Scheme of work

Physical geography: Hot desert systems and landscapes

This resource is a scheme of work for our accredited AS and A-level Geography specifications (7036, 7037). This scheme of work is not exhaustive or prescriptive, it is designed to suggest activities and resources that you might find useful in your teaching.

3.1 Physical geography

Core topic

3.1.2 Hot desert systems and landscapes

Specification content Week number	**Subject-specific skills development**	**Learning outcomes**	**Suggested learning activities (including ref to differentiation and extension activities)**	**Resources**
Week 1 **Systems in Physical geography** *(*If students have already studied the unit on Water and Carbon cycles then they should revisit the introductory section of that unit on 'Systems in Physical Geography'. Then return to the end of this section to introduce 'Deserts as natural systems'. If this is the first physical geography element	Use of key subject-specific and technical terminology. To identify **connections** and interrelationships between different aspects of geography. Constructing and using **systems** and models.	An overview of the concept and use of '**models**' by geographers as simplifications of a complex world. Understanding of the concept of '**systems frameworks**' as a type of model fundamental to most areas of geographical understanding. Students will be able to identify, describe and explain the elements of geographical systems, including: - stores/components - flows/connections - elements	Small group discussions followed by feedback - what models used in geography do students know? Students to draw and annotate a model system to show the key elements of a system. Students to draw and annotate a diagram of an example of a positive feedback system and a	Introductory presentation on Natural Systems Website with simple summaries of a number of earth systems A summary of the features of the lithosphere A summary of the features of the hydrosphere A summary of the features of the cryosphere

studied, then complete an introductory lesson covering the 'systems in physical geography' material outlined in this section) • Systems in physical geography: Systems concepts and their application to the development of desert landscapes – inputs, outputs, energy, stores/components, flows/transfers, positive/negative feedback, dynamic equilibrium. • The concepts of landform and landscape and how related landforms combine to form characteristic landscapes.	Labelling and annotation of diagrams. Develop an understanding of the concept of '**landscape**'.	- attributes - relationships. Students will be able to identify, describe and explain common characteristics of systems,including: - boundaries - inputs - outputs - flows. Students will understand systems that are classified as: - isolated systems - closed systems - open systems. Students will understand systems as being in a state of dynamic equilibrium that includes: - positive feedback - negative feedback. Students will be able to identify the four major subsystems of the earth: - atmosphere - lithosphere - hydrosphere - biosphere. To understand that these are interlinked as a 'cascading system'. **Desert as natural systems** Students will be able to identify desert environments as open systems.	negative feedback system. Repeat group discussion to see if students can now think of any more examples of systems in geography. Students to work in pairs/small groups to think of ways in which the 4 'spheres' are interlinked. To feedback and share ideas. Opportunity here for a short research task for interconnections. Practice low-tariff exam questions to assess learning – peer assessment opportunity. Small group discussion/Q&A to understand deserts as open systems.	More information on the cryosphere A summary of the features of the atmosphere An online lesson activity investigating connections in the atmosphere

		Students will be able to identify the different elements of a desert system, including: - inputs - components/stores - transfers/flows - outputs. Students will be able to understand desert landscapes as being in dynamic equilibrium that includes: - positive feedback - negative feedback. **Deserts as characteristic landscapes** Students will all understand the concepts of: - landform - landscape. Students will appreciate that characteristic desert landscapes are the combination of related landforms.	Construct and annotate a diagram to illustrate various elements of a desert as an open system. Paired/small group task to identify examples of positive and negative feedback in desert landscapes. Students to draw and annotate a diagram of an example of a positive or negative feedback in a desert landscape. Once all students have illustrated one example of feedback in a desert, there is the opportunity for individuals/small groups to research for others. Small group discussion to identify prior knowledge of desert landforms. Discuss what represents a characteristic desert landscape. (Specific landforms and landscapes are studied in detail later).	Some detail on positive feedback system in a desert environment Images of desert landscapes Features of different deserts
Week 1-2 **Deserts as natural systems** • The global distribution of mid and low latitude	Use of key subject-specific and technical terminology. Opportunities to	Students will be able to describe and explain the distribution of mid and low latitude deserts and their margins, including:	Q&A/discussion – to assess prior knowledge - where are hot deserts located? Draw and annotate world	Simple introduction to deserts and their distribution Some background to deserts

