OCR
RECOGNISING ACHIEVEMENT

GCSE

Physics B

General Certificate of Secondary Education

Unit **B651/02:** Unit1 – Modules P1, P2, P3 (Higher Tier)

Mark Scheme for June 2011

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The **Abbreviations, annotations and conventions** used in the detailed Mark Scheme are:

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

Question			Expected Answers	Marks	Additional Guidance
1	a		**USE ✓'s IN THIS QUESTION** **any two from:** (walls shiny to) reflect IR / waves(1) idea of (upper) surface / outer layers / outside of food cooked (1) idea of conduction or convection to centre (1) **then** increases <u>kinetic</u> energy of (food) particles / molecules (1)	3	 **allow** reflect (micro)waves / rays / radiation **but ignore** reflect heat **ignore** bounce **ignore** so walls do not absorb or stop waves / radiation / heat **ignore** idea of penetrating a cm. or a few cms. **allow** idea of conduction or convection in food / conduction or convection so all the food is cooked **allow** description eg energy or vibrations **passed on** from one particle to another **ignore** heat **not** just energy **allow** increased **movement energy** of particles or makes particles move or vibrate more or faster **ignore** makes the particles vibrate or makes the particles move **ignore** reference to water when referring to k.e. of particles not merely the (food) particles get or are given k.e. but are given **more** k.e. (1)
	b		(waves would have) more or a lot of energy (1)	1	**allow** gives particles more energy **allow** power for energy **allow higher** intensity **reject** answers about increased penetration due to higher frequency **ignore** heat **ignore** descriptions of higher frequency **ignore** stronger

Question			Expected Answers	Marks	Additional Guidance
	c	i	120 (minutes) (1)	1	
		ii	absorbs (1) tissue (1)	2	
	d		300 000 000 (m/s) (2) **but** if answer is incorrect 30 000 000 x 10 (1)	2	**allow** 3 x 10^8 or 300 x 10^6 or other 'correct' standard form type of notation **allow** correct answer in km/s if this unit is clearly stated **allow** 30MHz x 10
			Total	**9**	

Question			Expected Answers	Marks	Additional Guidance
2		a	c.wall £100 d.glazing £ 300 l. ins. £ 40 all 3 correct (in table or any other place in answer) (1) yes / blank no mark double glazing / B / it saves more than the other two (1)	2	if table is blank no mark unless correct figures given elsewhere in the answer **allow** d. glazing saves 3 times as much as c. wall (1) **allow** d. glazing saves 7.5 times as much as l. ins (1) **not** merely saves the most **ignore** merely saves £300 but **allow** correct comparison eg d.g. saves £300 **rather** than £100 or £40 (1) **B** saves £300 **A only** saves £100 and **C** £40 (1) ie comparison needed for second mark **allow** ecf if answer is no with correct explanation using figures in table for (1) mark eg £100 / £30 / £40 answer no.... c.w. saves the most (1)
		b	lowest payback time (1)	1	**allow** short / low / small / fast / quick / AW payback time **allow** idea of quickest return on money spent / less time to pay it off /save money on longer timescale **allow** idea of **only** has a 3 year payback time **allow** cannot afford d.g. and c.w. is the next best in terms of money saved
			Total	**3**	

Question			Expected Answers	Marks	Additional Guidance
3			chosen (1) absolute (1) inter-molecular (1)	3	**allow** arbitrary / named examples eg ^{o}C / K / ^{o}F / *C* / ^{o}K / F Celsius / centigrade / Fahrenheit **not** degrees on its own **not** intra-molecular
			Total	**3**	

Question			Expected Answers	Marks	Additional Guidance
4	a		on (or) off / 0 (or) 1 (1)	1	**both** needed either order **allow** high (or) low
	b		**both marks could be gained in part 1 or part 2** **any two from:** **more** information can be transmitted (1) signals / information can be multiplexed (1) noise not recognised or amplified / filtered out or removed (1) enables 'better' tuning of radio stations (1)	2	 **allow** 'faster' data or information transfer (1) **ignore** faster signal or faster signal transfer **ignore** data loss **allow** explanation of multiplexing eg more signals on a line or transmitted (1) **allow** multiplex(ing) **ignore** less or decreased interference **allow** idea of signal or noise can be cleaned up (1) **not** no interference / cannot be interfered with **allow** description of signal being only two values so original signal is still recognised **allow** better quality / clearer output (signal) including better sound quality eg output not affected by interference (1) clearer sound produced (1) **but ignore** merely better quality **ignore** ghosting
			Total	**3**	

