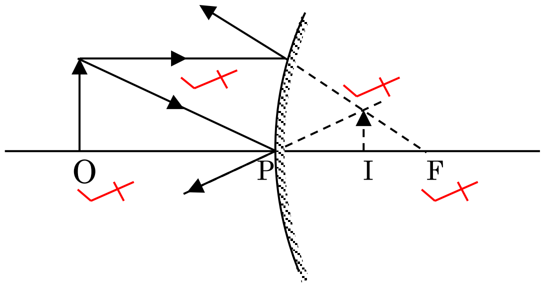
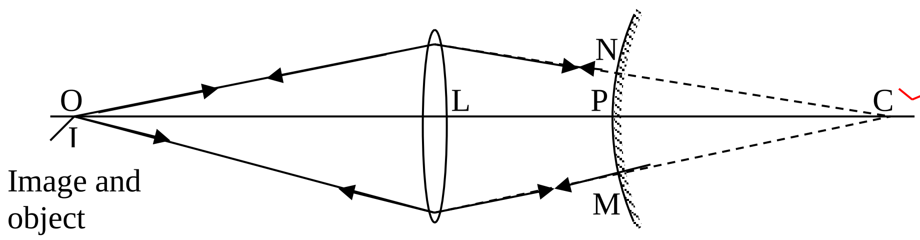
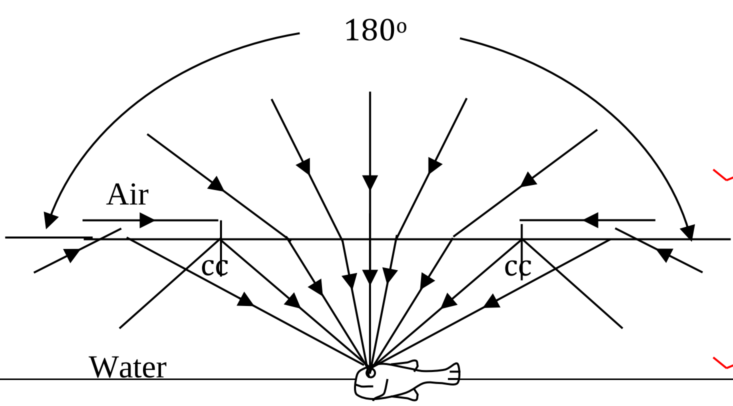
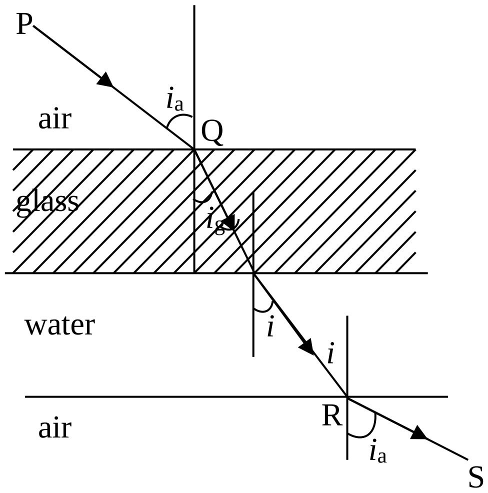
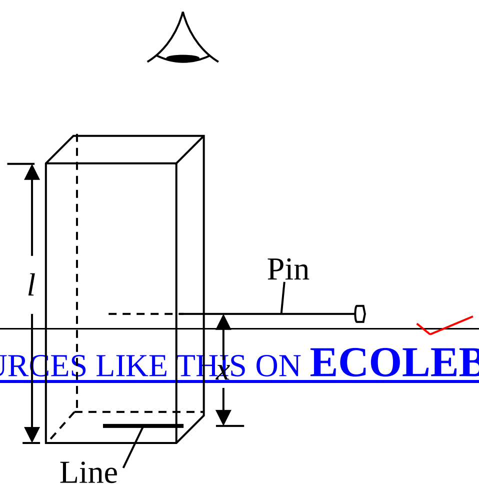
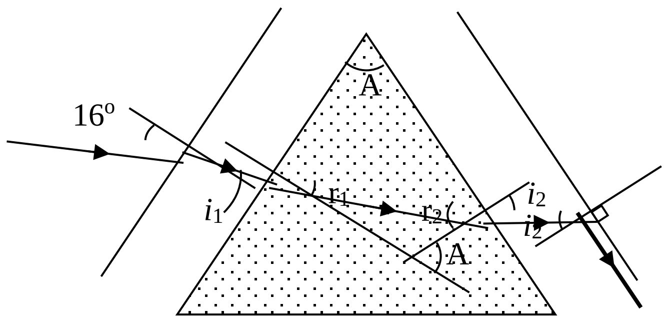
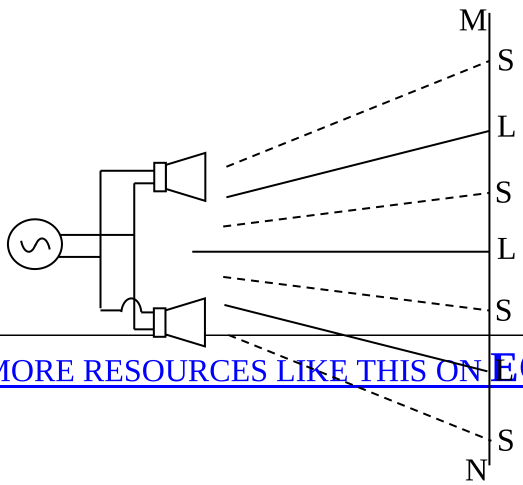
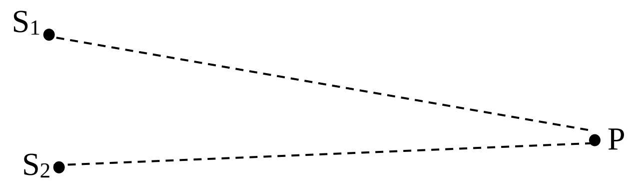
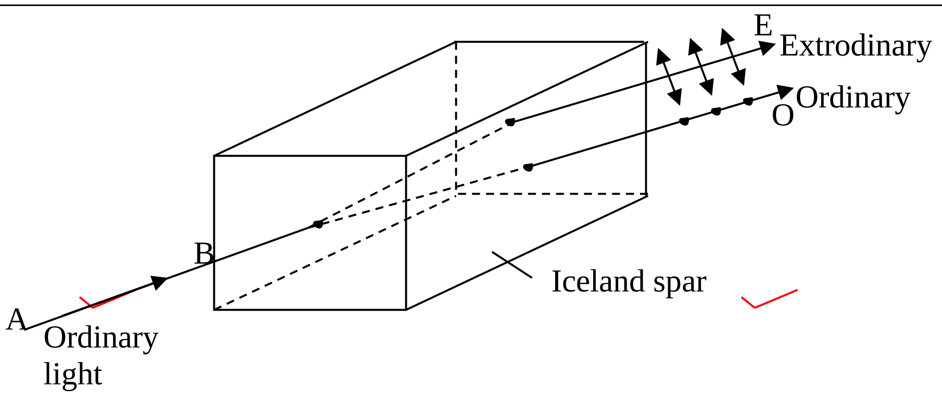
Qn	Answer	Marks
1. (a)	(i) - The reflected ray, the incident ray, and the normal to the mirror at the point of incidence all lie in the same plane. - The angle of incidence is equal to the angle of reflection	1 1
	(ii) Convex mirrors are used as rear-view mirrors on vehicles. Compared to a plane mirror, a convex mirror of the same aperture has a wider field of view.	1 1
	(iii) The purpose is to bring to focus a wide beam of light from the distant objects with minimal spherical aberration. (A wide beam is necessary for brighter images and higher resolving power). A wide beam in a spherical mirror would bring about spherical aberration.	1 1
(b)	(i)  O = object I = image F = principal focus	1 1
	(ii)  - Using a convex lens L, a real image of an illuminated object O is formed at point C. Distance LC is noted. - The convex mirror is then placed between L and C with its reflecting surface facing the lens and is moved along the axis OC until a real image of O is formed at O. Distance LP is noted. Under these conditions the rays from O must be striking the mirror normally e.g. at M and N. Thus PC = r, the radius of curvature Now PC = LC – LP $\therefore$ r = LC – LP $\therefore$ focal length, $f = \frac{1}{2}r = \frac{1}{2}(LC - LP)$	1 1 ½ 1 ½ ½ ½

