S2 Science Practice Paper 1 | Density, cells, food energy, circuits, light, acids

Junior Secondary Science

S2 Science practice paper with worked answers: density calculations, microscope magnification, food energy, series and parallel circuits, lenses and pH concentration.

1. Density and experimental skills (16 marks)

Density is mass divided by volume; the rise in water level gives the volume of an irregular solid.

#	Question
1	(a) A metal block has mass 54.0 g and volume 20.0 cm cubed. Find its density.
2	(b) Convert 2.70 g per cm cubed into kg per cubic metre.
3	(c) A measuring cylinder holds 40.0 cm cubed of water; after a stone is added the level rises to 58.0 cm cubed. The stone has mass 44.0 g. Find its density.
4	(d) A liquid has density 0.80 g per cm cubed. Find the mass of 250 cm cubed of it.

2. Cells and the microscope (16 marks)

Total magnification is the eyepiece power times the objective power; 1 mm = 1000 micrometres.

#	Question
5	(a) A microscope has a 10x eyepiece and a 40x objective. Find the total magnification.
6	(b) A specimen is 0.05 mm long. How long is its image at 400 times magnification, in mm?
7	(c) The field of view is 1.6 mm across and a cell is 0.04 mm in diameter. How many cells can lie in a line across the field?
8	(d) A cell has a real diameter of 20 micrometres. What is this in mm?

3. Food and energy (18 marks)

Scale energy with mass; for the burning food use E = m c delta T with water specific heat capacity 4.2 J per g per degree C.

#	Question
9	(a) Rice contains 480 kJ per 100 g. Find the energy in one 150 g bowl of rice.
10	(b) A student needs 8,000 kJ per day and takes 2,400 kJ at lunch. What percentage of the daily need is this?
11	(c) Burning 2.0 g of peanut raises the temperature of 100 g of water by 20 degrees C. Given specific heat capacity 4.2 J per g per degree C, find the energy absorbed.
12	(d) From (c), how much energy does each gram of peanut provide? Give the answer in J per g and kJ per g.

4. Circuits and electrical power (18 marks)

Use V = I R and P = V I; for parallel resistors 1/R = 1/R1 + 1/R2; energy billed in kWh.

#	Question
13	(a) A 12 ohm resistor is connected across a 6 V battery. Find the current.
14	(b) Two 6 ohm resistors in series are connected to a 12 V battery. Find the total resistance and the current.
15	(c) Two 6 ohm resistors are connected in parallel. Find the equivalent resistance.
16	(d) A 2000 W appliance runs for 3 hours. Find the energy used in kWh and the cost at $1.2 per kWh.

5. Light and lenses (16 marks)

Angles are measured from the normal; the image in a plane mirror is as far behind as the object is in front; use 1/f = 1/u + 1/v.

#	Question
17	(a) A ray makes 55 degrees with the surface of a plane mirror. Find the angle of incidence and the angle of reflection.
18	(b) An object is 1.5 m in front of a plane mirror. Find the distance between the object and its image.
19	(c) A convex lens has focal length 10 cm and the object is 30 cm in front of it. Find the image distance.
20	(d) From (c), find the magnification and state whether the image is enlarged or diminished.

6. Acids, alkalis and concentration (16 marks)

pH below 7 is acidic; concentration may be in g per dm cubed or mol per dm cubed; dilution and neutralisation conserve moles.

#	Question
21	(a) A solution has pH 3. Is it acidic or alkaline, and how many pH units is it from pH 7?
22	(b) 250 cm cubed of solution contains 5.0 g of solute. Find the concentration in g per dm cubed.
23	(c) 100 cm cubed of 2.0 mol per dm cubed solution is diluted with water to 500 cm cubed. Find the new concentration.
24	(d) What volume of 0.1 mol per dm cubed hydrochloric acid neutralises 25 cm cubed of 0.2 mol per dm cubed sodium hydroxide, in a 1 to 1 reaction?