and the expense of providing translations. Migrants from LEDCs are often less healthy and put a strain on health care services. They are often less educated. They have higher fertility rates, leading to population increase. Financial resources are strained. The price of houses, food, energy and other necessities rises because of the increased demand.

3. Migrants may send back some of their income and might return, bringing with them skills and experience gained.

4. The absence of many young men of working age causes problems for the families left behind. Children are deprived of their fathers and the women are left to do the work on the subsistence farms as well as look after the children and elderly, so productivity remains low and poverty continues. The migrants are mainly the most educated, so the area is deprived of people who could stimulate its economy. The birth rate also falls.

5. a) Internal voluntary rural – urban migration
   b) Internal temporary daily rural – urban migration - commuting
   c) temporary voluntary international economic migration
   d) Internal permanent voluntary urban to rural
   e) international, involuntary (forced) (may be temporary or permanent)
   f) internal involuntary (forced) (may be temporary or permanent) environmental
   g) internal involuntary (forced) temporary environmental rural to rural

6. There are much bigger numbers of people of working age and their children, than elderly people. Retired people tend to prefer to live in rural areas, especially near their former homes before they migrated to the town or city.

Chapter 4

1. a) 3
   b) B – it has more services (although A has a slightly bigger population)
   c) I – lowest population and lowest number of services
   d) Somewhere between 801 and 5000
   e) 700, but it could be less
   f) Doctors – has the highest threshold population

2. a), b) and c) – Not all answers will be the same. The spheres of influence of the lowest order settlements, F – J, should not include other settlements. The other spheres of influence will include lower order settlements.

3. A Linear, along a road for transport, on gentle slopes, above the flood plain.
   B Dispersed, on gentle slopes for easy access and cultivation.
   C Nucleated, at a road junction which is the most accessible point in the area, opposite a bridge point, on gentle slopes, above flooding level.

4. A 1 G 7 M 8
   B 3 H 2 N 14
   C 15 I 9 O 6
   D 4 J 10
   E 5 K 11
   F 13 L 12
Chapter 5

1. a) (Mainly) nucleated.
   b) Settlements are on slightly flatter areas on steep valley sides. They are good defensive points and are on the main road route.

   b) A – clustered around well for water supply. B – each farm in the centre of its own land. C – each farm in its own land but with access to the road and at the edge of the flood plain, possibly free from flooding. D – above the level of flooding on gentle slopes.

3. and 4. Answers will depend on the area you have chosen.

5. A 9 B 14 C 3 D 7 E 13 F 1 G 8 H 2 I 15 J 10 K 11

Chapter 6

1. The diagram represents a city in an LEDC. The high class residential areas are close to the centre and in spines. The quality of housing decreases with increasing distance from the centre and there are shanty towns on the outskirts.

2. a) In MEDCs the quality of life is greater away from the centre but in LEDCs the quality of life is greater closer to the centre (although not in the very centre).
   b) In MEDCs there is often older, poor quality, high density housing close to the centre and high quality low density suburbs. In LEDCs there may be recent informal squatter developments on the outskirts which have few basic services.

3. a) In 1980 there was an equal but low number of buildings of each height.
   b) By 2005 there had been a great increase in the number of each type of building. There were about 4000 5–8 storey buildings, with smaller numbers of the other categories. There were about 700 over 30 storeys.
   c) The buildings of over 30 storeys may be in the CBD where the shortage of land and high price of land has encouraged vertical building.

4. Your answer will depend on the area you have chosen.

5. a) shanty
   b) brownfield
   c) residential
   d) ghetto
   e) greenfield
   f) transition
   g) retail

6. A 5 D 9 G 2
   B 1 E 8 H 7
   C 4 F 6 I 3

Chapter 7

1. a) The poor quality housing in MEDCs is both in the inner-city areas (19th century slums, modern flats and former villas) and outer-city estates. These areas may face derelict housing, crime and social problems.
   b) In LEDCs there is some poor quality housing in the inner city but most is outside the city edge in squatter settlements. These areas face much more severe problems like temporary buildings, small buildings and lack of proper water, electricity and sanitation.

2. Core: Banks, businesses, department stores, chain stores, specialist retail outlets, highest quality shops.
   Frame: Transport terminals, office area, parking, shops requiring large land area, limited light manufacturing, warehouses and wholesaling, car sales, small and low-grade shops, specialist services.

3. Disadvantages of the CBD: Congestion, lack of parking, high land values, decreased accessibility, air and noise pollution.
   Advantages of a location on the edge of the city: Cheaper land, more space for parking, pleasanter ‘greener’ environment, greater accessibility via ring roads.

4. a) Recent immigrants concentrate in areas with low-cost housing; immigrants are attracted to others with the same language and culture.
   b) Ghetto
5. Your answer will depend on the example which you have chosen.

6. A 7 D 4 G 2
   B 5 E 1
   C 3 F 6

7. Across
   3. Transition
   5. Slum
   7. Park and ride
   8. Ghetto

   Down
   1. Rural urban fringe
   2. Commuter
   4. Shanty
   6. Twilight

Chapter 8

1. a) Overcrowding is greater in cities in LEDCs. Water and electricity supplies are more available in MEDCs, although Mexico City has a relatively high figure. Infant mortality is higher in cities in LEDCs. There is no clear link between economic development and noise levels.
   b) Possibilities include: refuse collection, mains sewerage, crime levels, unemployment, availability of transport, income levels.

2. a) Water pollution could lead to diarrhoea and dysentery. Nitrogen oxides, particulate matter and sulfur dioxide all lead to lung irritation and disease. The action of sunlight on vehicle emissions causes ground level ozone which causes photochemical smog and that also causes lung problems.
   b) Possible solutions include improving vehicle emissions, specific improvements to the road system and specific improvements to public transport.

3. Urban sprawl is the process of large urban areas growing outwards rapidly into the surrounding rural area.
   In New York it has been caused by: overall population growth, the affluent middle classes leaving the inner areas for a better lifestyle in the outer suburbs, businesses re-locating to the suburbs because of cheaper land and better accessibility, fear of terrorist attacks and expensive housing closer to the city.

4. b) c) c) a)
5. d) a) b) c)
6. A 3 C 2 E 4 G 6
   B 1 D 7 F 5

Chapter 9

1. a) i) I - Antarctica  II - Asia
    ii) Asia/Europe
    iii) Asia
    iv) $728\,000\,000$ divided by $10\,498\,000 = 69.35/69$ per square km
    v) MEDCs smaller/LEDCs larger, $1279$ million compared with $5250$ million, Asia alone larger than all North America, Oceania and Europe
    vi) No, because: it depends on the amount of resources, whether or not they are enough to give the population a good standard of living

   b) Reasons such as: extreme cold, ice/snow covered, high or steep mountains, poor soils, large swampy areas, climate unsuitable for farming.

   c) Problems, such as: shortage of labour force, inability to use resources to full potential, insufficient working population to support the dependent population, to manufacture goods, shortage of services, difficulty of attracting investors.

   d) You must name the country, clearly locate at least two densely populated areas and names of them or of places within them. Reasons for the high density should be detailed e.g. many industries provide employment for large numbers of people, large amount of mineral wealth provides employment and stimulates industrial development, very fertile soils on gently sloping ground allows intensive farming, ports stimulate industry and immigration, fertile areas surrounded by areas unsuitable for living e.g. swamps, so people crowd together where areas are suitable for living.

