S5 Geography Practice Paper: Plate Tectonics, Earthquakes and Volcanoes, River Landforms and Hydrology, Weather and Climate, Population Structure and Migration, Urban and Industrial Systems, Sustainable Development and Fieldwork (100 marks)

Level: S5 | Subject: Geography | 75 minutes | 100 marks | 24 questions | question paper

Part 1 Plate Tectonics, Earthquakes and Volcanoes (16 marks)

Show all formulae, substitutions and units; give percentages and ratios to 1 d.p.

#	Question	Marks
1	A plate boundary moves 5.0 cm per year on average. (a) Find the distance moved in 100 years, in metres; (b) describe three types of plate boundary and their main landforms; (c) within which plate does Hong Kong lie?	4
2	A P wave travels at 6.0 km/s and an S wave at 3.5 km/s; a station lies 84 km from the epicentre. (a) Find the travel time of each wave; (b) find the S minus P time difference; (c) explain why this time difference gives the distance to the epicentre.	4
3	Each unit of magnitude releases about 31.6 times more energy. An earthquake increases from magnitude 5.0 to 7.0. (a) Find the increase in energy; (b) if the 5.0 event releases energy E, express the 7.0 event in terms of E; (c) explain why a shallow earthquake of modest magnitude can still cause severe damage.	4
4	Acidic magma contains about 72% silica and basic magma about 50%. (a) Find the difference in percentage points; (b) compare their viscosity and eruption style; (c) explain how viscosity shapes a volcano.	4

Part 2 River Landforms and Hydrology (16 marks)

Express discharge in m3/s and volume in m3; always state the unit.

#	Question	Marks
5	A catchment of 250 km2 receives 2400 mm of rain a year and has a runoff coefficient of 0.45. (a) Find the annual runoff volume in m3; (b) find the mean discharge in m3/s to 1 d.p.; (c) explain how urbanisation changes the runoff coefficient and the flood peak.	4
6	A river runs 40 km from source to mouth with a fall of 320 m. (a) Find the average gradient in m/km; (b) express the gradient as a ratio; (c) describe how gradient and landforms differ between the upper, middle and lower courses.	4
7	The outer bank of a meander retreats at 0.5 m per year and a house stands 12 m from the bank. (a) Find the retreat after 20 years; (b) decide whether the house is threatened and explain; (c) describe deposition on the inner bank and the formation of an oxbow lake.	4
8	The 10-year return-period flood at a gauging station is 320 m3/s. (a) Find the probability of exceeding this discharge in any one year; (b) find the chance of at least one such flood in 50 years, as a percentage to 1 d.p.; (c) explain the correct meaning of a 10-year flood and how return period guides flood defence design.	4

Part 3 Weather and Climate (16 marks)

Give temperatures to 1 d.p. and pressure in hPa.

#	Question	Marks
9	On a given day the air at the foot of a hill is 30.0 C, the lapse rate is 6.5 C per km and the summit is 957 m high. (a) Find the temperature drop from foot to summit; (b) find the summit temperature to 1 d.p.; (c) explain the cause of the lapse rate and why measurements are often lower than theory.	4
10	Saturated air at 30 C holds 30.0 g/m3 and on a given day the air holds 21.0 g/m3. (a) Find the relative humidity; (b) if the air cools to 24 C, where saturation is 21.8 g/m3, decide whether condensation occurs and explain; (c) describe how high spring and summer humidity affects daily life in Hong Kong.	4
11	A typhoon has a central pressure of 950 hPa, an outer pressure of 1010 hPa and a 10-minute mean wind of 150 km/h near its centre. (a) Find the pressure difference; (b) convert the wind speed to m/s to 1 d.p.; (c) if the astronomical tide is 2.5 m and the storm surge 2.8 m, find the peak water level and explain the risk to low-lying areas.	4
12	On the same afternoon the urban area records 32.4 C and the countryside 28.1 C. (a) Find the urban heat island intensity; (b) give three causes of the heat island; (c) suggest two planning measures that reduce it.	4

Part 4 Population Structure and Migration (16 marks)

Express rates in per thousand (permille); give population figures as whole numbers.

