

**Physics B**

General Certificate of Secondary Education **B651/02**

Unit1: Modules P1, P2, P3

**Mark Scheme for June 2010**

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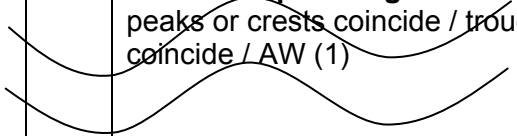
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Question		Expected Answers	Marks	Additional Guidance
1	(a)	no temperature rise or change / temperature stays the same / line is horizontal (1)	1	<b>allow</b> flat line or level line (1) <b>ignore</b> reference to <b>B</b> is along the axis / at 0°C <b>ignore</b> references to breaking inter-molecular bonds just line is straight scores (0)
	(b)	(i)	1	more than one answer scores (0) <b>allow</b> correct answer underlined, circled or ticked in list if answer line is blank
		(ii)	2	50 (2) <b>but if answer incorrect</b>  4 000 000 / (100 x 800)  <b>allow</b> 4 000 000 = 100 x 800 x temperature change (1) if the shc for oil is used and the answer is 21.05 (1) if the shc for water is used and the answer is 9.5 (1) <b>allow</b> any correct number of d.p.
<b>Total</b>			<b>4</b>	

Question		Expected Answers	Marks	Additional Guidance
2	(a)	<p>use ✓'s in this question</p> <p>conduction through or in or by (inner or outer) wall / brick / solid / concrete (1)</p> <p>convection (currents) in cavity / air (1)</p>	2	<p><b>allow</b> idea of conduction heating the (inner or outer) wall</p> <p><b>allow</b> correct reference to radiation from inner or outer wall (1) as an <b>additional</b> marking point</p> <p><b>allow</b> convection beyond outside wall (1)</p> <p><b>allow</b> description of conduction or convection correctly related to wall / brick / solid / concrete for conduction <b>or</b> cavity / air for convection for convection not merely 'circulation of air' but eg hot air rises and cold air falls (1)</p>
	(b)	4 (1)	1	
	(c)	<p><b>any 2 from:</b></p> <p>heat or infrared or IR or radiation reflects (1)</p> <p>idea of back (into room / house) (1)</p> <p>heating needed less often / AW (1)</p>	2	<p><b>not</b> refraction <b>but</b> refracts heat / IR / radiation back (into the room or house) (1)</p> <p><b>ignore</b> bounces</p> <p><b>ignore</b> heat particles eg reflects heat particles (0)</p> <p><b>but</b> reflects heat particles back (into the room) (1)</p> <p><b>ignore</b> hot air <b>but</b> reflects hot air <b>back (into room)</b> (1)</p> <p><b>ignore</b> less heat escapes (through the wall)</p> <p><b>ignore</b> references to insulation</p>
<b>Total</b>			<b>5</b>	

Question			Expected Answers	Marks	Additional Guidance
3	(a)	(i)	number of waves or oscillations or vibrations or wavelengths or cycles in a second / AW (1)	1	<b>allow</b> number of waves per unit time / in a period of time or named period of time (1) <b>allow</b> how many waves each second (1) <b>allow</b> how often a wave passes a point per second (1)
		(ii)	1 (2)  <b>but if answer incorrect</b>  0.2 x 5 scores (1)	2	<b>allow</b> 100 (2) if units (m/s) are clearly crossed out and cm/s is the units given by the candidate  <b>allow</b> 0.2 x 500 if answer is 100 (1)
	(b)		type part(s) of Earth <b>longitudinal (1)</b> all layers / everything / whole Earth (1)	2	mark independently <b>allow</b> core mantle and crust <b>but ignore</b> inner or outer for core part of answer (1) <b>allow</b> solid and liquid <b>ignore</b> primary <b>not</b> longitude for 1 <sup>st</sup> response
	(c)		<b>mark both parts together</b> peaks or crests coincide / troughs coincide / AW (1)   same or constant or specific (frequency) (1)	2	<b>allow</b> instep / coherent <b>allow</b> eg synchronised / in sync (with each other). eg one goes up the other one goes up as well eg peaks at the same time or troughs at the same time (oscillations or waves or peaks or troughs) in time with each other <b>ignore</b> peaks <b>and</b> troughs in time with each other or in line or match <b>ignore</b> colour award 1 <sup>st</sup> marking point if shown as a diagram eg scores (1)
<b>Total</b>				<b>7</b>	

