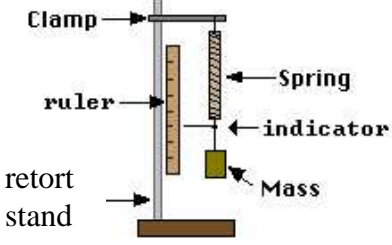
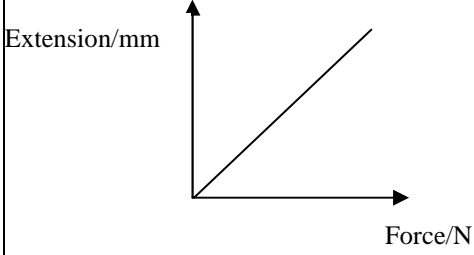
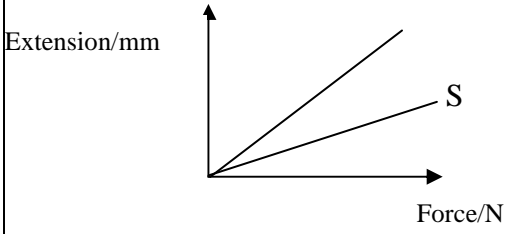
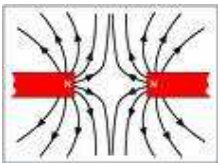
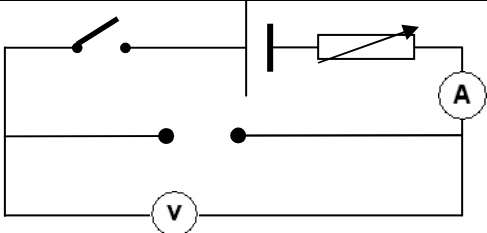
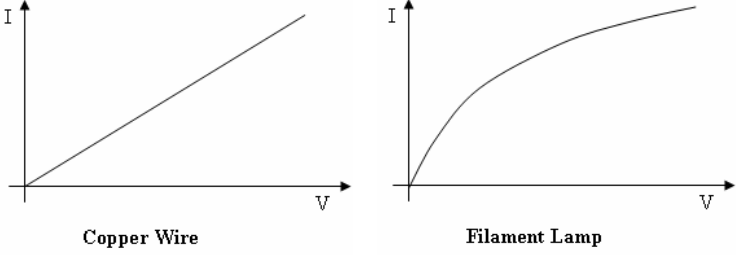
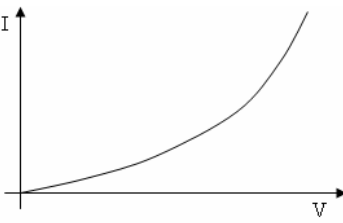


PHYSICS SEC MAY 2009 – MARKING SCHEME – PAPER IIA

		<i>Answer</i>	<i>Marks</i>	<i>Comments</i>
1	(a) (i)	for an elastic material, the extension is directly proportional to the applied force provided the elastic limit is not exceeded / reached	1 1	
	(ii)	 <p>spring, ruler and masses clearly shown correctly all apparatus labelled</p>	1 1	
	(iii)	repeated readings / reading ruler at eye level / vertical ruler / allowing spring to stop vibrating before taking readings / other reasonable precautions related to measurement / does not skip the elastic limit (any two)	1,1	
	(iv)	 <p>labelling of axes straight line through the origin axis may be interchanged in which case,</p> <p>attention for part (v) below</p>	1 1	
	(v)		1	
	(vi)	less extension for the same force / half as much extension for same force / would go down less	1	
	(vii)	otherwise when a large force acts on the sofa it will produce too large a compression spring will be permanently deformed	1 1	Do not accept 'you will sink in the sofa'
	(b) (i)	$20.5 - 18 = 2.5 \text{ cm}$	1	
	(ii)	10cm $10 + 18 = 28 \text{ cm}$	1 1	If ans is 7.5, then give 1 mark only
	(iii)	the elastic limit has been exceeded so spring extended more than expected by Hooke's law	1 1	

