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This document consists of **8** printed pages.

| Question | Answer | Marks |
|---|---|---|
| 1(a)(i) | A **AND** B cars identified | **B1** |
| | A = fastest AND B = slowest | **B1** |
| 1(a)(ii) | speed = distance ÷ time in any recognised form | **C1** |
| | 50 ÷ 4 | **C1** |
| 1(b)(i) | 12.5 (m / s) | **A1** |
| | $100 \times 3.6$ **OR** 360 (s) indicated | **C1** |
| | answers in the range 5–7 minutes | **A1** |
| 1(b)(ii) | any one from: | |
| | car will move faster / slower at times / speed not constant | **B1** |
| | road will have bends / hills etc. | |
| | slower moving traffic or other sensible road conditions | |

| Question | Answer | Marks |
|---|---|---|
| 2(a) | measuring cylinder (partially filled) with water / displacement can filled with water | **B4** |
| | object (submerged) into water  owtte | |
| | new volume noted / displaced water collected in measuring cylinder | |
| | (volume of object = ) difference in volumes / volume of water collected | |
| 2(b) | density = mass ÷ volume written in any recognised form | **C1** |
| | 347 ÷ 18 | **C1** |
| | 19.28 **OR** 19.3 (g / cm$^3$) | **A1** |

| Question | Answer | Marks |
|---|---|---|
| 3(a) | $w = m \times g$ in any recognised form | **C1** |
| | 2250 / 10 | **C1** |
| | 225 (kg) | **A1** |
| 3(b)(i) | moment = force × distance from pivot in any recognised form | **C1** |
| | 400 × 0.4 **OR** 400 × 40 | **C1** |
| | 160 **OR** 16 000 | **A1** |
| | Nm **OR** Ncm | **B1** |
| 3(b)(ii) | apply force further from pivot owtte | **B1** |

| Question | Answer | Marks |
|---|---|---|
| 4(a)(i) | elastic | **B1** |
| 4(a)(ii) | elastic | **B1** |
| | kinetic | **B1** |
| 4(a)(iii) | kinetic | **B1** |
| | thermal | **B1** |
| 4(b) | pull band further back / exert greater force on band / increase elastic potential energy | **B1** |

| Question | Answer | Marks |
|---|---|---|
| 5(a) | Tyre B | **B1** |
| | larger / bigger surface area | **B1** |
| | less pressure (on ground) / weight distributed | **B1** |
| 5(b) | molecules gain kinetic energy / move faster | **B1** |
| | more (frequent) / harder collisions (with tyre) | **B1** |
| | Increased / greater pressure (on tyre) | **B1** |

| Question | Answer | Marks |
|---|---|---|
| 6(a)(i) | mercury | **B1** |
| 6(a)(ii) | arrow between 0 $^{\circ}$C and start of capillary tube | **B1** |
| 6(a)(iii) | 0 ($^{\circ}$C) **AND** 100 ($^{\circ}$C) | **B1** |
| 6(b) | <u>emitter</u> | **B1** |
| | <u>conductor</u> | **B1** |
| | <u>convection</u> | **B1** |
| | <u>radiation</u> | **B1** |

| Question | Answer | Marks |
|---|---|---|
| 7(a) | wavelength correctly indicated | **B1** |
| 7(b) | <u>12</u> (cm) | **B1** |
| 7(c) | 40 / 60 | **C1** |
| | 0.67 (Hz) | **A1** |
| 7(d) | direction of travel perpendicular to direction of vibration owtte | **B1** |
| 7(e) | any component of the electromagnetic spectrum | **B1** |

| Question | Answer | Marks |
|---|---|---|
| 8(a)(i) | top ray passes through $f_2$ | **B1** |
| | bottom ray passes through $f_2$ | **B1** |
| | refraction correctly shown either at centre of lens **OR** at both edges of lens | **B1** |
| 8(a)(ii) | C to $f_2$ | **B1** |
| 8(b)(i) | critical angle | **B1** |
| 8(b)(ii) | ray internally reflected | **B1** |
| | reflecting angle = incident angle | **B1** |

| Question | Answer | Marks |
|---|---|---|
| 9(a) | light travels faster than sound **OR** reverse argument | **B1** |
| 9(b) | reflection (from building) / bouncing back (from building) | **B1** |
| 9(c) | time taken for first sound = 0.5 s | **C1** |
| | Time taken for echo = 2.5 s **OR** time for sound to travel from hammer and return = 2.0 s | **C1** |
| | 2.0 s | **A1** |
| 9(d) | quieter / less amplitude / less energy | **B1** |

| Question | Answer | Marks |
|---|---|---|
| 10(a)(i) | two curved field lines drawn above and below the magnet | **B1** |
| | lines start and finish at the poles of the magnet | **B1** |
| 10(a)(ii) | both arrows point left | **B1** |
| 10(a)(iii) | (plotting) compass | **B1** |
| 10(b) | place end on end / see if attraction / repulsion occurs | **B1** |
| | repulsion at one end | **B1** |

| Question | Answer | Marks |
|---|---|---|
| 11(a) | ammeter in series | **B3** |
| | voltmeter across wire | |
| | two cells correctly linked positive to negative | |
| 11(b) | V = IR in any recognised form | **C1** |
| | R = 2.7 ÷ 0.3 | **C1** |
| | 9 ($\Omega$) | **A1** |
| 11(c) | 1    higher / more | **B1** |
| | 2.    lower / less | **B1** |

| Question | Answer | Marks |
|---|---|---|
| 12(a) | Gamma | **B1** |
| 12(b) | 1     helium nuclei **OR** nuclide notation **OR** 2p, 2n | **B1** |
| | 2     low / few cm of air / stopped by paper | **B1** |
| 12(c) | 2 half-life indicated | **B1** |
| | <u>25</u> (%) | **B1** |