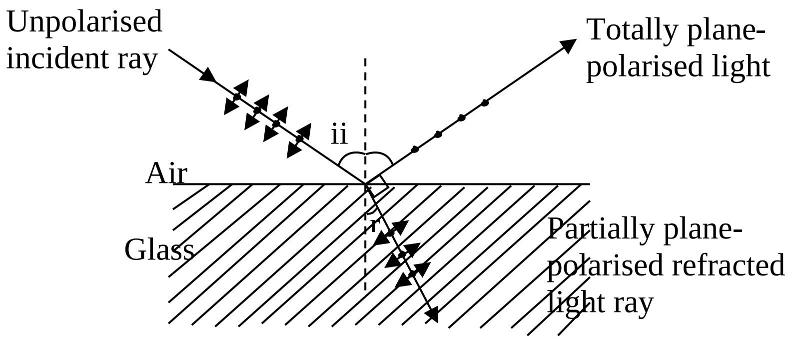
(c)	(i) Let u = original object distance f = focal length of the mirror x = shift of the object Since the image becomes bigger, the screen was moved away from the mirror as the object was shifted towards the mirror. Then, using $m = \frac{v}{f} - 1$ for the two cases, where for case (1) $v = (\frac{1}{2}u)$ and in case (2) $v = (\frac{1}{2}u + 25)$, we have $\frac{1}{2} = \frac{(\frac{1}{2}u)}{f} - 1$ ∴ $3f = u$ ……………….(1) and $3 = \frac{(\frac{1}{2}u + 25)}{f} - 1$ ∴ $6f = u + 50 - 2f$ ∴ $8f = u + 50$ …………..(2) Eqn (2) – eqn (1): $5f = 50$ ∴ f = **10 cm**	1½ 1 ½ 1
	(ii) From eqn(1) u = 3f = 30 cm For the linear magnification in second case $\frac{\frac{1}{2}u + 25}{u - x} = 3$ ∴ $\frac{1}{2}u + 25 = 3u - 3x$ ∴ $15 + 25 = 90 - 3x$ ∴ x = 16.7 **cm**	1 1 1
Total = 20		
2. (a)	(i) – The incident ray must be travelling from a denser medium to a less dense one. - The angle of incidence (in the denser medium) must be greater than the critical angle	1 1
	(ii) Optical fibre Binoculars Periscope } *A diagram of any one of these*	2
(b)		1 1

