S5 Geography Practice Paper: Population Structure and Transition, River Landforms and Flood Management, Coastal Landforms and Sea-Level Rise, Urban Land Use and Urban Problems, Industrial Location and Manufacturing Shift, Agricultural Systems and the Energy Mix (100 marks)

Level: S5 | Subject: Geography | 75 minutes | 100 marks | 24 questions | answer key

Part A: Population Structure and Transition (17 marks)

Each question carries 4-5 marks; show the formula and units, then state the result in one sentence.

#	Question	Answer	Marks
1	District A has an area of 78 km2 and a population of 486,000. Calculate its population density in persons per km2 (1 d.p.).	486,000 / 78 = 6,230.8 persons per km2. Marks: formula 1, substitution 1, answer with unit 1, one-sentence comment (a densely populated urban district) 1.	4
2	In the same year there were 5,832 births and 3,402 deaths with a mid-year population of 486,000. Calculate the rate of natural increase (per 1,000, 1 d.p.) and identify the stage of demographic transition.	(5,832 - 3,402) / 486,000 x 1,000 = 5.0 per 1,000; this is the low-growth stage (stage 3 to 4) with both birth and death rates low. Marks: formula 1, substitution and unit 1, answer 5.0 per 1,000 1, identification of stage 1.	4
3	Age structure: 68,040 aged 0-14, 330,480 aged 15-64 and 87,480 aged 65 or above. Calculate the young dependency ratio, the old dependency ratio and the total dependency ratio (1 d.p. each).	Young: 68,040 / 330,480 x 100 = 20.6%; old: 87,480 / 330,480 x 100 = 26.5%; total: 155,520 / 330,480 x 100 = 47.1%. Marks: 1 for each ratio (formula or answer), plus 2 for using the working-age population as the denominator.	5
4	Using the data above, identify the shape of the population pyramid and state two corresponding socio-economic characteristics.	Contractive (ageing) pyramid: a narrow base with a relatively wide top. Characteristics (any two): persistently low birth rate, long life expectancy, rising old-age dependency, shrinking workforce, higher health-care and pension spending. Marks: shape 2, 1 per characteristic.	4

Part B: River Landforms and Flood Management (17 marks)

Show units in all calculations; explanations must give causal links, not a list of features.

#	Question	Answer	Marks
5	A catchment covers 620 km2 with annual rainfall of 2,400 mm and a runoff coefficient of 0.45. Calculate the annual runoff volume in m3 (3 significant figures).	620 km2 = 620 x 10^6 m2; 2,400 mm = 2.4 m. 620 x 10^6 x 2.4 x 0.45 = 6.70 x 10^8 m3. Marks: area conversion 1, depth conversion 1, calculation 1, answer with significant figures 1.	4
6	180 mm of rain falls in 24 hours over the same catchment. Calculate the mean discharge	180 mm = 0.18 m; 620 x 10^6 x 0.18 x 0.45 = 5.02 x 10^7 m3; divided by 86,400 s = 581 m3/s. Reasons: rain concentrated in a few hours, tributary peaks arriving together,	5

	for that day in m3/s (whole number) and explain why the actual peak discharge is higher than the mean.	limited soil and channel storage, urbanisation raising the runoff coefficient. Marks: calculation 3, explanation 2.	
7	The designed channel capacity is 600 m3/s with a return period of 50 years. Find the probability that this discharge occurs at least once in 50 years (%, 1 d.p.).	1 - (1 - 1/50)^50 = 63.6%. Marks: formula 2, calculation 1, answer with % sign 1.	4
8	Compare the mean discharge with the channel capacity, identify the flood risk, and suggest two flood-management measures with one limitation each.	The mean discharge of 581 m3/s is already close to the 600 m3/s capacity, and the peak factor will certainly exceed it, so flood risk is high. Measures and limitations (any two): dredging or widening the channel (expensive, may raise water levels upstream); flood storage ponds (need large areas of land); embankments (risk of breaching, may worsen downstream flooding); land-use planning (restricts development, strong opposition). Marks: risk 2, 1 per measure with limitation.	4

Part C: Coastal Landforms and Sea-Level Rise (16 marks)

Each question carries 4 marks; support every judgement with the data given.

#	Question	Answer	Marks
9	Longshore drift moves 45,000 m3 of sediment per year. After a sea wall is built the downdrift beach loses the same volume each year and currently holds 135,000 m3. How many years until the beach disappears?	135,000 / 45,000 = 3 years. Marks: formula 2, answer with unit 1, identifying the sea wall blocking drift as the cause 1.	4
10	Sea level rises by 4.2 mm per year. How much will it rise in total after 30 years, in cm?	4.2 x 30 = 126 mm = 12.6 cm. Marks: calculation 2, unit conversion 1, answer 1.	4
11	The coast retreats at 1.8 m per year and a building stands 45 m from the shoreline. After how many years will the sea reach the building? Give one factor that makes this estimate too low.	45 / 1.8 = 25 years. Factors (any one): storm surges and typhoons intensify erosion, dams upstream cut sediment supply, accelerating sea-level rise, land subsidence from groundwater extraction. Marks: calculation 2, factor 2.	4
12	Option 1: build a 1.2 km sea wall at $38,000 per metre. Option 2: beach nourishment of 45,000 m3 at $180 per m3. Calculate both costs and give one advantage of each.	Sea wall: 1,200 x $38,000 = $45,600,000; nourishment: 45,000 x $180 = $8,100,000. The wall is durable and protects the hinterland directly; nourishment is cheaper and keeps the beach and its tourism value, though it must be repeated. Marks: 1 per cost, 1 per advantage.	4

Part D: Urban Land Use and Urban Problems (17 marks)

Give answers to 1 d.p.; evaluation questions need an explicit conclusion.