2. a) i) Population pyramids/age-sex pyramids
    ii) Large increase in birth rate (for $0-4$ age group), large increase in death rate (for $5-9$ age group)
iii) Young dependents are the largest group, economically active age groups are slightly smaller, smallest group/few over 65, roughly equal genders, slightly fewer young females than males, slightly more elderly females than males.

iv) more young/below 15 fewer 15-64 fewer elderly/65 and over more rapid decline in each older age group similar in the balance of males and females

v) Birth rate declined between 20 and 30 years ago and has been low and stable since. Death rate has reduced to give high life expectancy, resulting in many elderly.

b) Difficulties include: high cost of caring for the elderly, need for more hospitals and homes for the elderly, number of workers unable to support them, high cost of pensions, shortage of workers.

c) You need to name the source country of the migrants and the country or countries to which they moved, with possible names of ports or details of routes. Detailed reasoning is also required e.g. refugees from civil war or religious or racial persecution, economic migration because of unemployment and no prospect of a job in the home LEDC country, so low living standards with more chances of improved living in the host country because it is an MEDC.

3. a) i) The growth of towns and cities leading to an increasing percentage of the population living in urban areas.

   ii) Highest: less developed rural, lowest: more developed rural.

   iii) In the more developed regions, the urban population shows a slow, steady increase and the rural population shows a slow, steady decrease. In the less developed regions the rural population grows rapidly to 2020 then declines. The urban population grows rapidly throughout.

   iv) The rapid growth in world population is most noticed in the less developed countries, especially in India. Set against this, urbanisation has slowed in MEDCs and counter-urbanisation has happened (You can give reasons for this in your answer). Urbanisation continues rapidly in LEDCs. You should include the push and pull factors concerned in your answer.

b) i) In the rural areas there are fewer young people as a percentage of the population. This is true up to the age of 44. The percentage of children aged 0 – 4 is half that of the national population. There are more old people in the rural areas, especially those over 65 who are over double the national percentage.

   ii) Young people leave the rural areas to find work in urban areas. This leads to a decline in rural services such as shops, schools, public transport and social facilities. This gives greater cause for young adults to leave and a vicious circle of decline sets in.

c) Your answer should give specific detail about the example you have chosen. You should refer in detail to at least three of the following: decline of services in the CBD, transport problems, crime and racial conflict, housing shortages, squatter settlements, specific types of pollution.

4. a) i) Large shops and department stores, offices, government buildings, theatres and restaurants, hotels etc.

   ii) In two sectors, along major roads.

   iii) High class residential is in a zone around the CBD, there is also a sector of high class residential. Poor quality, permanent homes are in a concentric zone around the high class residential with shanty towns in the outer concentric zone.

   iv) The high class residents live next to the government and professional occupations in the CBD. The CBD may be the old colonial centre. The high class residential sector may be next to parks, good schools and open areas. The shanty settlements on the outskirts are the houses of recent immigrants. Conditions are better in
the more established areas nearer the centre where homes are permanent.

b) i) In MEDCs, quality of life increases with increasing distance from the centre. In LEDCs it increases at first but then decreases towards the outskirts. The quality of life is always lower in the LEDCs.

ii) In MEDCs, the increased quality of life is due to the decrease in building density. This leads to more recreational space, less crime, less noise pollution, less air pollution and less visual pollution. In the LEDCs, the CBD is congested. The high class residential area has larger houses and more space. The outer housing is poorly constructed and temporary. There may be no sewers or mains power. You should be aware of the other problems of these areas.

c) Your answer should give specific detail about the example you have chosen. You should refer to the locations of the CBD, different residential areas, industrial areas and open space. You should say whether these areas are in sectors or concentric zones.

Chapter 10

1. a) It is a place where plate is destroyed (by subduction).

b) Andes
c), d), e)

2. a) Japan, Philippines, Indonesia, New Zealand.

b), c), d)

3. a) Destructive / convergent / collision involving two continental plates.

b) Himalayas
c) The stresses of the collision cause the rocks to fault and earthquakes to form. There is no subduction and melting therefore no volcanoes.

4. Tension, compression, shearing.


b) In the mantle beneath the ocean ridge a concentration of heat causes partial melting. The small pockets of magma collect and rise towards the Earth’s surface. This magma cools and solidifies to form new oceanic crust. This new rock forms both below the surface and on the surface. The new oceanic crust cracks and diverges, pushed apart by the newly formed crust and dragged by the convection currents in the mantle.

c) The ocean will get wider.

6. Advantages: small areas of fertile soil for agriculture (especially on mineral-rich volcanic soils), attractive scenery for tourist industries, steep slopes and large rivers for hydro-electric power.

Disadvantages: steep slopes hinder communication and farming, cold temperatures, snow, shallow soils.
Chapter 11

1. a) Shield volcano. Examples include Mauna Loa, Mauna Kea, Kilauea and many others.
   b) Constructive margins (ocean ridges) plus mid-plate hot spots like Hawaii.
   c) Very large with a broad base, great height, gentle slopes with broad craters. Non-viscous lava flows a long way before solidifying.
   d) Non-violent, continuous eruptions of lava (but little ash) because non-viscous lava does not cause blockages and dormant phases.
2. a) Stratovolcano. Examples include Fuji, Aconcagua and many others.
   b) Destructive margins involving an oceanic plate.
   c) Steep, concave cones, often with parasitic cones. Viscous lava does not flow far before solidifying.
   d) Explosive eruptions with much pyroclastic material. Viscous lava causes blockages of the vent and dormant periods. Gas pressure builds up in the vent and is released by explosions.
3. c) Collapse of some buildings. Trees fall.
   d) The Mercalli Scale values describe the effects of the earthquake at different points. The magnitude is measured on the Richter Scale and shows the amount of energy released.

Chapter 12

   b) Polar: slow, low temperatures, slow chemical reactions. Temperate: quicker, as warmer temperatures increase reaction rates. Desert: slow no moisture for chemical reactions. Humid tropical: very fast, hot wet conditions speed up chemical reactions.
2. Across
   1. Physical weathering
   6. Anoxic
   8. Freeze thaw
   13. Oxidation
   15. Biological
   16. Humic acid

   Down
   2. Scree
   3. Carbonation
   4. Limestone
   5. Exfoliation dome
   7. Carbonic acid
   9. Erosion
   10. Exfoliation
   11. Weathering
   12. Oxic
   14. Soil

Chapter 13

1. The rapids are the steep part of the profile with the hard rock beneath the rapids. The soft rock is either side.
2. Waterfall: this can be labelled on any of the diagrams. Gorge: the dark shaded valley on the final diagram. Plunge pool: shown on diagrams B, C and D. Hard rock: on the first four diagrams hard rock is the top layer with soft rock underneath. Overhang: best shown on diagram B. Original position of waterfall: where the river passes the escarpment on the final diagram.
4. a) saltation  
   b) hydraulic action  
   c) corrosion  
   d) load  
   e) V-shaped  
5. Your answer will depend on the example that you have chosen but may refer to shape of the cross section, waterfalls, rapids, potholes and interlocking spurs.  
6. A 4        H 10        O 17  
   B 11        I 1         P 18  
   C 19        J 13        Q 12  
   D 5         K 14        R 3  
   E 6         L 16        S 9  
   F 7         M 21        T 2  
   G 8         N 20        U 15  

