Physics Unit 1 (Modular)
Mark Scheme

Question Number	Answer	Mark
1(a)	One mark for each correct row. Reject mark for row if more than one tick seen.	**4**

Type of motion	Graph			
	P	Q	R	S
constant acceleration			✓	
increasing acceleration				✓
moving at constant velocity	✓			
stationary		✓		

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

Question Number	Answer	Notes	Mark
2(a)(i)	substitution into F = (mv – mu/t; evaluation; correct direction; e.g. (F =) (6.7 - -4.2) / 0.012 (F =) 910 (N) (direction =) right	-1 if POT error independent mark 208.3… scores 2 marks max. If given with correct direction Allow 908.3… (N) allow forwards ignore compass directions 0.9083… Scores 1 mark	**3**

Question Number	Answer	Notes	Mark
2(a)(ii)	same forces as in (a)(i) AND <u>opposite</u> direction; e.g. (F =) 910 (N) AND (direction =) left	allow ECF from (a)(i) for both points allow ECF for compass direction only if opposite to direction given in (i)	**1**

Question Number	Answer	Notes	Mark
2(b)	any three from: MP1. Idea that there is a change of momentum (when ball hits player); MP2. (equipment) increases (impact) time; MP3. Decreases rate of change of momentum (of ball); MP4. Decreases force (on player); MP5. Decreases pressure (on player);	allow spreads force over larger area	**3**

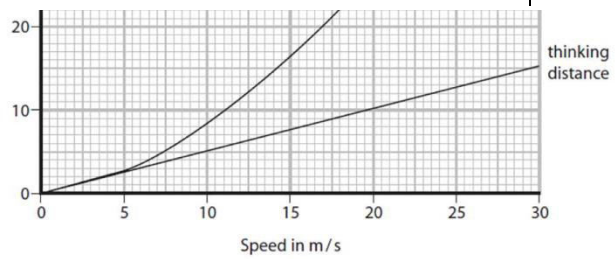
Question Number	Answer	Mark
3	column listing metals; column listing masses with mass and unit heading; column listing densities; correct unit for density in heading;	**4**

Question Number	Answer	Mark
4(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
4(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
4(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
4(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
4(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
4(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	Mark
5(a)(i)	The only correct answer is **C** the rod gains negatively charged electrons; *A is incorrect because electrons are not positively charged* *B is incorrect because electrons are not positively charged* *D is incorrect because this would make the rod positively charged*	**1**

Question Number	Answer	Mark
5(a)(ii)	a named demonstration; a relevant observation; e.g. put charged rod near hair hair moves towards/is attracted to rod put charged rod near (small) pieces of paper pieces of paper move towards to the rod put charged rod near steam of water water bends towards the rod put rod next to another charged rod rod will move towards/away from other rod use a gold lead electroscope (GLE) gold leaf deflects	**2**

Question Number	Answer	Notes	Mark
5(b)	MP1. Method to allow (rods) to swing freely; MP2. Idea that rods are brough close together; MP3. Observation of attraction AND repulsion;	marking points may be shown on a labelled diagram e.g. suspend/balance on watch glass allow if another **charged** insulator used e.g. a balloon allow if rod brought near another **charged** insulator reject if method would not give attraction and repulsion e.g. holding rod near stream of water	**3**

Question Number	Answer	Notes	Mark
6(a)	any FOUR from: advantages: MP1 no carbon (dioxide) emissions; MP2 no contribution to { global warming/ greenhouse effect/acid rain }; MP3 is renewable; MP4 low maintenance/no moving parts; disadvantages: MP5 needs a favourable climate; MP6 needs long days/doesn't work at night; MP7 needs a lot of space; MP8 cannot respond to rapid charges in demand;	 ignore unnamed 'greenhouse gases'	**4**

Question Number	Answer	Mark
6(b)	d.c travels in one direction only; a.c changes direction **frequently/continuously;**	**2**

Question Number	Answer	Notes	Mark
7(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
7(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
7(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
7(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
7(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
7(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	Mark
8	line starting from y-axis with positive gradient and line after melting with positive gradient; gradient of liquid line greater than solid line; horizontal line showing melting;	**3**

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

Question Number	Answer	Notes	Mark
9(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
9(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
9(b)(ii)	0.48 (A);	**1**

Question Number	Answer	Notes	Mark
9(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
9(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
9(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
9(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
10(a)	Downward arrow labelled weight; downward arrow is equal in length to upthrust arrow;	Ignore starting point of arrow allow 'gravitational force', 'force due to gravity' reject 'gravity' judge by eye	**2**

Question Number	Answer	Mark
10(b)(i)	Pressure (difference) = height x density x g;	**1**

Question Number	Answer	Mark
10(b)(ii)	substitution; evaluation of pressure difference in Pa OR kPa to at least 3s.f.; addition of surface pressure (100kPa) to give answer; e.g. p = 15.8 x 1030 x 10 p = 162740 Pa OR 162.74 kPa p = 162.74 + 100 (=260 kPa)	**3**

Question Number	Answer	Mark
10(b)(iii)	any two from: MP1. idea that {weight of ship/downwards force} is greater; MP2. larger pressure difference (when deeper in water); MP3 larger upthrust force (needed to keep forces balanced);	**2**

Question Number	Answer	Notes	Mark
11(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
11(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
11(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**