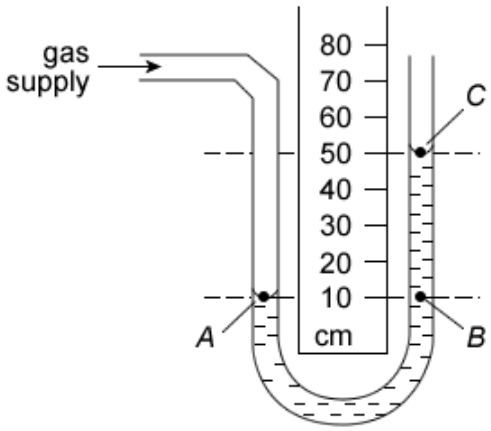
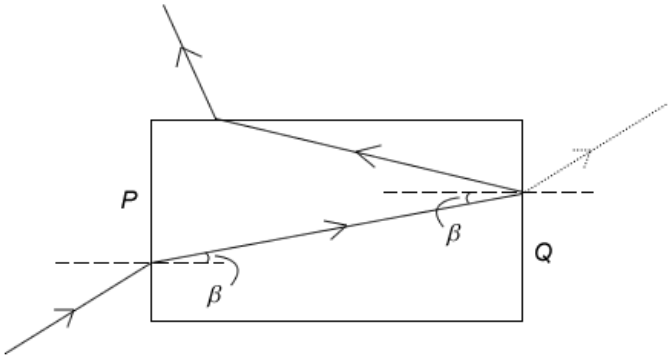
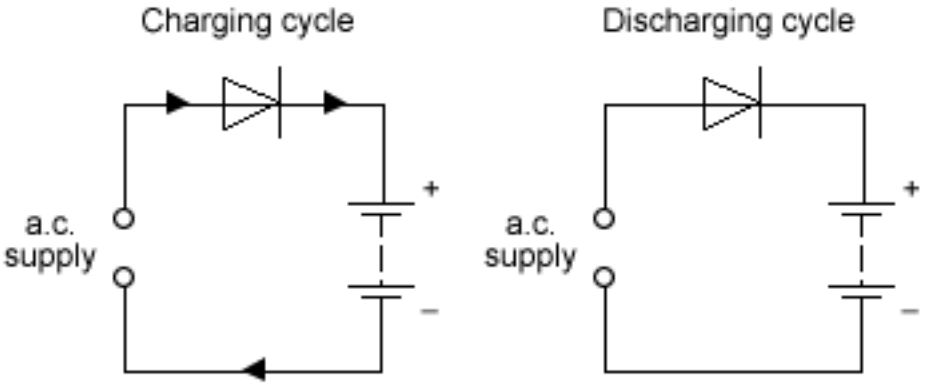
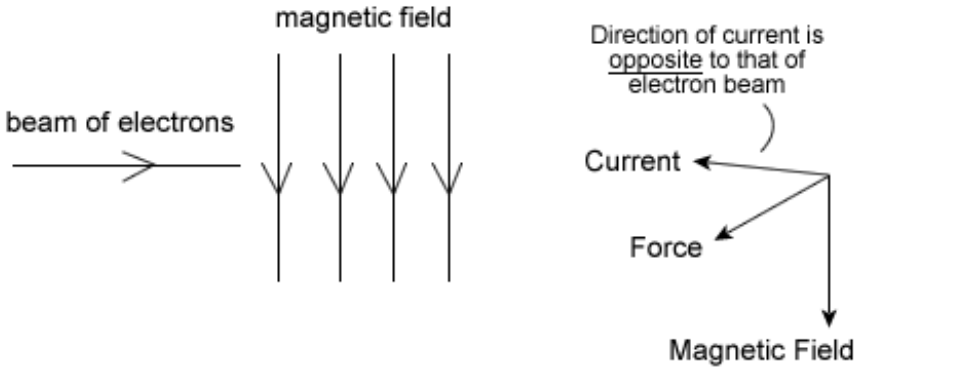
#	Ans	Workings/Remarks
1	C	 End correction = 0.2cm Actual length of object X = 1.1 + 0.2 = 1.3cm
2	D	Force, Acceleration, Velocity and Displacement are vectors. Work, Time and Mass are scalars.
3	D	Gradient of speed-time graph = acceleration Changing gradient (curve) = non uniform acceleration Constant gradient (straight line) = uniform acceleration
4	C	● … 9 dots … ● … 9 dots … ● … 9 dots … ● … 9 dots … ● … 9 dots … ● 20 cm Noting that dots are shared across consecutive interval, we calculate based on the spacings between consecutive dots. In each 20 cm interval, there are 11 dots ⇒ 10 spacings ⇒ Between 50 dots, there's a total of 49 spacings. Since 50 dots/49 spacings are moved in 1 sec, time taken for 1 spacing = $\frac{1}{49}$ s Time taken to move 20 cm/10 spacings = $\frac{1}{49} \times 10$s $\therefore$ Speed of tape = $\frac{\text{distance}}{\text{time}} = \frac{20}{\frac{1}{49}\times 10} = 98 \text{ cm/s} \approx 100 \text{ cm/s}$
5	B	Resultant force = 10 – 2 = 8 N The weight of 5N (towards centre of earth/downwards on trolley) is not included in the calculation because it is not acting in the same direction as the motion of trolley (along a level bench).
6	C	Acceleration = (30 – 10) / 16 = 1.25 m/s^2 F = ma = 12000 × 1.25 = 15000N
7	A	Density is inversely proportional to volume (Density = Mass / Volume) Minimum volume = Maximum density and vice versa
8	A	Clockwise moment = 1.5 × (50 − 30) = 30 N cm Anticlockwise moment = 2 × (30 −15) = 30 N cm Resultant moment is the difference between clockwise and anticlockwise moment.
9	B	Pressure = Force / Area = Weight / Area A: P = 30/100 = 0.3 N/cm^2 B: P = 500/150 = 3.33 N/cm^2 C: P = 750 / 300 = 2.5 N/cm^2 D: P = 10000 / 4000 = 2.5 N/cm^2