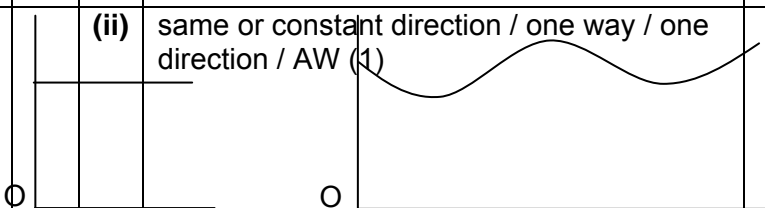
Question		Expected Answers	Marks	Additional Guidance
4	(a)	<p><b>use ✓'s in this question</b>  <b>any two from:</b>  more information is carried (1)</p> <p>noise or interference not recognised / is not amplified (1)</p> <p>less interference or noise in <b>output</b> (signal) (1)</p>	2	<p><b>allow</b> multiplexing</p> <p><b>allow</b> easier to decrease or remove interference / interference can be reduced or removed</p> <p><b>ignore</b> just less or no interference</p> <p><b>allow</b> idea of better or more signal at the end / less signal loss</p> <p><b>allow</b> better quality of output (signal) to include better sound or picture quality</p>
	(b)	<p><b>use ✓'s in this question</b></p> <p><b>any two from:</b>  transmitters and receivers closer together / AW (1)</p> <p>high positioning of transmitters (1)</p> <p>larger receivers or transmitters or dishes / AW (1)</p> <p>(more) booster stations (1)</p> <p>avoid obstacles / place or site away from obstacles / reduce or remove obstacles / obstructions (between transmitter and receiver) (1)</p>	2	<p><b>allow</b> closer receivers or transmitters or dishes / more receivers or transmitters or dishes or 'them'</p> <p><b>allow</b> make 'them' bigger</p> <p><b>allow</b> idea of reducing chance of diffraction</p> <p><b>allow</b> idea of keeping a line of sight (between transmitter and receiver)</p> <p><b>ignore</b> stronger signals</p>
		<b>Total</b>	<b>4</b>	

Question		Expected Answers	Marks	Additional Guidance
5	(a)	3 (2)  but if answer is incorrect  1.5 x 2 (1)	2	
	(b)	36 (pence) (1)	1	no working mark <b>allow</b> £0.36 <b>allow</b> ecf from 5(a) eg 3000 in (a) then 36000(pence) = (1)
	(c)	8.26 (A) (2)  but if answer is incorrect  1900 ÷ 230 (1)	2	<b>allow</b> 8.2 / 8.3 / 8.2608695652 or any correct number of d.p. between 8.2 and 8.2608695652  <b>allow</b> 8 if clearly rounded up from any of the expected or allowed answers eg just 8 on answer line with no working (0) 8 on answer line with merely 1900 ÷ 230 (1) {working mark} <b>but</b> 8 on the answer line and 1900 ÷ 230 = 8.26 shown (2)
		<b>Total</b>	<b>5</b>	

Question		Expected Answers	Marks	Additional Guidance
6		reflected (1)  (principal) focus / focal point (1)	2	<b>allow</b> converged or focused <b>ignore</b> bounced <b>not</b> just point <b>but</b> eg focused .....to a point (1) focused.....to the focal point (2) focused .....to a focus(2)
		<b>Total</b>	<b>2</b>	

Question		Expected Answers	Marks	Additional Guidance
7	(a)	gamma / $\gamma$ (1)	1	<b>allow</b> correct answer ringed ticked or underlined if answer line is blank
	(b)	ionised (1)	1	<b>allow</b> become charged / ions formed (1) <b>allow</b> correct description eg electron knocked off or lost or gained <b>ignore</b> references to speed of collision or atoms damaged / break up
	(c)	rocks / soil / living things / cosmic rays or cosmic radiation / <b>building materials</b> or named building material / isotopes of carbon (1)	1	<b>allow</b> <u>nuclear</u> testing or <u>nuclear</u> bombs or <u>nuclear</u> weapons / <u>nuclear</u> accidents / example of medical <b>use</b> / radon / <u>nuclear</u> waste <b>ignore</b> nuclear power <b>ignore</b> nuclear fallout unless qualified <b>ignore</b> merely buildings or equipment or hospitals <b>ignore</b> radioactive materials <b>ignore</b> food or drink <b>ignore</b> simple references to the Sun eg from the Sun (0) cosmic rays / gamma from the Sun (1) alpha / beta from Sun (0) <b>not</b> X-rays or microwaves any incorrect response (in a list) negates the mark
		<b>Total</b>	<b>3</b>	