Chapter 14  
1. a) Fast  
   b) Erosion  
   c) River cliff  
   d) Slow  
   e) Deposition  
   f) Slip off slope (or point bar)  
2. a) Meander  
   b) Oxbow  
   c) Erosion  
3. a) Levées  
   b) Deposition  
   c) X – during floods, Y – during normal flow  
   d) They will become raised.  
4. a) Interlocking spurs  
   b) Delta  
   c) Vertical erosion 

Chapter 15  
1. Beginning A, ending 7  
   Beginning B, ending 3  
   Beginning C, ending 1  
   Beginning D, ending 2  
   Beginning E, ending 4  
   Beginning F, ending 5  
2. a) attrition  
   b) hydraulic action, corrosion  
   c) corrosion  
   d) corrasion  
3. A 8        E 6         I 7  
   B 3         F 4         J 9  
   C 1         G 11        K 10  
   D 2         H 5  
4. Across  
   1. Wave-cut platform  
   5. Wave-cut notch  
   6. Caves  
   7. Arch  
   8. Hydraulic action  
   11. Backwash  
   14. Stack  
   17. Attrition  
   18. Line of weakness  
Down  
2. Crest  
3. Trough  
4. Low water mark  
9. Destructive  
10. Discordant  
11. Bay  
12. Headland  
13. Shingle  
15. Fetch  
16. Swash
Chapter 16

1. A or B. Each can be either suspension - held in the water, or solution - dissolved in the water. C saltation - pebbles bounce as one hits another. D Traction Larger pebbles and shingle are rolled along the sea bed.

   b) North west

3. Your answer will depend on the coastline you have chosen but may include:
   • Mud on mudflats or marshes in sheltered environments e.g. behind spits.
   • Sand or shingle on beaches, spits and bars, with the sand being on the lower part and the shingle on the higher parts. Dunes are also made of sand.

   b) i) Long, and narrow with a re-curved end and a small hook.
      ii) A low ridge,
   c) Meandering creeks, two saltwater pools, between the foot of the cliffs and the mudflats.
   d) Spit grew out, mud deposited in calm water between it and the cliffs, marsh grew on the mudflats.

5. oblique
   swash
   angle
   backwash
   straight
   along
   drift

6. A 8  C 2  E 7  G 1
   B 3  D 4  F 6  H 5

7. When comparing constructive waves to destructive waves:

<table>
<thead>
<tr>
<th>Constructive waves are…</th>
<th>Swash</th>
<th>Backwash</th>
<th>Height</th>
<th>Wave-length</th>
<th>Frequency</th>
<th>Result of their action</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>stronger</td>
<td>weaker</td>
<td>lower</td>
<td>longer</td>
<td>longer between waves</td>
<td>deposit instead of erode</td>
</tr>
</tbody>
</table>
8. a) Attrition because it is not a transport process
   b) Marsh because it is not a type of sediment
   c) Shingle because it is not a feature of a salt marsh
   d) Longshore current because the others are to do with tides

Chapter 17

1. a)  
   c)  

2. a) Sunlight cannot penetrate far into the water if it has sediment in suspension. Sediment also provides the load for corrasion during storms causing reefs to break up (especially if in the paths of cyclones). Polyps are also unable to feed if sediment settles on them. Freshwater from rivers lowers the salinity levels of the sea. (Being less dense, the freshwater tends to stay in the surface zone where the living corals are and causes their deaths).
   b) An increase of sea temperature (caused by a reversal in the direction of equatorial ocean currents) causes bleaching of the reefs because it kills the colourful algae that live with the polyps. Deprived of food, the polyps then die. Reduced salinity also causes bleaching.

3. A 8 D 4 G 3
   B 7 E 1 H 6
   C 2 F 5

4. You should have marked:
   Strong onshore winds
   Wide expanse of sand exposed at low tide
   Obstacle at top of beach to slow down wind and cause deposition

5. Across
   1. Lagoons
   4. Constructive
   9. Attrition
   12. Hydraulic action
   16. Backwash
   17. Sand dune
   18. Wave-cut platform
   20. Longshore drift

Chapter 18

1. alcohol
   bulb
   expands
   mercury
   index
   maximum
   alcohol
   contracts
   minimum
   meniscus

2. a) anemometer
   b) rain gauge
   c) aneroid barometer or barograph
   d) wind vane
   e) aneroid barometer or barograph
   f) hygrometer or wet bulb thermometer

3. Beginning A, ending 5
   Beginning B, ending 1
   Beginning C, ending 4
   Beginning D, ending 2
   Beginning E, ending 3

4. Use is quick and easy. They measure to a far finer degree of accuracy than is possible on non-digital instruments.

5. evaporates
   humidity
   cools
   temperature
   dew
   relative
   condensation
   water
Chapter 19

1. a) actual temperature = 20°C, the maximum = 25°C the minimum = 20°C, the range = 5°C and mean daily temperature = 22.5°C.
   b) North west
   c) 68%
   d) A high relative humidity/the air is close to being saturated.

2. a) Aswan 0 mm none, Kisangani 1704 mm high.
   b) i) Annual rainfall is under 500 mm in the north and south west areas.
       ii) It is over 1000 mm across central Africa, except near the east coast.
   c) Choropleth map.

3. a) Northern because the temperature is highest in the middle of the year.
   b) Small, 5°C (30 – 25°). Summers are very hot and winters are hot.
   c) The annual rainfall total of 1605 mm is high. Summers have very heavy rainfall. It is extremely high from June to September. There is little winter rain.

4. a) Place A Place B
    | Difference in annual rainfalls | 260 – 65 | 225 – 80 |
    | Modal rainfall | 160 mm | 100 mm |
    | Median rainfall | 170 mm | 140 mm |

   b) Place A has the most unreliable rainfall.

5. a) Daily range of temperature is maximum temperature minus minimum temperature for one day.
   b) Mean daily temperature is maximum + minimum temperatures \( \frac{2}{2} \)
   c) Mean monthly temperature is total of the average daily temperatures the number of days in the month
   d) Annual range is the mean temperature of the warmest month minus the mean temperature of the coldest month.
   e) Mean annual temperature is the total of the monthly means \( \frac{12}{12} \)

7. a) Isolines/Isobars
   b) Circles
   c) Shading inside each station circle
   d) Arrows into the station circle
   e) The number of feathers on the arrow
   f) A symbol by the circle shows the type of precipitation
   g) Temperature is written in numbers above the station circle.

8. a) Temperature is continuous data (a recording of 6 followed by 10 must have had 7, 8 and 9 between them) whereas rainfall is discrete data with no such progression.
   b) Pressure recordings are converted to their sea level equivalents to eliminate the influence of altitude (pressure reduces with increased altitude) and to allow high and low pressure systems to be seen. (If this was not done, the pressure map would be like an inverted relief map).

Chapter 20

1. a) Cumulus – the others are high level clouds and made of ice crystals
   b) Cumulonimbus – the others do not produce precipitation
   c) Altocumulus – the others produce precipitation

2. a) Tropical storms form in the tropics between 5º and 20º north and south only.
They form over warm oceans between May and November in the Northern Hemisphere and between November and May in the Southern hemisphere. With the exception of those affecting the west coast of Mexico, they form towards the west sides of the oceans.

b) About half an hour during the passage of the eye.

3. b) c) a) b)

4. If the cloud is thin sunlight will pass through and it will be white; a cloud with a very large vertical extent will prevent sunlight penetrating to its base and will appear to be black or dark grey.

5. a) Stratus form in layers.
   b) Cumulus are heaped with flat bases and globular upper surfaces.
   c) Cirrus are thin, made of ice crystals and found at high levels.
   d) The prefix cirro means high.
   e) The prefix alto means medium level.