10	C	 Pressure at C = atmospheric pressure Pressure at A = Pressure at B Pressure at B = (50-10) cm of water + atmospheric pressure Pressure is directly proportional to height of column of liquid. Pressure = density of liquid × g × height of column of liquid Therefore, pressure at any point along the same height will be the same. Pressure of gas = (50 – 10 = 40) cm of water + atmospheric pressure
11	B	Friction slows down the moving cart. Friction gives rise to heat energy that is converted from kinetic energy of the cart.
12	C	At start (20m above ground): Potential energy = mgh = 4 × 10 × 20 = 800 J When it hits the ground: Kinetic energy = ½ mv^2 = ½ × 4 × 20^2 = 800 J According to principle of conservation of energy, energy is neither destroyed nor created, but it is changed from one form to another. During the fall, all potential energy (800 J) is changed into kinetic energy (800 J). No work is done against air resistance as none of the potential energy is changed into heat energy. When it hits the ground, all kinetic energy (800 J) is changed into heat and sound energy (800 J). No kinetic energy is changed back to potential energy as the object doesn't rebound.
13	A	
14	A	100 units = 2.5 – 2.0 = 0.5 ohms 20 units = 0.5 / 100 × 20 = 0.1 ohms Resistance at 20C = 2.0 + 0.1 = 2.1 ohms
15	B	Heat energy needed to melt ice = mass of ice × specific latent heat of fusion of ice 1700 = mass of ice × 340 Mass of ice = 5g Mass of ice that remains unmelted = 8 – 5 = 3g

16	B	
17	B	Temperature is directly proportional to average kinetic energy of molecules. As the atoms move faster, the kinetic energy increases and the temperature increases. Pressure is inversely proportional to volume. As the cloud gets smaller, its volume decreases and hence its pressure increases.
