

GEOGRAPHY

REVISION

NOTES

FOR EDEXCEL B GCSE (9-1)
SIMPLE, CLEAR & MEMORABLE

PAPER 3

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Topic 7

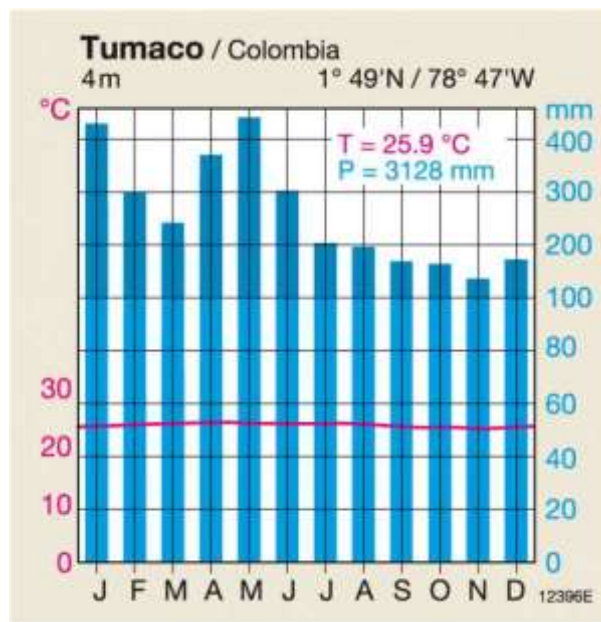
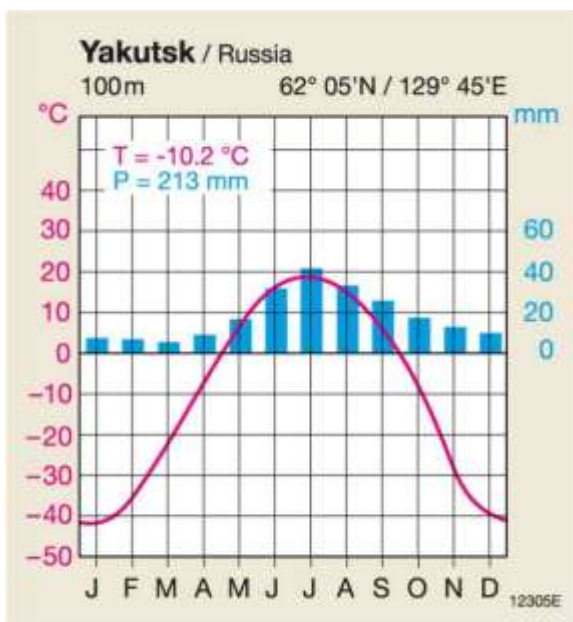
7 PEOPLE AND THE BIOSPHERE

7.1 The Earth is home to a number of very large ecosystems (biomes) the distribution of which is affected by climate and other factors

- A biome is a large ecosystem, i.e. a group of plants and animals that interact, over a large area of the Earth.

Latitude	Biome	Location	Temperature	Precipitation	Sunshine hours
HIGH (arctic)	Tundra	polar circles	LOW	LOW	LOW
	Taiga (boreal) forests	outside polar circles			
(Europe/USA)	Temperate forests	between polar circles and tropics	MEDIUM	MEDIUM	MEDIUM
	Temperate grasslands	outside tropics			
(tropics)	Deserts	tropics			
	Tropical grasslands	either side of Equator			
LOW (Equator)	Tropical	Equator	HIGH	HIGH	HIGH

Climate graphs (high latitude vs. low latitude):



- Local factors affecting biome distribution:
 - **altitude:** higher altitudes mean lower temperatures, at which different plants grow
 - **rock and soil type:** acidity/alkalinity can influence which plants grow
 - **drainage:** fewer plants grow in boggy areas
- **Biotic** (living components of an ecosystem):
 - flora (plants)
 - fauna (animals)
- **Abiotic** (non-living components of an ecosystem):
 - soils
 - rock
 - water
 - atmosphere
- Abiotic components, such as soil type, influence the biotic components, such as which flora grow, in an ecosystem.
- For example, in the taiga biome:
 - **abiotic:** long cold winters, low precipitation and frozen soils
 - **biotic:** this means only few, tolerant plants grow
 - limited food is available for animals
 - there are limited species, so a low biodiversity