6. a) 8 oktas
   b) 0 oktas
   c) 4 oktas

7. Across
   1. Cumulonimbus
   5. Altostratus
   8. Anvil head
   13. Altocumulus
   14. Cirrocumulus
   16. Tropical storm
   17. Typhoons
   18. Condensation
   19. Stratocumulus

   Down
   1. Cyclone
   2. Stratus
   3. Cirrus
   4. Cumulus
   6. Oktas
   7. Nimbostratus
   9. Eye
   10. Drought
   11. Cirrostratus
   12. Hurricane
   15. Troposphere

Chapter 21

1. a) About 27.5°C – high/hot
   b) 28 – 26.5 = 1.5 °C – very small
   c) It is a cloudy climate because there is sunshine only for about half the daylight hours.
   d) About 80.5% - high.
   e) Very high, falling all year with most between November and January.

2. a) There is a double maxima of rainfall when the noonday sun is overhead on 21 March and 23 September. The total annual rainfall is high.
   b) High temperatures cause rapid evaporation from seas, the wet ground, lakes and rivers. Transpiration from the dense vegetation adds to the high humidity.

3. December 22nd
   low
   larger
   the way a slope faces
   30
   because of contact with a hot land surface

4. Equator
   March
   September
   June
   Tropic of Cancer
   December
   Tropic of Capricorn

5. a) By the afternoon the intense heating has made the ground very hot, setting off convection currents.
   b) The ITCZ moves over twice a year with the overhead sun. There is increased convectional activity along it.

6. b)

Chapter 22

1. a) Northern, because the highest temperatures are in the middle of the year.
   b) Total annual rainfall is very low with a maximum in August and most in the summer. The winter rainfall is extremely low.
   c) 8.26°C

2. a) They are highest at the beginning and end of the year and much lower all year than at Khartoum.
b) It is in the southern hemisphere. The lower temperatures could be because it is by the sea with a cold offshore ocean current or because it is at a higher altitude.

3. 16.5°C - very large

4. a) Insolation
   b) Inter-Tropical Convergence Zone
   c) Relief rainfall

5. a) Because the air becomes thinner with increased altitude and so absorbs less of the Earth's long-wave radiation.
   b) The maximum amount of solar radiation can reach the Earth's surface as there is no cloud.
   c) There are no clouds to stop the Earth's long-wave radiation escaping to space at night.

6. rainfall, descends, high, decreases, Trade (or equivalent words)

### Chapter 23

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Tropical rain forests</th>
<th>Tropical deserts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>(Fairly) low daily range</td>
<td>Very high daily range</td>
</tr>
<tr>
<td>Rainfall</td>
<td>High all year Predictable</td>
<td>Low all year Erratic and unpredictable</td>
</tr>
<tr>
<td>Pressure</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Air movement and result</td>
<td>Ascending, cooling</td>
<td>Descending, warming</td>
</tr>
<tr>
<td>Winds</td>
<td>Variable Light In-blowing (to ITCZ/LP)</td>
<td>Constant Strong Trades Out-blowing from HP</td>
</tr>
<tr>
<td>Humidity</td>
<td>High</td>
<td>Low</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Vegetation</th>
<th>Lush and dense Great variety of species</th>
<th>Sparse – widely spaced Few species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leaves</td>
<td>Large and broad Small and spiny or none</td>
<td></td>
</tr>
<tr>
<td>Tree Height</td>
<td>Tall Small</td>
<td></td>
</tr>
<tr>
<td>Tree roots</td>
<td>Shallow Deep</td>
<td></td>
</tr>
<tr>
<td>Plant Growth</td>
<td>Continuous In short rapid spurts after rain</td>
<td></td>
</tr>
<tr>
<td>Soils</td>
<td>Very deep Weathered into small clay particles Dry Red Shallow Stony, rocky or sandy Wet/muddy Grey</td>
<td></td>
</tr>
<tr>
<td>Fauna</td>
<td>Great variety, numerous Few species, sparse</td>
<td></td>
</tr>
</tbody>
</table>

### Chapter 24 part 1

1. A 3  
   B 8  
   C 6  
   D 4  
   E 1  
   F 2  
   G 5  
   H 7

2. Any three of the following:
   - **Lava flow diversion**: mechanical excavators can be used to channel lava away from buildings. Lava flows can be sprayed with water to make them solidify and stop flowing.
   - **Mudflow barriers**: walls built across valleys to trap mudflows and protect settlements further down the valley.
   - **Building design**: stronger roofs can be used to prevent collapse when buried by ash.
   - **Volcano monitoring to warn of future eruptions**: small earthquakes, ground deformation and gas emissions.
   - **Remote sensing**: monitoring ash clouds from satellites is useful for warning aircraft.
   - **Hazard mapping and planning**: looking at the pattern of past eruptions and predicting future eruptions. This can lead to a ban on building in areas at high risk, or constructing evacuation routes.

3. Any three of the following:
   - **Geothermal power**: electricity is generated, either directly from steam in volcanically active
areas, or by water pumped down and heated from hot rocks. Hot water from the ground can be used directly in central heating systems or in swimming pools. 

**Fertile soils**: some types of lava and ash form a rich, thick soil layer, rich in trace elements. These soils can produce high crop yields.

**Increased landmass**: volcanoes produce new islands and enlarge existing landmasses. 

**Tourism**: this can help the economy and creates jobs, e.g. as tour guides or in hotels. 

**Minerals and mining**: sulfur is mined around active volcanoes. Other mineral deposits were formed by volcanoes that are now extinct.

### Chapter 24 part 2

1. Your answer will depend on the examples which you have chosen, but it should give information which is specific to those places.

### Chapter 24 part 3

1. Strong winds which destroy buildings, flooding, landslides and mudflows.
2. Your answer will depend on the example that you have chosen.

### Chapter 24 part 4

1. and 2. Your answers will depend on the examples that you have chosen.

### Chapter 25 part 1

1. a) A line on a map joining places with equal rainfall. 
   b) They are moving to areas with higher rainfall. The north has less than 250mm of rain and is a desert.
   c) Areas on the fringes of deserts have very unreliable rainfall. The rains should come in summer but sometimes the rain does not come. In other years it is double the average.
2. Drought occurred in 2002 and 2006 because rainfall was well below the mean. Flooding occurred in 2010 when rainfall was well above the mean.
3. Your answer will depend on the example that you have chosen, but remember to give information which is specific to the example you choose.

### Chapter 25 part 2

1. Summer temperatures are hot (28°C). Winter temperatures are cool/warm 13°C. Annual temperature range is moderate (15°C). Rainfall is very low (54mm) as this is a desert climate. Most rain falls in summer.
2. Your answer will depend on the example that you have chosen.
3. **Exotic river** - a river that moves into a desert from an area with a wetter climate. 
   **Oasis** - an area in a desert where a natural supply of water is available for farming and settlement. It is usually from a spring or well.

