OCR
RECOGNISING ACHIEVEMENT

GCSE

Physics B

General Certificate of Secondary Education

Unit **B652/02:** Modules P4, P5, P6 (Higher Tier)

Mark Scheme for January 2013

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

Annotations used in Scoris

Annotation	Meaning
	correct response
	incorrect response
	benefit of the doubt
	benefit of the doubt **not** given
	error carried forward
	information omitted
	ignore
	reject
	contradiction

11. Abbreviations, annotations and conventions used in the detailed Mark Scheme.

/ = alternative and acceptable answers for the same marking point
(1) = separates marking points
allow = answers that can be accepted
not = answers which are not worthy of credit
reject = answers which are not worthy of credit
ignore = statements which are irrelevant
( ) = words which are not essential to gain credit
__ = underlined words must be present in answer to score a mark (although not correctly spelt unless otherwise stated)
ecf = error carried forward
AW = alternative wording
ora = or reverse argument

Question			Answer	Marks	Guidance
1	(a)		A / rod gained electrons (1)	1	more than one answer scores (0)
	(b)		**any three from** droplets have same charge (1) droplets repel (1) produce mist / fine spray / AW (1) object charged opposite to paint / AW (1) attracts paint (1) produces even coat / less waste / shadows painted / AW (1)	3	**not** paint stuck to object
			Total	**4**	

Question			Answer	Marks	Guidance
2	(a)		high frequency / above 20kHz (1) above threshold of human hearing / AW (1)	2	**not** 'too high' **allow** can't be heard (1) too high to hear scores (1) too high a frequency to hear scores (2) **not** electromagnetic - if the two correct responses are given, followed by electromagnetic this scores (1)
	(b)		ultrasound shows up soft tissue / X-rays don't (1) X-rays damage cells / cause cancer / ultrasound does not (1)	2	**allow** non-ionising / no radiation so safer (1) **ignore** unqualified less harmful
	(c)	(i)	(firing) fast electrons (1) at metal (target) (1)	2	**allow** rapidly decelerated electrons (1) **allow** named metal e.g. Pb, W (1)
		(ii)	gamma comes from isotopes which cannot be switched off (1) X-rays are (more) controllable (1)	2	**allow** isotope dangerous all the time / X-rays can be switched off (1) **allow** X-rays intensity can be changed / AW (1)
			Total	**8**	

Question			Answer	Marks	Guidance
3	(a)	(i)	helium (1)	1	
		(ii)	electron (1)	1	
	(b)		2 (years) (1)	1	
	(c)		nuclear industry leaks / hospitals / smoke alarms (1)	2	**allow** nuclear power station (1) **allow** nuclear bomb (1)
	(d)		carbon (1)	1	
			Total	**6**	

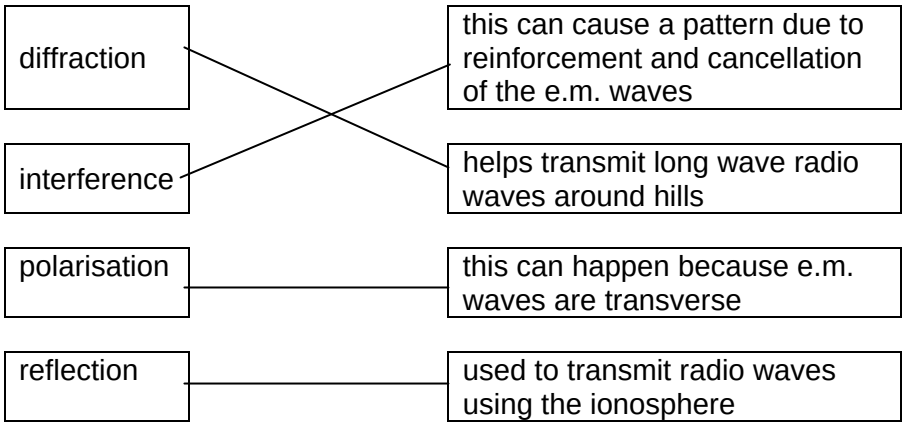
Question			Answer	Marks	Guidance
4			15 (2) but if answer is incorrect then 6 / 0.4 scores (1)	2	mark answer first
			Total	**2**	

Question			Answer	Marks	Guidance
5	(a)		11 (1)	1	more than one answer scores (0)
	(b)		**any 2 from** idea of (horizontal and vertical) velocities are vectors (1) vector sum / resultant (of horizontal and vertical velocities) (1) no acceleration / constant velocity in the horizontal direction (1) accelerates / velocity increases / decelerates / velocity decreases / velocity falls then rises in the vertical direction (1)	2	**allow** answers in the form of diagrams
			Total	**3**	

Question			Answer	Marks	Guidance
6	(a)		idea that (different colours) have different wavelengths / different frequencies or travel at different speeds in glass (1)	1	**allow** different refractive index (1) **allow** different colours have different changes in speed when entering / leaving medium (1) **ignore** simple references to refractions, angle or bending
	(b)		ray along the base of the block (1)	1	**ignore** reflected rays
			Total	**2**	

