Geography Teachers'
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GEOGRAPHY

Trial Examination Paper, 2022

EXAM A

GUIDELINES FOR STUDENT RESPONSES

Note: Numbers in brackets indicate the number of marks allocated

Question 1 (6 marks)

a. (3 marks)

Students are required to briefly outline the global distribution of Boreal Parkland at both time periods, the Last Glacial Maximum and Holocene Climatic Optimum (2 marks). This should be brief and does not require a full PQE description. Students need to also compare the spatial distributions at these two time periods (1 mark). This requires a statement demonstrating how the distribution has changed over time.

During the Last Glacial Maximum (LGM), small amounts of Boreal Parkland were located in eastern Europe, central North America and eastern Asia, together covering less than 5% of the global land mass. During the Holocene Climatic Optimum (HCO), Boreal Parkland covered around 30% of North America, around half of Russia and a large part of northeastern China. This represents a combined global coverage of 10–15%. This demonstrates a large increase in the distribution of Boreal Parkland between the LGM and HCO.

b. (3 marks)

This question refers to one natural process causing the change in the spatial distribution of biomes. If the process is not natural, no marks are awarded. No additional marks are awarded for multiple processes. Students must clearly state an appropriate natural process (1 mark), describe how it causes changes to the distribution of biomes (1 mark) and provide an elaboration such as a specific example (1 mark).

Large-scale changes to the distribution of biomes such as Boreal Parkland are due to natural variations in climate as the earth cycles through glacial and interglacial periods. The natural process leading to these cyclical changes is called a Milankovitch Cycle, referring to changes in the earth's orbit, which leads to variations in solar radiation and seasonal contrasts. This is due to the changes in the shape of the earth's orbit (eccentricity), changes in its axial tilt, and changes to the earth's wobble (precession). The LGM marked the end of the most recent glacial period. The sharp rise in average temperature towards the HCO period caused the change in distribution of biomes such as a change in Russia from Shrub Tundra to Boreal Parkland.

Question 2 (7 marks)

Students need to explicitly name and briefly describe one natural process and one human activity causing melting glaciers and ice sheets at a selected location. Two marks are awarded for each of these causes (4 marks). Students must outline how these causes are interconnected (1 mark) and must include elaborations that demonstrate this interconnection in the form of additional detail and evidence (2 marks).

Bhutan's 677 glaciers are retreating at an average rate of 30–60 metres per decade. This is largely caused by anthropogenic climate change which is fuelled by the human activity of burning fossil fuels and the subsequent increase in the concentration of greenhouse gases in the earth's atmosphere. As a result, global temperatures have increased by 0.85°C between 1880 to 2012. The increased average temperature in Bhutan is leading to excessive ablation during summer which is exceeding the rate of accumulation during winter. Heatwaves, a natural meteorological process, are periods of unusually warm weather over an extended period of several days. Heatwaves in places like Bhutan can lead to very rapid melting of glaciers as it accelerates the rate of ablation. These two causes are interconnected because anthropogenic climate change is increasing the frequency, length and severity of heatwaves. Similarly, heatwaves in the context of a warmed climate are causing an unprecedented fast rate of melting. An example of demonstrating this interconnection occurred in June 2019 when a nine-day heatwave of two degrees above recent averages, combined with a delayed monsoon season, melted large volumes of ice at a rate far greater in scale than what was occurring due to climate change alone. This excessive melting was evident in places such as Lake Thorthormi where glacial lakes that had already grown due to climate change were at risk of collapsing due to this sudden increase in glacial runoff.

Question 3 (10 marks)

Students need to outline an appropriate global response to the impacts of melting of either ice sheets and glaciers, or deforestation. If the response is not global, no marks will be awarded. This response will need to be explicitly linked to an appropriate impact. Students must name two or more criteria to be used to evaluate their chosen response. These should be justified as appropriate by demonstrating why they are an essential measure in evaluating the response. Students should demonstrate the extent to which their chosen response has met, or is likely to meet, these criteria with the use of appropriate evidence, and provide a summary stating the overall effectiveness based on this discussion.

8–10	Responses are very clear and have answered all aspects of the question in detail. They include: • a clear and detailed outline of a global response to melting glaciers and ice sheets or deforestation • an explicit link between the response and an appropriate impact • an outline and justification of two or more criteria • a discussion of the effectiveness of the response based on these criteria • a statement of the overall effectiveness of the response based on this discussion • the appropriate use of data/statistics, elaborations and geographical terms and concepts throughout the response.