Question		Expected Answers	Marks	Additional Guidance
8	(a)	<p><b>any two from:</b>                      move coil fast(er) (1)                      move magnet fast(er) or do it fast(er) (1)                      more coils / turns (1)</p> <p>insert (soft) iron core (1)                      strong(er) or more powerful magnet (1)</p>	2	<p>move coil fast(er) relative to magnet / AW (2)</p> <p><b>ignore</b> idea of magnet and coil being closer</p> <p><b>allow</b> more twists in coil  <b>allow</b> idea of more turns per metre                      eg squash coils together                      push coils closer                      wind coil tighter</p> <p><b>ignore</b> bigger coil</p> <p><b>allow</b> add magnetic core / put magnetic material inside coils</p> <p><b>allow</b> add another magnet or more magnets  <b>ignore</b> bigger magnet</p>
	(b) (i)	<p><b>both answers needed</b>                      cycles or oscillations                      second / unit time (1)</p>	1	<p><b>allow</b> waves / wavelengths  <b>allow</b> other named unit of time  <b>ignore</b> turns or rotations or alternations for first part of response  <b>ignore</b> direction change</p>
	(ii)	<p>same or constant direction / one way / one direction / AW (1)</p> 	1	<p><b>allow</b> positive /+ to negative / - or negative / - to positive / +  <b>allow</b> clockwise or anticlockwise <b>but not</b> clockwise and anticlockwise  <b>ignore</b> does not alternate  <b>ignore</b> straight / goes in straight lines  <b>allow</b> correct answer in diagram form eg but zero must be correct</p>
		<b>Total</b>	<b>4</b>	

Question		Expected Answers	Marks	Additional Guidance
9		<p><b>use ✓'s in this question</b></p> <p>1 dust and gas cloud form</p> <p>2 gravity makes dust particles spiral together</p> <p>(3) (protostar formed)</p> <p>4 temperature becomes very high</p> <p>5 thermonuclear fusion takes place</p> <p>6 main sequence star formed</p>	3	<p>all five correct scores (3)</p> <p>if not all correct award maximum 2 marks for</p> <p>first <b>and</b> last correct (1)</p> <p>thermonuclear fusion immediately after temperature becomes very high (1)</p> <p>gravity response immediately after dust and cloud form (1)</p> <p>thermonuclear fusion followed immediately by main sequence star (1)</p>
		<b>Total</b>	<b>3</b>	

Question		Expected Answers	Marks	Additional Guidance
10	(a)	centripetal (1)	1	<b>allow</b> phonetically acceptable attempts eg centripedal <b>ignore</b> pull <b>not</b> centrifugal or gravity in answer
	(b)	gravity <b>increases</b> / AW	1	<b>allow</b> stronger gravity <b>ignore</b> pull <b>not</b> just gravity / force due to gravity / accelerating due to gravity
	(c)	magnetic field pulls them in / travel along magnetic field (1)	1	<b>allow</b> higher level answers eg charged particles move along magnetic (field) lines (1) <b>allow</b> magnetic field / Earth's magnetic field / electromagnetic field / that is where the magnetic field is from <b>ignore</b> deflects to poles / cosmic rays attracted to poles / poles are magnetic / magnetism / magnetic attraction or pull
		<b>Total</b>	<b>3</b>	

Question			Expected Answers	Marks	Additional Guidance
11	(a)	(i)	10 (litres) (1)	1	
		(ii)	more or lots of people carried / more cars needed to carry 60 people / less fuel per person / AW (1)	1	<b>allow</b> 'need 12 cars' (1) <b>ignore</b> 60 cars needed <b>ignore</b> references to engine size
	(b)		<b>any two from:</b> different driving conditions (1)  different speed / going faster / slower (1)  different loads / carrying different weights or masses or people / adding a roof rack / towing (1)  different driving styles / drivers (1)	2	<b>allow</b> different road (condition or surface) or terrain or weather conditions (that would affect the road)  <b>allow</b> speed or how fast you are going  <b>allow</b> just the weight / mass / load / people  <b>allow</b> examples of different driving style eg constantly changing speed or accelerating or decelerating / driving in third gear when fifth could be used / driving in low gear(s) / frequent gear change or braking <b>allow</b> max 1 from these <b>additional</b> marking points <ul style="list-style-type: none"> <li>• using air conditioning / extra electrical use (1)</li> <li>• idea or example of increased <b>drag</b> (1)</li> <li>• van becomes less efficient as it gets older</li> </ul>
	(c)	(i)	<b>no</b> fumes / CO <sub>2</sub> / CO <sub>2</sub> / CO <sup>2</sup> / carbon dioxide / (exhaust) gases / greenhouse gases / oxides of nitrogen or carbon / no (carbon) emissions from car (1)	1	<b>allow</b> quieter (1) <b>allow</b> reduces noise pollution (1) <b>ignore</b> no pollutants / no pollution at point of use <b>ignore</b> don't burn fossil or non-renewable fuels
		(ii)	electricity generation or power stations / power plants / where the electricity is made pollutes (1)	1	<b>allow</b> idea of battery disposal (1) <b>but ignore</b> disposal of car <b>allow</b> electricity comes from a power station / plant <b>or</b> electricity has to be produced <b>allow</b> (fossil) fuels are burned to produce electricity / in a power station or plant <b>ignore</b> charging battery causes pollution / need energy to charge the battery <b>ignore</b> electricity used to manufacture car
			<b>Total</b>	<b>6</b>	