### Chapter 26

1. a) i) The point on the earth’s surface directly above an earthquake focus. 
   ii) Volcanoes, mountain ranges, ocean ridges, ocean trenches, island arcs.
   iii) In long narrow bands along the plate margins. These include the Pacific Ring: Andes, Rockies, Aleutian Islands, Japan, Philippines, Indonesia, New Zealand; Alps – Himalayas; ocean ridges such as the Mid-Atlantic Ridge.
   iv) The plate margins are where the plates move against each other. Stress is built up in the rocks. The rocks fracture and are displaced (faulting) and the energy is released as earthquake waves. The plates may converge and be subducted by compressional forces, diverge with tensional forced or slide past each other, causing shearing stress.

   b) i) The pattern is roughly concentric with the highest intensities at the centre closest to the epicentre. The highest intensity is IX. The pattern is uneven and not circular. There are areas of higher intensity surrounded by lower intensity and vice versa.
ii) The ground cracks, pipes break causing fires, windows break leading to injuries due to flying glass, landslides, many buildings roads and bridges damaged or destroyed, ground surface rises and falls in waves, objects thrown into the air.

c) Explain the plate tectonic setting of the earthquake you have chosen and link this to the processes which caused the earthquake. Describe the relief effort. This may depend on whether your earthquake is in an MEDC or an LEDC.

2. a) i) Meander
   ii) A – upper course, B – lower course
   iii) A – interlocking spurs, B – flood plain, oxbow lake, bluffs
   iv) Hydraulic action – the force of the water alone hitting the bed and banks. Corrasion (abrasion) – erosion of the bed and banks by the river's load. Attrition – erosion of the load, making particles smaller and more rounded, by striking the bed and banks and other particles. Solution – soluble minerals in the rocks being dissolved by the water.

b) i) Monsoon torrential rains lead to large amounts of runoff. Steep slopes lead to rapid runoff. Deforestation leaves slopes bare causing rain to runoff rapidly. Too many people living in the flood plain to practise agriculture means that they cannot escape when the river floods.

ii) Explain at least three of the following methods: planting vegetation, use of reservoirs, straightening the channel, artificial levees, bridge design, wash lands.

iii) Give specific details about your chosen example. Advantages might include: flat land which is easy to build on, soils that are naturally fertile, valleys are natural routeways, navigable rivers, water supply, fish for food. Disadvantages might include: flooding, diseases, river is a barrier to navigation.

3. a) i) Cliff
   ii) 3 points from: Between high and low tide level, very gentle slope, slopes seawards, smooth, exposed at low tide, covered with water at high tide.
   iii) 3 points from: Rock pools, made of rock, water channels, may have ridges if rocks are tilted, may have beach material on top,
   iv) 5 points from: Waves attack foot of cliff, wave-cut notch, undercutting, rock above unsupported and collapses, cliff worn back, process repeats.

b) Name plus one point of description for each. Hydraulic action, wave traps air in crack/ it expands violently when the wave retreats causing the crack to enlarge. Corrasion, waves carrying pebbles/load crash against the rock and scrape it. Corrosion, limestone/calcium carbonate dissolves/goes into solution.

c) Locate the coast and give the local names of features, such as beaches and spits. Your description needs to have some specific detail (which could include the material of which the landform is made, its height, width and/or length, the number of hooks the spit has etc.).

4. a) i) Correct plots should be added, temperature should be joined with lines.
   ii) 29 – 13 = 16ºC.
   iii) Total of 29mm, very low, totally dry in summer, very low rain in winter.
   iv) Warm winter, hot summer, moderate annual range, hot or very hot days, cold nights.

b) Lack of clouds, very high amounts of insolation get through the atmosphere/reach the Earth's surface, at night there are no clouds to stop the Earth's long-wave radiation from escaping to space.

c) Very low mean annual rainfall, one year had nearly 124 times as much/over 100 times more, many years must have had no rainfall (to give such a low mean), nearly 39 times as much as the mean/a great deal more than the mean fell in one day, erratic/unreliable/unpredictable, torrential, convectional.

d) You need to name the desert or desert area you have studied, and give specific details, such as naming plants e.g. cactus,
yucca and Joshua tree (according to the area chosen). Also you need to give detail about the way plants are adapted to the climate.

Chapter 27

1. |
<table>
<thead>
<tr>
<th>Physical input</th>
<th>Human input</th>
<th>Process</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labour</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Milk</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Rainfall</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ploughing</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Soil</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storage and transporting to market</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capital</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pesticides</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Application of fertilizers, pesticides, herbicides and irrigation</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Government influence</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Irrigation</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fertilizers</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Harvesting</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Herbicides</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperatures</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drainage</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Sowing</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Land</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Market influence</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Weeding</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Machinery</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seeds</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meat</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Sunshine</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. The differences are shown by the following table.

<table>
<thead>
<tr>
<th>Products such as cotton, rubber or leather</th>
<th>An intensive farm</th>
<th>An extensive farm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social structures</td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>

3. Your answer will depend on the example that you have chosen. However it is important that you give specific information that applies to your example, for example referring to specific places.

4. Across

1. Combine harvester
2. Monoculture
3. Hybrid
4. Extensive
5. Alluvium
6. Herbicide
7. Foot and mouth
8. Commercial
9. Pesticide
10. Elevator
11. Intensive
12. Dry farming
13. Manure
14. Arable
15. Agriculture
16. Mixed farming
17. Irrigation
18. Capital
19. Physical
20. Cereal
21. Outputs
22. Pastoral

Chapter 28

1. It is important that your answer includes information on each of the four areas mentioned in the question. Your answer should include specific details that apply to your example, e.g. place names or specific climatic information.
2. The causes and solutions are listed in this chapter.

3. a) 15 F 6 K 3 P 19 U 13
    b) 17 G 4 L 5 Q 24 V 22
    c) 21 H 2 M 12 R 14 W 7
    d) 16 I 8 N 11 S 9 X 20
    e) 23 J 10 O 18 T 1

4. a) The areas with the greatest need will be those in the north west of the country with less than 400mm (and sometimes less than 200mm) of rainfall.
   b) 600 – 1000mm.
   c) The canal leads towards the north west to take irrigation water to the very dry area.

Chapter 29

1. a) raw materials – local iron ore and limestone, coal only 130 kms away
    b) transport - railway from Anshan to bring the coal
    c) large, flat site
    d) capital - from the government to modernize it
    e) large labour force
    f) large market in nearby industries (helped its growth, rather than initial development)

2. a) MEDC countries have high standards of education, plenty of money to invest, excellent transport and telecommunications systems, as well as populations with ample purchasing power.
    b) Branch factories, in which the work is just assembling the parts to form the product, are sometimes located in LEDCs where labour and land are cheaper and abundant. (Labour is about 40% cheaper.)

3. a) It is cheaper to assemble components for sale in a country than to pay duty on the imported vehicle. Spreading the industry makes it less vulnerable to problems in any one country e.g. a strike by workers.
   b) Instant communication is made possible by email, video conferencing and rapid fibre optic communication systems, so firms can move their activities to favourable countries when necessary and locate in any country with a big market.

Chapter 30

1. a) Great increase in both over the period. In the last 20 years tourist numbers doubled from nearly half a million to over 1 million while earnings increased fourfold.
    b) All except China are MEDCs with relatively rich populations with a considerable amount of leisure time. China's economy has expanded rapidly and sections of its population are rich.

2. Examples include:
   a) i) France: Eiffel Tower, Arc de Triomphe, Versailles,
       USA: Grand Canyon, Disneyworld, Monument Valley, Hollywood, Golden Gate Bridge, Niagara Falls, Times Square
       Spain: Alhambra, cities such as Seville, beach resorts,
       China: The Great Wall, Forbidden City, Terracotta Warriors, Yangtse Gorge
       Italy: Rome, Florence, Leaning Tower of Pisa, Amalfi coast, Italian Alps and lakes etc.
   ii) All are MEDCs or have tourist areas with reasonable standards of living and health care. Also, all are politically stable.