		<i>Answer</i>	<i>Marks</i>	<i>Comments</i>
	(c)(i)	<p>Extension/mm</p> <p>Force/N</p> <p>labelling; correct shape of graph</p>	1 1	
	(ii)	rubber band does not obey Hooke's Law	1	
		Total	20 marks	
2	(a) (i)	A	1	
	(ii)	$90 - 55 = 35^\circ$	1	
	(iii)	$90 + 35 = 125$ $180 - 125 = 55^\circ$ or any other method	1	
	(iv)	angle of incidence at BC in glass is greater than critical angle total internal reflection takes place	1 1	Do not accept 'reflection' only
	(b) (i)	<p>correct ray diagram correct image</p>	1 1	if no arrows are drawn & all virtual lines are not dotted, remove 1 mark allow for part of the diagram to go out of the graph paper
	(ii)	magnification = v/u or $h_i/h_o = 2.5 \pm 0.4$ 0.2	1	
	(iii)	magnifying lens / map reader	1	Only these 2 ans are correct
	(c) (i)	convex lens / converging lens	1	
	(ii)	inverted, diminished	1,1	
	(d)	They move the card forward and backward until a sharp image of the wire is obtained on card. At least 5 lenses of different thickness are used. Each time they measure the thickness of the lens and the focal length of the lens - the distance from the lens to the screen. The results are presented in a table and then on a graph Repeated readings / image obtained needs to be sharp / dark room / other reasonable precautions	1,1 1,1 1,1 1,1	
		Total	20 marks	
3	(a) (i)	$(35 \times 1000) / (60 \times 60)$ $= 9.7 \text{ m/s}$	1 1	
	(ii)	same as train 9.7 m/s	1	
	(iii)	the passengers keep on moving due to Newton's 1 st Law / inertia, an object which is moving at constant speed keeps on moving unless an external force acts on it	1 1	
	(iv)	$v = u + at$ $9.7 = 0 + (a \times 20)$ $0.485 \text{ m/s}^2 = a$	1 1	

		<i>Answer</i>	<i>Marks</i>	<i>Comments</i>
	(v)	$F = m a$ $= 890 \times 0.485$ $= 432 \text{ N}$	1 1	
	(vi)	No, the forward force is greater than the resultant force due to the frictional force acting in the reverse direction / air resistance	1 1	
	(b)	No, the two forces are equal and opposite	1 1 1	
	(c) (i)	$m_1 v_1 + m_2 v_2 = (m_1 + m_2) v_3$ $(0.075 \times 0.05) - (0.1 \times 0.08) = (0.075 + 0.1) v_3$ $0.024 \text{ m/s} = v_3$	1 1 1	Remove 1 mark if $m_1 v_1$ is added to $m_2 v_2$
	(ii)	in the direction the bigger train was moving	1	
	(iii)	no, once they hit each other, they continue to move due to their combined momentum	1 1	
		Total	20 marks	
4	(a) (i)	if like poles are N  If like poles are S, same as above but opposite direction of field lines for indicating like poles correct shape of field lines correct direction of field lines	1 1 1	
	(ii)	X in the middle between the bar magnets	1	Exactly in the middle
	(iii)	Move the compass around the bar magnets the direction of the N pole of the needle gives the direction of field lines	1 1	
	(b) (i)	like poles repel unlike poles attract	1 1	
	(ii)	in both cases the metal paper clips are attracted to the magnet	1	
	(iii)	the metal paper clips are unmagnetised but made of magnetic material so they attract to the bar magnet	1 1	accept by induction
	(iv)	temporary magnets are magnets which retain their magnetism for a short period of time permanent magnets retain their magnetism for a long period of time	1 1	Only these defns are to be accepted
	(c)(i)	Magnetic field lines are being cut by the coil which induces an emf across the coil wire A current flows which lights the bicycle lamp	1 1 1	
	(ii)	mechanical energy to electrical energy / light	1,1	
	(iii)	increase no of turns of wire in coil / increase speed of	1,1	

		<i>Answer</i>	<i>Marks</i>	<i>Comments</i>
		bicycle / stronger bar magnet		any two
			Total	20 marks
5	(a) (i)	 <p>battery, rheostat, bulb/copper wire rheostat ammeter and voltmeter connected correctly overall circuit</p>	1 1 1 1	
	(ii)	<p>The copper wire is connected and the circuit is switched on. The readings of the Ammeter and voltmeter are recorded. A new voltage is set using the rheostat and the experiment is repeated until five readings of voltage and current are taken. The copper wire is removed from the circuit and the whole procedure is repeated using the lamp.</p>	1 1 1 1	
	(iii)	 <p>Copper Wire Filament Lamp</p>	1,1	
	(iv)	<p>Copper wire: Voltage and current are directly proportional. Therefore, copper wire is ohmic. Filament lamp: Voltage and current are not proportional. Therefore, filament lamp is non ohmic.</p>	1 1 1 1	
	(b) (i)	 <p>curve graph passes from the origin</p>	1 1	If shape of graph is a straight line then give 0 marks even if it passes through the origin

