

**Physics B**

General Certificate of Secondary Education **B652/02**

Unit 2: Modules P4, P5, P6

**Mark Scheme for June 2010**

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Question			Expected Answers	Marks	Additional Guidance
1			2.4 (ohms) (2)  but if answer is incorrect  $12/5 = (1)$	2	ignore units
			<b>Total</b>	<b>2</b>	

Question			Expected Answers	Marks	Additional Guidance
2	(a)	(i)	(nuclear) <u>fission</u> (1)	1	<b>not</b> fusion
		(ii)	(extra) <u>neutrons</u> (1)	1	<b>ignore</b> energy absorb neutrons and protons / electrons (0)
	(b)		electron (1) fast / quick (moving) (1)	2	<b>ignore</b> reference to nucleus <b>ignore</b> any other reference to motion
	(c)	(i)	60 / stays the same (1)	1	
		(ii)	28 / goes up by one (1)	1	
			<b>Total</b>	<b>6</b>	

Question		Expected Answers	Marks	Additional Guidance
3	(a)	idea that they have low penetration / cannot penetrate skin / leave body / be detected / AW (1)	1	<b>ignore</b> references to danger <b>allow</b> very ionising (when inside the body)
	(b)	have the similar ( short ) wavelength / (high ) frequency / penetrating power / speed / travel through vacuum / transverse / (1)	1	<b>ignore</b> damage and cancer <b>allow</b> both ionisation (1) <b>allow</b> for example “pass through skin” for penetrating power <b>allow</b> other properties of electromagnetic waves such as polarisation, interference, no mass etc <b>not</b> just ‘both harmful’ / invisible
		<b>Total</b>	<b>2</b>	

Question		Expected Answers	Marks	Additional Guidance
4	(a)	(very) high frequency sound / above 20 000 Hz (1)  above threshold / range of human hearing (1)	1	<b>allow</b> high or very high pitch (1) <b>not</b> just high  <b>not</b> just impossible to hear <b>not</b> just a longitudinal wave
	(b)	region where <b>particles</b> are (close(er)) together (1)	1	<b>allow</b> clear diagrams showing marking point (1) <b>allow</b> high pressure / concentration / density of <b>particles</b> (region) (1) <b>ignore</b> where waves are close together <b>ignore</b> shorter wavelength / higher frequency
		<b>Total</b>	<b>2</b>	

Question		Expected Answers	Marks	Additional Guidance
5	(a)	(C)14 (1)	1	
	(b)	<p><b>any three from:</b>  trees take in carbon dioxide / carbon / C14 / photosynthesis (1)  C14 constant in living things (1)  when tree dies photosynthesis / gas exchange / respiration / absorption of carbon dioxide stops / no more carbon is added (1)  isotopes / C14 / carbon reduces (1)  but C14 / carbon / isotope decays (2)</p>	3	<p><b>ignore</b> trees produce C14  <b>ignore</b> radioactivity / activity decreases</p> <p><b>allow</b> extra marking point for cosmic rays acting on nitrogen atoms to produce C14</p>
	(c)	<p>11400 years = (2)  <b>but if answer is incorrect</b> <math>2 \times 5700 = (1)</math></p>	2	<p><b>allow</b> two half lives or equivalent calculation to show two half lives have passed (1)</p> <p><b>not</b> 1140 as this is a wrong answer</p>
		<b>Total</b>	<b>6</b>	

Question		Expected Answers	Marks	Additional Guidance
6		<b>electrons/negative charges</b> are transferred (1) <b>but</b> electrons/negative charges transferred from rod / to duster (2)	2	rod gains electrons (1) cloth gains electrons (2) it (rod) loses electrons/negative charges = 2 marks transfer of protons / positive electrons deduct 1 mark
		<b>Total</b>	<b>2</b>	



Question		Expected Answers	Marks	Additional Guidance
7	(a)	weight (1)	1	allow gravity / gravitational (force) (1)
	(b)	(i) constant (1)	1	allow no change / nothing changes
		(ii) increases (1)	1	allow accelerates not stronger
	(c)	two vectors at 90 degrees drawn or described (1) resultant vector drawn or described (1)	2	allow two correct vectors at 90 deg if not connected
		<b>Total</b>	<b>5</b>	

Question		Expected Answers	Marks	Additional Guidance
8	(a)	all rays drawn converging to a point (1) <b>but</b> all rays meeting on principal axis (2)	2	minimum of two rays rays must be continuation of the incident rays <b>allow</b> dotted lines <b>ignore</b> rays inside lens <b>ignore</b> rays after focus
	(b)	(i) mag glass virtual / proj real (1) mag glass erect / proj inverted (1)	2	any order <b>allow</b> can be projected on screen for real and cannot for virtual
		(ii) changes distance between object / image and lens (1)	1	<b>allow</b> moves forward or backwards <b>not</b> just closer / further / moves
		<b>Total</b>	<b>5</b>	

Question		Expected Answers	Marks	Additional Guidance
9		radio (1) diffract (1)	2	
		<b>Total</b>	<b>2</b>	