Question			Expected Answers		Marks	Additional Guidance
5			(conduction)	..... kinetic ....particles..... .	2	**allow** heat for kinetic
			(convection)	.....density.....air..... .		**allow** medium for air
			(radiation)	.....medium		all 3 boxes correct (2) any 2 boxes correct (1) only one box correct (0)
			Total		**2**	

Question			Expected Answers	Marks	Additional Guidance
6	a		kinetic (1) electrical (1)	2	**must be in correct order** **allow** movement **allow** electric or electricity
	b		current or electrons or charge or it flows / travels / goes in one **direction** (1)	1	**allow** does not change direction / has a constant direction / does not change from +ve to -ve **allow** only goes one way round a circuit **allow** does not alternate **ignore** diagrams unless explained **ignore** voltage **not** stays constant
	c		**USE ✓'s IN THIS QUESTION** **any three from** energy <u>from the Sun</u> / infrared / light / radiation passes through glass / window or penetrates / enters room (1) it / infrared / light / Sun's rays / radiation / energy is **absorbed** inside the building / by objects (1) (re-)emitted as **long(er) wavelength / low(er) frequency** (1) but (re-) emitted **long(er) wavelength / low(er) frequency** cannot pass through glass or leave the room / is reflected (back into room) (2)	3	 **allow** Sun's rays / Sun's waves **ignore** heat **not** UV **not** enters (and heats up) glass **ignore** heat **not** just (re-)emitted or infrared (re-)emitted **allow** (re-) emitted **infrared** cannot pass through glass or leave the room / is reflected (back into room) (1) **allow** given out / released /AW for emitted in answer **if answer is only about a solar water heating panel or a photocell max (1) for the first marking point**
			Total	**6**	

Question			Expected Answers	Marks	Additional Guidance
7	a		methane (1)	1	If no answer on the line **allow** correct answer circled or underlined in the list
	b	(i)	59.8 (W) (2) **but** if answer is incorrect 0.26 x 230 (1)	2	**allow** 60 (W) (2)
		(ii)	111 (hours) (2) **but** if answer is incorrect 9W = 0.009kW **or** $\frac{1}{0.009}$ **or** $\frac{1000}{9}$ (1)	2	**allow** 111.111 to any number of d.p. **allow** 111.1 recurring
			Total	**5**	

Question			Expected Answers	Marks	Additional Guidance
8	a		radioactive (1)	1	
	b		become charged / become positive / become negative (1)	1	**allow** higher level answers such as gain / lose electrons **but reject** loses all of its electrons or charged by loss / gain of protons **not** charged by nuclear decay **not** just becomes an ion but **allow** becomes a positive / negative ion
	c		landfill sites if low level waste specified / encase or vitrified in glass / reprocessed / stored in steel / concrete / lead / sealed containers / idea of (stored) **deep** underground (1)	1	**ignore** dumped or buried in the sea **allow** strong containers but not merely containers not merely buried **but allow** (stored) in mines **ignore** references to earthquake sites or leaking into groundwater
			Total	**3**	

Question			Expected Answers	Marks	Additional Guidance
9			**put X beside incorrect answers then allocate the final mark** magnetic field poles / N or S pole atmosphere / ionosphere gamma / γ aurora borealis(both required)	3	 **allow** magnetic poles **allow** named gas ie oxygen or nitrogen or O or N or O_2 or N_2 for atmosphere **allow** phonetic spelling 5 = (3) 3 or 4 = (2) 1 or 2 = (1)
			Total	**3**	

Question			Expected Answers	Marks	Additional Guidance
10	a		elliptical / ellipse (1)	1	**allow** oval / egg shaped if answer line is blank allow an elliptical orbit drawn **ignore** reference to circular but **allow** squashed or elongated circle **not** eclipse
	b		gravity (of the Sun) / gravitational pull / gravitational field or force / the Sun's mass (1)	1	**ignore** weight **not** planets / planets mass or weight **not** just the Sun
	c		idea of close(r) to the Sun or star (1)	1	**allow** by the Sun / star or passing by the Sun / star
			Total	**3**	

Question			Expected Answers	Marks	Additional Guidance
11	a		thrust from the engines is equal to the drag - 1st box (1)	1	more than one tick scores (0)
	b		**either** boat (sits) lower in the water / more surface under or in the water (1) **OR** increased (surface) area in contact with water (1) **second mark for** more drag / friction / resistance (from water) (1)	2	**ignore** increased weight or mass **not** air resistance
	c		**as speed increases** drag increases ORA (1)	1	**not** just drag increases
			Total	**4**	