deserts and their margins (arid and semi-arid). • Characteristics of hot desert environments and their margins: climate, soils and vegetation (and their interaction) • Water balance and aridity index. • The causes of aridity: atmospheric processes relating to pressure, winds, continentality, relief and cold ocean currents.	develop skills such as drawing, labelling and annotating diagrams. Opportunities to engage with a range of maps. Develop an understanding of water budgets and aridity index. Handling primary and secondary sources of data. Online research. Constructing and interpreting a range of graphical and statistical techniques – including climate graphs. Opportunity to apply systems theory to identify the inputs, processes, and outputs operating in hot deserts.	- arid regions - semi-arid regions. Students will understand the water balance and aridity index. Students will develop an understanding of the features and interaction of characteristics of hot deserts, including: - climate, including precipitation and temperature - soils, including characteristics and formation of - vegetation, including characteristics, adaptations. Students will understand and be able to describe, explain and analyse the causes of aridity, including: - the general pattern of atmospheric circulation - distance from oceans or continentality - relief - cold ocean currents.	map to identify hot desert regions – produce accompanying notes to explain this distribution. Discussion to refer back to the idea of water balance from the Water and Carbon unit. Students to research the aridity index. Possible discussion Q – What are the reasons for aridity in deserts? Paired research/discussion to find out and explain the extreme temperatures experienced in some hot deserts and the large diurnal range. Opportunity to construct, describe, analyse and explain climate graphs for hot desert areas. Students to research a desert soil(s). Opportunity to sketch a soil profile of a typical desert soil, with annotations to describe its characteristics and analyse its formation. Students to use textbooks and internet resources to research the characteristics of vegetation in hot deserts, and explain reasons for these	Detail of distribution of different categories of deserts More background on deserts, including aridity index Some excellent images and summary introductory material Detailed text on causes of aridity 1. Detailed text on causes of aridity 2. Detailed text on causes of aridity 3. Detailed text on causes of aridity 4. Continentality and deserts 1. Continentality and deserts 2.

			characteristics and describe and explain various adaptations to the environment – this could be presented as notes, annotated sketches, revision poster, electronic presentation etc. Q&A and small group discussion to see if students can explain possible causes of aridity. Followed by research task – in groups individuals could research each element and then feedback back and exchange findings and build up a full explanation Opportunity to assess learning with a range of exam style questions relating to the distribution of hot desert environments and aridity – peer assessment opportunity.	
Week 3-4 **Systems and processes** • Sources of energy in hot desert environments: insolation, winds, runoff. • Sediment sources, cells and budgets. • Geomorphological processes: weathering, mass movement, erosion, transportation and deposition.	Use of key subject-specific and technical terminology. Opportunities to develop skills such as drawing, labelling and annotating diagrams. Opportunity to measure/study characteristics of	Students will be able to identify and analyse the characteristics of the sources of energy in hot desert systems, including: - insolation - winds - runoff. Students will be able to identify and analyse the sources of sediment for systems in hot deserts, including: - weathering of underlying parent	Paired/small group discussion to identify sources of energy at the coast. Students to explore energy in hot deserts. Opportunities for Q&A, discussion and research. including: - Insolation – insolation controlling changes in temperature and driving processes; the high angle of incidence; lack of surface	Global insolation patterns Interactive map of current surface winds Has desert features – but includes a short section on wind and water in deserts desert winds and *place!* Sediment in deserts (desert dust)