Question			Answer	Marks	Guidance
7	(a)	(i)	v = u + at 22 (m / s) (2) **but** if answer incorrect (v = 0 +) 1.5 x12 (1)	2	**mark answer first**
		(ii)	increases / AW (1)	1	
	(b)		idea that momentum changes in a collision (1) idea that crumple zone increases the time of collision (1) force reduced (1) idea that size of **force** = **rate of change** of momentum (1)	3	**maximum 2 marks if momentum not mentioned correctly** e.g. longer collision time (✓) means momentum changes more slowly (✓) and so force is less (✓) (3) e.g. force = (^) change in momentum (✓) over a longer time (✓) (2) e.g. momentum is the force (X) that is reduced (✓) because the crumple zone means the collision is longer (✓) (2) **allow** stated in equation format
			Total	**6**	

Question			Answer	Marks	Guidance
8	(a)		gravity (1)	1	**allow** weight / gravitational force (1) **ignore** Earth **but** Earth's **mass** (1)
	(b)		idea of above same point on Earth / in a fixed position / AW (1)	1	look at part (ii) and (iii) together **not** just 'stays in same place' **not** just same speed as Earth **allow** above equator (1)
	(c)		60 (hours) (1)	1	look at part (b) and (c) together **allow** reference to 24 hours in part (b) if no answer in part (c) if 24 hours in part (b) but incorrect time in part (c), it scores (0) for part (c). But award other correct responses in part (b). e.g. (b) 24 hours above equator (1) ie (1) for above equator (c) 365 days (0) as contradiction e.g. (b) takes 24 hours to orbit (0) as credited in part (c) (c) 24 hours (1) e.g. (b) takes 24 hours to orbit (NR) (c) ……. (1) as answer (24 hours) in part (b)
			Total	**3**	

Question			Answer	Marks	Guidance
9	(a)			2	3 correct = (2) 1 or 2 correct = (1)
	(b)		gap size = wavelength (1)	1	
	(c)	(i)	polarised waves all vibrate in the same plane / AW / ORA (1)	1	**allow** answers from correctly labelled diagrams
		(ii)	sunglasses are filtered in one plane / AW (1) sunglasses reduce transmission in one plane / allow only transmission in one plane (1)	2	**allow** only has one plane / AW (1) **allow** one plane absorbed (1) and one plane transmitted (1)
			Total	**6**	

Section C

Question			Answer	Marks	Guidance
10	**(a)**	**(i)**	moves faster / AW (1)	1	**ignore** melting / fuse blowing **allow** spins more (1)
		(ii)	**reverses** direction / AW (1)	1	**allow** goes backwards (1) **not** merely goes forwards / changes direction
		(iii)	moves faster / AW (1)	1	**allow** more powerful (1)
		(iv)	moves slower / AW (1)	1	
	(b)		idea that field is 90^0 to the coil at all times (1) more force / torque / power (1)	2	**allow** labelled diagrams
			Total	**6**	

Question			Answer	Marks	Guidance
11	**(a)**		using a variable resistor / other device such as LDR or thermistor (1) in place of R_1 or R_2 (1)	2	**allow** change or replace resistors R_1 or R_2 (1)
	(b)		4(V) (2) **but if answer is incorrect** 12 x 50 ÷ (100 + 50) or $\text{Vin} \times \frac{R_2}{R_1 + R_2}$ (1)	2	
	(c)	**(i)**	reduced / AW (1)	1	resistance increases scores (0)
		(ii)	increases / AW (1)	1	if resistance increases given for (c)(i) and reduced given for (c)(ii) then award 1 mark only for (c)(ii)

Question			Answer	Marks	Guidance
	(d)	**(i)**	reduced / AW (1)	1	resistance increases scores (0)
		(ii)	increases / AW (1)	1	if resistance increases given for (d)(i) and reduced given for (d)(ii) then award 1 mark only for (d)(ii).
			Total	**8**	

Question			Answer	Marks	Guidance
12	**(a)**		Input A Input B Output (0) (0) **1** (0) (1) **1** (1) (0) **1** (1) (1) **0** (1)	1	all 4 correct outputs needed for the mark
	(b)		**ideas of** small current switches or controls a larger current (1) logic gate output current is low (1) relay isolates from mains / protection of circuit / protection of user (1)	3	**allow** as alternative to first marking point correct description of the working of the relay e.g. magnetic explanation
			Total	**4**	

Question			Answer	Marks	Guidance
13			**any two from** holes lack electrons / holes are positive / AW (1) holes 'move' in the opposite direction to electrons (1) holes (appear to move) towards the negative (1) electrons fill up the holes (1)	2	**ignore** incorrect descriptions of n type and p type **allow** holes attract electrons (1) **allow** electrons move to positive and holes towards negative (2)
			Total	**2**	

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