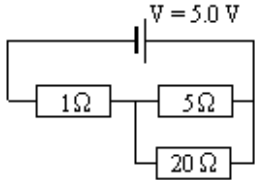
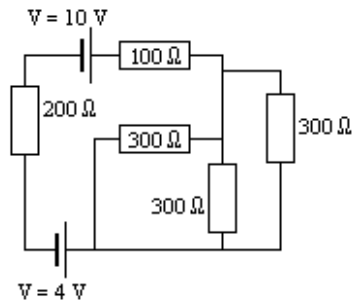
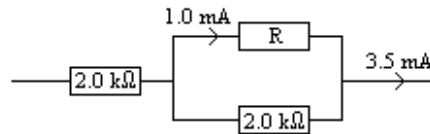


37.		Find the current through each resistor. Find the voltage across each resistor. Find the power dissipated in each resistor.
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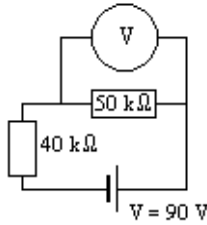
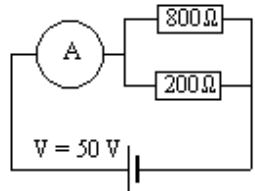
38. For the circuit shown below, find the voltage across the 200 Ω resistor.

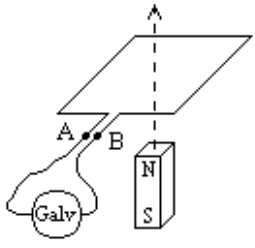


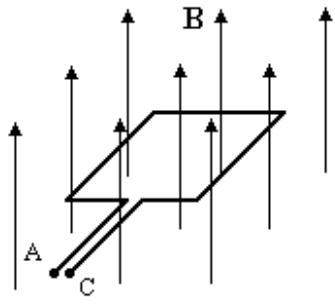
39.

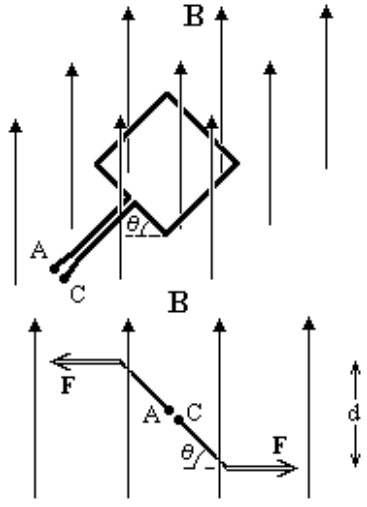


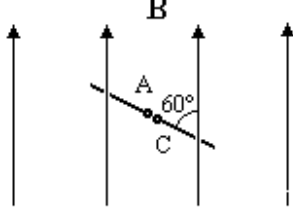
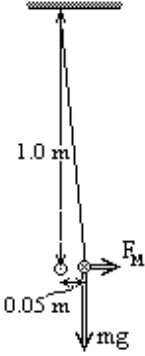
For the circuit fragment shown above, find the value of R the unknown resistor, find also the voltage difference,  $V_{AB}$  between A and B.

40.		The circuit shows a voltmeter, V used to measure the potential difference across a 50.0 kΩ resistor. If the resistance in the voltmeter is $1.0 \times 10^6 \Omega$ , what will be its reading? If the resistance in the voltmeter is only 100.0 kΩ, what will it read?
41.		The circuit shows an ammeter, A used to measure the current flowing from a 5.0V cell. If the ammeter has a resistance of 0.50Ω, what will be its reading? If the ammeter has a resistance of 40.0Ω, what will it read?

42.		<p>A bar magnet is moved along a vertical axis up through the centre of a conducting loop. If the circuit of the loop is complete, will the induced current flow out of A or B when the north pole passes upwards through the centre of the loop? Will the current reverse when the south pole passes through the centre?</p>
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43.		<p>A uniform magnetic induction field of <math>B=0.10</math> Tesla passes perpendicularly through a conducting loop with square sides of <math>0.10</math> m. What is the magnetic flux through the loop? If <math>B</math> reduces to zero in <math>0.10</math> seconds, what is <math>V_{AC}</math> the average voltage across AC. Will the potential at A be positive or negative compared to C when <math>B</math> reduces? If the circuit of the loop is closed and the loop is pulled horizontally to the right, will the induced current flow out through A or C?</p>
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44.		<p>Two perspectives of a square loop circuit cut by an induction field of <math>B = 2.0</math> T are shown. The loop has ten turns, side lengths of <math>2.0</math> cm and a current of <math>0.50</math> A flowing through it. Find the magnitude of the force on each of the four sides if <math>\theta = 45^\circ</math>. When the lines of action of equal and opposite forces are parallel and never intersect the torque of these two forces is defined as the product of the force times the perpendicular distance between their lines of action. What is the magnitude of the torque on this coil? If the current passes in through A and returns out from C, will the coil tend to turn clockwise or anti-clockwise?</p>
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45.		<p>The plane of a single turn coil makes an angle of <math>60^\circ</math> with a uniform magnetic induction field <math>\mathbf{B}</math>, as shown. Find the magnetic flux through this coil in terms of <math>\mathbf{B}</math> and <math>A</math> the area of the coil. If <math>\mathbf{B}</math> varies with time so that <math>\mathbf{B} = 0.50 + 0.20t</math> T (where <math>t</math> is in seconds) and <math>A = 0.0020</math> m<sup>2</sup> what voltage will be induced across the coil terminals? If the coil is expanded so that <math>A = 0.0020 + 0.0030t</math> m<sup>2</sup> (<math>t</math> is still in seconds) but <math>\mathbf{B}</math> remains at 0.70 T, what voltage will be induced across the coil terminals?</p>
46.		<p>Two parallel wires C and D have a mass per unit length of <math>0.500</math> kg m<sup>-1</sup>. Wire C is fixed horizontally, while wire D is supported by cords which are fastened to a support directly above C. Both wires carry the same current <math>I</math> flowing in opposite directions. The magnetic induction field a distance <math>d</math> from a long straight wire carrying a current <math>I</math> is given by</p> $B = 2 \times 10^{-7} \frac{I}{d} \text{ Tesla}$ <p>Write an expression for the force per unit length <math>\mathbf{F}_M</math> on D. If D is suspended in equilibrium, find the current <math>I</math>.</p>

