S6 Geography Practice Paper (Set 4): Plate Tectonics, Earthquakes and Volcanoes; Weathering and Mass Movement; Fluvial Landforms and Flood Management; Urban Climate and Air Pollution; Energy Production and Carbon Intensity; Globalisation and Industrial Location (100 marks)

S6 Geography | Time: 75 minutes | Total: 100 marks | 24 questions

---

Section A: Plate Tectonics, Earthquakes and Volcanoes (16 marks)

Show all working with units; give answers to 3 significant figures.

1. A seismograph records a 20 s difference in arrival times of P and S waves. Given P-wave speed 6.0 km/s and S-wave speed 3.5 km/s, find the epicentral distance.

2. A fault ruptures over 50 km2 with mean slip 2.0 m; the shear modulus is 3.0 x 10^10 N/m2. (a) Find the seismic moment M0; (b) find Mw using Mw = (log M0 - 9.1) / 1.5.

3. A volcanic cone has a base radius of 2.0 km and a height of 1.5 km, assumed conical. (a) Find the slope angle; (b) find the volume.

4. A magma chamber holds 0.5 km3 and erupts at a steady 25 m3/s. Find the number of days needed to empty it.

Section B: Weathering and Mass Movement (16 marks)

Show all working with units; give answers to 3 significant figures.

5. A limestone plateau lowers by 0.30 mm per year; rock density is 2700 kg/m3 over an area of 1.0 km2. Find the mass removed each year in tonnes.

6. Chemical weathering proceeds at 0.05 mm/yr at 10 C, and the rate doubles for every 10 C rise. Find the rate at 30 C.

7. A slope has cohesion 10 kPa, normal stress 80 kPa, friction angle 30 deg and shear stress 60 kPa on the slip plane. (a) Find the factor of safety; (b) state whether it is stable.

8. A rock falls freely from 60 m (air resistance neglected). Find its speed on reaching the base of the slope.

Section C: Fluvial Landforms and Flood Management (18 marks)

Show all working with units; give answers to 3 significant figures.

9. A river cross-section is 45 m2 with a mean velocity of 1.8 m/s. Find the discharge.

10. A 25 km2 catchment receives 180 mm of rain in 24 hours; the runoff coefficient is 0.35. (a) Find the runoff volume; (b) find the mean discharge.

11. A flood peak of 120 m3/s lasts 6 hours while the downstream channel can carry only 60 m3/s. Find the volume that must be stored.

12. In 30 years of records, the design flood level was exceeded in 2 years. (a) Find the return period; (b) find the annual exceedance probability.

Section D: Urban Climate and Air Pollution (18 marks)

Show all working with units; give answers to 3 significant figures.

13. Rural temperature is 26.0 C and the city centre 29.5 C. Cooling uses 0.08 kWh per m2 per day per kelvin over 10,000 m2 of floor area. (a) Find the heat island intensity; (b) find the extra cooling energy.

14. Inside an inversion layer the temperature rises 2.0 C per 100 m. Surface air is 20.0 C; find the temperature at 300 m.

15. Nitrogen dioxide is measured at 80 ug/m3 at 25 C and 1 atm (molar volume 24.45 L, molar mass 46.01 g/mol). Express the concentration in ppb.

16. Box model: emission 500 kg/h, mixing height 500 m, wind speed 3.0 m/s and city width 10 km. Find the mean ground-level concentration in ug/m3.

Section E: Energy Production and Carbon Intensity (16 marks)

Show all working with units; give answers to 3 significant figures.

17. A wind farm of 50 MW installed capacity generates 131.4 GWh in a year. Find its capacity factor.

18. A grid draws 40% of its power from coal (0.90 kg CO2/kWh) and 60% from gas (0.45 kg CO2/kWh), supplying 500 GWh a year. Find (a) the carbon intensity and (b) annual emissions.

19. Solar irradiation is 5.0 kWh/m2/day, panel efficiency is 18% and the array covers 20 m2. Find the daily output.

20. A rooftop system costs HK$60,000 and saves HK$7,200 a year. Find the simple payback period.

Section F: Globalisation and Industrial Location (16 marks)

Show all working with units; give answers to 3 significant figures.

21. A region employs 12,000 in an industry out of 200,000 total jobs; nationally the industry employs 300,000 out of 10,000,000. Find the location quotient and interpret it.

22. Region A needs 2 hours for a unit of cloth and 8 hours for a computer; region B needs 4 and 6 hours. (a) Find the opportunity cost of a computer in each; (b) state comparative advantage.

23. A plant uses 2.5 tonnes of raw material per tonne of output. Find the material index and the locational pull.

24. Wages are 25% of total cost and rise by 12%; the profit margin was 8%. (a) Find the rise in total cost; (b) find the percentage fall in the margin.

TutorZoneOriginal material written for TutorZone, not from any school or publisher.