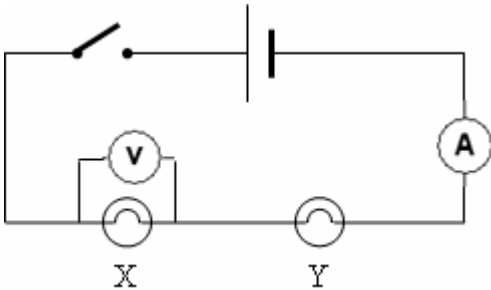
	<i>Answer</i>	<i>Marks</i>	<i>Comments</i>
(ii)	<p>The current flowing in the thermistor increases the temperature</p> <p>This decreases resistance within the thermistor</p> <p>More current can flow through the thermistor; steeper graph</p> <p>Current and Voltage are not proportional; Ohm's law does not hold</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p>	
	Total	20 marks	

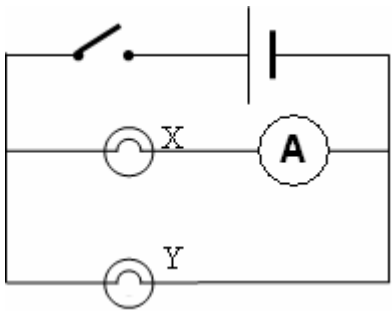
PHYSICS SEC MAY 2009 – MARKING SCHEME – PAPER I

		<i>Answer</i>	<i>Marks</i>	<i>Additional guidelines</i>
1	(a)	wt = m x g = 36 x 10 = 360 N	1 1(units)	
	(b) (i)	A = l x b = 0.01 x 0.01 = 0.0001 m ² 0.0001 x 4 = 0.0004 m ²	1 1	delete 1 mark if cm are used if area is not correct then give 0 marks for whole question
	(ii)	P = F/A = 360 / 0.0004 = 100,000 N/m ² or 900,000 Pa	1 1(units)	
	(iii)	increases P ∝ F or pressure increases as force increases (area remains constant)	1 1	
	(c)	stiletto shoes may damage the wooden floor as P ∝ 1/A or pressure increases as area decreases / pressure is inversely proportional to area	1 1	
		Total	10 marks	
2	(a) (i)	90 s	1	
	(ii)	180 m	1	
	(iii)	60 s	1	
	(b)	average velocity = total distance / total time = 180 / 90 = 2 m/s	1 1(units)	
	(c)	Daniel did not move / waited at the newsagent	1	
		during return journey	1	
	(d)	steeper gradient/ less time for the same distance	1	
		velocity will be less /longer time to travel the same distance	1	
	(e)	gradients will be less steep/ less	1	
		Total	10 marks	

		<i>Answer</i>	<i>Marks</i>	<i>Additional guidelines</i>
3	(a) (i)	Saturn	1	
	(ii)	Saturn, heat/solar	1,1	
	(iii)	26 m/s ² or acceleration due to gravity is biggest	1	
	(iv)	Mars	1	
	(v)	700 kg/m ³ or smallest density	1	
	(vi)	the time for a planet to rotate on itself	1	
	(b)	the distance from the Earth to Jupiter is much larger than the distance from the Earth to the moon	1	
	(c)	B the ball is pulled by the earth's force of gravity which always acts towards the centre of the earth	1 1	
		Total	10 marks	
4	(a)	ultraviolet, infrared, microwaves, speed	1,1,1,1	
	(b) (i)	black / dark coloured surface absorbs heat and temperature rises	1	do not accept black is a good conductor of heat
	(ii)	A its position in the infrared region/infrared waves which causes heating / raises its temperature	1 1 1	
	(c)	infrared cameras, sensors, imaging, night vision, toaster etc.	1,1	do not accept microwave, cooking, or mobile.
		Total	10 marks	
5	(a)	10.2, 10.9, 11.6, 12.3	1,1	if number after decimal point is incorrect, then reduce 1 or 2 marks according to the no. of incorrect values.
	(b)	Correct scale correct axes correct points marked size of graph about 50% of graph paper	1 1 1 1	
	(c)	gradient = change in y/change in x = 33.3 ± 5 J/m ² /s ²	1 (correct working) 1 1 (units)	if calculation is not shown then reduce 1 mark
	(d)	33.3 = ½ m m = 66.6kg (depends upon the value of the	1	