• Distinctively arid geomorphological processes: weathering (thermal fracture, exfoliation, chemical weathering, block and granular disintegration. • The role or wind – erosion: deflation and abrasion; transportation; suspension, saltation, surface creep; deposition. • Sources of water: exogenous, endoreic and ephemeral; the episodic role of water; sheet flooding, channel flash flooding.	wind and other aeolian processes including erosion, transportation, deposition and weathering (in the context of sand dune environment). Handling primary and secondary sources of data. Online research. Constructing and interpreting a range of graphical and statistical techniques. Using a range of maps, photographs and satellite imagery to identify desert features. Opportunity to apply systems theory to identify the inputs, processes, and outputs operating in hot desert environments.	material - rivers bringing sediment into deserts - aeolian sediments transported into deserts and deposited by winds. Students will be able to understand sediment budgets and cells in hot deserts. Including: - deserts as a source and recipient of sediment - net sediment loss and net sediment gain in hot deserts. To explore these using a systems approach. Students will understand that hot deserts are affected by distinctive geomorphological processes that produce distinctive landscape features. - Weathering, including: ○ thermal fracture ○ exfoliation ○ chemical weathering ▪ crystal growth ▪ hydration ▪ hydrolysis ▪ oxidation ○ block and granular disintegration. Students will understand the role of wind as an agent of: - erosion: deflation and abrasion - transportation: suspension, saltation, surface creep - deposition.	moisture for evaporation making more energy available to heat the air in contact with the ground - Wind – wind as a driver of processes; hot deserts located on mid-latitude high pressure belts being subject to localized winds blowing outwards; wind as an agent of erosion, transport and deposition; bare desert surfaces mean effects of winds are more notable - Run-off – rainfall is spatially and temporally unpredictable so too are inputs of energy from runoff; Intense rain storms can produce huge amounts of rainfall in localized areas where run-off can have very significant effects Q&A/paired discussion about where sediment in hot deserts comes from and how hot deserts can be both sources and sinks for sediment. Practice low-tariff exam questions to assess learning – peer assessment opportunity. Research opportunity to find out about the nature of distinctive geomorphological	(briefly about source) Link to weathering processes Link to weathering processes Link to weathering processes Link to weathering processes Short RGS guide to types of mass movement Desert processes (weathering and erosion introduction) (processes in deserts) (general web page about deserts – contains information on processes) (simple 'onion skin weathering' animation) (simple notes on processes in deserts) (weathering and erosion in deserts) Wind in deserts (animation of aeolian processes) (the role of wind) (the role of wind) (the role of wind) (summary notes on aeolian processes) (short video on wind erosion – second has good wind animations)

		Students will understand the sources of water in hot deserts: - exogenous - endoreic - ephemeral. The episodic roe of water in hot deserts: - sheet flooding - channel flash flooding.	processes in hot deserts. This could be presented as a revision poster, revision cards, digital presentation etc. and findings shared with the rest of the group. Q&A/paired discussion – what is the role of wind in hot deserts? Ensure students have notes on how wind erodes, transports and deposits sediment. In pairs/small groups research the sources and role of water in hot deserts – produce a revision resource – mind-map; PowerPoint/Prezi presentation; animation; information sheet or poster, etc. Opportunity to assess learning with a range of exam style questions – could involve some peer assessment.	Water in deserts (endoreic water) (amateur video of river Zin in Jordan) (Colorado River) (A number of the general 'desert' links above have information about water and wind in deserts also)
Week 5-6 **Arid landscape development in contrasting settings** • Origin and development of landforms of mid and low latitude deserts:	Use of key subject-specific and technical terminology. Develop knowledge and understanding of a range of related landforms that	Students will revisit the idea of distinctive hot desert landscapes resulting from a combination of related landforms. Students will be able to describe the characteristics and analyse the factors and processes in the	Q&A/discussion to define of 'landforms' and 'landscapes'. For each aeolian landform listed in the specification use a range of resources to produce a revision card/sheet (or electronic	(aeolian processes and landforms) (landforms created by wind) (The Big Hollow – short video on deflation hollow) (desert pavement)

