S3 Science Practice Paper: density and upthrust, speed and acceleration, pressure and power, energy and specific heat capacity, series and parallel resistance, solution concentration and pH, microscope magnification (100 marks)

Level: S3 | Subject: Science | 60 minutes | 100 marks | 24 questions | answer key

Section A - Density, Mass and Upthrust (16 marks)

Answer all questions and show your working.

#	Question	Answer	Marks
1	A metal block has a mass of 156.0 g and a volume of 20.0 cm3. Find its density.	Density = mass / volume = 156.0 / 20.0 = 7.8 g/cm3	4
2	A wooden block of density 0.60 g/cm3 and volume 250 cm3 floats on water. Find its mass and the volume of water displaced (water density 1.0 g/cm3).	Mass = 0.60 x 250 = 150 g; upthrust equals weight, so displaced volume = 150 / 1.0 = 150 cm3	4
3	A liquid has a density of 1.2 g/cm3. Find the mass of 500 cm3 of the liquid.	Mass = density x volume = 1.2 x 500 = 600 g	4
4	The density of aluminium is 2.70 g/cm3. An aluminium block has a mass of 540 g. Find its volume.	Volume = mass / density = 540 / 2.70 = 200 cm3	4

Section B - Speed, Acceleration and Force (16 marks)

Assume uniform acceleration and take g = 10 m/s2.

#	Question	Answer	Marks
5	A car accelerates uniformly from rest to 20 m/s in 5.0 s. Find its acceleration.	a = (v - u) / t = (20 - 0) / 5.0 = 4 m/s2	4
6	An athlete runs 150 m in 25 s. Find the average speed.	Average speed = distance / time = 150 / 25 = 6 m/s	4
7	A 4.0 kg object experiences a net force of 12 N. Find its acceleration.	F = ma, so a = 12 / 4.0 = 3 m/s2	4
8	A car travelling at 30 m/s brakes and stops uniformly in 6.0 s. Find the deceleration and the braking distance.	Deceleration = 30 / 6.0 = 5 m/s2; distance = average speed x time = (30 + 0) / 2 x 6.0 = 90 m	4

Section C - Pressure, Work and Power (16 marks)

State the formula used and the unit of each answer.

#	Question	Answer	Marks
9	A force of 40 N acts perpendicularly on an area of 0.020 m2. Find the pressure.	Pressure = force / area = 40 / 0.020 = 2000 Pa	4
10	The depth of water is 0.50 m and the density of water is 1000 kg/m3. Find the water pressure there (g = 10 m/s2).	p = rgh = 1000 x 10 x 0.50 = 5000 Pa	4

11	A horizontal push of 250 N moves a box 8.0 m along the floor. Find the work done.	W = F x s = 250 x 8.0 = 2000 J	4
12	A machine does 2000 J of work in 5.0 s. Find its power.	P = W / t = 2000 / 5.0 = 400 W	4

Section D - Energy, Heat and Specific Heat Capacity (16 marks)

The specific heat capacity of water is 4200 J/(kg degC).

#	Question	Answer	Marks
13	2.0 kg of water is heated through 25 degC. Find the energy absorbed.	E = mcDT = 2.0 x 4200 x 25 = 210000 J (2.1 x 10^5 J)	4
14	An electric kettle of power 1500 W is switched on for 300 s. Find the electrical energy consumed.	E = P x t = 1500 x 300 = 450000 J (4.5 x 10^5 J)	4
15	A 20 kg object is lifted through 3.0 m. Find the gain in gravitational potential energy (g = 10 m/s2).	dEp = mgh = 20 x 10 x 3.0 = 600 J	4
16	A 60 W lamp is used for 5.0 h. Find the energy consumed in kWh.	E = 60 x 5.0 / 1000 = 0.3 kWh	4

Section E - Circuits and Resistance (20 marks)

Each question carries 5 marks. Show the formula used.

#	Question	Answer	Marks
17	A 12 V supply is connected across a 4.0 ohm resistor. Find the current through it.	I = V / R = 12 / 4.0 = 3 A	5
18	Two 6.0 ohm resistors are connected in series. Find the total resistance.	Series: R = R1 + R2 = 6.0 + 6.0 = 12 ohm	5
19	A 6.0 ohm resistor and a 3.0 ohm resistor are connected in parallel. Find the total resistance.	Parallel: 1/R = 1/6.0 + 1/3.0, R = (6.0 x 3.0) / (6.0 + 3.0) = 2 ohm	5
20	A current of 2.0 A flows through a 5.0 ohm resistor for 3.0 min. Find the energy produced.	t = 3.0 x 60 = 180 s; E = I^2 R t = 2.0^2 x 5.0 x 180 = 3600 J	5

Section F - Solutions, pH and Biological Data (16 marks)

Give the unit with each answer.

#	Question	Answer	Marks
21	A 250 cm3 solution contains 10 g of solute. Find the concentration in g/dm3.	Volume = 250 / 1000 = 0.250 dm3; concentration = 10 / 0.250 = 40 g/dm3	4
22	A strong acid solution has pH 3. It is diluted 100 times with water. Find the new pH.	Diluting 100 times lowers [H+] to 1/100, so pH rises by 2: new pH = 3 + 2 = 5	4
23	A microscope has a 10x eyepiece and a 40x objective. Find the total magnification.	Total magnification = 10 x 40 = 400 x	4
24	A cell has a diameter of 0.05 mm. What is the diameter of its image at a total magnification of 400x?	Image size = 0.05 x 400 = 20 mm	4

TutorZone - original practice paper. Time allowed: 60 minutes. Total: 100 marks.