S1 Science Practice Paper

S1 | Science | Time: 60 minutes | Total: 100 marks | 24 questions

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Part 1: Laboratory Safety and Measurement Units

Study the data below and answer the questions, showing all steps.

1. A beaker holds 1250 cm³ of water. After pouring it into 3 measuring cups of 250 cm³ each, how much remains in the beaker in cm³, and in litres? Also convert 0.045 kg of salt into grams and milligrams.

2. A balance reads 12.48 g for a beaker plus sample, and the empty beaker was earlier found to weigh 8.72 g. Find the sample mass and explain why the answer keeps only two decimal places.

3. A Bunsen flame is about 800 °C and room temperature is 25 °C. Find the temperature difference and express it in K, and explain why a water bath, not a direct flame, is used for flammable liquids.

4. 50 cm³ of concentrated sulphuric acid is added slowly to 200 cm³ of water. Find the percentage by volume of acid in the mixture and state the correct safe procedure for dilution.

Part 2: States of Matter, the Particle Model and Density

Study the data below and answer the questions, showing all steps.

5. A metal block has a mass of 270 g and a volume of 3 cm³. Find its density, suggest which metal it is (aluminium 2.7, iron 7.9 g/cm³) and state whether it floats or sinks in water.

6. 100 g of ice melts at 0 °C. Given a specific latent heat of fusion of 334 J/g, find the energy needed in J and kJ, and describe what happens to the particles while the temperature stays constant.

7. 100 cm³ of gas at 1.0 atmosphere is compressed by a piston to 25 cm³ at constant temperature. Find the new pressure and use the particle model to explain the rise.

8. A 20 m steel rail warms by 30 °C; the linear expansivity of steel is 1e-05 per °C. Find the expansion in mm and explain why gaps are left between rails.

Part 3: The Microscope and Cell Structure

Study the data below and answer the questions, showing all steps.

9. A microscope has a 10x eyepiece and a 40x objective. Find the total magnification, and the real diameter of a cell drawn 20 mm across in the field of view (in mm and µm).

10. Match the nucleus, chloroplast and cell membrane to their main functions (storing genetic material, carrying out photosynthesis, controlling what enters and leaves), and explain why chloroplasts are not seen in onion epidermis cells.

11. A cell is about 50 μm across. How many such cells in a row make 1 cm, and name two structures found in plant cells but not in animal cells.

12. A leaf surface measures 20 mm by 20 mm with 250 stomata per mm^2 on the lower epidermis. Find the total number of stomata and explain their role in gas exchange.

Part 4: Forces and Pressure

Study the data below and answer the questions, showing all steps (take g = 9.8 N/kg).

13. A student has a mass of 5 kg. Find her weight on Earth and explain how weight differs from mass in unit and in direction.

14. A book weighs 20 N and its cover touches the desk over 0.05 m by 0.20 m. Find the pressure on the desk and state how it changes when the book stands on its edge.

15. A tank holds water 2.5 m deep; the density of water is 1000 kg/m^3. Find the water pressure at the bottom and explain why a dam is thicker at its base.

16. A box of mass 3 kg is pushed with 10 N against a friction of 4 N. Find the resultant force and acceleration, and state what happens if the push falls to 4 N.

Part 5: Energy and Simple Circuits

Study the data below and answer the questions, showing all steps.

17. An appliance runs on 220 V drawing 2.0 A for 3 hours. Find its power, the energy used in kWh and the cost at $1.2 per kWh.

18. Resistors of 6 Ω and 4 Ω are connected in series to a battery with a current of 0.5 A. Find the total resistance, the battery voltage and the voltage across each resistor.

19. A lamp takes in 100 J of electrical energy each second and emits 20 J as light. Find the efficiency, the energy lost as heat each second, and explain why an LED lamp saves energy.

20. A 2000 W kettle runs on 220 V. Find the current it draws and explain why a Hong Kong socket and its fuse rating (3 A or 13 A) must match that current.

Part 6: Acids, Alkalis and Common Substances

Study the data below and answer the questions, showing all steps.

21. Solution A has pH 2, B has pH 5 and C has pH 7. Arrange them from most to least acidic and find how many times more hydrogen ions A has than B.

22. 25 cm^3 of 0.1 M sodium hydroxide is neutralised by 0.1 M hydrochloric acid. Find the volume of acid needed and the moles of sodium chloride formed, and write the equation.

23. Classify oxygen, water, air and salt solution as element, compound or mixture, and describe one method of separating salt solution back into salt and water.

24. 0.24 g of magnesium reacts with excess dilute sulphuric acid (relative atomic mass 24). Find the moles and room-temperature volume of hydrogen produced (24 dm^3/mol) and describe a test for the gas.