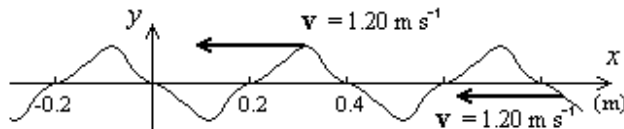
47. A particle, of mass  $1.0 \times 10^{-24}$  kg and charge  $1.0 \times 10^{-18}$  C, moves around a circular path in a magnetic induction field of 6.0 T. If the speed of the particle is  $3.0 \times 10^5$  m s<sup>-1</sup> what is the radius of this circular path? If an electric field is also applied so that the particle now moves in a straight line, what is the strength of this electric field and what is its orientation with respect to the particle's velocity and the magnetic field?
48. A straight wire is dragged through a magnetic induction field of 0.50 T with the wire remaining perpendicular to the field. The field is uniform and is found in a strip 0.30 m wide, the wire is dragged down the strip with a speed of 3.50 m s<sup>-1</sup>. If the wire forms part of a circuit with 10  $\Omega$  of resistance in the circuit, what steady current will flow in this circuit?
49. The impulse of sound from a rifle shot takes 4.4 s to arrive in the ear of an observer. The pulse of sound is obviously lengthened when it arrives. This effect is best described as the result of:

(i) reflection, (ii) refraction, (iii) dispersion, (iv) diffraction or (v) interference?

50.		<p>The parallel wave crests in a ripple-tank travel as indicated by the velocity vectors <math>v_1</math> and <math>v_2</math>. When the waves meet a (depth) boundary, the wave length changes from 50.0 mm to a new shorter value. Use the angles shown to determine this new value. If the speed of the longer waves is 0.70 m <math>s^{-1}</math> what is the speed <math>v_2</math> of the shorter waves?</p>
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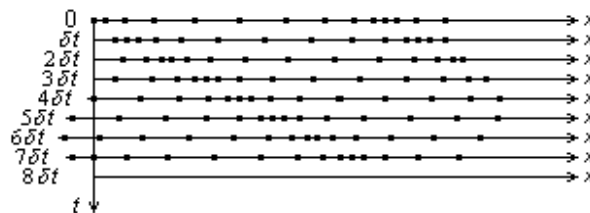
51. The fundamental note of a fixed stretched string is 400.0 Hz, what are the frequencies of the first and the next harmonic? Repeat the problem for an open pipe closed at one end, with a similar fundamental pitch.

52.



A series of pulses is shown above. They are moving to the left with a speed of 1.20 m  $s^{-1}$ , What is the frequency at which they are being transmitted?

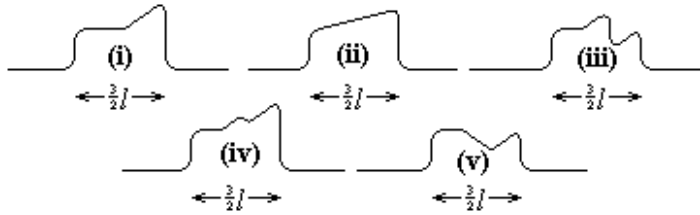
53. In the diagrams below, the positions of particular particles displaced by a longitudinal wave are indicated. Each diagram shows the positions of the particles at a time  $\delta t$  after the picture above it. Use a pencil to connect the positions of each particle as time passes and extend your sketch to draw the next picture.



54.



Two pulses travel towards each other at the same speed and without any change of shape as shown above. Which of the sketches below best shows the superposition of these two pulses as they cross?



55. A single pulse can be described using the mathematical formula

$$y = \frac{1}{(2x - t + 2)^2 + 4}$$

This pulse will travel along an x-axis with time in the same manner as the pulses in questions 52 and 54. Calculate some values of y for the range  $-5 \text{ m} < x < 5 \text{ m}$  and the condition  $t = 0$  and then sketch the pulse shape. Repeat this procedure for  $t = 1 \text{ s}$  and  $t = 2 \text{ s}$  and determine the velocity of this pulse.