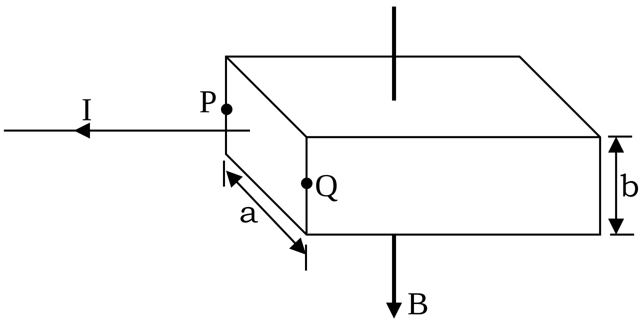
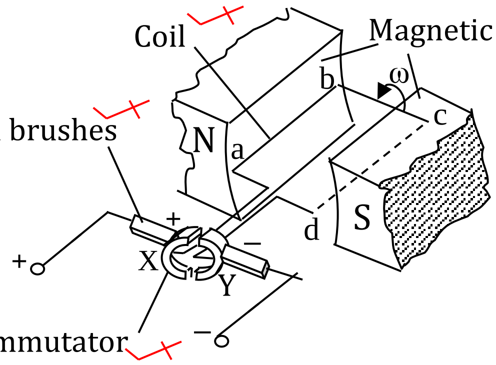
	If the water surface is calm, all the rays of light striking it are refracted in such a way that the fish's eye can receive light from anywhere above the water surface.	1
(c)	Consider a ray PQ incident in air on a plane glass boundary and finally emerging along a direction RS in air.  If the boundaries of the media are parallel, RS is parallel to PQ. Let i_a, i_g, i_w respectively be the angles made with the normals in glass and water media. Then, looking at the upper side, $\sin i_a = {}_a n_g \sin i_g$ .... (1) and at the lower side $\sin i_a = {}_a n_w \sin i_w$ .... (2) from (1) and (2) $\sin i_a = {}_a n_g \sin i_g = {}_a n_w \sin i_w$ Since $n_a = 1$, it follows that ${}_a n_g = n_g$ and ${}_a n_w = n_w$ So we can write $n_a \sin i_a = {}_a n_g \sin i_g = {}_a n_w \sin i_w$ **$\therefore n \sin i = \text{constant}$**	½ 1 1 ½ ½ ½
(d)	 	

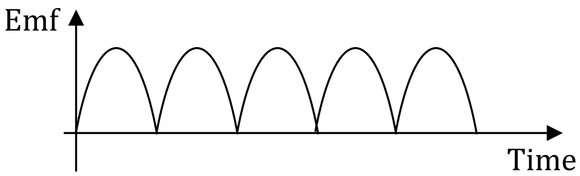
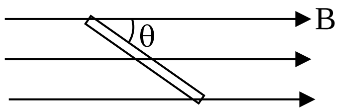
	- The length, *l*, of the longest edge of the glass block is measured and noted. - A clear line is drawn on a white sheet of paper. - The glass block is placed on the line, with its longest edge vertical. - While observing the image of the line from above, a horizontal pin is moved along the side of the block to a position where it coincides with the image of the line. - Then, the height, *x*, of the pin above the line is measured. Now, the apparent height of the block is $l - x$. So, the refractive index $= \dfrac{l}{l-x}$	1 ½ ½ ½ ½ ½ ½
(e)	 Let n_g = refractive index of glass Then $\sin 16^o = n_g \sin i_1$ ………….. (1) and $1.33 \sin r_1 = n_g \sin i_1$ ………….. (2) From (1) and (2) $1.33 \sin r_1 = \sin 16^o$ $\therefore \quad \sin r_1 = \dfrac{\sin 16^o}{1.33} = 0.207$ $\therefore \quad r_1 = 11.9^o$ Also $1.33 \sin r_2 = n_g \sin i_2$ ………….. (3) and $\sin 90^o = n_g \sin i_2$ ………….. (4) From (3) and (4): $1.33 \sin r_2 = \sin 90^o$ $\therefore \sin r_2 = \dfrac{1}{1.33} = 0.752$ $\therefore \quad r_2 = 48.8^o$ Now, $A = r_1 + r_2 = 11.9 + 48.8 =$ **60.7^o**	½ ½ ½ ½ ½ ½ ½ ½ 1
	Total = 20	
3. (a)	(i) - There are points, called ***nodes***, where the displacement is permanently zero.	