3. Words need not be the same as these, but should have the same meaning: sustainable conserving improving employment
4. Business, visiting friends and relatives, religious and health reasons.

5. The main types include sight-seeing (historical cities or beautiful landscapes), sailing, sport fishing, cruising, beach holidays, adventure, theme parks, climbing, skiing and other physical pursuits. Sport tourism (has grown rapidly through international competitions.) There are others.

6. A Tourism - 8
   B Stop-over destination - 3
   C Leisure activity - 7
   D Short-haul destination - 6
   E Honeypot - 1
   F Long-haul destination - 2
   G Ecotourism - 5
   H Domestic tourist - 4

7. Beginning A, ending 4
   Beginnings B & C, endings 3 & 7 (any pairing is correct)
   Beginning D, ending 2
   Beginning E, ending 5
   Beginning F, ending 8
   Beginning G, ending 9
   Beginning H, ending 6
   Beginning I, ending 1

8. Increased noise pollution and litter, increased congestion on pavements and roads, increased air pollution from greater vehicle use, resorts have priority over limited water supplies, so local farmers may not be able to irrigate at times, sewerage systems can become overloaded and sewers discharging into the sea can cause pollution, possible conflict between tourists and locals and between different groups of tourists, if they have different social norms and cultures, increased prices of goods and services for local people, some seasonal unemployment and some facilities are under-used at the same time.

9. Answers will depend on your choice. Physical reasons could include attractive scenery - beaches, mountains, waterfalls, a warm climate/season with guaranteed sun and little rain, wildlife. Artificial attractions could include historical structures, theme parks, provision for adventure holidays like jet boats on rivers.

Chapter 33

1. There are many answers, so one example is given for each: minerals are used in manufacturing e.g. iron ore converted into steel which is used to make vehicles or useful utensils. Each stage of the process generates wealth for the industrialist and the worker.

   Energy provides the power which industries depend on, allowing mass production to meet the needs of the people.

   Manufacturing industries produce goods, such as washing machines, which make our lives easier.

   Transport enables raw materials to move to factories and to be taken to market, as well as workers to get to their places of work.

   Tourism benefits people who work in the industry, such as hotel owners and employees.

2. a) Fossil fuels - Use alternative energy sources, such as HEP and solar power.

   Increase efficiency – switch off electrical items after use, develop engines that need less fuel, insulate and double glaze homes, re-use the heat from waste incinerators for heat and power.

   b) Mineral ores - Recycle industrial products when no longer useful. Replace with other substances, such as plastic (but, being made from oils, this is not sustainable in the long term).

   c) Forests - Reforestation, sustainable methods of harvesting (such as selective felling), more efficient use of timber, recycling paper and timber and using substitute materials for them. Supply wood through fuelwood (woodlot) plantations (using a constant cycle of re-planting, pruning and thinning -to encourage more growth). Plant new fast growing species and introduce fuel-efficient stoves.

3. crop rotation and monoculture, deforestation and reforestation, ploughing up and down a slope and contour ploughing, irrigation and dry farming,
cover cropping and fallow.

4. terraced gullies loose structure over-cultivation

monoculture up down bare over-grazing

5. Conservation method Erosion prevented Description

<table>
<thead>
<tr>
<th></th>
<th>Wind</th>
<th>Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terracing</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A series of retaining walls are built on a slope with the soil banked up behind each wall (forming steps). It prevents water running down the slope and carrying soil away. The water is trapped and soaks into the ground.</td>
<td></td>
</tr>
<tr>
<td>Contour ploughing</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ploughing takes place across a slope, not up and down it, so that water does not run down the furrows and wash soil away but is trapped and soaks into the ground.</td>
<td></td>
</tr>
<tr>
<td>Afforestation</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Planting large areas of trees stops strong winds and heavy rainfall reaching the soil and the roots hold the soil together.</td>
<td></td>
</tr>
<tr>
<td>Shelter belts (wind breaks)</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rows of trees are grown on the side of the field at right angles to the prevailing wind. The trees reduce the speed of the wind so that it is not strong enough to pick up the soil.</td>
<td></td>
</tr>
</tbody>
</table>

Irrigation ✓ ✓ Careful irrigation keeps the soil moist and heavier, preventing it being picked up, especially by the wind.

6. A 7 F 10 K 9
   B 8 G 2 L 12
   C 13 H 3 M 14
   D 4 I 5 N 11
   E 1 J 6

Chapter 34

1. a) The water and air pollution caused by one country is often “exported” to another in rivers and seas by prevailing winds, for example gases released by power stations in the UK are blown to Norway.
   b) Small businesses cannot afford more environmentally friendly technology. The country lacks the money to make many improvements.

2. a) Water vapour
   b) Nitrous oxide and methane (for both time periods).
   c) Methane only remains in the atmosphere for a very short period and nitrous oxide is only in a very small amount. Carbon dioxide is in large amounts and also long lasting. It is also greatly increasing in amount over time.
   d) The greenhouse effect is natural warming of the atmosphere. It is enhanced by the addition of greenhouse gases through human activities.
   e) Cows and padi fields release methane.

3. a) Carbon dioxide
   b) Methane
   c) Eutrophication
   d) Gully
   e) Fallow
   f) Cover cropping
   g) Dry farming
   h) Structure
   i) Nuclear
   j) Winds
   k) Leaching
   l) Ozone
   m) Hydro-electricity
   n) Wind
   o) Scrubbers
   p) Booms
   q) Geothermal
   r) Sea level
   s) Sustainable

Chapter 35
1. a) i) By the Brazilian and US governments. 
   ii) Limestone.  
   iii) Steel and slag. 
   iv) Two points from: the waste gas from the coking process is used to make thermal electricity, the slag is used in cement manufacture, HEP does not produce waste.  
   v) HEP is a cheap form of energy and the gas used to make thermal electricity is a waste bi-product released when coal is turned into coke. 
   vi) Three points from: low labour costs, high grade iron ore, cheap transport costs for imported coal by bulk carrier as deep water port nearby, most raw materials are nearby, e.g. water is available in the town. 
b) Transport costs of raw materials have reduced because of economies of scale, bulk carriers, container transport, which is cheap and more secure so fewer losses occur. 
c) Industries which use fossil fuels cause air pollution, e.g. smelting minerals, Industries which discharge waste in solution cause water pollution, e.g. textiles or leather tanning, industries which use big machinery or blasting cause noise pollution, e.g. opencast mining. 
d) You need to name the country and name locations within it where the industry has been set up. You also need to give specific reasons for the location. For example, the town has a university for well educated workers, with qualifications or degrees in science or engineering. The workers need to be inventive to keep the industry able to compete. 
2. a) i) 53-55%. 
   ii) The rainfall decreased so some vegetation would die, the increase in temperature would evaporate rain more quickly before it could be taken up by plants. Water passes quickly into sandy soils through the many spaces between the sand grains. 
   iii) Heavy rain, rain falls on bare soil, soil moves down slope into river. 
   iv) Three points from: vegetation dies leaving soil exposed, no roots to hold it, strong wind blows the soil away, because it is loose and dry. 
   v) More use of water, so less for farmers to use for irrigation, so crops and pastures may die. Increased cutting of vegetation for fuelwood, leaves more soil unprotected and loose. 
   b) The soil becomes loose/not held together = 1 mark, because it lacks humus and minerals, more demand for food pushes farming onto marginal soils which quickly lose their structure because of overcultivation, removal of vegetation means there is no longer a supply of humus, overcultivation and monoculture use up minerals. 
c) You need to name an area and some specific places within it e.g. the name of a valley where the side has been terraced or a gully has been filled with stones, or crop rotation has replaced monoculture etc. Give detail, such as naming a specific fertiliser e.g. phosphate, or stating that leguminous plants have nitrogen-fixing bacteria in nodules in their roots. 
3. a) i) Pastoral = animals, arable = crops.  
   ii) Intensive farms have a small area of land but large inputs of labour and fertiliser and a high output per hectare. Extensive farms are the opposite. 
   iii) Three from: land preparation, ploughing, sowing, weeding, applying fertiliser/herbicide/pesticide, harvesting, storage, transport to market. 
   iv) Commerical more capital, land, machinery, paid labour, fertiliser, pesticides, market influence. Subsistence more hand tools and hand labour, traditional methods. 
   b) i) Japan and California have similar yields but California is higher (17.6 and 22.3). Borneo has much lower at 7.3. 
   ii) California has greater inputs of machinery, fuel, fertiliser, irrigation, electricity and transport. Twice as much fertiliser is used. 
c) You should give specific information about physical inputs: climate, soil and land; and human inputs: such as capital, labour, machinery, seeds, government and market influence, fertilisers, pesticides,
insecticides, irrigation.

