2020-2021 DSE Physics Mock Paper 2 Marking Scheme

Questions	Solutions
B(1-8)	CDBB ACCB
9.(a)	The spectrum consists of discrete lines at certain wavelengths. Each line corresponds to the photons emitted when electrons transit from a high energy level to a lower energy level. This indicates the atomic energy levels have discrete values.
(b)	energy of carried by a photon of wavelength 486.1 nm $= \frac{hc}{\lambda} = \frac{(6.63\times10^{-34})(3\times10^{8})}{486.1\times10^{-9}}$ =4.092×10^{-19} J = 2.558 eV; 2.558 eV = (-13.6 eV)$\left(\frac{1}{n^2} - \frac{1}{2^2}\right)$; n = 4.02 ≈ 4 ⇒ the line of 486.1 nm is due to the transition from n = 4 to n = 2
(c)(i)	KE of emitted electrons = 24.86 – 13.6 = 11.26 eV = 1.80×10^{-18} J; $\frac{1}{2}mv^2 = 1.80\times 10^{-18} \Rightarrow \frac{1}{2}(9.11\times10^{-31})v^2 = 1.80\times10^{-18}$ v = 1.989×10^{6} m s^{-1}
(ii)	$\lambda = h / (mv)$ ≈ 3.659×10^{-10} m
C(1-8)	AACD ABBB
9.(a)	mass = $\frac{354\times\frac{16}{100}}{0.150}$ = 377.6 kg
(b)	Work done against friction = Energy output – K.E.$_{final}$ = Pt - $\frac{1}{2}mv^2$ = (211×1000)(5.3) - $\frac{1}{2}(1611)(\frac{100}{3.6})^2$ = 497000 J
(c)	Friction from the ground Friction in the moving part of the car Air resistance
(d)	Overall energy efficiency = (0.38)(0.95)(0.79)(0.80) ×100% = 22.8 %
(e)	Yes. Although the overall efficiency in converting the fuel to mechanical energy for the electric car is 22.8 % which is just slightly lower than that of the car with internal combustion engine which is 25 %, the electric car is more energy efficient because part of the KE can be saved by the regenerative system of the electric car during braking.