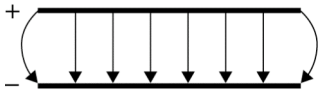
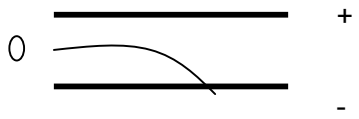
Assessment Schedule – 2008

Physics: Demonstrate understanding of electricity and electromagnetism (90257)

Evidence Statement

Q	Evidence	Achievement	Achievement with Merit	Achievement with Excellence
ONE (a)		[1] Downward line.	[1] Evenly spaced parallel lines with curved end(s).	
(b)		[1] Curves towards negative plate.		
(c)	The electric force is at right angles to the direction in which the positive particle is moving. This causes the particle to describe a parabolic path.	[1] Force is down. OR [1] Repelled from +. OR [1] Attracted to –.	[1] Achievement plus has link to forward motion **or** constant downwards force and parabolic path	
(d)	Magnetic field **into the page**.	[1] Correct answer.		
(e)	The electric force depends only on the electric field strength and the size of the charge. Hence is not affected by the velocity of the particle. The magnetic force $F = Bqv$ increases as the velocity of the particle increases, as the magnetic force is directly proportional to the velocity, provided the magnetic field strength is a constant.	[1]Electric force is not affected by the velocity OR Magnetic force increases as velocity increases.	[1]Electric force is not affected by the velocity, but the magnetic force increases as the velocity increases.	[1]Merit, plus F depends only on E and q; eg $F=E_q$ AND $F = Bqv$ depends on v.
(f)	$E = \frac{V}{d} = \frac{220\ \text{V}}{0.05\ \text{m}} = 4400\ \text{V m}^{-1}$ $F = Eq \Rightarrow F = 4400 \times 1.6 \times 10^{-19}$ $F = 7.0 \times 10^{-16}\ \text{N}$	[2]**Correct formula** used to find E, but did **not** convert cm to m.(E=44)	[2]Correct value for E (4400) OR **F using cm** [2] $F = 7.0 \times 10^{-18}$ N	[2]Correct answer. 7.0×10^{-18}
		[2] Correct sig figs. Any attempt to find F correct to **2sf**		
(g)	$I = \frac{q}{t}$ $I = \frac{3.5 \times 10^{15} \times 1.6 \times 10^{-19}}{10}$ $I = 5.6 \times 10^{-5}\ \text{A}$	[2] Correct except for charge, eg $I = \frac{3.5 \times 10^{15}}{10}$ $= 3.5 \times 10^{14}$	[2] Correct answer. 5.6×10^{-5} A	
TWO (a)	12 J	**Two grades here** [2] Correct number. [2] Correct unit.		

(b)	**This is a "show" question**: $4.5+\left(\frac{1}{3.4}+\frac{1}{5.2}\right)^{-1}$ = 4.5 + 2.06 = 6.56 Ω	[2]States $\frac{1}{R}=\frac{1}{3.4}+\frac{1}{5.2}$	**This is a "show" question**: [2] Correct working.	
(c)	$I=\frac{V}{R}=\frac{12}{6.56}=1.83A$	[2]Correct answer.		
(d)	Effective resistance of 3.4 Ω and 5.2 Ω = 2.06 and V=IR=1.83 × 2.06 = 3.8 V **OR** Voltage across 4.5 Ω resistor is: $V = IR$ = 8.235 V Voltage across the 3.4 Ω resistor is 12 – 8.235 = 3.8 V		[2]Calculates voltage correctly. 3.8 V	
(e)	The voltage across the 5.2 Ω resistor will also be 3.8 V, as it is in parallel with the 3.4 Ω resistor.	[1]Mentions that the voltage is 3.8 V.	[1]Achievement, plus states that this is because it is in **parallel** with the 3.4 Ω resistor.	
(f)	The circuit current depends on the supply voltage and the effective resistance. The supply voltage does not change. Current is inversely proportional to resistance. The diode is in the reverse bias and hence no current flows through the 5.2 Ω resistor. The effective resistance of the circuit increases to 7.9 Ω. This means the circuit current will decrease.	[1]Mentions that current will decrease. OR Resistance increases.	[1]Achievement, plus states that the current decreases **because** the resistance increases	[1]Merit, plus gives reason why the resistance increases (removing another path), **or** states that the supply voltage does not change. **Or** R increases to 7.9
(g)	$I_{new}=\frac{V_s}{R_T}$ $R_T = 4.5 + 3.4$ R_T = 7.9 Ω $I_{new}=\frac{12.0}{7.9}$ = 1.52 A $V_{3.4} = IR = 1.52 \times 3.4 = 5.168$ V $E = VIt = 5.168 \times 1.52 \times 60$ E = 471 J OR Could also use $P = I^2R = 1.52^2 \times 3.4$	[2]Calculated new current (1.52 A)	[2]Calculated voltage across the 3.4 Ω resistor correctly, but did not convert minute to seconds for calculating energy and gets P = 5.168 × 1.52 = **7.8**	[2]Correct answer. **471 J**
THREE (a)	$V = BvL = 0.75 \times 0.20 \times 0.146 \times 2$ V = 0.044 V	[2]Correct except for one mistake. Either incorrect unit conversion (4.4) or missing x2 (0.022)	[2] Correct answer. 0.044	
(b)	**Stronger magnetic** field, **longer** length of **wire** in the field, **increasing the speed** with which the wire is made to move in the magnetic field.	[1]Correct answer.		

(c)	The induced voltage depends on the speed that the wire cuts across the magnetic field. The maximum induced voltage is produced when the coil is moving perpendicular to the direction of the magnetic field. The size of the induced voltage is minimum when the coil is moving parallel to the direction of the magnetic field. Hence the induced voltage changes from a maximum to a minimum every quarter cycle.	[1]Max when coil is flat or moving at 90 deg to field OR Min when coil is upright/vertical at 90 deg to field or moving along field.	[1] States the condition for both maximum and minimum voltage to be induced.	[1] Full and correct explanation eg linking changing velocity perpendicular to the field to voltage. OR Voltage must change from max to min (must state when min and max occur)
(d)	$I = \frac{V}{R} = \frac{12}{4.5} = 2.66 \text{ A}$ $F = BIl = 0.75 \times 2.66 \times 0.146 \times 100$ $F = 28 \text{ N}$	[2] Correct current. **2.66 A**	[2]Correct answer except for number of turns. OR Unit conversion (2800 N)	[2]Correct answer. 28N (29 N)

Judgement Statement – 2008

Achievement	Achievement with Merit	Achievement with Excellence
5 × A1	4 × A1 + 3 × M1	4 × A1 + 2 × M1 + 2 × E1
5 × A2	4 × A2 + 3 × M2	4 × A2 + 2 × M2 + 2 × E2