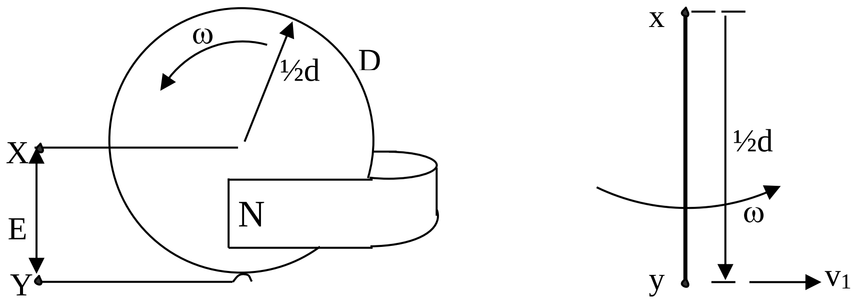
	- At points between successive nodes the vibrations are in phase - The amplitude of the particles varies along the direction of the wave Any 2	2
	(ii) This is the apparent change in the frequency of a wave motion when there is relative motion between the source and the observer.	1
(b)	The wavelength, λ = 1.328 m Now, velocity V = $f\lambda$ = 252 x 1.328 = **334.7 ms^{-1}**	1 2
(c)	When the temperature rises, the density of the air drops. Since, according to the expression, $v \propto \sqrt{\frac{1}{\delta}}$, the velocity increases when temperature rises.	1 2
(d)	(i) Let f = frequency of the sound and V = velocity of sound in air When the train passes the observer, it behaves as a source receding from the observer. So, the f waves produced in a second occupy a distance V + v_1 $\therefore$ apparent wavelength, $\lambda' = \frac{V + v_1}{f}$ Now, apparent frequency, $f' = \frac{\text{velocity of waves}}{\text{apparent wavelength}}$ $= \frac{V}{(V + v_1)/f} = \frac{Vf}{V + v_1}$	½ ½ 1 1
	(ii) When approaching, the apparent frequency, $f'' = \frac{Vf}{V - v_1}$ So, $\frac{f''}{f'} = \frac{Vf}{V - v_1} \cdot \frac{V + v_1}{Vf} = 1.2$ $\therefore$ $V + v_1 = 1.2(V - v_1)$ $\therefore$ $2.2v_1 = 0.2V$ $\therefore$ $v_1 = \frac{0.2}{2.2}V = \frac{0.2 \times 330}{2.2}$ = **30 ms^{-1}**	1 1 1 1
(e)	 L = loud (Constructive) S = soft (Destructive)	1

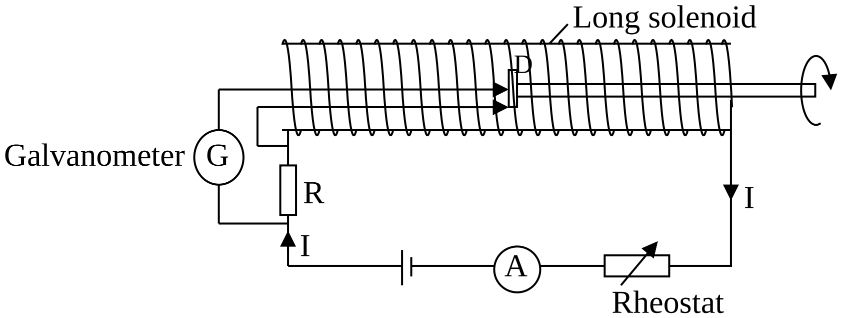
	- Two loud speakers, placed abreast, are connected in parallel to an audio-frequency oscillator. - A microphone is moved along line MN. Alternate loud (L) and soft (S) sounds are detected. L are regions of constructive interference while S are those of destructive interference.	1 1 ½ ½
Total = 20		
4. (a)	(i) The spreading of waves when they travel through apertures or round obstacles.	1
	(ii) This light which is propagating due to oscillations in only one plane	1
	(iii)  Suppose S_1 and S_2 are coherent sources of light. Consider a point P. As the waves arrive at P, they have travelled different distances. The difference in the distances travelled as the waves from coherent sources arrive at a point, e.g. P, is their path difference at P Thus, $S_1P - S_2P$ is the ***path difference*** at P for the waves from S_1 and S_2.	1 1 1
(b)	 Iceland spar (a form of calcium carbonate) is used.	½ ½ 2 ½

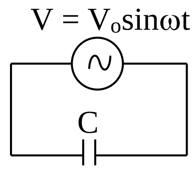
	A beam of unpolarised light is directed to one face of a crystal of Iceland spar. Two beams, one plane polarised in a certain direction and the other plane polarised in a direction which is perpendicular to the direction of polarisation of the first ray, emerge from the opposite face.	1 ½
	(ii) Used: - In sunglasses to reduce intensity of incident sunlight and to eliminate reflected light from the roadside. - In photoelastic stress analysis: to provide vital information about stress distribution in a metallic body - In saccharimetry to measure concentration of sugars in a solution - In liquid crystal display (LCD) *Any two @1*	2
	(iii)  Now $i + r = 90^o$ $\therefore \quad r = 90^o - i$ Hence if n is the refractive index of the glass, then $\sin i = n \sin(90^o - i) = \cos i$ $\therefore \quad n = \tan i = 1.62$ $\therefore \quad i = \mathbf{58.3^o}$	½ ½ ½ ½ 1
(c)	(i) A diffraction grating is a large number of close parallel equidistant slits, ruled on glass or metal.	1
	(ii) $\sin\theta = \frac{\lambda}{d}$ since n = 1 or $\theta = \frac{\lambda}{d}$ since θ is small Angular separation $\theta_1 - \theta_2 = \frac{\lambda_1}{d} - \frac{\lambda_2}{d}$ $\therefore \frac{2}{60} \times \frac{\pi}{180} = \frac{\lambda_1 - \lambda_2}{d}$	1 1 ½