Question			Expected Answers	Marks	Additional Guidance
12	a		13 / 13.3 (2) **but** if answer not correct 200/15 (1)	2	**allow** 13.333 to any number of d.p. or 13.3 recurring **allow** 13 1/3 (1) 13.334 or 13.34 can only gain a mark for the correct working shown in the answer
	b	i	straight line with positive gradient (1)	1	**allow** straight line drawn freehand **but not** a curve line does not have to start at the origin
	b	ii	measure the gradient / slope of the line (1)	1	**allow** instantaneous values or described values **from the graph** eg the distance between any two points (on the graph) ÷ the time between the points (1) overall distance of graph ÷ overall time of graph (1) change in y-axis or change in distance ÷ change in x-axis or change in time (1) **allow** symbols for distance time and change in answer **allow** distance ÷ time at any point on the graph providing the line drawn in 12(b)(i) passes through the origin **but** distance ÷ time (0) **allow** answer correctly shown on graph in 12(b)(i) **allow** steepness of the line
	c		(car is) changing direction (1)	1	**allow** going round in circle / idea of not travelling in a straight line / turning / going around bends or corners **allow** velocity is changing
			Total	**5**	

Question			Expected Answers	Marks	Additional Guidance
13	a		180 (2) **but** if answer not correct 540x20 ÷ 60 (1)	2	 **allow** correct steps in calculation eg 540 x 20 then their answer ÷ 60 (1) **allow** 540 ÷ 60 = 9 (W) (1) not merely 9 on its own
	b		gravitational or potential or gravitational potential to kinetic (1)	1	**both needed** in correct order **allow** PE to KE
			Total	**3**	

Question			Expected Answers	Marks	Additional Guidance
14	a		**any one from** influence of drug / **increased higher / more** speed / distraction / lack of concentration or poor concentration / age / older driver(1)	1	 **allow** drunkenness / alcohol or any other named drug **allow** example of distraction eg conversation, mobile phone, children playing on back seat, driver being ill **ignore** poor visibility or poor weather
	b		**USE ✓'s IN THIS QUESTION** **any two from** friction reduced / has less effect (1) less retarding force / AW (1) braking relies on friction between **two** surfaces in the wheels or brakes (1) **k.e.** not converted to heat energy as fast or takes a greater distance or time to convert **k.e.** to heat energy (1)	2	 **allow** less grip **ignore** brakes less efficient or effective **not** no friction or grip **allow** less stopping or braking force **ignore** idea of driver having to press brake pedal with a greater force **allow** two named surfaces eg brake pads and disc / brakes and wheels **but** there is less friction between brake and wheel (2) friction is less because there is less contact with brakes (or pads) (1) **allow** friction between brakes and tyres but **not** friction between tyre and road **allow** movement for k.e. but not merely energy

Question			Expected Answers	Marks	Additional Guidance
	c		**USE ✓'s IN THIS QUESTION** **any one from** idea that at 40 (mph) / higher speed more <u>kinetic</u> energy has to be transferred (1) **OR** reference to (kinetic) energy depending on the square of the speed or when the speed of the car doubles the (kinetic) energy quadruples (1) **then for the second mark** recognising (braking) distance increase by 2^2 or 4 times or quadruples as speed **doubles** (1)	2	**ignore** references to driving force throughout answer **allow** longer time or distance needed to dissipate or convert the extra k.e. to heat energy (1) **not** extra time or distance to lose extra k.e. **allow** idea that work done (by the brakes) increases by a factor of 4 when the speed doubles **ignore** ½ mv^2 unless used to explain answer **allow** (braking) distance depends on the square of the speed / v^2
			Total	**5**	

Question			Expected Answers	Marks	Additional Guidance
15	a		**any two from:** change shape (1) energy absorbed or dissipated or converted or transferred (1) allows driver or passenger to move forward more slowly (1) reduce injury / saves (driver or passenger) lives / AW (1)	2	**allow** squashed / compressed / deflates **allow** energy released or relinquished but not lost **ignore** stops passenger / driver hitting dashboard or going into or through window / windscreen **ignore** ideas of safer or less harmful **allow** higher level answers eg increased collision / impact time or distance (1) reduced acceleration (1) reduced force (on person) (1) **but** increased time to absorb / dissipate / convert energy [2]
	b		seat belt / crumple zone or area / anti-roll bar / safety cage or reinforced frame / side impact bars (1)	1	**allow** padded dashboards / collapsing steering wheel / AW / laminated windscreens / child seats / AW **allow** areas that would crumple eg bumpers / wings / engine compartment
			Total	**3**	

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