	Responses answer most parts of the question well but lack sufficient details in some areas. They include: • a brief outline of a global response to melting glaciers and ice sheets or deforestation • an attempt at linking the response to an appropriate impact • an outline of two or more criteria • a discussion of the effectiveness of the response with some reference to these criteria • a summary of the overall effectiveness of the response based on this discussion • Some references to statistics or geographical terms and concepts.
6–7	
3–5	Responses address some parts of the question. A basic understanding of the question is demonstrated although responses lack sufficient detail and depth. They include: • a brief outline of a global response to melting glaciers and ice sheets or deforestation • little or no reference to an impact of melting glaciers and ice sheets or deforestation • a brief discussion of the effectiveness of the response which lacks elaborations and evidence and makes little or no reference to criteria.
1–2	Response does not adequately address the question or contains lots of incorrect information. Insufficient detail is included in outlining the response and evaluating its effectiveness and criteria are not used as part of this process. The student has not demonstrated an adequate understanding of a global response to melting glaciers and ice sheets or deforestation.

The United Nations Forum on Forests' Strategic Plan for Forests 2017–2030 (UNSPF) is a global response to deforestation, focusing on achieving a balance between the environmental priorities of forest protection and the uses of forests by Indigenous peoples and rural communities. This responds to the environmental degradation of forest ecosystems with a loss of 10 million hectares of forests globally each year, and the negative economic impact that this deforestation is having on the livelihoods of one-third of the global population who depend on forests for both subsistence and income. The UNSPF aims to achieve this balance by providing financial resources and support to deforestation hotspots to improve the sustainable management and protection of forests and enhance the economic and social benefits of retaining forests, especially in developing countries. Two criteria that can be used to evaluate the effectiveness of the UNSPF are:

1. *whether it will meet its target of achieving a three per cent increase in forest land cover from 2015 levels by 2030 – an essential measure of its success in reducing the environmental degradation associated with deforestation*

2. *whether it has been able to financially support Indigenous peoples and rural communities who currently rely on forests for their primary income – essential in ensuring that the response is both economically and socially sustainable in addition to its environmental aims.*

A report released in 2020 determined that the first criterion is very unlikely to be met given deforestation is continuing at a large scale. However, there has been some minor success as the global rate has decreased from 12 million hectares to 10 million hectares per year while the area of protected forests has increased. Similarly, a 2019 review of the UNSPF showed that the funding needed to support communities in developing countries to shift their reliance on deforestation as a source of income has been inadequate. The review identified that many countries that had announced their plans to enable sustainable forest management, end illegal logging and change forest uses, have failed to take appropriate actions, demonstrating that the second criterion has not been met. Therefore, although there have been some slight reductions in the negative environmental and economic impacts of deforestation on a global scale, the UNSPF is not on track to meet its targets by 2030 and is largely unsuccessful.

Question 4 (10 marks)

a. (6 marks)

Students are required to clearly identify an appropriate change in land use (1 mark) using a "from…to…" statement. This should contain additional detail, descriptions or evidence such as changes to land use zoning (1 mark). Students should outline the spatial extent of the change with the use of appropriate evidence (2 marks). They must also discuss the temporal scale of the change with reference to specific time periods that link to specific parts of the rocess (2 marks). To achieve f ull marks, students should include appropriate elaborations throughout including reference to primary and secondary data as evidence.

Land use at Cave Hill Limestone Quarry, Lilydale, has changed from industrial use as a quarry to a mixed use, predominantly residential, in a new estate named Kinley. The process of land use change began in 2015 when the quarry was closed due to it no longer being financially viable. The site was then sold in 2016 to Intrapac Property. The masterplan shows that half of the 163-hectare site will become housing. This will contain 3200 properties for 8000 new residents, increasing Lilydale's population by 60 per cent. Around one-quarter will become mixed land use, including the 25-hectare zone where the quarry pit was previously located and the 45-hectare zone containing a heritage overlay in which some historic strctures will be retained. The remainder of the site will contain artificial wetlands, recreational reserves, transport infrastructure and a proposed new school. As of 2022, Site 1 has already been rezoned from Special Use to General Residential and housing lots have been sold ready for construction. The remainder of the development will occur over the next 15 to 20 years.

b. (4 marks)

This question should be answered with reference to a specific form of geospatial technology rather than a general discussion of several geospatial technologies. Students must name and outline an appropriate form of geospatial technology (2 marks). Examples include GIS, GNSS, satellite imagery or other forms of remote sensing. Students must clearly demonstrate how this form of geospatial technology was used to gather primary or secondary data for their fieldwork investigation (2 marks).