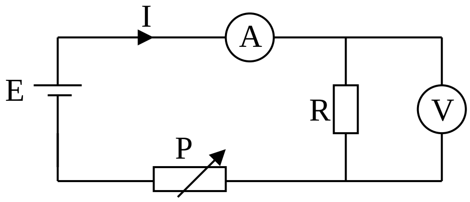
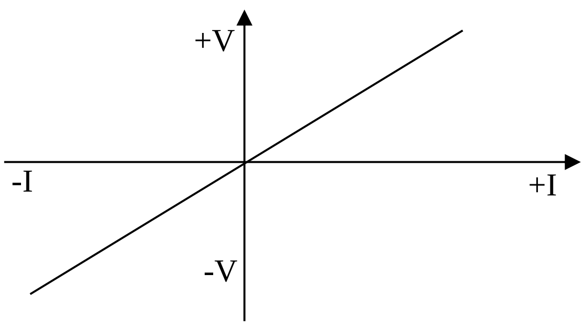
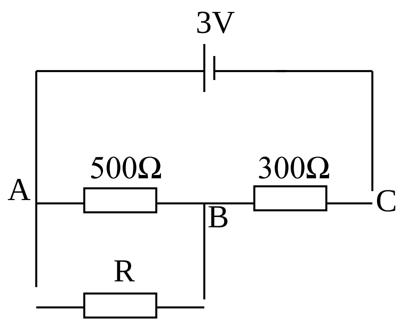
	$\therefore \quad d = \frac{(\lambda_1 - \lambda_2) \times 60 \times 180}{2\pi} = \frac{(1.896 - 1.890) \times 10^{-7} \times 60 \times 180}{2\pi}$ $= \mathbf{1.03 \times 10^{-6}\ m}$	½ 1
Total = 20		
5. (a)	…. a space in which a magnetic field can be detected.	1
(b)	(i) The current, I, is due to flow of electrons. Now each electron experiences a force F = Bev, where v is the drift velocity and e the electronic charge. By Fleming's left hand rule the moving charges, which are electrons in this case, are forced towards Q. This leaves a deficiency of electrons on P. So a voltage between P and Q, called the ***Hall voltage***, comes into existence. P is the positive side while Q is the negative side.	1 ½ ½ 1
	(ii)  The p.d leads to an electric field, of intensity $E = V_H/a$, is set up between P and Q. Equilibrium is struck when the force due to the created electric field on an electron is equal to the force due to the magnetic field B on it. i.e when $Ee = Bev$ $\therefore \quad E = Bv$	1 1 1
(c)	(i) 	1 ½ ½

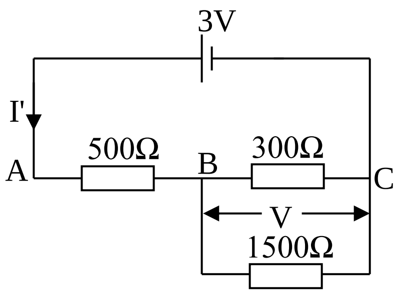
	Suppose the coil is rotated anticlockwise. Then side ab moves downwards while dc upwards. According to Fleming's right hand rule, an emf is induced in the coil in the direction ba and another emf in the other side in the direction dc. The two emfs join up in series to constitute the output emf at the commutator parts X and Y. As the side ab crosses to the right and cd to the left, the parts X and Y of the commutator also interchange their contacts with the brushes so as to maintain the polarity at the brushes. This is due to the fact that the induced emf in the coil reverses as the commutator contacts cross over.	1 1 1
	(ii) 	1
	(iii) A motor is run by passing a current through its coil which is placed in a magnetic field. As the motor runs, its coil sweeps across the magnetic field and by virtue of this, an emf is induced in the coil. According to Lenz's law, the induced emf opposes the applied voltage and the rotation of the coil. Hence it is referred to as a back emf.	1 1
(d)	(iii)  The flux linkage, $\varphi = NAB\sin\theta$ The induced emf, $E = \frac{d\varphi}{dt} = \omega NAB\cos\theta$ $= 2\pi fNAB\cos\theta$, where $f = 50$ Hz $= 2\pi \times 50 \times 100 \times (0.1 \times 0.1) \times 0.8 \cos 60^{o}$ $=$ **40 V**	1 1 1 1
Total = 20		
6. (a)	- The induced emf is in such a direction as to oppose the flux change causing it. - The magnitude of the induced emf is directly proportional to the rate of change of flux linkage.	1 1