#	Question	Answer	Marks
13	A city has 610,000 people in a built-up area of 50 km2, of which 42% is residential. Calculate the overall population density and	Overall: 610,000 / 50 = 12,200 per km2; residential land = 50 x 0.42 = 21 km2, so	5

	the residential density (persons per km2, 1 d.p.).	610,000 / 21 = 29,047.6 per km2. Marks: overall 2; residential 3 (area, division, answer).	
14	Land use shares: residential 42%, commercial 9%, industrial 6%, roads 18%, open space 8%, others 17%. Verify that the total is 100% and identify the use most likely to occupy the city centre, with a reason.	42 + 9 + 6 + 18 + 8 + 17 = 100%. Commercial use is most likely in the centre: it has the highest accessibility, the greatest ability to bid for rent and needs to be close to large numbers of people. Marks: total 2, use 1, reason 1.	4
15	Commuters travel 12.4 km each way on average and work 240 days a year. Calculate the total distance each commuter travels per year in km.	12.4 x 2 x 240 = 5,952 km. Marks: return trip (x2) 1, calculation 2, answer with unit 1.	4
16	Open space covers 4.0 km2 of the 50 km2 built-up area for 610,000 people, against a standard of 2 m2 per person. Calculate the share of open space and the actual open space per person, then judge whether the standard is met.	Open space share: 4.0 / 50 x 100 = 8%; per person: 4.0 x 10^6 / 610,000 = 6.6 m2. Since 6.6 > 2 the standard is met in quantity, but provision is unevenly distributed and older districts may still fall short. Marks: share 1, per person 2, judgement 1.	4

Part E: Industrial Location and Manufacturing Shift (16 marks)

Keep all costs and profits for the same period (per month); comparison questions need a clear verdict.

#	Question	Answer	Marks
17	A factory of 1,800 m2 rents at $28 per m2 per month and employs 120 workers at $16,500 per month. Calculate the monthly rent and total wage bill.	Rent: 1,800 x $28 = $50,400; wages: 120 x $16,500 = $1,980,000. Marks: rent 1, wages 2, units 1.	4
18	Monthly revenue is $6,200,000 and materials plus transport cost $3,600,000, on top of the rent and wages above. Calculate the monthly profit and the profit margin (%, 1 d.p.).	Total cost: 3,600,000 + 1,980,000 + 50,400 = $5,630,400; profit: 6,200,000 - 5,630,400 = $569,600; margin: 569,600 / 6,200,000 x 100 = 9.2%. Marks: total cost 2, profit 1, margin 2.	5
19	The firm considers relocating: wages fall 35% but materials and transport rise 18% (rent unchanged). Calculate the new monthly total cost and judge whether relocation is worthwhile.	Wages: 1,980,000 x 0.65 = $1,287,000; materials and transport: 3,600,000 x 1.18 = $4,248,000; new total: 1,287,000 + 4,248,000 + 50,400 = $5,585,400, which is $45,000 less. Relocation is worthwhile but the saving is small (about 0.8%), so lead time, supply-chain reliability and moving costs must also be weighed. Marks: 1 per new cost, total 1, judgement with reason 1.	4
20	Fixed costs are $1,200,000 per month, the unit price is $240 and unit variable cost is $165. Calculate the break-even output in units.	1,200,000 / (240 - 165) = 1,200,000 / 75 = 16,000 units. Marks: unit contribution 1, formula 1, answer 1.	3

Part F: Agricultural Systems and the Energy Mix (17 marks)

Give units with every calculated answer; justify every suggestion.

#	Question	Answer	Marks

21	A farm has 320 hectares of farmland and produces 1,920 tonnes of rice a year. Calculate the yield in tonnes per hectare.	1,920 / 320 = 6.0 tonnes per hectare. Marks: formula 2, answer with unit 2.	4
22	Local food output is 15,600 tonnes against total demand of 104,000 tonnes. Calculate the food self-sufficiency rate (%).	15,600 / 104,000 x 100 = 15.0%. Marks: formula 2, calculation 1, answer 1.	4
23	Energy mix: coal 38%, natural gas 26%, nuclear 15%, renewables 21%, with total generation of 42,000 GWh. Verify the percentages and calculate renewable generation in GWh.	38 + 26 + 15 + 21 = 100%; 42,000 x 0.21 = 8,820 GWh. Marks: verification 2, calculation 2, answer with unit 1.	5
24	Annual generation emits 26.4 Mt of CO2 for 42,000 GWh. Calculate the carbon intensity in g CO2/kWh and suggest two ways to cut emissions.	26.4 x 10^9 kg / 42 x 10^9 kWh = 0.629 kg/kWh = 629 g CO2/kWh. Methods (any two): raise the renewable share, retire coal units, improve plant and grid efficiency, demand-side management and energy saving. Marks: calculation 2, 1 per method.	4