A Geographic Information System (GIS) was used as a secondary source to determine the spatial scale of land use change that will occur at Cave Hill Limestone Quarry site and the proportion of land uses in the surrounding region. GIS is a form of geospatial technology in which spatial data is organised in layers using an interactive digital map. This allows the spatial comparison between data sets and analysis of spatial distributions and associations. Google Earth was used as the basis of our GIS and polygon layers were traced onto a satellite image representing different types of land use such as residential, industrial, vegetated and open space. We also used Google Earth layers such as Roads and Places to determine existing infrastructure. We were able to use a website called Earthpoint to calculate the area of our polygons, allowing us to quantify the spatial extent of the land use at the site and in the surrounding region. As the development occurs, new satellite images will enable us to updated layers and calculate the spatial extent of the changes.

Question 5 (7 marks)

a. (2 marks)

Students need to clearly state both the nature (1 mark) and scale (1 mark) of the land use change planned for Egypt. This will require stating what the land use has changed from and to, and some information about the spatial extent of the changes.

Land use change at this site is from minimal use to a mixed-urban land use. The dominant land use will be residential, divided into 13 districts, covering around half of the site's area. These districts will be surrounded by entertainment zones and parklands.

b. (5 marks)

Students have the opportunity to identify and evaluate positive and/or negative impacts of the land use change on the natural and/or human environments. As impacts is plural, at least two impacts should be used. Students need to clearly state two or more appropriate impacts (2 marks). Students must demonstrate the link between the impacts and the land use change (1 mark). When evaluating the impacts, students must comment on the severity or importance of the impacts and justify this severity with the use of elaborations (2 marks).

This land use change from minimal use to mixed urban use is likely to have a severe negative impact on the natural desert environment. The conversion of desert to urban land use will completely destroy the local desert ecosystem by removing all natural characteristics. The use of 650,000 cubic metres of water per day to service the parklands and artificial river will increase the magnitude of this impact both in this region and regions further downstream. In contrast, this administrative capital will have a significant positive impact on the human environment both at this site and in Cairo. This newly developed environment will contain many amenities and services such as a university, justice courts and transport links, while also providing a range of recreational opportunities. An additional positive aspect to this impact will be the reduction in traffic congestion, pollution and water stress in Cairo. Both of these contrasting impacts are likely to be very significant in scale, trading the current characteristics of the land that benefit the natural environment for future characteristics that will benefit the human environment.

Question 6 (6 marks)

a.   (4 marks)

Students should recognise that there is a negative correlation between GDP per capita and fertility rate – that is, as income increases, fertility decreases. They do not have to use the term negative correlation as long as they can identify the relationship (1 mark). They should identify that the region of Africa has the highest fertility and lowest income and provide appropriate example/s and data (1 mark). Regions of low fertility and high income are more varied and include countries from Asia, Europe and North America; again, appropriate example/s and data should be included (1 mark). The final mark should be allocated for identifying an exception to this relationship such as China with a relatively low income and yet low fertility (1 mark) and include relevant statistics.

The relationship shown in Figure 3 is that fertility rate decreases as GDP per capita increases. The region of Africa has the highest fertility and a low income as shown by the countries of Niger at 7 children per woman and Democratic Republic of Congo with 6 children per woman and GDP per capita of under $5000. In contrast, many countries in the region of Middle East have low fertility and high income such as Qatar and United Arab Emirates both with over $60,000 GDP per capita and fertility rates below 2. An exception would be China which has a low fertility rate of 2 as well as low GDP per capita of under $20,000.

b.   (2 marks)

Students could provide one of several logical reasons here. SHEEPT terminology could be used. (1 mark). Providing further explanation of their reasoning (1 mark).

One possible social factor which could account for the relationship is the education and empowerment of women. Where countries have a higher GDP per capita, more money

is likely to be spent on schooling and ensuring all children are literate. Each generation would therefore have a growing awareness of contraception and preventing unwanted pregnancies, therefore reducing the fertility levels as income increased.