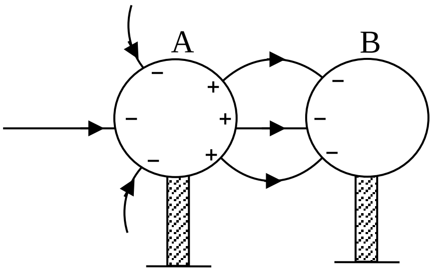
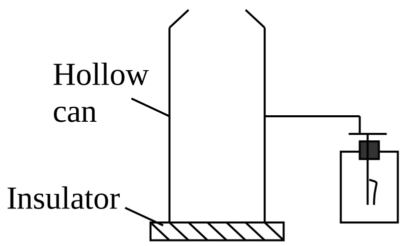
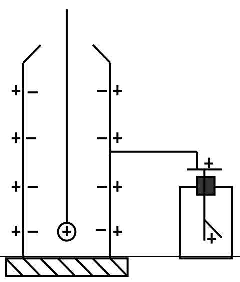
(b)	(ii) Suppose that at a certain instant the normal to the coil makes an angle θ with the magnetic field, then the flux linkage through the coil is $\Phi = NAB\cos\theta$ The induced emf, $E = -\frac{d\Phi}{dt}$ $= -NAB\frac{d(\cos\theta)}{dt}$ $= NAB\sin\theta.\frac{d\theta}{dt}$ But $\frac{d\theta}{dt} = 2\pi f$, where f is the frequency of rotation and $\theta = 2\pi ft$ **∴ $E = 2\pi fNAB\sin 2\pi ft$**	½ ½ ½ ½ 1
	(ii) The induced emf depends on the: - frequency of revolution of the coil - number of turns in the coil - area of the coil - strength of the magnetic field - angular position of the coil *Any four @½*	2
	(iii) - frictional forces in the moving parts - resistance in the windings reduce the output voltage	1 1
(c)	$E_o = 2\pi fNAB$ $= 2\pi \times 50 \times 50 \times 0.15 \times 0.30 \times 0.04$ = **28.3 V**	½ ½ 1
(d)	(i) (i) (ii) Imagine the disc the disc to be made up of spokes parked together and each sweeping across the magnetic field – see fig. (ii). x and y are the tapping points. Taking one such spoke, Let v_1 = velocity of the tapping point y	

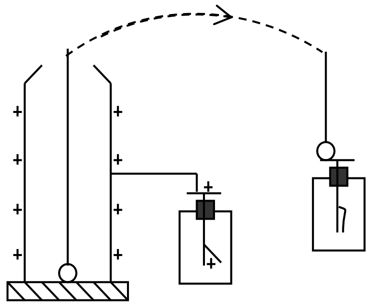
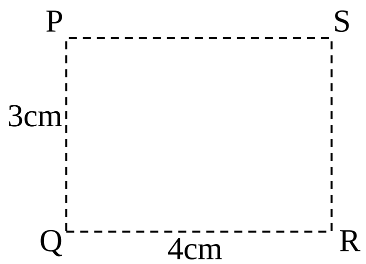
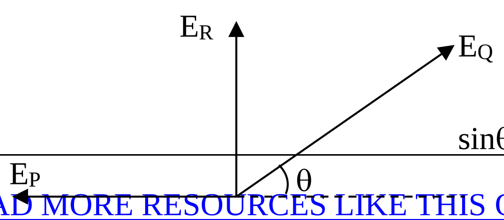
	Now, $E = Blv$, where v is the average velocity of the spoke, and $\overline{XY} = \frac{1}{2}d$ ∴ $E = \frac{1}{2}Bd.\frac{1}{2}v$ But $v = \frac{1}{2}d\omega$, where ω is the angular velocity of the disc ∴ $E = \frac{1}{4}Bd \times \frac{1}{2}d\omega$ $= \frac{1}{4}\pi f B d^2$, where $\omega = 2\pi f$	1 1 ½ ½ 1
	(ii) 	1
	- The resistance, R, to be measured is connected in series with a long solenoid. - A metal disc D, placed coaxially with the solenoid is rotated at the centre of the solenoid. - The emf, E, induced between the centre and the rim of D is connected across R. - The frequency of rotation of D is varied until the galvanometer G reads zero. Then, $IR = E$, where I is the current flowing in the solenoid. But, $E = \pi f r^2 B$, where r is the radius of D ∴ $IR = \pi\mu n I f r^2$, where n = number of turns per metre of the solenoid ∴ $R = \pi\mu n f r^2$	½ ½ ½ ½ ½ ½ ½ ½
Total = 20		
7. (a)	(i) The r.m.s value of an alternating current is that value of steady current which would dissipate heat at the same rate in a given resistor as the alternating current whereas the peak value is the maximum value of the current in a cycle	2
	(ii) Now $V_{r.m.s} = 220 = \frac{V_o}{\sqrt{2}}$ ∴ $V_o = 220\sqrt{2} = \mathbf{311.1\ V}$	1 1
(b)	(i) The current produces a magnetic field which is generally perpendicular to the plane of the coin. On switching on, as the current grows the coin experiences a fluctuating magnetic field. So an eddy current circulates in the coin According to Lenz's law, the eddy current produces a magnetic field facing (opposing) the growing field. The result is a repulsion between the coin and the solenoid.	½ ½ ½ ½ ½ ½

