S1 Science Practice Paper: Laboratory Safety and Scientific Method, Measurement and Units, States of Matter and the Particle Model, Separating Mixtures, Energy and Heat Transfer, Simple Circuits, Forces and Magnets

S1 | Science | Time: 75 minutes | Total: 100 marks | 24 questions

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Section A Laboratory Safety and the Scientific Method

Part A: 4 marks each, 16 marks in total.

1. State four safety rules that must be followed in a science laboratory. [4]

2. Ming measures the volume of the same beaker of water three times and records 24.5 mL, 24.7 mL and 24.8 mL. Find the mean value. (Give the answer to 1 decimal place.) [4]

3. Complete the unit conversions: (a) 250 m = how many cm? (b) 3200 g = how many kg? (c) 45 mL = how many cm3? (d) 0.75 L = how many mL? [4]

4. Mei studies how the length of light exposure affects the growth of pondweed: one jar is placed by a window, another inside a dark cupboard, all other conditions being the same. State the hypothesis, the independent variable, the dependent variable and one controlled variable of this experiment. [4]

Section B States of Matter and the Particle Model

Part B: 4 marks each, 16 marks in total.

5. Name each change of state: (a) ice to water; (b) water vapour to water; (c) water to water vapour; (d) dry ice changing straight into carbon dioxide gas. [4]

6. A solid is heated and its temperature is recorded every 2 minutes: 20, 35, 50, 80, 80, 80, 95 degrees C. Find (a) the melting point of the substance; (b) how long the melting process lasts. [4]

7. Use the particle model to explain why (a) a gas can be easily compressed while (b) a liquid can hardly be compressed. [4]

8. A piece of metal has a mass of 270 g and a volume of 100 cm3. Find its density and decide whether it floats on water (density of water = 1 g/cm3). [4]

Section C Separating Mixtures

Part C: 17 marks in total.

9. Choose the most suitable separation method for each mixture: (a) sand and water; (b) salt and water (to recover the solid salt); (c) a mixture of ethanol and water; (d) the dyes in ink. [4]

10. A mixture of ethanol (boiling point 78 degrees C) and water (boiling point 100 degrees C) is separated by fractional distillation. (a) Which liquid distils over first? (b) Where should the thermometer bulb be placed? (c) Why may the distillate still contain a little water? [5]

11. In paper chromatography of a dye, the spot centre moves 3.6 cm while the solvent front moves 9 cm. (a) Find the Rf value of the dye; (b) can an Rf value be greater than 1? Explain. [5]

12. At 60 degrees C, 100 g of water dissolves 110 g of potassium nitrate. The saturated solution is cooled to 20 degrees C, where 100 g of water dissolves only 32 g. Find the mass of potassium nitrate that crystallises out. [3]

Section D Energy and Heat Transfer

Part D: 17 marks in total.

13. Identify the main mode of heat transfer in each case: (a) the handle of a metal spoon in hot water also becomes hot; (b) an air conditioner mounted high in a room cools the whole room; (c) you feel warm standing in sunlight. [4]

14. 0.5 kg of water is heated from 20 degrees C to 60 degrees C. Given that the specific heat capacity of water is 4200 J/(kg degrees C), find the heat energy required. [5]

15. A lamp is supplied with 1200 J of electrical energy, of which 900 J is given out as light and heat. Find the energy efficiency of the lamp. [4]

16. A vacuum flask keeps a drink hot for a long time. State two features of its design and explain how each reduces heat loss. [4]

Section E Simple Circuits

Part E: 17 marks in total.

17. Draw (or describe in words) the circuit symbols for: a battery, a lamp, a switch and an ammeter. [4]

18. Two lamps L1 and L2 are connected in series to a 4.5 V battery. The voltage across L1 is 1.8 V. (a) Find the voltage across L2; (b) if the current is 0.3 A, state the current through L1 and through L2. [5]

19. A current of 0.5 A flows through a circuit for 120 seconds. Find the charge that passes. [4]

20. (a) Give one example of a conductor and one of an insulator. (b) Why is a short circuit dangerous? (c) How does a fuse protect a circuit? [4]

Section F Forces, Simple Machines and Magnets

Part F: 17 marks in total.

21. A school bag has a mass of 12 kg. Given g = 10 N/kg on Earth and g = 1.6 N/kg on the Moon, (a) find the weight of the bag on Earth; (b) find its weight on the Moon. [5]

22. A crowbar is used as a lever: a load of 60 N is 0.4 m from the pivot and the effort is applied 1.2 m from the pivot. (a) Find the moment of the load; (b) find the minimum effort needed (ignore the weight of the bar). [5]

23. (a) What happens when like poles of two bar magnets are brought together? (b) What is the direction of magnetic field lines? (c) Why does a compass needle point north-south? [4]

24. A spring is 8 cm long with no load and 11 cm long when a 2 N weight hangs on it. Assuming the elastic limit is not exceeded, find the total length of the spring when a 5 N weight hangs on it. [3]