Topic 7

7.2 The biosphere is a vital life-support system for people as it provides both goods and services

- The biosphere provides goods (resources):
 - **food:** sustainable harvesting; variety of fish and animals
 - **medicine:** plants used to treat diseases; aloe plant (cosmetics); poppies (in painkiller morphine)
 - **building materials:** straw for insulation; timber; animal dung and clay (traditional bricks)
 - **fuel resources:** biofuels by fermenting crops; wood (burnt); animal dung (burnt)
- Commercial exploitation of the biosphere:
 - **energy resources:** deforestation for timber
 - **water resources:** overfishing decreases number of species
 - **mineral resources:** slash-and-burn farming makes soils infertile
- The biosphere provides global services:
 - **regulates the composition of the atmosphere:** photosynthesis takes in carbon dioxide and produces oxygen for animals to respire
 - **maintains soil health:** decaying plant material provides new nutrients
 - **regulates water within the hydrological cycle:** plants filter throughflow and thereby slow the flow of water to rivers
- Global and regional trends show increasing demands for food, energy and water resources:
 - **population growth:** exponential, i.e. the rate of increase is increasing
 - **rising affluence:** increased global income means more energy use
 - **urbanisation:** increased demand for water and food in cities
 - **industrialisation:** factories and transporting goods use energy
- Theories on the relationships between population and resources:

Malthus' theory	Boserup's theory
<ul style="list-style-type: none">- pessimistic- impossible to increase resources as rapidly as population growth- overpopulation will bring famine- population decreases	<ul style="list-style-type: none">- optimistic- new techniques will be invented to increase food, water and energy supplies- resources will increase as population increases

8 FORESTS UNDER THREAT

8.1 The structure, functioning and adaptations of the tropical rainforest reflect the equatorial climate

**TROPICAL
RAINFORESTS**

- Biotic and abiotic characteristics are interdependent:
 - plants depend on climate, soil and water to grow
 - animals depend on plants for food
 - humans depend on goods and services from the rainforest

- Plant adaptations to the climate:
 - **buttress roots:** grow above ground to absorb nutrients, cover large area for support
 - **drip tips:** pointed leaf tips allow water to run off quickly without damaging them
 - **stratified layers:** plant adaptations vary depending on altitude:
 - *emergent layer: evergreen trees, many leaves, home to monkeys and birds*
 - *canopy layer: plenty of plants and animals*
 - *undercanopy layer: young trees with large leaves to capture sunlight, insects*
 - *forest floor: largest leaves, most insects*

- Animal adaptations to the climate:
 - **camouflage:** fur that blends with darkness of forest floor
 - **long tails:** needed by monkeys and lemurs for balance, especially in strong winds
 - **loud calls:** most birds cannot see each other in the dense canopy, so call

- Nutrient cycle:
 - nutrients in the soil are leached (washed), weathered away or absorbed by plants
 - plants are an instance of biomass
 - plants die
 - nutrients return to soil via decay

- Tropical rainforests have a very high rate of nutrient cycling to support high levels of biodiversity and complex food webs because:
 - **larger biomass** store (larger transfers of nutrients)
 - **faster decay** (higher temperatures, moister conditions)
 - **larger growth transfer** (plants grow all year round)

Topic 8

8.2 The taiga shows different characteristics, reflecting the more extreme and highly seasonal climate

TAIGA

- Biotic and abiotic characteristics are interdependent:
 - plants depend on climate, soil and water to grow
 - animals depend on plants for food
 - humans depend on services (e.g. regulating atmospheric composition)
- Plant adaptations to the climate:
 - **cone-shaped:** this helps shed winter snow
 - **needles:** acidic pine needles on forest floor prevent other trees from growing nearby
 - **simple structure:** only one type of cell (tracheid) is needed to serve water transport and plant support, so coniferous wood is simpler in structure
- Animal adaptations to the climate:
 - **migratory:** some birds migrate during winter due to lower temperatures and lack of food
 - **hibernation:** some bears, mice, bats and squirrels hibernate due to a lack of food
 - **thick oily fur:** prevents heat loss and provides waterproofing
- The taiga has lower productivity due to:
 - **less active nutrient cycling:** cold temperatures make decay slower, less growth
 - **lower biodiversity:** limited range of plants in taiga due to soil acidity and permafrost

8.3 Tropical rainforests are threatened directly by deforestation and indirectly by climate change

- Causes of deforestation:
 - **commercial hardwood logging:** making profits in LICs
 - **subsistence and commercial agriculture:** farming to support oneself as well as make larger profits by deforesting large areas and farming them
 - **local demand for fuel wood/biofuels:** wood and biofuels such as palm oil in Indonesian rainforests release energy when burnt
 - **mineral resources:** precious metals (e.g. coltan in Congo) dug in shallow mines by poor families and sold to TNCs for money
 - **hydroelectric power (HEP):** forests cleared to make HEP dams, e.g. Tucurui Dam in Amazonia, Brazil
- Climate change as an indirect threat to the health of tropical rainforests:
 - **ecosystem stress:** some organisms become extinct, threatening food webs
 - **drought:** wildfires release CO₂, reduce food supplies and kill decomposers