Question		Expected Answers	Marks	Additional Guidance
12	(a)	drugs / alcohol / tiredness / lack of concentration (1)	1	<p><b>allow</b> how tired you are</p> <p><b>allow</b> drinking or intoxication (1)</p> <p><b>allow</b> older (1)</p> <p><b>allow</b> distractions or named distraction eg mobile phone (use) or children in back of car or passenger talking or radio (on) (1)</p> <p><b>ignore</b> references to weather</p> <p><b>but</b> eg bad weather can distract (the driver) (1)</p> <p>eg if its snowing its hard to concentrate (1)</p>
	(b)	<p>0.75 (2)</p> <p><b>but if answer incorrect</b></p> <p>6/8 or 12/16 or 24/32 scores (1)</p>	2	<b>allow</b> $\frac{3}{4}$ (2)
	(c)	<p><b>use ✓'s in this question</b></p> <p><b>any two from:</b></p> <p>driving within thinking distance or 15 m is not enough to think (1)</p> <p>need 24m thinking distance (1)</p> <p>idea of risk of crash or accident between the car and the coach / AW (1)</p> <p>needs 136 m to stop (1)</p>	2	<p><b>not</b> merely driving too close</p> <p><b>allow</b> too close to think or react in time</p> <p><b>allow</b> won't be able to (apply or hit) brake in time</p> <p><b>allow</b> idea of dangerous if coach stops <b>suddenly</b></p> <p><b>allow</b> too close to stop or can't stop in time</p>

Question		Expected Answers	Marks	Additional Guidance
12	(d)	<p><b>use ✓'s in this question</b>            kinetic energy or KE or ke absorbed / converted / transferred / AW (in braking or the brakes) (1)</p> <p>speed doubles (braking) distance / KE more than doubles (1)</p> <p><b>but</b> speed doubles (braking) distance / KE quadruples / increases by (a factor of) four or 4 / KE is proportional to speed squared / AW (2)</p>	3	<p>figures quoted from the table can only score if a correct conclusion is made ie more than doubles (1) or x 4 (2)</p> <p><b>allow</b> correct reference to <math>KE = \frac{1}{2} mv^2</math>            eg from <math>KE = \frac{1}{2} mv^2</math> speed double braking distance or KE more than doubles (2)</p> <p><b>but</b> no mark for just writing down <math>KE = \frac{1}{2} mv^2</math></p>
<b>Total</b>			<b>8</b>	

Question		Expected Answers	Marks	Additional Guidance
13	(a)	reduced risk of skidding or stops skidding / better grip / more friction with road or tyres or wheels / stop car sliding sideways or slipping / helps stop wheels or tyres spinning or locking (1)	1	<p><b>allow</b> reduces braking / stopping distance (1)</p> <p><b>allow</b> gives more traction / better traction (1)</p> <p><b>not</b> controls traction (0)</p> <p><b>allow</b> examples            eg help car to stay on the road            gives driver more or better control            car will slow down faster or in shorter time            better steering            quicker braking</p> <p><b>ignore</b> 'helps avoid a crash'</p>
	(b)	(kinetic) energy (1) increased / AW (1) reduced / AW (1)	3	<p><b>not</b> force / impact</p> <p><b>ignore</b> momentum</p> <p><b>ignore</b> slowed</p>
<b>Total</b>			<b>4</b>	

Question		Expected Answers	Marks	Additional Guidance
14		800 (J) (2)  but if answer incorrect  400 x 2 (1)	2	
		<b>Total</b>	<b>2</b>	

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