aeolian – deflation hollows, desert pavements, ventifacts, yardangs, zeugens, barchans and seif dunes; water – wadis, bahadas, pediments, playas, inselbergs. • The relationship between process, time, landforms and landscapes in mid and low latitude desert settings: characteristic desert landscapes.	combine to form distinctive hot desert landscapes. To identify connections and interrelationships between different aspects of geography. Opportunities to develop skills such as drawing, labelling and annotating diagrams. Opportunity to analyse and present geographical data employing a variety of graphical techniques and descriptive statistics (see skills checklist). Develop understanding of the concept of 'landscape' as a combination of related landforms.	development of landforms and landscapes associated with the action of wind in hot deserts, including: - deflation hollows - desert pavements - ventifacts - yardangs zeugens - barchans and seif dunes. Students will be able to describe the characteristics and analyse the factors and processes in the development of landforms and landscapes associated with the action of water in hot deserts, including: - wadis - bahadas - pediments - playas - inselbergs. Students will explore the relationship between process, time, landforms and landscapes in characteristic desert landscapes.	resource). To include: - annotated sketch/ diagram showing its characteristics - a flow diagram giving a sequenced explanation of formation – explaining processes in their development - factors affecting their formation - reference to inputs, processes and outputs of desert landscapes. - a named illustrative example (not developed case study) - a summary of the timescales involved in the formation of the landforms and subsequent landscapes of which they are a part. For each landform resulting from water action listed in the specification, use a range of resources to produce a revision card/sheet (or electronic resource). To include: - annotated sketch/ diagram showing its characteristics - a flow diagram giving a sequenced explanation of formation – explaining processes in their	Examples of (ventifact images) (short video clip on ventifacts) (the yardang landforms Geo-Area) Examples of (aeolian landforms) Examples of (types of dunes) Examples of (dunes) Blog about (desert landforms - mainly fluvial)

			development - factors affecting their formation - Reference to inputs, processes and outputs of desert landscapes. - a named illustrative example (not developed case study) - a summary of the timescales involved in the formation of the landforms and subsequent landscapes of which they are a part. Identify a distinctive hot desert area – describe and assess the relative roles of water and wind in forming individual landforms and how they have combined to form the distinctive landscape they see. Students should discuss how a range of processes operate over different timescales and how the distinctive desert landscape has changed over time. (There is an opportunity to investigate landforms/ landscapes in the field). Opportunities to assess all aspects with a full range of exam style questions, including peer assessment.	
Week 7-8	Use of key subject	Students will be able to describe	Opportunity for students to	(Various maps of world regions showing

Desertification The changing extent and distribution of hot deserts over the last 10 000 years. • The causes of desertification – climate change and human impact; distribution of areas at risk; impact on ecosystems, landscapes and populations. • Predicted climate change and its impacts; alternative possible futures for local populations.	specific and technical terminology. Opportunities to develop skills such as drawing, labelling and annotating diagrams. Opportunities to engage with a range of maps. Develop an understanding of change through geological timescales. Handling primary and secondary sources of data. Online research. Opportunity to use a range of sources of information to research the impacts of historical, recent and predicted climate changes on the distribution of hot deserts and impacts of climate change.	and analyse the changing extent and distribution of hot deserts over the last 10 000 years since the end of the last glacial period of the Pleistocene. Students will be able to describe and analyse the causes of desertification in relation to recent current arid areas, including: - climate change – less and more unpredictable rainfall; higher temperatures; reduced water supply from rivers - human impact – population growth; population pressure on land. Students will be able to describe and justify the distribution of areas at risk of desertification. Students will be able to assess the nature of predicted climate change and evaluate potential impacts of desertification, including: - impacts on ecosystems - impacts on populations - impacts on landscapes. Students will be able to assess alternative possible futures for populations affected by desertification, including: - opportunity to explore links and feedback between desertification, global climate change and biodiversity loss - possible alternative development paths	use atlases, textbooks and internet resources to research the changing distribution of hot deserts over the last 10 000 years. Students could produce maps of changing distribution which could be described and analysed. Q&A/small group discussion for students to identify potential causes of desertification. Ideas to be shared with whole class. Use textbook or other wider reading to ensure students have a comprehensive range of causes. Opportunity for students to use atlases, textbooks and internet resources to research the areas at risk of desertification – these could be added to map produced above showing distribution of current hot desert areas. Map to be annotated, described and analysed. Opportunity to research current observable impacts of climate change in hot desert environments, followed by research into predicted future impacts. Findings could be shared using a display, or electronic	change since the last glacial maximum) Examples of (causes of desertification) Examples of (causes and effects) Info about (areas at risk of desertification) Info about (areas at risk of desertification) Info about (impacts of desertification) Info (environmental impacts of desertification) Article about Desertification: Its effects on people and land Unesco information on climate change and desertification Climatica.org information about Desertification: land degradation under a changing climate (desertification and climate change) Article on Desertification: The people whose land is turning to dust - BBC website article from 2015