**TROPICAL
RAINFORESTS**

Topic 8

8.4 The taiga is increasingly threatened by commercial development

TAIGA

- Direct threats to the taiga:
 - **logging for softwood:** used in construction as timber
 - **pulp and paper production:** constant supply of softwood needed in these factories
- Indirect threats to the taiga:
 - **mineral exploitation:** over 4000 rare metal mines in Ontario, Canada
 - **fossil fuels:** mining for oil and gas underground destroys the forest and produces toxic waste, e.g. Athabasca tar sands in Canada
- Loss of biodiversity is due to:
 - **acid precipitation:** damages spruce needles, releases aluminium compounds in soil which damages roots, weaker trees
 - **forest fires:** fire-tolerant species dominate, some species killed, incomplete regeneration of forests between fires
 - **pests and diseases:** kill tree species, alter food webs and make forests less dense

8.5 Conservation and sustainable management of tropical rainforests is vital if goods and services are not to be lost for future generations

- **Convention of International Trade in Endangered Species (CITES):**
 - an international treaty from 1975 signed by 180 countries
 - lists 34 000 endangered species
 - bans cross-border trade of listed species

**TROPICAL
RAINFORESTS**

Advantages	Disadvantages
many countries have signed up	only protects species, not ecosystems, so does not prevent deforestation
wide variety of species	affected by global warming
has key successes such as reducing ivory trade and halting decline of African elephants	LICs cannot always afford policing to enforce agreements
works well for high profile threatened species such as rhinos	species have to be under threat to be listed, so it may be too late

- **Reducing Emissions from Deforestation and forest Degradation (REDD):**
 - UN project to stop deforestation and global warming, conserve forests and promote sustainable management
 - e.g. Juma Sustainable Forest Reserve (JSFR), which has reduced deforestation in Amazonia, Brazil
 - provides locals alternative income to logging

Advantages	Disadvantages
educates locals on importance of rainforest	relies on donations which can stop
promotes ecotourism to provide extra income for families	reserve managers earn 70 times more than each family does (just \$1 a day)
has protected 60% of Juma's forest	large area is hard to police (illegal logging may continue)
supports conservation of carnivores and larger primates	local people have unethically 'signed away' their rights without really knowing

- Why deforestation rates are rising in some areas and falling in others:
 - **increasing in:** DR of Congo, Indonesia and Nigeria due to:
 - rural poverty, weak laws, industrialisation, development
 - **decreasing in:** Brazil, Costa Rica and Colombia due to:
 - strong laws, fines, national parks, smaller rural population, public opinions
- Challenges of achieving sustainable forest management:
 - population growth
 - industrialisation
 - less international donations
 - climate change
- Alternative livelihoods could protect the rainforest through:
 - **ecotourism:** income from tourists all over the world to see nature first-hand
 - **sustainable farming:** selective logging, afforestation, agroforestry

Topic 8

8.6 The taiga wilderness areas need to be protected from over-exploitation

TAIGA

- Challenges of creating and maintaining protected wilderness areas, national parks and sustainable forestry in the taiga:
 - TNCs push for oil, gas and mineral extraction
 - HEP is seen as 'renewable' but destructs taiga
 - timber is needed for paper making and construction
- Reasons for conflicting views on protecting or exploiting forest and natural resources in the taiga:

Conservation	Exploitation
<i>environmentalists, indigenous groups, scientists</i>	<i>businesses, local government, some residents</i>
one of last intact forests	creation of jobs to boost economy
vital global carbon sinks (exploitation causes global warming)	exports boost national GDP
cultural importance	exploitation only affects a tiny fraction of a vast biome
exploitation causes deforestation, degradation and pollution	some exploitation is renewable, e.g. HEP and afforestation

9 CONSUMING ENERGY RESOURCES

9.1 Energy resources can be classified in different ways and their extraction and use has environmental consequences

Non-renewable	Renewable	Recyclable
coal oil gas	solar wind HEP	nuclear biofuels

- Environmental impacts of mining and drilling:
 - **landscape scarring:** causes visual pollution
 - **oil spills:** poisons surrounding land and rivers which harms animals and plants
 - **carbon emissions:** engines produce CO₂ which contributes to global warming
 - **removal of forests:** less photosynthesis and intake of CO₂ from the atmosphere

- Landscape impacts of renewable energy:
 - **HEP flooding:** damages habitats and endangers animals
 - **land use for wind turbines and solar panels:** visual pollution and taking up space