Question		Expected Answers	Marks	Additional Guidance
10	(a)	<p>angle of incidence greater than critical angle (1)</p> <p>idea of more dense and less dense boundary / glass or plastic and air boundary (1)</p>	2	<p><b>allow</b> greater than <u>42</u> deg (1)</p> <p><b>ignore</b> equal to critical angle</p> <p><b>allow</b> change in refractive index / density</p>
	(b)	<p>16.4 (3)</p> <p>if answer is incorrect</p> <p><math>\sin r = 0.28(2)</math> (2)</p> <p>if answer is incorrect</p> <p><math>1.5 = \sin 25 / \sin r</math> (1)</p>	3	<p><b>range from</b> 16.25 – 16.4</p> <p><b>beware</b> that <math>25/1.5 = 16.66</math> (0)</p> <p>also <math>\sin 25 / \sin 1.5 = 16.14</math> (0)</p> <p><b>allow</b> final answer of 16 (3) if working is correct</p>
		<b>Total</b>	<b>5</b>	

Question		Expected Answers	Marks	Additional Guidance
11	(a)	48 (2)  <b>but</b> if answer is incorrect  $(14+18) \times 3/2$ or correct average speed of 16m/s or $(14 +18) / 2$ (1)	2	
	(b)	vector / velocity has <b>direction</b> (as well as magnitude) / AW (1)	1	ORA eg. scalar / speed is just magnitude or <b>no direction</b>
		<b>Total</b>	<b>3</b>	

Question		Expected Answers	Marks	Additional Guidance
12	(a)	resistance (of variable resistor) is reduced / AW (1) current increases / AW (1)	2	
	(b)	B (1)	1	Mark answer on line. If no answer on line mark answer indicated in table. More than one answer on line scores (0)
		<b>Total</b>	<b>3</b>	

Question		Expected Answers	Marks	Additional Guidance
13	(a)	using a variable resistor / other device such as LDR or thermistor in place of $R_1$ or $R_2$ (2)  <b>but</b>  change or replace resistors $R_1$ or $R_2$ (1)	2	<b>allow</b> add variable resistor / LDR / thermistor (1)  <b>allow</b> change resistance (1)  <b>ignore</b> changing input voltage
	(b)	5(V) (2) <b>but if answer is incorrect</b> $12 \times 50 / (50 + 70)$ (1)	2	
		<b>Total</b>	<b>4</b>	

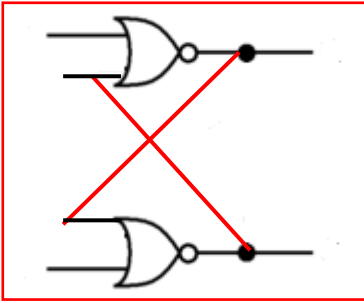
Question		Expected Answers	Marks	Additional Guidance
14	(a)	(concentric) circle(s) (1)	1	<b>allow</b> recognisable attempt to draw concentric circles on diagram if answer is neutral or answer line blank
	(b)	reverses / AW (1)	1	<b>ignore</b> changes direction as it does not imply opposite <b>allow</b> correct change from answer in (a) <b>allow</b> anticlockwise / switches direction
		<b>Total</b>	<b>2</b>	



Question		Expected Answers	Marks	Additional Guidance
15	(a)	200 (2)  <b>but</b> if answer is incorrect  $(N_s) = N_p \times V_s / V_p$ 4000 x 11 / 220 (1)	2	
	(b)	idea of more turns in secondary / fewer in primary coil (1)	1	<b>allow</b> correct references to diagram e.g. 'more turns on right' (1) <b>allow</b> coils as alternative to turns <b>not</b> bigger coils
		<b>Total</b>	<b>3</b>	

Question		Expected Answers	Marks	Additional Guidance
16	(a)	diode (1)	1	allow LED
	(b)	+ve direction low resistance (1)  -ve direction high resistance (1)	2	<b>alternatives to first marking point only</b> allow idea of threshold voltage (1) allow idea of resistance reducing in the forward direction / AW (1)  allow high level answers in terms of "holes"
		<b>Total</b>	<b>3</b>	

Question		Expected Answers	Marks	Additional Guidance
17	(a)	to keep motor / coil spinning (in the same direction) / AW (1)	1	<b>allow</b> motor spins / turns 360deg (1) <b>ignore</b> references to AC
	(b)	field lines always $90^{\circ}$ to coil / AW (1)	1	<b>allow</b> so coil feels maximum / constant force as it turns <b>allow</b> runs smoothly / runs faster (1) <b>ignore</b> constant field / length of time in field <b>ignore</b> reference to making magnetic field / magnet stronger <b>ignore</b> references to being more efficient / distance from coil / move easier
		<b>Total</b>	<b>2</b>	

Question		Expected Answers	Marks	Additional Guidance
18	(a)	reverses output of OR gate / high output if both inputs low / AW (1)	1	allow NOT + OR gate / AW
	(b)	 <p>one line correctly drawn (1) second line correctly drawn (1)</p>	2	if more than two lines drawn deduct (1) mark per extra line down to zero  allow correct answers from either top or bottom inputs
<b>Total</b>			<b>3</b>	

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