Name of the Student:_____
Max. Marks : 20 Marks **Time : 20 Minutes**

Mark Schemes

Q1.

Question Number	Acceptable answers	Additional guidance	Mark
(i)	• Use of $R=\rho l/A$ (1) • Using $A=0.5\times28$ ($\times10^{-6}$ m^2) (1) • Use of $V=IR$ (1) • $I = 22$ (mA) (1)	Example of calculation $R=\frac{1.6\Omega\text{m}\times0.6\times10^{-3}\text{ m}}{0.5\times10^{-3}\text{ m}\times28\times10^{-3}\text{ m}}$ $R = 68.6\Omega$ $1.5V = I\times68.6\Omega$ $I = 1.5\text{V}/68.6\Omega$ $I = 0.022\text{A} = 22\text{mA}$	4

Question Number	Acceptable answers	Additional guidance	Mark
(ii)	• Use of $F=BIL$ ecf values from (i) (1) • Force = 5.3×10^{-6}N (1)	Use of show that values gives 4.8×10^{-6}N Example of calculation $F = 0.40\text{T}\times0.022\text{A}\times0.6\times10^{-3}\text{ m}$ $F = 5.3\times10^{-6}\text{N}$	2

Q2.

Question Number	Answer		Mark
(a)	Use of $N\Phi = NBA$ $\Phi = 1.2 \times 10^{-3}$ Wb (accept T m^2) Example of calculation $\Phi = 200 \times 3.0 \times 10^{-2}$ T $\times$ 2.0×10^{-4} m s^{-1} $\Phi = 1.2 \times 10^{-3}$ Wb	**(1)** **(1)**	**2**
(b)(i)	Time = 0.125 (s) **Or** Time = 1/8 (s) Use of $\varepsilon = (-)d(N\Phi)/dt$ $\varepsilon = (-)9.6 \times 10^{-3}$ V (ecf $N\Phi$ from (a)) Example of calculation $\varepsilon = 1.2 \times 10^{-3}$ Wb /0.125 s $\varepsilon = 9.6$ mV	**(1)** **(1)** **(1)**	**3**
(b)(ii)	Maximum values when coil is horizontal **Or** maximum values when the coil is parallel to the magnetic field **Or** minimum value when coil vertical **Or** minimum value when the coil is perpendicular to the magnetic field e.m.f. determined by rate of change of flux **Or** see $\varepsilon = (-)d(N\Phi)/dt$ Greatest rate of change of flux as coil goes through horizontal **Or** greatest rate of change of flux occurs when $\theta=90°$ **Or** least rate of change of flux as it goes through vertical **Or** least rate of change of flux occurs when $\theta=0°$	**(1)** **(1)** **(1)**	**3**
(b)(iii)	Peaks would be smaller amplitude **Or** maximum e.m.f. smaller Rate of change of flux (linkage/cutting) less	**(1)** **(1)**	**2**
(c)(i)	Energy required to turn generator Transferred from kinetic energy of the car	**(1)** **(1)**	**2**
(c)(ii)	Greater rate of kinetic energy transfer/loss at high(er) speeds At slower/low speeds there is less/negligible braking effect (so car would not fully stop)	**(1)** **(1)**	**2**
	Total for question		**14**