		- focus on sustainable development.	presentation shared via a VLE. Opportunity for Q&A/group discussion/role play/debate about alternative possible futures for the different stakeholders involved depending on a different development paths.	
Week 8-9 **Case study 1** Case study of a hot desert setting to illustrate and analyse key themes in hot desert landscapes and engage with field data (exemplifying field data may be gathered in settings that experience some of the aeolian processes associated with mid and low latitude desert environments such as coastal dunes). **Case study 2**	Collect, analyse and interpret a range of quantitative data from a range of primary and secondary sources – this could include: Present, analyse, draw conclusions and evaluate those findings using a range of geographical techniques (see skills checklist). Collect, analyse and	Students could either study aeolian processes in a local coastal sand dune landscape through the use of secondary data sources – including online digital mapping, secondary data, local authority websites and textbook resources, or students could engage first hand or complete fieldwork to collect primary data, or a combination of both. The aims of such work are to: - illustrate how some places are affected by encroaching sand dunes - to investigate how geographers could employ fieldwork techniques to measure the aeolian processes at work - to show how such fieldwork could be practised in a local sand dune setting. Students will be able to describe,	An opportunity to either create a 'virtual fieldwork investigation' and provide students with a range of data relating to a local coastal sand dune environment for students to investigate and address the themes of the enquiry. Or, an opportunity for students to conduct a short fieldwork enquiry of a local coastal sand dune environment to investigate the main themes of the lesson. Students could write up a mini-fieldwork enquiry to act as a case study of a local coastal sand dune environment. (This could feed into the completion of *coursework* for the Non-examination assessment element of the specification).	Many of the accompanying textbooks will have illustrative examples of possible coastal fieldwork opportunities, other guidance may be found below. Guidance on coastal fieldwork techniques from the RGS Guidance on coastal fieldwork from the Field Studies Council Many of the accompanying textbooks will have illustrative examples of possible case

Case study at a local scale of a landscape where desertification has occurred to illustrate and analyse key themes of desertification, causes and impacts, implications for sustainable development. Evaluation of human responses of resilience, mitigation and adaptation.	interpret a range of qualitative and quantitative data from a range of primary and secondary sources – this could include discursive/creative material when looking at the experiences of people in place. (It might be advisable to conduct an investigation of causes, impacts and implications of desertification in a named area in or close to a hot desert region)	analyse and evaluate a range of themes relating to causes, impacts and implications of desertification in an area currently affected by desertification: - how population pressure can lead to desertification - an analysis of the relationships between people and landscape in areas affected by desertification - showing how sustainable solutions can help people adapt to and mitigate the effects of desertification.	Opportunity for individual, paired or group research task, using a range of textual, digital or audiovisual resources. Findings could be shared in traditional classroom approaches or shared through a VLE on a blog for example. For a more active learning approach students could research from the point of view of different stakeholders. Feedback could then take the form of a debate/roleplay or construction of SWOT analysis in groups etc.	studies of populations affected by desertification, but other guidance relating to impacts of desertification can be found above.

Quantitative and qualitative skills

Students must engage with a range of quantitative and relevant qualitative skills.

Making connections

Students must consider connections across the themes within the theme of hot desert systems and landscapes, connections between this and other themes in the specification and connections with novel geographical themes beyond the specification.