		<i>Answer</i>	<i>Marks</i>	<i>Additional guidelines</i>
		gradient found)		
		Total	10 marks	
6	(a) (i)	source of energy cannot be used more than once	1	
	(ii)	nuclear or other sensible correct answer	1	
	(b)	internal energy/heat energy → K.E., K.E. → electrical energy	1,1	
	(c) (i)	oil is expensive / causes air pollution / will not last forever	1	
	(ii)	solar / wind / biomass	1	do not accept 'tidal', 'hydroelectrical', nuclear.
	(iii)	clean source	1	accept 'causes no air pollution'
	(d)	using energy saving lamps instead of incandescent lamps using energy efficiency appliances switching off lights when not in use	1,1,1	any other sensible answer
		Total	10 marks	
7	(a)	GM tube	1	Geiger Muller tube
	(b) (i)	background radiation	1	
	(ii)	cosmic rays / earth crust / rock	1,1	
	(c) (i)	time taken for half the I-123 to decay is 13 hrs	1	
	(ii)	100 % → 50 % 13 hours or 1 → ½ → ¼ → 1/8	1	remove 1 mark if answer is not given in %
		50 % → 25 % 13 hours	1	
		25 % → 12.5% 13 hours	1	
	(d)	handle with tongs / protective clothing / protective screen or concrete wall etc.	1,1	do not accept radiation badge, wearing sunglasses, not eating, washing one's hands
		Total	10 marks	
8	(a) (i)	positive charge	1	
	(ii)	induction	1	
	(b)	negative charge	1	
	(c) (i)	so that charge does not leak / discharge	1	
	(ii)	negative charges on the spheres move away from the ruler so that	1	
		sphere A becomes +ve, sphere B becomes -ve	1	
	(iii)	+ve sphere A; -ve sphere B; -ve charges ruler	1	
		charges on sphere A close to the ruler, on	1	

		<i>Answer</i>	<i>Marks</i>	<i>Additional guidelines</i>
		sphere B furthest away from the ruler		
	(iv)	Sphere A becomes neutral Sphere B becomes neutral	1 1	
		Total	10 marks	
9	(a) (i)	Glass cover produces a greenhouse effect/Heat waves from the sun being energetic penetrate the glass but the heat emitted by the pipe is less energetic and cannot escape back	1	
	(ii)	So that heat inside the panel cannot escape to the surroundings	1	
	(b) (i)	copper copper is a good conductor so that heat can reach the water inside the pipe	1 1	
	(ii)	water takes some time to pass through the whole pipe whilst it is being heated up / since longer pipe has a bigger area more heat waves are absorbed	1	
	(c)	when water absorbs radiation it gets hotter and moves upwards by convection in the tank.	1 1	
	(d)	$\Delta H = m c \Delta \theta$ $2 \times 10^6 = 80 \times 4200 \times \Delta \theta$ $6 = \Delta \theta$ Final temp = $15 + 6 = 21^\circ\text{C}$	1 1 1	
		Total	10 marks	
10	(a) (i)	 <p>correct symbol of voltmeter and connected in parallel to X correct symbol of ammeter and connected in series</p>	1 1	
	(ii)	in series	1	
	(iii)	$0.75 \times 2 = 1.5\text{V}$	1	

	<i>Answer</i>	<i>Marks</i>	<i>Additional guidelines</i>
			
(b) (i)	ammeter drawn in series to X	1	
(ii)	in parallel	1	
(iii)	$P = IV$ $= 0.01 \times 1.5$ $= 0.015W$	1 1	
(c)	<p>Y in circuit 1/ in series: not at maximum brightness or dim since at 0.75V</p> <p>Y in circuit 2/ in parallel which is at maximum brightness since at 1.5V</p> <p>OR brightness of Y in series is less than in parallel since</p> <p>Voltage across bulb is also half, 0.75V as opposed to 1.5V</p>	1 1	
	Total	10 marks	