S5 Geography Practice Paper (Set 3): River Discharge and Runoff Coefficient, Coastal Erosion and Wave Energy, Lapse Rate and Relative Humidity, Plate Tectonics and Earthquakes, Agricultural Output and Food Self-sufficiency, Urban Density and Industrial Location

S5 Geography | Time: 75 minutes | Total: 100 marks | 24 questions

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Section A: River Discharge and Runoff Coefficient (16 marks)

Show the formula and full working; give answers to 3 significant figures with units.

1. A catchment of 120 km^2 receives 80 mm of rain in six hours. The runoff coefficient is 0.45. Find the total runoff volume in m^3.

2. Assuming all runoff leaves within the six hours, find the mean peak discharge.

3. The channel is 40 m wide with mean depth 2.5 m and mean velocity 1.2 m/s. Find its capacity.

4. Compare the two results: by what percentage does the peak exceed the channel capacity? State one urban planning measure that reduces peak flow.

Section B: Coastal Erosion and Wave Energy (16 marks)

Wave energy density E = rho*g*H^2/8 with rho = 1000 kg/m^3 and g = 9.81 m/s^2.

5. For waves of height 1.5 m, find the wave energy density in J/m^2.

6. Water depth is 8 m. Find the shallow water wave speed c = sqrt(g*d).

7. Longshore drift carries 45000 m^3 of sediment a year along 1200 m of coast. Find the drift per metre per year.

8. A seawall costs $8500 per metre. Find the total cost for the whole frontage and state one side effect of seawalls.

Section C: Lapse Rate and Relative Humidity (16 marks)

Environmental lapse rate 6.5 deg C per km; vapour pressures in hPa.

9. The foot of a hill is at 28 deg C; the summit is 1800 m higher. Find the summit temperature.

10. At 25 deg C the saturation vapour pressure is 31.7 hPa and the actual vapour pressure is 21.0 hPa. Find the relative humidity.

11. Using Td = 243.5 ln(e/6.112) / (17.67 - ln(e/6.112)), estimate the dew point.

12. A catchment of 250 km^2 receives 95 mm of rain. Find the volume of rain falling on it.

Section D: Plate Tectonics and Earthquakes (16 marks)

P waves travel at 6.0 km/s and S waves at 3.5 km/s; log10(E) = 4.8 + 1.5M.

13. P and S waves from an earthquake arrive 24 s apart. Find the epicentral distance.

14. How much energy does a magnitude 5.5 earthquake release?

15. How many times more energy does a magnitude 6.5 event release than a magnitude 5.5 event?

16. A plate moves 7 cm a year. How long does it take to accumulate 500 km of displacement?

Section E: Agricultural Output and Food Self-sufficiency (18 marks)

Yield is in tonnes per hectare (t/ha); 1 hectare = 10,000 m^2.

17. Farmland covers 12000 ha with average rice yield 5.4 t/ha. Find total production.

18. Annual rice demand is 78000 tonnes. Find the food self-sufficiency rate.

19. Fertiliser is applied at 180 kg/ha at $4.2 per kg. Find the total fertiliser bill in $ million.

20. Irrigation supplies 1,100 mm a year. Find the total water volume in m^3 and state one way to raise water efficiency.

Section F: Urban Density and Industrial Location (18 marks)

Compare land rent plus transport cost; give totals in $ million.

21. A city has 486000 people over 32 km^2. Find the population density.

22. Land use is 45% residential, 12% industrial, 15% roads and 28% green space. Find the industrial and green areas in km^2.

23. A firm compares two sites: A rents at $95/m^2 with transport $12 per unit; B rents at $62/m^2 with transport $21 per unit. Each site is 20000 m^2 and output is 180000 units a year. Find both total costs and the better site.

24. Labour is 35% of total cost and wages rise 18%. By what percentage does unit cost rise?

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