18	D	Speed = Frequency × Wavelength = $\frac{1}{\text{period}}$ × Wavelength = $\frac{1}{0.2}$ × 4 = 20 cm/s
19	D	Refractive index, $n = \frac{c}{v}$ where c is the speed of light in vacuum and v is the speed of light in the medium. To add on, the refractive index of vacuum = 1 (∵ speed of light in vacuum / speed of light in vacuum) and since light travels fastest in a vacuum, the refractive index of a medium is always greater than 1. Note that the refractive index of air is ≈ 1.0003, which is close enough to that of a vacuum to be used as an *approximation* for practical purposes, but the vacuum is still the ideal reference with its perfect refractive index of 1.
20	B	 Since refraction occurs at Surface P, total internal reflection is not possible at Surface Q (∵ β < critical angle of the glass block and Q // P). Instead there should be an emergent ray at Surface Q that is parallel to the incident ray at Surface P.
21	D	Using a lens of longer focal length (with the object remaining at the same position) has the same effect as moving the object right and closer towards the first focal point of the lens i.e. the intersection of the light rays will be further away from the lens, resulting in the image being focused on the screen.
22	D	Electromagnetic waves are transverse waves which do not require a medium to travel. However not all of them can be deflected by magnets e.g. visible light is an electromagnetic wave that cannot be deflected by magnets.
23	C	That's why it's called an Ultrasound Scan!
24	C	Rarefactions are regions where pressure is lower than that of surrounding air.
25	B	Like charges repel, unlike charges attract.
26	C	
27	D	Parallel arrangement of two identical lamps decreases the effective resistance of circuit by two times, which increases the total current by two times, using the same cell.

28	A	 During the charging cycle, the diode allows the clockwise current from the a.c. supply to flow, thereby charging the battery. During the discharging cycle, the diode blocks the anti-clockwise current and hence prevents the battery from discharging, and thus the efficiency of the charging process is maintained.
29	D	
30	C	$\frac{1}{R_T} = \frac{1}{6} + \frac{1}{(6+6)}$ $R_T = 4\ \Omega$ $I = \frac{V}{R}$ $= \frac{1.8}{4}$ $= 0.45$ A
31	C	In a series circuit, current is constant and voltage is directly proportional to resistance. Output voltage = $\frac{R_2}{R_1+R_2} \times 6 \Rightarrow \frac{1}{5+1} \times 6 = 1$ V
32	D	$P = \frac{V^2}{R}$ $R = \frac{250^2}{100} = 625\ \Omega$
33	C	Total number of kWh = $\left(\frac{1500}{1000} \times 1.0\right) + \left(\frac{2000}{1000} \times 3.0\right) = 7.5$ Cost of electricity = 7.5 × 24 cents = 180 cents
34	D	
35	A	Use right hand grip rule, grip wire with thumb pointing in the direction of current, the rest of fingers indicate direction of magnetic field.
36	C	Iron, being a magnetic material, helps to concentrate the magnetic field lines and thus create a stronger magnetic field. Removing the soft iron cylinder will decrease the force generated from the interaction between the current in the coil and the magnetic field, and thus decreasing the turning effect on the coil.

37	B	 **Using Fleming's Left Hand Rule** Using Fleming's left hand rule, the direction of the electron beam is opposite to that of a conventional current.
38	D	By Lenz's Law, pushing the N-pole into Q will induce a current to flow in a direction that produces a N-pole at Q to oppose it (and thereby producing a S-pole at P). Likewise, pushing the S-pole into P will produce a S-pole at P (with the induced current flowing in the same direction).
39	D	Increasing the speed of rotation steadily increases the rate of 'cutting' the magnetic field lines and hence the steady increase of the magnitude of induced e.m.f. (output voltage) i.e. the increasing amplitude of the graph. At the same time, increasing the speed of rotation decreases the time taken per revolution (period) and thus increases frequency i.e. the decreasing period of the graph.
40	D	$\frac{V_s}{V_p} = \frac{I_p}{I_s}$ $I_s = 0.5 \times \frac{40}{2}$ $= 10\ \text{A}$