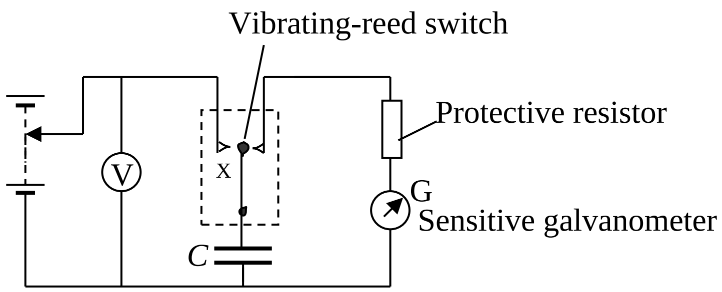
	When the current has become steady, the eddy current stops circulating. So the coin settles back	
	(ii) The magnetic field induced in the solenoid continuously fluctuates. So the eddy current continues to flow, also alternating as the current in the solenoid. This current is quite high. Because the continuous circulation of the eddy current, the coin heats up	1 1 1
(c)	(i) .. the opposition to flow of a.c. due to the behaviour of the capacitor in the circuit	1
	(ii)  Suppose that at a certain instant the p.d across the capacitor is $V = V_o\sin\omega t$. Then, the charge $Q = CV = CV_o\sin\omega t$. The current flowing at the instant is the rate at which charge is accumulating on or leaving the capacitor i.e $I = \frac{dQ}{dt} = \frac{d(CV_o\sin\omega t)}{dt} = \omega CV_o\cos\omega t \ldots\ldots\ldots(1)$ Equation (1) can also be written as $I = I_o\cos\omega t \ldots\ldots\ldots\ldots(2)$ where I_o is the peak current. i.e $I_o = \omega CV_o$ $\frac{V_o}{I_o} = \frac{1}{\omega C}$ But $\frac{V_o}{I_o} = \frac{V_{r.m.s}}{I_{r.m.s}} = \frac{1}{\omega C} = \frac{1}{2\pi fC}$ The quantity $\frac{1}{2\pi fC}$ is measure of the opposition offered by the capacitor to the flow of alternating current and is the capacitive reactance	1 1 1 1 1
	(ii) $X_L = 2\pi fL = 20\pi L$ $I = \frac{V_{r.m.s}}{X_L} = \frac{V_o}{\sqrt{2} \times X_L} = \frac{10}{\sqrt{2} \times 20\pi \times 0.5}$ $= \mathbf{0.225\ A}$	1 1 1

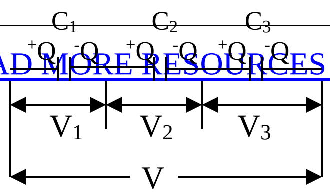
Total = 20		
8.(a)	(i) At constant temperature, the current flowing through a wire is directly proportional to the potential difference between the ends of the wire *and the relationship is independent of the direction of current or potential difference.*	1
	(ii) The following circuit is connected. 	1
	E is a steady source, R a wire-wound resistor of low resistance and P a rheostat of the same order of resistance as R. The voltmeter V and the ammeter A must be those whose calibration does not depend on Ohm's law – otherwise the experiment then would not be valid. - The current I is varied by adjusting P, and the potential difference V is measured at each value of current. - The procedure is repeated when the current is reversed. - A graph of V against I is plotted - It is a straight line through the origin. 	1 1 ½ 1 ½
(b)	(i)  Let R = resistance of the voltmeter Then $R_{AB} = \frac{500R}{500 + R}$	

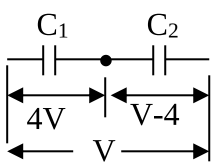
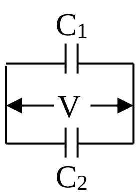
	$\frac{V_{AB}}{V_{AC}} = \frac{R_{AB}}{R_{AB} + R_{BC}} \times V_{AC}$ So $\frac{5}{3} = \frac{3 \times R_{AB}}{R_{AB} + 300} = \frac{1500R}{500R + 150000 + 300R}$ $\therefore$ 25R + 7500 + 15R = 45R $\therefore$ 7500 = 5R $\therefore$ R = $\frac{7500}{5}$ = **1500 Ω**	1 1 1 1
	(ii)  $R_{BC} = \frac{1500 \times 300}{1500 + 300} = 250\ \Omega$ $V = \frac{250}{500 + 250} \times 3$ = **1.0 V**	1 2
(c)	(i) Resistivity is the resistance per unit length of a material of unit cross-sectional area.	1
	(ii) … the fractional increase of the resistance at 0°C per kelvin rise of temperature.	1
(d)	$R_1 = \frac{4\rho l}{\pi d^2} = \frac{4 \times 1.12 \times 10^{-6} \times 4.64}{\pi \times 5^2 \times 10^{-8}} = 26.5\ \Omega$ $R_2 = \frac{V^2}{P} = \frac{240^2}{2000} = 28.8\ \Omega$ Now, $R_1 = R_o(1 + \alpha\theta_1)$ and $R_2 = R_o(1 + \alpha\theta_2)$ $\therefore \frac{R_2}{R_1} = \frac{R_o(1+\alpha\theta_2)}{R_o(1+\alpha\theta_1)}$ $\therefore R_2(1 + \alpha\theta_1) = R_1(1 + \alpha\theta_2)$ $\therefore \alpha(\theta_2 R_1 - \theta_1 R_2) = R_2 - R_1$ $\therefore \alpha = \frac{R_2 - R_1}{\theta_2 R_1 - \theta_1 R_2} = \frac{28.8 - 26.5}{(1015 \times 26.5) - (15 \times 28.8)}$	1 1 1 1

