
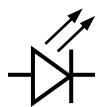
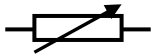

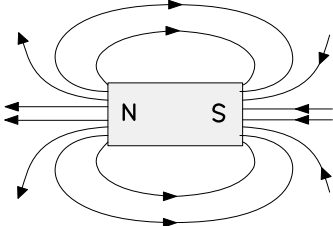


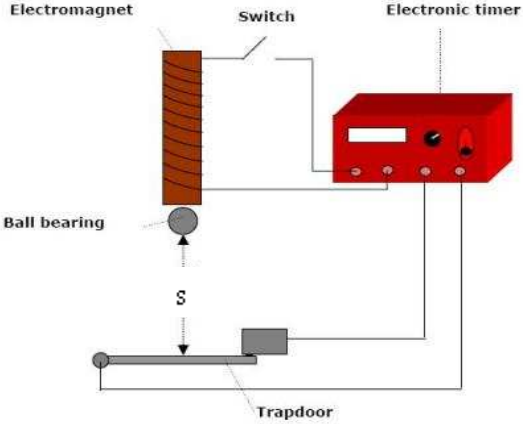
PHYSICS SEC MAY 2010 – MARKING SCHEME – PAPER IIA

		<i>Answer</i>	<i>Marks</i>	<i>Additional guidelines</i>
1	(a)	LDR 	1	
		LED 	1	
		Variable resistor 	1	
		Thermistor 	1	
	(b) (i)	$P = I \times V$ $960 = I \times 240$ $4 \text{ A} = I$	1 1	For value For correct units
	(ii)	5 A The fuse amperage is slightly more than the maximum current as a safety feature so that if the current increases the fuse will melt	1 1	Do not accept 4.5 A or 6 A
	(iii)	$V = I \times R$ or $P = V^2/R$ $240 = 4 \times R$ $960 = 240^2 / R$ $60 \Omega = R$ $R = 60 \Omega$	1 1	For value For correct units
	(iv)	960 J per second or W	1 1	For value For correct units
	(c) (i)	$0.5 - 0.4 = 0.1 \text{ A}$	1	
	(ii)	Across 40Ω $V = I \times R$ $= 0.4 \times 40$ $= 16 \text{ V}$ Across R $V = I \times R$ $16 = 0.1 R$ $160 \Omega = R$	1 1	Other methods may be used to arrive at the same answer
	(d) (i)	Across 3Ω resistor $V = I \times R$ $= 1.25 \times 3$ $= 3.75 \text{ V}$ p.d. across X $= 6 - 3.75 = 2.25 \text{ V}$ Across X $V = I \times R$ $2.25 = 1.25 \times R$ $X = 1.8 \Omega$	1 1 1	Other methods may be used to arrive at the same answer

		<i>Answer</i>	<i>Marks</i>	<i>Additional guidelines</i>
	(ii)	Current is proportional to thickness	1	Accept the thicker the resistor the lower the resistance or vice-versa; Thicker wire - (less resistance) - more current
	(iii)	Current is inversely proportional to length	1	Longer wire - (more resistance) - less current
		Total	20 marks	
2	(a)	Earth spins upon itself every 24 hours Earth orbits the sun every 365 days	1 1	Accept an answer in terms of motion only without giving the time
	(b)	Gravitational force	1	Do not accept 'gravity' only or 'centripetal force'
	(c)	Monitoring weather - polar satellite; low orbit around the poles many times a day Communication - geostationary satellite; high orbit above equator / seems to be in a fixed position	1,1 1,1	
	(d) (i)	Gas and dust come together due to gravitational forces.	1 1	
	(ii)	Planets	1	
	(iii)	A star gives out its own light, a planet reflects the light of a star A star has planets orbiting around it; a planet has satellites (moons) orbiting around it	1 1	Do not accept that a star has a larger mass than a planet
	(e) (i)	A galaxy is a collection of solar systems	1	Do not accept 'group of stars' only
	(ii)	Milky Way	1	
	(f) (i)	Red Shift	1	
	(ii)	Galaxies are moving away from us	1	
	(iii)	The further away the galaxy is, the faster it is moving away from us	1	
	(g)	Big Bang Theory suggests that all the matter in the universe was concentrated into a single incredibly tiny point. This began to enlarge rapidly in a hot big bang and it is still expanding. The big bang was initially suggested because it explains why distant galaxies are travelling away from us at great speeds.	1 1 1	
		Total	20 marks	