Topic 9

9.2 Access to energy resources is not evenly distributed which has implications for people

- Access to energy resources is affected by access to technology:
 - **finances**: some countries cannot afford the expensive technology required to access energy resources, e.g. drills to access underground shale gas
 - **conflict**: countries fighting wars usually have their technology destroyed by others
- Access to energy resources is affected by access to physical resources:
 - **geology**: harder rock is more difficult to drill into to access oil/gas reserves
 - **accessibility**: shallow coal is easier and cheaper to mine
 - **climate**: a wet climate makes it harder to produce dry, easily flammable coal
 - **landscape influences on renewable potential**: solar power is easier to access in sunnier countries, such as the Middle East, so there is no need to access fossil fuels
- Global pattern of energy use per capita and the causes of variations:
 - **level of economic development**: MEDCs tend to use more energy due to more buildings and therefore more needs for electricity
 - **reliance on traditional fuel sources**: e.g. some rural Indian villages use biofuels
 - **demand from different economic sectors**: industrialised countries, such as China, use a lot of energy to power their factories

9.3 The global demand for oil is increasing, but supplies are unevenly available

- How oil reserves/production are unevenly distributed:

Region	North America	South + Central America	Europe + Eurasia	Middle East	Africa	Asia Pacific
No. of billion of barrels of oil produced per day	19	8	17	29	8	8

- Why oil consumption is growing:
 - **rising per capita GDP:** rising affluence results in higher energy use per capita
 - **rapid industrialisation in emerging economies:** e.g. Mexico
- How oil supply and oil prices are affected by changing international relations:
 - **conflicts:** inability to provide oil (e.g. Iraq due to Saddam Hussein) results in a dramatic increase in oil price then a stabilisation by other countries
 - **diplomatic relations:** e.g. Saudi Arabia, an ally to England and provides us with oil
- How oil supply and oil prices are affected by economic factors:
 - **periods of recession versus boom:** e.g. UK recession of 2008 caused by the global banking crisis saw a dramatic increase in oil prices
 - **over or under supply:** over supplies result in lowered oil prices while under supplies result in higher oil prices

Topic 9

9.4 The world's continuing reliance on fossil fuels increases pressure to exploit new areas

- Economic benefits and costs of developing new conventional oil and gas sources in ecologically-sensitive and isolated areas:

Benefits	Costs
<ul style="list-style-type: none">- provides energy security- benefits national GDP- boosts local economy (creates jobs)	<ul style="list-style-type: none">- expensive to access some areas, e.g. Arctic- drilling technology is expensive

- Environmental costs of developing new unconventional oil and gas sources in ecologically-sensitive and isolated areas:
 - **water pollution:** oil spills will pollute rivers, e.g. the Athabasca River has experienced leaks from Athabasca tar sands extraction
 - **ecosystems:** fracking for shale gas requires large machinery and temporary infrastructure which destroys ecosystems, e.g. Canadian forests

9.5 Reducing reliance on fossil fuels presents major technical challenges

- Energy efficiency and energy conservation aims to reduce demand, help finite supplies last longer and reduce carbon emissions by:
 - **transport:** regenerative braking, cycle schemes, electric vehicles
 - **the home:** insulation, solar panels, energy efficient lighting, double glazed windows, hot water cylinder jacket, ground-source heat pump
- Alternatives to fossil fuels:
 - **biofuels:** energy production from plants/crops
 - **wind energy:** wind turbines provide clean energy
 - **solar energy:** converting light energy into electricity
 - **HEP:** uses water flow to produce electricity
- Future technologies:
 - **hydrogen:** fuel cells are being trialled (e.g. some London buses) to power vehicles
 - **electric cars:** use electricity produced more efficiently than by burning petrol/diesel
- A **carbon footprint** is a measure of all the greenhouse gases individuals contribute to the environment as a result of their daily lives:
 - **primary footprint:** energy use in the home + energy use for transportation
 - **secondary footprint:** energy use to provide goods/services + recreation
- Costs and benefits of avoiding fossil fuels to reduce carbon footprints, improve energy security and diversifying the energy mix:

Benefits	Costs
<ul style="list-style-type: none"> - low carbon emissions - available forever (non-exhaustible) - no pollution - widely available in most countries - reduces fuel transport costs 	<ul style="list-style-type: none"> - noise pollution from wind turbines - can occupy large land area - can destroy local ecosystems - more expensive than fossil fuels

Topic 9

9.6 Attitudes to energy and environmental issues are changing

- Contrasting views about energy views (business as usual versus sustainable):
 - **consumers:** unwilling to pay more for renewable energy
 - **TNCs:** unwilling to reduce profits to be sustainable
 - **governments:** enjoy imposing taxes on polluting vehicles etc.
 - **climate scientists:** think climate change is a serious risk which needs addressing
 - **environmental groups:** invest in renewable energy that won't harm ecosystems

- Why there are changing attitudes to sustainable energy consumption and reducing carbon footprints:
 - **rising affluence:** increased energy use per capita
 - **environmental concerns:** more frequent extreme weather events raise awareness
 - **education:** today's youth are well aware of the problems of climate change

GEOGRAPHY PAPER 3

7 PEOPLE AND THE BIOSPHERE

8 FORESTS UNDER THREAT

9 CONSUMING ENERGY RESOURCES