#	Question	Marks
13	A city of 8 million people covers 1110 km2. (a) Find the population density in persons per km2 as a whole number; (b) explain what the average hides about distribution; (c) give two planning considerations that depend on density.	4
14	A place has a crude birth rate of 5.0 per thousand, a crude death rate of 8.0 per thousand, a net migration rate of +4.2 per thousand and a mid-year population of 7.5 million. (a) Find the rate of natural increase; (b) find the total growth rate and the annual change in population; (c) explain the main source of growth and its policy implications.	4
15	The age structure of a place is: 0-14 years 16.0%, 15-64 years 64.0% and 65 and over 20.0%. (a) Find the total dependency ratio; (b) find the old-age dependency ratio; (c) compare their policy meaning.	4
16	The share of people aged 65 and over is expected to rise from 20.0% to 33.0% by 2036. (a) Find the rise in percentage points; (b) give two causes of population ageing; (c) use push and pull factors to explain a young person decision to migrate.	4

Part 5 Urban, Industrial and Energy Systems (16 marks)

Express energy in kWh or MWh and state every assumption.

#	Question	Marks
17	A new town of 350,000 people has a mean density of 45,000 persons per km2. (a) Find its area in km2 to 1 d.p.; (b) give one advantage and one disadvantage of high-density development for transport and energy; (c) suggest one measure that improves liveability in a high-density neighbourhood.	4
18	A factory needs 4 tonnes of raw material for every 1 tonne of product; material and product cost the same to move, 2.5 dollars per tonne-kilometre, and the material site is 100 km from the market. (a) Find the material index; (b) compare transport costs and decide where the plant should locate; (c) give two modern factors that can overturn this conclusion.	4

19	A wind turbine has a rated capacity of 3.0 MW and a capacity factor of 35%, over 8,760 hours a year; a household uses 4,500 kWh a year. (a) Find the annual output in MWh; (b) estimate the number of households it can supply, as a whole number; (c) explain the intermittency of wind power and give two ways of managing it.	4
20	A housing estate installs a 1 kW solar array with 3.5 peak sun hours a day; grid emissions are 0.71 kg CO2 per kWh. (a) Find the daily and annual output in kWh; (b) find the CO2 avoided each year in kg to 1 d.p.; (c) give two constraints on rooftop solar in Hong Kong.	4

Part 6 Sustainable Development and Fieldwork (20 marks)

Show the working for all fieldwork calculations and state the assumptions behind estimates.

#	Question	Marks
21	An ecology survey lays 20 random quadrats of 1 m2 and counts 480 plants; the meadow covers 500 m2. (a) Find the mean density in plants per m2; (b) estimate the total number of plants; (c) explain why random sampling matters and give one source of error; (d) suggest one way of making the sample more representative.	5
22	A river survey uses the float method: a float travels 10 m in 25 s and the channel cross-section is 2.0 m2. (a) Find the surface velocity in m/s; (b) find the discharge in m3/s; (c) if surface velocity exceeds mean velocity by about 15%, find the corrected discharge; (d) state one limitation of the float method.	5
23	A driver covers 20 km a day and the car emits 0.15 kg CO2 per km. (a) Find the daily emission; (b) find the annual emission in tonnes to 1 d.p.; (c) if the trip is made by rail, at 0.04 kg CO2 per km, find the annual saving in kg; (d) suggest two further behaviour changes that cut emissions.	5
24	A class compares urban and rural temperatures using one station in each place, measured 4 times a day for 3 days. (a) Find the total number of readings; (b) list three variables that must be controlled; (c) explain why both sites are measured at the same time; (d) give one instrument precaution and one safety rule.	5