Physics Unit 5
Science (Double Award) (Modular)
Mark Scheme

Question Number	Answer	Mark
1(a)	One mark for each correct row. **Type of motion** / **Graph**: P, Q, R, S constant acceleration: R ✓ increasing acceleration: S ✓ moving at constant velocity: P ✓ stationary: Q ✓ Reject mark for row if more than one tick seen.	**4**

Question Number	Answer	Mark
1(b)	area (under the line) / eq;	**1**

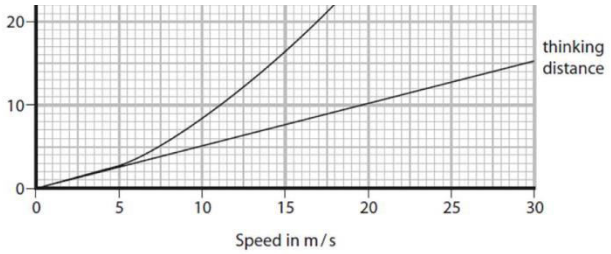
Question Number	Answer	Mark
2	column listing metals; column listing masses with mass and unit heading; column listing densities; correct unit for density in heading;	**4**

Question Number	Answer	Mark
3(a)	The only correct answer is **B** (condition of the road); 1 *A is incorrect because consumption of alcohol increases reaction time* *C is incorrect because thinking distance is determined by speed* *D is incorrect because tiredness increases reaction time*	**1**

Question Number	Answer	Mark
3(b)	The only correct answer is **B** (ice on the road); *A is incorrect because reaction time does not affect braking distance* *C is incorrect because more powerful brakes would decrease the braking distance* *D is incorrect because tyres with more grip would decrease the braking distance*	**1**

Question Number	Answer	Notes	Mark
3(c)	idea that stopping distance = thinking distance + braking distance; correct reading of either distance; correct evaluation; e.g. stopping distance = thinking distance + braking distance thinking distance = 10.0 m / braking distance = 26.5 m stopping distance = (10.0 + 26.5) = 36.5 (m)	stated or implied allow 26.0-27.0 (m) for braking distance allow 10.0-10.5 (m) for thinking distance allow 36.0-37.5 (m)	**3**

Question Number	Answer	Notes	Mark
3(d)(i)	(average) speed = distance (moved) / time (taken);	allow standard symbols and rearrangements e.g. t=s/v allow s or d for distance	**1**

Question Number	Answer	Notes	Mark
3(d)(ii)	suitable pair of readings taken from graph; rearrangement of formula; evaluation; e.g. thinking distance = 15 m when speed = 30 m/s time = distance / speed (time = 15 / 30 =) 0.50 (s)  	allow v or s for speed i.e. (30,15), (20,10), 3(10,5) etc. allow any answer in range 0.40-0.60 (s)	**3**

Question Number	Answer	Notes	Mark
3(e)	correct braking distance reading from graph; substitution into $v^2 = u^2 + 2\times a\times s$; rearrangement; evaluation; e.g. braking distance = 53 m $0^2 = 30^2 + [2\times a\times 53]$ a = (-)900 / 106 (a =) (-)8.5 (m/s^2)	allow 53 seen anywhere 4 in working final answer of 6.6 (m/s^2) (using stopping distance instead of braking distance) scores 3 marks final answer of 30 (m/s^2) (using thinking distance instead of braking distance) scores 3 marks allow 52-53 m allow 8.49-8.65	**4**

Question Number	Answer	Notes	Mark
4(a)	any two from: MP1. Mass (being lifted); MP2. Height (lifted)/distance; MP3. Power supply/circuit being used; MP4. Temperature (of motor);	Ignore 'some motor' condone weight	**2**

Question Number	Answer	Notes	Mark
4(b)	conversion of cm to m; substitution into GPE = mass x g x height; e.g. 50cm = 0.5m GPE = 1 x 10 x 0.5 (= 5 J)	 allow 0.5 seen anywhere allow use of g = 9.8(1) (m/s^2)	**2**

Question Number	Answer	Notes	Mark
4(c)(i)	Efficiency formula seen; substitution; evaluation; e.g. efficiency = useful energy output/total energy input efficiency = 5/12.7 (x100%) efficiency = 39.4 (%)	 ignore s.f. allow 39,39.37… reject unsupported incorrect answer	**3**

Question Number	Answer	Notes	Mark
4(c)(ii)	suitable linear scale chosen (>50% of grid used); axes labelled with quantities and unit; all plotting correct to nearest half square;	ignore orientation ignore plotting at 10v	**3**

Question Number	Answer	Notes	Mark
4(c)(iii)	Acceptable curve of best fit drawn up to a voltage of 6V; straight horizontal line of best fit drawn from 6V onwards;	i.e. curved line with even distribution of points either side by eye	**2**

Question Number	Answer	Notes	Mark
4(c)(iv)	correctly read voltage from graph consistent with candidates curve of best fit;	allow ranges 5.4V – 6.6V allow ecf from (iii)	**1**

Question Number	Answer	Notes	Mark
5(a)(i)	variable resistor;	allow rheostat	**1**

Question Number	Answer	Notes	Mark
5(a)(ii)	idea that it allows the current / voltage (across lamp) to be varied;	ignore references to changing resistance	**1**

Question Number	Answer	Notes	Mark
5(b)(i)	charge = current × time;	allow standard symbols 1 and rearrangements e.g. Q=I×t reject C, c for current and charge	**1**

Question Number	Answer	Mark
5(b)(ii)	0.48 (A);	**1**

Question Number	Answer	Notes	Mark
5(b)(iii)	substitution; evaluation; unit; e.g. charge = 0.48 × 30 (charge =) 14 coulombs / C	allow ecf from (ii) mark independently allow 14.4 ignore As	**3**

Question Number	Answer	Notes	Mark
5(b)(iv)	substitution into E = V × I × t; rearrangement; evaluation; e.g. 250 = 10 × 0.48 × time time = 250 / 4.8 (time =) 52 (s)	allow ecf from (ii) allow alternative method involving calculating charge transferred, then using Q=It allow 52.08…(s)	**3**

Question Number	Answer	Notes	Mark
5(b)(v)	curve drawn of similar shape to existing but through 180° rotation into negative quadrant of graph; curve starts at (0,0) and finishes at (-12,0.5); coulombs / C	DOP	**2**

Question Number	Answer	Notes	Mark
5(c)	any two from: MP1. idea that current changes direction; MP2. LED only allows current in one direction; MP3. LED will not light up when current in reverse direction;	Allow descriptions of electrons movement for current allow RA	**2**

Question Number	Answer	Notes	Mark
6(a)	line decreases from 70; other line increases from 5; both are correctly curved; lines become asymptotic at an intermediate temperature;	DOP reject if intermediate temperature closer to 70 than 5	**4**

Question Number	Answer	Notes	Mark
6(b)	any 4 from: MP1. hot water loses energy/cold water gains energy; MP2. (thermal) energy is transferred from hot to cold water; MP3. By conduction (through the metal); MP4. idea that energy transfer stops when thermal equilibrium is reached; MP5. some (thermal) energy lost (to surroundings) by convection/evaporation/radiation; MP6. little/no (thermal) energy is transferred out through the insulated plastic cup;	 allow colder water gains heat from hot water allow equivalent statements for thermal equilibrium e.g. same temperature	**4**

Question Number	Answer	Notes	Mark
6(c)	(energy transfer by) convection/radiation decreases; idea that equilibrium temperature will be higher; idea that time taken to cool (to room temperature) will be longer;	Allow reference to evaporation condone no change to intermediate temperatures	**3**