	$= \frac{2.3}{26466} = \mathbf{8.69 \times 10^{-5}K^{-1}}$	1
Total = 20		
9. (a)	- When materials are rubbed together, the heat generated due to friction raises the kinetic energy of the electrons on the periphery of the atoms. - The material with the lower function loses some of its electrons to the other. - The material that has lost electrons becomes positively charged while the one that has gained electrons gains a negative charge - If the materials are insulators, the charges remain where they are deposited.	½ ½ 1 ½ ½
(b)	(i) and (ii) 	2 2
	(iii) As the spheres are moved apart, the p.d. rises. This is because the neutralising effect of the opposite charges on the spheres becomes smaller at a greater separation so that the magnitude of the electric potential of each sphere rises. Hence increased p.d.	1 1
(c)	 - A hollow metallic can is placed on an insulator and connected to a neutral electroscope. - A metal ball, is suspended from a silk thread, given a positive charge and lowered into the can, without touching its walls. 	½ 1

	The leaf is observed to diverge, and as long as the ball is inside the can no change of deflection occurs even when it is moved about within the can. - The ball is allowed to touch the inside  Still the deflection is unchanged. This shows that the outside did not lose or gain any charge. - Finally, the ball is removed. The deflection still remains unchanged, and when tested with another electroscope, the ball is found to have lost all the charge; also, the inside of the can has no charge.	½ 1 ½ ½ 1
(d)	 $E_P = \frac{Q_P}{4\pi r_P^2} = \frac{-3\times10^{-6}\times9\times10^{9}}{0.04^2} = 1.69\times10^{7}\ N\,C^{-1}$ horizontally to the left $E_Q = \frac{Q_Q}{4\pi r_Q^2} = \frac{4\times10^{-6}\times9\times10^{9}}{0.05^2} = 1.44\times10^{7}\ N\,C^{-1}$ diagonally towards S $E_R = \frac{Q_R}{4\pi r_R^2} = \frac{3\times10^{-6}\times9\times10^{9}}{0.03^2} = 3.0\times10^{7}\ N\,C^{-1}$ vertically upwards  sinθ = 0.6 and cosθ = 0.8	1 1 1 ½

	Let E_X = horizontal component of the resultant intensity and E_Y = vertical component of the resultant intensity Then $E_X = E_P - E_Q\cos\theta = (1.69 - 1.44 \times 0.8) \times 10^7$ to the left $= 0.538 \times 10^7$ N C^{-1} and $E_Y = E_R + E_Q \sin\theta = (3.0 + 1.44 \times 0.6) \times 10^7$ upwards $= 3.864 \times 10^7$ N C^{-1} Resultant intensity $= \sqrt{E_X^2 + E_Y^2}$ $= \sqrt{0.538^2 + 3.864^2} \times 10^7 =$ **3.9×10^7 N C^{-1}**	½ ½ ½ 1
Total = 20		
10.(a)	(i) Capacitance is the ratio of the magnitude of charge on either plate to the potential difference between the plates.	1
	(ii) The dielectric strength of a dielectric is the maximum potential gradient the dielectric can withstand without its insulation breaking down.	1
(b)	The following arrangement, known as the vibrating-reed switch, may be used to investigate the relationship.  C is the capacitor formed by two large square plates separated by small pieces of polythene at the corners. When the vibrating reed makes contact with X, C gets charged and when it makes contact with Y, C is discharged. - A p.d V is set and the vibrating-reed is switched into operation. - V is noted and the current, I, registered by the galvanometer is also noted. Now, if f is the frequency of the reed switch and Q the charge acquired by C and discharged through G, the current I =fQ. Thus for a given frequency, $Q \propto I$ By varying V in steps of tens of volts the procedure is repeated using various values of V, each time noting the corresponding values of I. A graph of I against V is plotted. It is a straight line through the origin and since $Q \propto I$, it follows that $Q \propto V$.	1 ½ ½ ½ ½ ½ ½ ½ ½



(c)	In series all the capacitors carry the same charge, Q but the potential differences are different as follows $V_1 = \frac{Q}{C_1}, \quad V_2 = \frac{Q}{C_2}, \quad V_3 = \frac{Q}{C_3},$ The total p.d across the network is $V = V_1 + V_2 + V_3 = Q\left(\frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3}\right)$ If C is the equivalent capacitance of the network, then $V = \frac{Q}{C} = Q\left(\frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3}\right)$ $\therefore \frac{1}{C} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3}$	1 ½ ½ ½ ½
(d)	(i) The voltmeter reading decreases. This is because the inserted material increases the capacitance of the arrangement. Since the charge has remained the same, the p.d drops (since Q = CV)	1 1
	(ii) The voltmeter reading rises Increasing the plate separation decreases capacitance. Since the charge has remained the same, the p.d increases	1 1
(e)	(i)   $4C_1 = 8$ $\therefore \quad C_1 = \mathbf{2\ \mu F}$ Also $\quad C_2(V - 4) = 8$ $C_2V - 4C_2 = 8$ ……….. (1) From the parallel connection: $(C_1 + C_2)V = 36$ …. (2) From (2) $\quad V = \frac{36}{C_1 + C_2}$	½ 1 ½ ½

	Substituting for V in (1), we have $\frac{36C_2}{C_1 + C_2} - 4C_2 = 8$ $\therefore C_2^2 - 5C_2 + 4 = 0$ $\therefore \quad C_2 = \frac{5 \pm \sqrt{25 - 16}}{2} = 1 \text{ or } 4$ So C_2 = **4 μF**	½ 1
	(ii) From above $V = \frac{36}{C_1 + C_2} = \frac{36}{2+4}$ = **6 V**	1 1
Total = 20		