4. a) i) A fuel produced from organic matter that was growing millions of years ago.
   ii) They are being used faster than they are being created and will therefore run out. Burning them produces air pollution (carbon dioxide, sulphur dioxide and oxides of nitrogen). This can increase global warming by increasing the greenhouse effect.
   iii) Geothermal, wind, solar, hydro power. Biofuels and fuelwood can also be renewable.
   iv) Geothermal: restricted to certain types of geology, in volcanic and earthquake areas, wells can be exhausted. Wind: cannot be used in calms or storms, visual pollution, expensive at present. Solar: high capital input, not so effective in cloudy countries or high latitude countries. Biofuels: uses land which could be used for food increasing the cost of food.

b) i) Large amounts in Asia (including Arabia) and North America. Two smaller producers in Africa, one in South America. Non in Europe and Australasia.
   ii) China, Russia and USA have large reserves and large demand. There is a large demand in Europe but no major reserves. Arabia and Venezuela have large reserves but low demand and are exporters. Export is by ocean tankers from Arabia to North America and Europe. Pipelines transport oil from Russia and North Africa to Europe.

   c) For you chosen example, give detailed information about the river, the rainfall, the relief of the dam site, the geological conditions and the previous population density of the reservoir location. Problems are about the size of the capital input, flooding environments, flooding people's homes, possible dam collapse, sediment being trapped in the dam, reduction in water flow downstream.

Chapter 36

1. a) $4 \text{cm} \times 4 \text{cm}$ (1km$^2$ on the ground)
   b) $2 \text{cm} \times 2 \text{cm}$ (1km$^2$ on the ground)
   c) A small scale map
   d) A large scale map

2. a) 3700 metres
   b) 4450 metres

3. $C = 2683$, $D = 3085$, $E = 2786$

4. $F = 260820$, $G = 269820$, $H = 266825$, $I = 261829$

5. a) north west
   b) south east
   c) $308^\circ$
   d) $128^\circ$

6. a) 1 in 74
   b) 1 in 89
   c) 1 in 74

7. A 1    E 9    I 3
   B 7    F 8    J 4
   C 6    G 10    K 5
   D 12    H 11    L 2

Chapter 37

1. The area is a lowland with the maximum height being 93m above sea level. There is a valley running from north west to south east. This has a flat flood plain. A small V-shaped tributary valley joins from the north east. The slopes of the valley sides are gentle.

2. The main river has variable width and flows towards the south east. It meanders, has islands (braided) and marsh on its flood plain. It is joined by a number of tributaries. The north east has a high density of small streams forming a dendritic pattern. Drainage density in the south west is low and there is a reservoir (dam).

4. a) The settlement is on an area of gentle slopes. The steep valley sides have been avoided. This will make transport and agriculture easier.
b) The area is slightly above the level of the flood plain to avoid flooding. The small tributary stream can provide a water supply.

c) The settlement is at a very accessible point. It is at a road junction (route centre) next to the bridge over the main river. The settlement has grown in a linear pattern along the road.

Chapter 39

a) i) 4871.
   ii) 492686.

b) i) 4250 – 4350m.
   ii) 5500 – 5700m. (Some tolerance would be allowed in the answers)

c) i) 24m.
   ii) 1 in 233. (Answers will vary depending on the exact distance used)

d) i) south east.
   ii) 125 – 127°.

e) The positions of the four points should be shown clearly with arrows that point to the cross section. For the road and river, exact points are needed but for the flood plain and valley side a range of points would be accepted.

f) This area is part of the valley of the River Hutton. The lowest point is 210m, or just below. The highest point is 254m. There is a flat flood plain about 1km wide. The valley sides are quite gentle, although the west side is steeper than the east side.

g) The main river is the River Hutton in the south. This flows from north to south, meanders gently and is about 100m wide. There are two tributaries, the Rivers Hay and Wode. These are narrower and wind slightly. The River Hay has a dam or reservoir.

h) The settlements on the map are small. The village of Hightown is nucleated at a road junction. The village of Lowtown is linear along a road. Both these settlements are on gentle slopes but slightly above the level of the river’s flood plain. There is also an area of dispersed settlement on the north west. The highest ground and the flood plain is not settled.

i) The roads run parallel to the slopes, just above the level of the flood plain but avoiding the steeper slopes. A road crosses the flood plain at a bridge point and runs up a small valley in the north west.

Chapter 40

1. a) It is impossible to research all the population under investigation or to ask all the population in an area questions. Sampling saves time, effort and expense.

b) Either you would pick up the 39th pebble, then the one 58th after the first, then the 17th and so on, or you would pick up pebbles 39 cm along the line, then 58 cm from that point, then a further 17 cm etc.

c) 15 arable, 9 mixed and 6 pastoral.

d) i) A systematic line sample of points along a transect from the top of the slope down the slope to the river, possibly repeated three times to get an average at each height. The sample could be stratified to give proportional samples for the different types of land use, if they were thought to be significant.

ii) A point to be sampled could coincide with a terrace wall. It would be difficult to keep a straight line among the trees. Random samples could miss out parts of the slope and could concentrate too much on one height e.g. if a line ran along a terrace. Quadrat samples would be too large.

e) Systematic quadrats along transect lines at right angle to the sea to ensure coverage of dunes of all ages. Quadrats allow percentages of species or bare ground to be obtained quickly.

f) Too large an interval means features or people can be missed, too small an interval takes longer. It needs to be small enough to give a representative sample.

2. i) To avoid bias, a random point sample is needed. Give each building a number from 1 to 34. Use random number tables to select the 15 buildings, discarding any
numbers higher than 34.

ii) Line and area samples might miss buildings altogether or, if a line coincides with the valley, may have too many with the same type of site. Using large squares would be likely to include buildings with many similar sites in one area.