Question 7 (10 marks)

a. (5 marks)

Any two regions may be chosen. It is advised that students select two which are contrasting as this gives them more scope in their answer. Each region should be clearly identified and the range of data provided for each (2+2 marks). The final mark would be gained by a comparative statement: how different or similar are the regions? (1 mark)

The annual net migration for the regions of Asia and Oceania contrast greatly with the former being largely a region of net out-migration and the latter mainly being one of gain. For example, China, India and Indonesia in the region of Asia all experienced an emigration of up to 5 migrants per 1000 population. Thailand was an exception with up to 5 immigrants per 1000. In contrast Australia in the region of Oceania had 10–20 immigrants and New Zealand up to 5. Papua New Guinea was an exception in this region with a loss of up to 5 per 1000.

b. (5 marks)

Students should refer to an example they have studied in class here. It could be their ageing or growing case study country or another country they have discussed. Students should identify their country they are discussing and provide specific origin or destination in terms of population movement (1 mark). Quantification should be given (1 mark). Students should then discuss the contribution of movement in or out of the country to changes in both population growth and structure (2 marks). This could refer to specific age groups, genders, workforce changes or total population. A sentence providing an opinion of the extent of the contribution of this movement should be provided (1 mark). Students may choose to include a population profile to assist in their response.

Population movement has had only a slight impact on the population growth and structure of Japan. Migrants comprise only 2% of Japan's population of 82.93 million. The majority of migrants to Japan are from neighbouring countries in Asia: China 810,000, Korean 440,000 and Vietnam 410,000 are the largest contributors. Most of these people emigrate to Japan under the temporary labour category so they are working age, mainly 20–30 years of age whereas the median age of Japanese citizens is 47.8 years. Population movement to Japan therefore has some impact on age structure in that migrants have a greater proportion in working ages. However, due to low total numbers and their temporary nature, they have minimal impact on population growth and structure of the Japanese population as a whole.

Question 8 (7 marks)

It is suggested that students should break the question into key parts since it is asking students to make interconnections between Malthus theory and current global population growth and sustainability. Marks could be allocated as follows: outline of Malthusian theory (2 marks); current global population trends (2 marks); link to population growth and sustainability (2 marks); evaluative statement of relevance (1 mark). There is no need for students to give background information on Malthus. It does not matter whether students argue the theory is relevant or not as long as appropriate evidence is used to support their points.

Malthusian theory suggests that population growth will occur at a rate where production of resources such as food will not be able to keep pace with population increase. Food production would grow arithmetically (2, 4, 6, 8…) compared with population increasing exponetially (2, 4, 8, 16…). Thus, population growth could not be sustained long term; the social, economic and environmental needs of the population would not be adequately met into the future. Malthus argued that a crisis would therefore occur such as a war or famine to bring the two back into balance. Currently the world does have sufficient food and resources to meet the needs of its population. The current global trend of population growth is one which is slowing: 1.03% in 2021 compared with over 2.09% in 1968 as fertility levels are falling globally. However, regional variations in population growth across the world mean that population growth is not always sustainable. Sub-Saharan Africa for example still has a high rate of population growth at 3.7% in 2021 with 23% suffering from food insecurity, compared with Europe with 0.01% and 2.4% respectively. Europe however, faces potential issues in relation to economic sustainability as its rate of population growth is too low to sustain its workforce. Therefore, it could be argued that Malthusian theory may be more relevant at a regional scale rather than in relation to global population trends and that the particular aspects of sustainability impacted will vary.

Question 9 (7 marks)

a.   (3 marks)

Students are expected to have an understanding of the five stages of the Demographic Transition Model (DTM). This question is only focusing on Stage 5 so no discussion of the other stages is necessary. Discussion of population dynamics requires students to make interconnections in relation to births and deaths, the DTM model and population ageing. Suggested marks: 1 mark for a clear grasp of Stage 5 of the DTM; 1 mark for links to population dynamics; 1 mark for definition of ageing population.

