Question number		Answer	Notes	Marks
1 a		light; (to) electrical;	must be in this order only	2
b	(i)	charge = current x time;	allow rearrangements and standard symbols e.g. Q=Ixt reject use of c/C for current and charge	1
	(ii)	substitution; evaluation; e.g. (charge =) 2.3 x 15 (charge =) 35 (C)	 allow 34.5	2
c		idea that solar panels will still produce electricity if one breaks / does not receive light;	allow idea that they still work if one breaks / does not receive light ignore ideas relating to independent switching	1

Total for question 1 = 6 marks

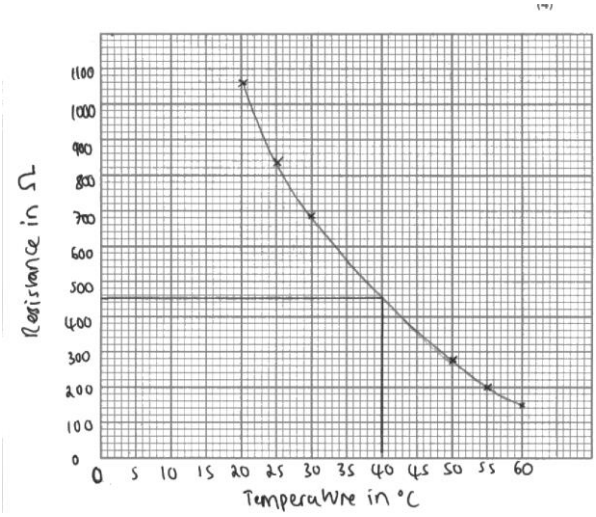
c	(i)	any one of: fluorescence; production of vitamin D; calcifying fillings/eq; killing bacteria; treating skin conditions/(skin) cancer;	ignore **unqualified** ultraviolet lamps, security markers etc. allow tanning bed, fluorescent tubes, **detecting** security markings/false bank notes allow setting fillings	1
	(ii)	any **one** similarity from: MP1. both EM waves / part of EM spectrum; MP2. both travel at the same speed / speed of light (in free space); MP3. both transverse waves; MP4. both can travel through a vacuum; any **one** difference from: MP5. visible light has **lower** frequency / ORA; MP6. visible light has **higher** wavelength / ORA;	 allow $3x10^8$ m/s ignore references to energy and penetrating power, ultraviolet can't be seen by humans	2

Total for question 2 = 10 marks

Question number	Answer	Notes	Marks
11 a	MP1. method **to show shape**; e.g. use compass(es) use of iron filings/powder MP2. use of plotting compass **to show direction**; MP3. a further method detail; e.g. mark card/move compass/multiple compasses idea of another line or lines added sprinkle (iron filings) tap card (to distribute iron filings)	all marks may be given from a clearly labelled diagram	3
b	(lines are) parallel; (lines are) evenly spaced;	ignore references to lines being straight	2
c (i)	idea that wire cuts magnetic field lines; voltage is induced;		2
(ii)	any two from: MP1. move wire faster; MP2. coil wire into loops; MP3. use stronger magnets / magnetic field;	ignore references to using a different wire condone 'more coils / turns' allow move magnets closer together	2

Total for question 11 = 9 marks

Question number	Answer	Notes	Marks
14 a	C;		1
b (i)	(independent) temperature; (dependent) resistance;	must be this way round	2
(ii)	label on both axes with units; scale on both axes; plotting;;	ignore orientation sensible linear scale using ≥50% of the grid tolerance is +/- 0.5 square -1 for each error	4
(iii)	suitable curve passing no more than 1 square from any point;		1
(iv)	value in the range 420 – 480 (Ω)	allow ecf from line drawn in (iii) ± 1/2 sq	1
(v)	any three from: MP1. idea of thermometer reading being the actual temperature of the thermistor; MP2. measure a greater range of temperatures; MP3. take readings to fill in the gap in the temperature range; MP4. idea of measuring temperature/resistance to greater precision; MP5. take repeats AND average;	e.g. • position thermometer closer to the thermistor • position thermometer at the same height as the thermistor • placing thermistor at the bottom (of the beaker) • stirring the water allow 'measure for higher temperatures' etc. allow 'measure more temperatures' in the absence of MP2 and MP3 allow use a temperature sensor and data logger more sensitive / digital thermometer	3



Temperature in °C	Resistance in Ω
60	150
55	200
50	280
30	690
25	840
20	1060