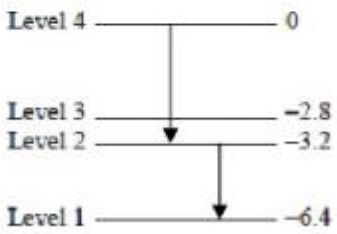
Name of the Student:_____

Max. Marks : 22 Marks **Time : 22 Minutes**

Mark Schemes

Q1.

Question Number	Answer		Mark
(a)	A statement which implies only certain energy levels are allowed e.g. Allowed/possible energy of atoms/electrons Discrete energy of an atom/electron	(1)	1
(b)	Identifies correct pairs of levels, 4 and 2 **AND** levels 2 and 1 Two arrows both showing correct direction [irrespective of identified levels]  	(1) (1)	2
(c)	**Max 3** Atom/electron gains energy and moves to a higher level **Or** atom/electron becomes excited atom/electron has discrete energies **Or** atom/electron can only move between fixed levels **Or** only certain energy changes are possible atom/electron falls to a lower level By emitting energy in the form of photons **Or** reducing their energy by emitting photons Photons have a specific energy/frequency **Or** reference to $E = hf$ **Or** photon energy $= E_2 - E_1$	(1) (1) (1) (1) (1)	3

(d)	Use of $E = hf$ with any of the possible energy differences Identifies ΔE as (±) 0.4 ($\times 10^{-19}$ J) $f = 6.0 \times 10^{13}$ Hz Example of calculation Smallest energy difference is 0.4×10^{-19} J $f = 0.4 \times 10^{-19}$ J / 6.63×10^{-34} Js $f = 6.03 \times 10^{13}$ Hz	(1) (1) (1)	3
(e)	Divides an energy by 1.6×10^{-19} Energy = 4.0 (eV) (no ue) Example of calculation Energy = 6.4×10^{-19} J / 1.6×10^{-19} C Energy = 4.0 eV	(1) (1)	2

Q2.

Question Number	Answer		Mark
(a)	Operable circuit with bulb and power supply variable to 12 V (ignore meters) Ammeter correctly positioned Voltmeter correctly positioned (voltmeter may be across ammeter as well, or whole circuit – but not across any additional resistive components such as a variable resistor)	(1) (1) (1)	3
(b)(i)	The gradient of this graph is the rate of change of current with p.d. Resistance is the ratio of pd/current **Or** It is calculated using a value of pd ÷ the corresponding value of current **Or** it isn't a straight line so the gradient is not R (credit R not constant, so value at 6 V isn't applicable to other voltages)	(1) (1)	2
(b)(ii)	Use of $R = V/I$ $R = 4.76\ \Omega$ Example of calculation $R = 6.00$ V / 1.26 A $R = 4.76\ \Omega$	(1) (1)	2
*(c)	**(QWC – Work must be clear and organised in a logical manner using technical wording where appropriate)** The resistance increases (Because) the temperature increases (accept heats up) Increasing the amplitude of the oscillation of the lattice ions Leading to more (frequent) collisions of electrons with lattice ions Allow converse marks for an explanation explicitly based on decreasing potential difference	 (1) (1) (1) (1)	4
	Total for question		11