3. | Random sampling         | Systematic sampling                                                                 |
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>Without bias.</td>
<td>Quicker and easier to do. Ensures a coverage of the population and prevents clusters being selected.</td>
</tr>
<tr>
<td>Takes longer in the field because of the irregular spread of points, areas or lines. It is not always representative as it can miss small quantities of data.</td>
<td>Can give a false idea by giving too few or to many counts of a feature if they are arranged in regular lines. Not all features or people have an equal chance of being chosen.</td>
</tr>
</tbody>
</table>

4. a) Primary data is collected in the field by the person or group doing the investigation whereas secondary data is already obtained and published by a person or persons unconnected with the investigation.

b) Objective (quantitative) data is measured or counted and, being in numerical form, is invaluable for analysis whereas subjective (qualitative) data is less reliable as it uses the judgment or opinion of a person.

c) Secondary data from the local weather station could be compared with the findings of the investigation. These could be used to identify any differences or similarities.

5. Methods to be used are tested. If faults are found, changes can be made before the full study is undertaken.

6. A title, headings for date (and sometimes the day), time, location, name of the recorder, spaces by each to be filled in at the time of the investigation. Spaces for other factors likely to affect the study, if relevant. Sufficient space for all the recordings.

7. a) There are many possible questions, e.g. How often does aircraft noise disturb your sleep? Make sure the options do not overlap.

b) These are sensitive issues which should not be asked, yet are essential for a stratified sample and may be useful during analysis of the results of any sample.

8. A 4  D 6  G 3
    B 7  E 5  H 2
    C 8  F 9  I 1

Chapter 41

1. a) Choose a straight stretch of river, as free of boulders and vegetation as possible. Measure a set distance along the river with a tape measure. Float an orange along the distance, timing it with a stopwatch. Repeat three times and average the results. Velocity is distance divided by time.

b) Measure the width from one edge of the stream to the other.

2. At a site on each road, at least one student stands on each side of the road, one counting the traffic moving in to the town centre and the other the traffic moving out of it. Each student will start a stop watch which has been set to stop after a pre-agreed time. Ten minutes for each count would be appropriate. The counts should be done a minimum of three times spaced through the day to include a range of flows. The length of the school day and need for students to take organised transport home may dictate when surveys can be undertaken.

3. a) People living in area X shop in both supermarkets. Their spheres of influence overlap there.

b) Conduct a questionnaire with at least 30 shoppers at each supermarket at the same time. Include the question ‘Where do you live?’

c) To stop asking more questions if they do not live in the area, as their answers would not be useful to the enquiry.

4. Place a ranging pole at high water mark. Lay out a transect from it at right angles to the shore by extending a tape measure as far as it will go. Mark the end with another ranging pole. At regular intervals, place the quadrat at the side of the tape and count the number of different vegetation species and the percentage vegetation cover. A long ruler could be used to measure the highest species within the quadrat at each point.

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Record the results on the recording sheet. Move the start of the measuring tape to the second ranging pole and repeat the process until all the sand dune ridges have been crossed.

5. a) Indicators of environmental quality include the amount of outside space properties have, how much litter, graffiti and noise there is, the quality of pavements and roads and the quality of house exteriors. There are many more.

b) It is used as a guide to what each score for each characteristic represents so that all groups apply the same standards at different locations.

c) Spaces to write the site number, date and time. At the bottom add a space for the total score for the site.

d) By using an average score from ratings given by each member of the group.

e) The sites can be ranked according to their total scores. The place with the highest score is perceived to have the highest quality environment.

6. The times and days chosen for a survey can cause certain groups of people to be excluded, so giving bias to the investigation. For example, if it is conducted during working hours on a weekday only, workers will not be included.

7. Taking a photograph, which can be annotated later from a rough, labelled sketch, is quicker and better to do in adverse weather. A field sketch is more subjective but is more likely to highlight the most significant features.

8. Observe the colour and odour of the water and test its pH. Note the extent of any plant, fish or aquatic animal life or death visible at each site.

Chapter 42

1. a) Positive relationship until it turns negative when it becomes too wet for crop growth.

b) The closer the points are to the best fit line, (which may be curved or straight or go up and down), the stronger the relationship is.

c) An anomaly does not fit the relationship. It is a point considerably further from the best-fit line than the others and may indicate the influence of another factor.

d) No – The existence of a relationship does not mean that one variable causes the other. There may be a different factor influencing both.

2. a) R, R, S, P, Q, Q, S, P, P.

b) It suggest species P is the most abundant.

c) P, suggested by the transect G-H, is incorrect, as species R is by far the most abundant in the area. On the other lines P is equal to another species. This is because the species tend to be grouped and the lines miss some of the groups.

d) Total accuracy can only be achieved if the entire population (rather than a sample) is investigated and the work of all the students involved is also accurate.

3. a) random area sampling using quadrats.

b) 9 + 7 + 1 + 3 + 10 = 30. Divided by 5 = 6 to find the average per quadrat. Multiply by 100 for the whole area = 600.

c) 6 + 7 + 6 + 4 + 7 = 30. Divided by 5 = 6. Multiply by 100 = 600.

d) They are the same results but it is obvious that there are far fewer plants in the second diagram. Random quadrat sampling has failed to detect this.

e) The randomly chosen sites all had larger numbers of plants than normal for the area. Systematic sampling would have given better results.

f) Do more surveys, either using more survey points or doing the survey more times. Take an average of the results of several groups doing the same counting or measuring task.

4. Road radiate out from the central area. They are approximately equidistant except to the north east and south east where large areas have no motorways or A roads. Two are circular – an inner A road and the M25 outside the built-up area.

5. China shows a large increase of about 10 %, whereas India has increased little - by only about 1%. USA has decreased its percentage by about 5%. USA was by far the largest in 2000 but now China equals it. China’s rate of increase was rapid to 2007 but has slowed since then. USA’s rate of decrease has slowed since 2007.
Chapter 43

1. a) i) Maximum and minimum thermometer/Six's, at same time every day, read from lower end of index at eye at level. Reset using a magnet to draw the index back to the mercury.
   ii) Position of pointer on the dial.

b) i) 7°C, 4°C.
   ii) It was a weekend, student on duty forgot, could not gain access to the school etc.
   iii) 3.5°C and 11°C. Low on day 5 and increases by 7.5°C on day 20.

c) i) Correct plot for day 15.
   ii) Cannot accept/there is no relationship from the data collected. The days with the highest (1040mb) and lowest pressures (1009mb) have the same high temperature range (8°C).
   iii) High pressure has descending, warming air. Skies are therefore cloudless. The maximum insolation can reach the ground in the daytime. A lot of the Earth's long-wave radiation escapes to space at night because of the lack of cloud.

d) i) Look at the arrow which points to where the wind has come from. Read the compass direction from the fixed compass points.
   ii) On grass, part-buried with the rim 30 cm above the ground, in an open space (away from trees and buildings), upright.

2. a) i) Advantages – people might be willing to answer questions, as they were having to wait and at the end of their holiday they would be able to give accurate answers to question 5.
   Disadvantages -The investigation would have bias because the people chosen would depend on the flights going out and also because people travelling by other means would not be included.
   ii) Stratified systematic sampling to ensure that all age groups were equally represented and that the student could

   e) i) Plot for day 11.
   ii) The ESE wind with rain is an anomaly, as all others have a westerly component. It might be student error in recording on the sheet e.g. in day 3 instead of day 2 when rain might be expected.
   iii) Agree with the hypothesis. All days with rain, apart from day 3, have a westerly component. 12 out of 13 have rain. The most rain comes with a SW or SSW wind.
   iv) The school is on the west side of the continent. Winds from the west have crossed the sea. They contain a lot of water vapour. As they rise over higher ground they cool and condensation might occur.
   v) See if there is a relationship between other weather elements e.g. pressure and rainfall, temperature and wind direction. Compare the results with data from the local weather station.