Assess Quizzes from the o-book – Explanations for the answers.

Chapter 7 Review – Support

Q	Reason
1	Using Ampere's Right Hand Rule: thumb points into the page and fingers curl clockwise. Thus, at the East point the field is pointing down the page towards the South. See NCPQ p 187.
2	Using Ampere's Right Hand Rule for loops and solenoids: fingers curl clockwise and thumb points into the page. Thus, at the centre the current is pointing into the page. See NCPQ p 193.
3	Using Ampere's Right Hand Rule: thumb points to the right and fingers curl out of the page above the wire (at P). See NCPQ p 187.
4	$B_1 = \frac{kI}{r}$ $B_2 = \frac{k \times 2I}{2r} = \frac{kI}{r} = B_1$ $B_2 = B_1$ so the field strength is unchanged.
5	$B = \frac{kI}{r} = \frac{2 \times 10^{-7} \times 20}{0.10} = 4 \times 10^{-5} T$
6	$n = \frac{N}{L} = \frac{100}{0.400} = 250\ turns / metre$ $B = \mu_0 nI = 4\pi \times 10^{-7} \times 250 \times 5.0$ $= 1.57 \times 10^{-3} T$
7	Using Fleming's Left Hand Rule: Index finger up the page, Middle finger to the right. Result: thumb points out of the page.
8	$B = \frac{kI}{r} = \frac{2 \times 10^{-7} \times 2.25}{2} = 2.25 \times 10^{-7} T$
9	Using Ampere's Right Hand Rule: thumb points up the page and fingers curl anticlockwise. Other diagrams don't meet the rule.
10	Current goes up the page in the wire beside P. Using Ampere's Right Hand Rule: thumb points up the page and fingers curl into the page at P.

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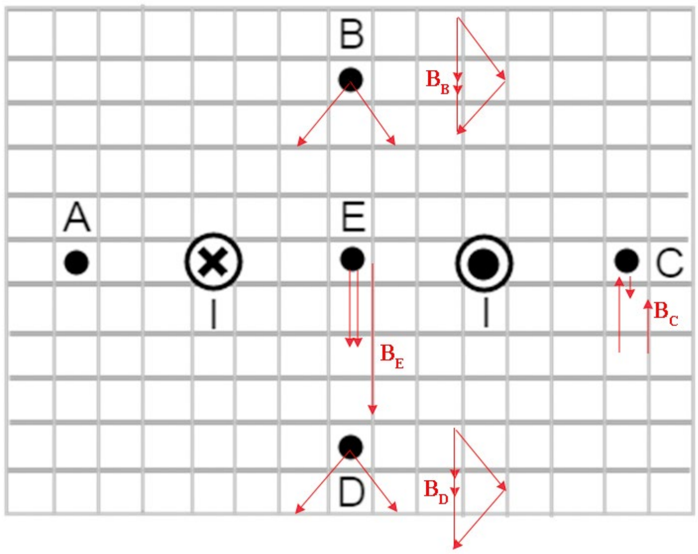
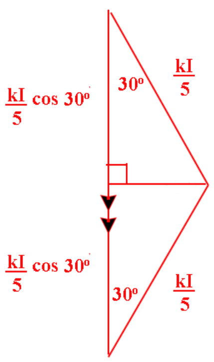
Chapter 7 Review – Consolidate

Q	Reason
1	$B_A = B_0 = \frac{kI}{r_A} = \frac{kI}{2}$ $B_B = \frac{kI}{r_B} = \frac{kI}{4} = \frac{B_0}{2}$
2	 $B_E = \frac{kI}{3} + \frac{kI}{3} = \frac{2}{3}kI = 0.67kI$ $B_C = \frac{kI}{3} - \frac{kI}{9} = \frac{3kI}{9} - \frac{kI}{9} = \frac{2kI}{9} = 0.22kI$ B_D *vector diagram*:  $B_D = 2(\frac{kI}{5}\cos 30^\circ) = 2 \times 0.17kI = 0.35kI$

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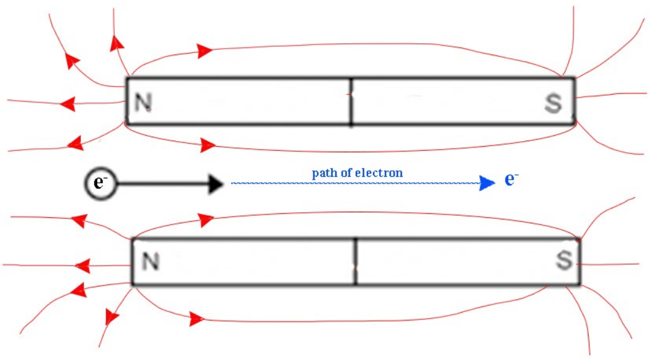
	$B_B = 2(\frac{kI}{5}\cos 30^\circ) = 2\times 0.17kI = 0.35kI\ (same\ as\ B_D)$ Answer: B_E is greatest, as shown by a value of 0.67kI
3	$n = \frac{N}{L} = \frac{55}{0.200} = 275\ turns/metre$ $B = \mu_0 nI = 4\pi\times10^{-7}\times275\times4.2$ $= 1.45\times10^{-3}T$
4	Field is out of page at points A, C, P B_A would be less than 4.0 mT as it is further away from the wire than P. $B_C = 2B_P = 8$ mT as it is at half the distance (B proportional to 1/r) Thus B_C is the biggest, and is out of the page.
5	The magnetic field is into the page and the particle has a negative charge (cathode ray). Using Fleming's LH Rule, the particle must deflect down the page. Thus, the force due to the magnetic field (F_B) is down the page (↓). To have an electric field that will produce a force on the particle up the page, the electric field must be downwards (↓) as a negatively charged particle moves in the opposite direction to the electric field.

Chapter 7 Review – Extend

Q	Reason
1	 The electron doesn't cut through any field lines of the magnet. It runs parallel to them so there is no force experienced by the electron. It continues to move in a straight line.
2	The scale reading increases so the magnet must be pushed down which means (by Newton's 3rd law) the wire is pushed up. The force on the wire must be up the page. You can also check by using Fleming's LH Rule: index finger (B) points from left to right across the page; middle finger (I) points

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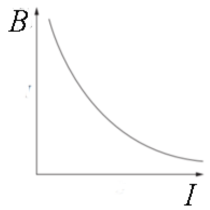
	out of the page; result is that your thumb (F) points up the page. Two approaches and both are satisfactory answers.
3	Fleming's LH Rule: index finger (B) points from left to right across the page; middle finger (I) points out of the page; result is that your thumb (F) points up the page. If the current is increased then the upwards force on the wire would also increase. This means the downward force on the magnet would increase and so the scale reading would also increase.
4	$F = BIL\sin\theta$ $B = \dfrac{F}{IL\sin\theta}$ $B \propto \dfrac{1}{I}$ [when L and θ are constant] This is an inverse relationship. If you wanted to linearise it you would plot B vs 1/I. 
5	The force on a charged particle is given by the formula (NCPQ p 196): $F = qvB\sin\theta$ $When\, v = 0$ $F = q\times 0\times B\sin\theta = 0$ $When\, v = 10\,m\,s^{-1}, \theta = 0^\circ$ $F = q\times 10\times B\sin 0^\circ = 0$ $When\, v = 4\,m\,s^{-1}, \theta = 90^\circ$ $F = q\times 4\times B\sin 90^\circ = 4qB$ $When\, v = 5\,m\,s^{-1}, \theta = 45^\circ$ $F = q\times 5\times B\sin 45^\circ = q\times 5\times B\times 0.707 = 3.5qB$ [*greatest force*]