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IGCSE PHYSICS 0625 · TOPICAL PAST PAPERS

Mass, Weight & Density — Paper 1

Worked Answer Key (Multiple Choice)

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Mass, Weight & Density — Paper 1 · Worked Answer Key

These are **Megalecture worked answers** for the topical multiple-choice compilation on **Mass, Weight & Density (IGCSE Physics 0625, Paper 1)**. Every answer below was solved from first principles by the Megalecture team; calculations use the data given in each question, with the equations **ρ = m/V** (density) and **W = mg** (weight), taking *g* as stated. Use this key to mark your work and to see the one-line reasoning behind each correct letter. Question numbers follow the compilation's own numbering as printed on the question paper.

Worked Answers

Q #	Exam reference	Answer	Brief working / reason
1	M/J 16 P11 Q7	**C**	A newton meter is a spring scale that stretches under the pull of gravity, so it measures **weight**. A beam balance compares the brick against known masses (1.5 + 0.5 kg), so it measures **mass**. Newton meter = weight, beam balance = mass → **C**.
2	M/J 17 P11 Q10	**C**	Mass is the amount of matter and never changes with location, so it is **the same** on the ISS. Weight = mg, and g in orbit differs from g on Earth, so weight is **different**. Mass same, weight different → **C**.
3	M/J 17 P12 Q11	**D**	V = 5.0 × 4.0 × 3.0 = 60 cm³. m = ρV = 2.5 × 60 = **150 g** → **D**.
4	M/J 18 P11 Q6	**A**	Mass is measured directly with a **balance**. (A manometer measures pressure, a measuring cylinder measures volume, a newton meter measures weight.) → **A**.
5	M/J 18 P11 Q7	**B**	For free fall the gravitational field strength equals the acceleration of free fall: g = a = **1.6 N/kg** → **B**.
8	M/J 18 P12 Q8	**B**	An electronic balance reads **mass**, whose unit is the gram (g). Weight is a force, so its unit is the newton (N). Balance in g, weight in N → **B**.
9	M/J 19 P11 Q8	**C**	Weight W = mg. A: 3.0×10.4 = 31.2 N; B: 3.5×9.5 = 33.25 N; C: 4.0×10.2 = 40.8 N; D: 4.5×9.0 = 40.5 N. Greatest is **40.8 N** → **C**.
10	M/J 20 P11 Q9	**D**	Field strength g = W/m. A: 125/5 = 25; B: 150/15 = 10; C: 220/20 = 11; D: 225/25 = **9.0 N/kg**. Smallest g → **D**.
11	M/J 20 P11 Q10	**B**	Heating copper raises its temperature, which causes thermal expansion, so the volume rises and the density falls. Only the amount of matter is conserved, so the quantity that does **not** change is **mass** → **B**.
12	M/J 20 P11 Q11	**D**	

Q #	Exam reference	Answer	Brief working / reason
			Volume of 3 bolts = 42 − 30 = 12 cm³. Total mass = 3 × 34 = 102 g. ρ = m/V = 102/12 = **8.5 g/cm³** → **D**.
13	M/J 20 P12 Q9	**B**	Mass is unchanged: m = W/g = 40/10 = 4.0 kg. Weight on the new planet = mg = 4.0 × 4.0 = 16 N. Mass 4.0 kg, weight 16 N → **B**.
14	M/J 20 P12 Q10	**A**	Mass of liquid = (mass of beaker + liquid) − (mass of empty beaker). Then ρ = mass of liquid / volume of liquid → **A**.
15	O/N 16 P11 Q5	**A**	A mass placed in a gravitational field experiences a downward force = its weight (W = mg). So **"a mass experiences a weight due to a gravitational field"** → **A**. (Mass and weight have different units, kg vs N, so B and C are wrong.)
16	O/N 16 P12 Q7	**A**	The spring's extension is proportional to the load, so the marker scale reads a definite, fixed quantity. The block always contains the same amount of matter, so the calibrated scale gives the **mass of the block in kg** → **A**. (Moment in N·m and "weight in kg" use wrong units.)
17	O/N 16 P12 Q8	**B**	Thickness 2.0 mm = 0.20 cm. V = area × thickness = 4.5 × 0.20 = 0.90 cm³. m = ρV = 19 × 0.90 = 17.1 ≈ **17 g** → **B**.
18	O/N 17 P11 Q6	**C**	In balance the moments are equal, so the weights are equal, hence the masses are equal. The two objects can still be of different materials, so their **volumes may be different** → **C**.
19	O/N 17 P12 Q6	**C**	Left block: V = 1.0×1.0×1.0 = 1 cm³, m = 6.0×1 = 6.0 g. Right block: V = 2.0×1.0×1.0 = 2 cm³, m = 9.0×2 = 18 g. Overall ρ = (6+18)/(1+2) = 24/3 = **8.0 g/cm³** → **C**.
20	O/N 18 P11 Q6	**C**	Greater g means greater W = mg. Mass, volume and density are properties of the object and do not change with location, so only the **weight increases** → **C**.
21	O/N 18 P11 Q7	**C**	Density depends only on the material, not on size or shape. Both cylinders are copper, so **the density of P equals the density of Q** → **C**.
22	O/N 18 P12 Q5	**A**	A (beam) **balance** compares an unknown object against another by balancing their weights, which compares their masses → **A**.
23	O/N 18 P12 Q6	**D**	Extension ∝ load = mg. For the same mass, the spring extends more on planet X (steeper line). The slope ratio is about 3 : 1 (X reaches 30 cm at ≈2 kg, Y reaches 30 cm at 6 kg), so g on X is **three times** g on Y → **D**.
24	O/N 20 P11 Q6	**A**	Same reasoning as Q16: the spring scale gives a fixed reading proportional to the constant load, so it determines the **mass of the block in kg** → **A**.
25	O/N 20 P11 Q7	**B**	

Q #	Exam reference	Answer	Brief working / reason
			The ball has charge, so it creates an **electric** field, and it has mass, so it creates a **gravitational** field. It is at rest (no moving charge), so there is no magnetic field. Electric and gravitational only → **B**.
26	O/N 20 P11 Q8	**D**	**Weight is the force of gravity acting on a mass** (W = mg) → **D**. (Mass ≠ weight; they have different units; weight is a vector force, mass is a scalar.)
27	O/N 20 P11 Q9	**B**	Density is mass per unit volume: ρ = **mass / volume** → **B**.
28	O/N 20 P12 Q8	**D**	The balance is calibrated for Earth, so it converts the force it feels into a "mass" by dividing by g_{Earth}. Force on it = N × 0.1 × (g_{Earth}/5). Reading = force / g_{Earth} = N × 0.1/5 = 0.02N kg. Set 0.02N = 1.0 → N = **50** → **D**.

Note from Megalecture. Throughout, mass (kg) is the constant amount of matter in a body, while weight (N) is the gravitational force on it, W = mg. Density is ρ = m/V and depends only on the material, not on size or shape. These are original Megalecture worked solutions prepared for revision use.