		<i>Answer</i>	<i>Marks</i>	<i>Additional guidelines</i>
3	(a) (i)	Place one end of one bar close to but not touching the other and feel the force between them If a force of attraction is noticed, turn around one of the bars If an attractive force is again noticed, then one of the bars is a magnet and the other is just made of magnetic material / metal If at any stage, a repulsive force is noticed, then both bars must be magnets	1 1 1 1	Do not accept experiment using iron filings If experiment includes use of magnetic compass around magnet and around metal bar, give a maximum of 3 marks
	(ii)	Steel Since it has retained its magnetism for a long time, it must be a permanent magnet	1 1	Accept 'hard iron'
	(iii)		1 1	Shape of field Correct direction of field lines
	(iv)	The needle of the compass will point away from the north pole of the bar magnet and towards the south pole of the bar magnet	1 1	
	(b) (i)	Electrostatic induction The rod acquires an electrostatic charge which attracts uncharged objects	1 1 1	'Induction' only is not correct
	(ii)	The two charged rods are tied separately to two lengths of nylon and brought close to each other If they attract each other the unknown rod is negative / have unlike charge If they repel each other the unknown rod is positive / have like charge	1 1 1	
	(iii)	+ve - Perspex / acetate / glass -ve - polythene / polyester / PVC	1 1	
	(iv)	Fuel tankers make use of a length of chain dangling to the ground to dissipate charge / Lightning conductors dissipate charge to the ground / Airport trolleys may have a small piece of conductor dangling to the ground to dissipate accumulated charge	1,1	Any suitable answer
		Total	20 marks	

		<i>Answer</i>	<i>Marks</i>	<i>Additional guidelines</i>
4	(a) (i)	Isotopes are atoms of the same element having the same atomic / proton number But different mass / nucleon number	1 1	
	(ii)	A GM tube is brought close to the plant, a short, fixed distance above the soil The plant is watered using radioactive water and a stop watch started Once the GM tube starts to detect radiation, both the height above the soil and the time are noted. The GM tube is moved to a higher point and the process is repeated.	1 1 1 1	
	(iii)	A small amount of radioactive water is used / body contact with radioactive water is avoided	1,1	Any other plausible precaution
	(iv)	To detect uniform thickness of materials / to detect leakages in underground pipelines	1	Do not accept 'treatment of cancer' as this is not an industrial use
	(b) (i)	Mass number - 226 Atomic number - 88 Number of protons - 88 Number of neutrons - 138	1 1 1 1	
	(ii)	Half life is the time taken for half the atoms in a radioactive element to decay	1	
	(iii)	1600 → 1600 → 1600 = 4800 years 1 → 1/2 → 1/4 → 1/8	1 1	
	(iv)	The alpha particle would definitely not be able to pass through the watch glass, The beta particle may pass and The gamma will pass. However, given the small amount of radium present, the amount of gamma radiation would be small. Not very dangerous to wear but better not to.	1 1 1 1	
		Total	20 marks	
5	(a) (i)	Both touched the ground together Since on the moon there is a vacuum, both were equally attracted by the moon's gravitational force	1 1	Accept 'there is not frictional force due to air resistance'
	(ii)	Hammer	1	

	<i>Answer</i>	<i>Marks</i>	<i>Additional guidelines</i>
	Due to air resistance, the feather will take longer to touch the ground	1	
(b) (i)	Initial velocity = 0 / let to fall from rest / were not pushed	1	
(ii)	Measuring tape; stopwatch	1,1	
(iii)	Timer not started exactly as the moment that the match box was dropped	1	Any other reasonable answer
(iv)	Repeated readings	1	Do not accept, centisecond timer is brought home from school
(c) (i)	 <p>Correct diagram, including electromagnet, timer and trapdoor</p>	1 1 1	If light gates are used instead of the trap door system, ensure that one of the light gates is at the position where the ball starts from rest. Otherwise, reduce 1 mark from diagram, 1 mark from method and 1 mark from how value of 'a' is obtained.
(ii)	<p>As soon as the electromagnet circuit is switched off, the ball drops and the centisecond is automatically switched on</p> <p>When the ball touches the trap door, this opens, the centisecond stops and the time is noted.</p> <p>Distance 's' is measured using a ruler.</p> <p>Time taken is read from centisecond timer</p> <p>Results are presented in a table</p> <p>Using the equation $s = \frac{1}{2} at^2$ the acceleration due to gravity is calculated</p> <p>Repeated readings are taken</p>	1 1 1 1 1 1 1	Accept indication that a graph is drawn of 's' vs 't ² ' and the value of 'a' is the value of the gradient of the graph multiplied by 2
(iii)	At school ball is dropped and timer is started instantly / Ball touches the trap door and timer is switched off instantly	1	
	Total	20 marks	