Stage 5 of the DTM is characterised by lower birth rates compared with death rates. A country in Stage 5 will have very low fertility, well below replacement level of 2.1. Secondly, they will be likely to have a high life expectancy with most people living well into old age. This combination of few babies being born results in a low youth population whilst those in the older age groups 65 plus increase. Therefore, a higher

percentage of people over 65 years results: this is the definition of an ageing population.

b. (4 marks)

Students should select the country they have studied for their ageing population. A maximum of two marks can be awarded for a general discussion not linked to a specific country example. Discussion of an issue of an ageing population (2 marks); subsequent challenge (2 marks). For each part, 1 mark can be given for a general comment in regard to their selected country; the second mark should be allocated for providing additional detail such as quantification. A key word in the question is 'transitioned' so there should be some understanding shown that there has been/will be change over time.

Germany has an ageing population. Over 22% of the population in 2021 was aged 65 years and over and it is expected to grow to over 30% by 2030. One issue that Germany faces due to this ageing population is an increased elderly dependency ratio. The old-age dependency ratio was 21.6 in 1970, and has grown over 4% per year. By 2030, only two people will be working to support each retiree. A challenge is therefore to meet the growing demands for aged care services with a much-reduced tax base to support this. Health services, such as geriatric care, are costly and already account for over 11% of Germany's GDP.

Question 10 (10 marks)

Students need to outline an appropriate geospatial technology and how it is used to develop a country's response to manage a growing population. If geospatial technology is not included and/or the country selected does not have a growing population, no marks will be awarded. Students should demonstrate the extent to which their chosen geospatial technology has been effective to develop or implement the strategy. A summary stating the overall effectiveness based on this discussion should be included. It is recommended that students spend time planning their answer prior to writing their response.

8–10	Responses are very clear and have answered all aspects of the question in detail. They include: • a clear and detailed outline of a form of geospatial technology • an explicit link between the geospatial technology and a strategy to manage a growing population • a statement of the overall effectiveness of the geospatial technology based on this discussion • the appropriate use of data/statistics, elaborations and geographical terms and concepts throughot the response.

	Responses answer most parts of the question well but lack sufficient details in some areas. They include:
6–7	• an outline of a form of geospatial technology • an attempt at linking the geospatial technology to the strategy to manage a growing population • a summary of the overall effectiveness of the response based on this discussion. • Some use of relevant data/statistics and geographical concepts
3–5	Responses address some parts of the question. A basic understanding of the question is demonstrated although responses lack sufficient detail and depth. They include: • a brief outline of a form of geospatial technology • little or no reference to how this geospatial technology is used to help manage a growing population • a brief discussion of the effectiveness of the geospatial technology • little or no use of supporting data.
1–2	The student has not demonstrated an adequate understanding of the question. • Response does not adequately address the question or contains lots of incorrect information. • Insufficient detail is included in outlining the geospatial technology and its use in managing a growing population. • No evaluation of its effectiveness.

Niger is a country with a growing population. Its population of 24 million is growing at a rate of 3.6% so it will double in about 21 years. The main reason for this is the high fertility rate of over 6 children per woman, one of the highest in the world, accompanied by a falling death rate. One strategy implemented in 2012 in response to this has been the Family Planning Action Plan by the Nigerien government. A geospatial technology used in conjunction with this has been the use of aerial images captured by drones.

The Nigerien government's Family Planning Action Plan provided 2120 contraceptive distribution sites and training for 2500 workers to inform about reproductive health, including family planning. Together with increased health spending and improvements in female literacy, it aimed to increase contraceptive prevalence to 50% for married women by 2020. It hoped to reduce the fertility rate in order to help overcome issues such as food insecurity and pressures on education provision.

One geospatial technology used to assist in this program is the use of drone technology. Three quarters of Niger's population is rural and approximately one third of this population is nomadic. In addition, there is movement of displaced persons and refugees, especially in south eastern Niger. Drone technology is used by aid organisations such as UNHCR and REACH to monitor the changing distribution of the

population. Drones can capture aerial images which can be combined with other GIS-referenced data to map settlements. This information can then be used to help the government determine the distribution of appropriate health and contraceptive provision.

Whilst this geospatial technology has been successful at capturing information, it has mainly been used by aid agencies rather than the Nigerian government. Poor communication between government departments and supply chain issues, especially during COVID-19 have meant that the response has not been very effective. Under 17% of women were using contraception in 2020, well short of the 50% target and unmet need was at approximately 20%. Rural areas have lacked contraceptive supplies whilst urban areas have faced surpluses. Therefore, the geospatial technology has been only partially effective in helping implement Niger's strategy to manage its growing population.