

Mark Scheme (Results)

Summer 2014

Pearson Edexcel GCSE  
in Physics (5PH1H) Paper 01

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Question Number	Answer	Acceptable answers	Mark
<b>1 (a) (i)</b>	C travel with the same speeds in a vacuum, have different frequencies		<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>1 (a) (ii)</b>	{damage to/ionise/mutate} {cells / DNA/tissue/ organs/ fetus} / cause {cancer/tumour}	kills cells/bacteria	<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>1 (b) (i)</b>	Gamma, $\gamma$ , $\gamma$ , $\gamma$	UV, ultraviolet (rays/waves/radiation) Ignore X-rays	<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>1 (b) (ii)</b>	one correct use (for UV/X-ray/gamma ray)	for example, (UV) – sunbeds, sterilise, detect banknotes (X-ray) - viewing internal organs / broken bones/airport security (gamma ray) – treat /cure cancer, kill {cells/bacteria}	<b>(1)</b>
		If one incorrect example is given, this mark is lost	

Question Number	Answer	Acceptable answers	Mark
<b>1 (c) (i)</b>	one from: MP1 heating of (body/human/internal) {cells / organs/tissues} (1)  MP2 {heating/boiling/exciting / vibrating} water (in the body) (1)	Accept heating of blood Ignore damages, burns, cancer, mutates, heating (on its own), skin	<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>1 (c) (ii)</b>	<p>explanation to include any <b>three</b> of:</p> <p>MP1 (Phones/ they) use lower frequencies / RA (1)</p> <p>MP2 lower frequency: lower energy / RA (1)</p> <p>MP3 lower {frequency/energy} less (potential) danger / RA (1)</p> <p>MP4 (phones /they) emit less (intense) radiation RA (1)</p> <p>MP5 phones are less powerful (1)</p>	<p>wavelength can suitably replace frequency eg use longer wavelength</p> <p>condone use lower MHz (comparison needed not just values quoted)</p> <p>Accept lower frequency (not energy) does {less /no} {damage/harm} for 2 marks</p> <p>ignore references to penetration</p> <p>ignore references to energy replacing power here</p> <p>For 2 marks -The resonant frequency of water molecules is the same as the oven frequency</p>	<b>(3)</b>

**(Total for Question 1 = 8 marks)**

Question Number	Answer	Acceptable answers	Mark
<b>2(a)</b>	<p>An explanation linking two from</p> <p>MP1 (so that they) decrease the (high) voltages (1)</p> <p>MP2 high voltages used for efficiency/energy saving (1)</p> <p>MP3 (step-down transformers) used {near / for} {homes / factories/appliances} (1)</p> <p>MP4 (so that it is) safer (1)</p>	<p><b>stepping down voltage reducing from {high/eg 200 000 V} to {low /e.g.230 V} voltage</b></p> <p><b>low current used for efficiency/ energy saving</b></p> <p>less risk of electrocution</p> <p>high voltages are dangerous</p>	<b>(2)</b>

Question Number	Answer	Acceptable answers	Mark
<b>2(b)</b>	<p>one line / curve above <b>and</b> below x-axis (1)</p> <p>two complete cycles in the 1.0 s (1)</p>	<p>one complete cycle in 0.5 s</p>	<b>(2)</b>

Question Number	Answer	Acceptable answers	Mark
<b>2(c)</b>	Transposition (1)	Substitution and transposition in either order  i.e. if <u>12 x 100</u> is seen this scores 2 2400 If they sub Vp, Np and Ns correctly, ignore anything for Vs even a blank	<b>(3)</b>
	$V_s = V_p \times n_s/n_p$		
	Substitution (1)		
	$(V_s =) \frac{12 \times 100}{2400}$		
Evaluation (1)	Calculation may be done using <u>turns ratio</u>	Correct answer no working = full marks answer (no working) with POT error =2 (eg 5 or 0.05) Ignore powers of 10 until evaluation	
0.5 (V)			

Question Number	Answer	Acceptable answers	Mark
<b>2(d)</b>	C		<b>(1)</b>

**(Total for Question 2 = 8 marks)**

Question Number	Answer	Acceptable answers	Mark
<b>3(a)(i)</b>	D the spring has more elastic potential energy than the weight has kinetic energy		<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>3(a)(ii)</b>	<p>A description including three from</p> <p>MP1 Elastic potential energy /EPE (in stretched spring) (1)</p> <p>MP2 (EPE is) transferred to KE (initially) (1)</p> <p>MP3 change from KE to GPE or vice versa(1)</p> <p>MP4 (correct idea of) energy changes continuing</p> <p>MP5 {total mechanical energy /kinetic +potential energy} decreases (continuously) (1)</p> <p>MP6 (Eventually all is transferred to) {thermal/heat} (energy) (1)</p>	<p>care should be taken not to award marks for contradictory examples</p> <p>Starting point for description does not matter</p> <p>Ignore sound energy</p> <p>EPE becomes/goes to KE (initially)</p> <p>condone amplitude decreases to zero KE or PE 'lost' to surroundings</p>	<b>(3)</b>

Question Number	Answer	Acceptable answers	Mark
<b>3(b)(i)</b>	B increase the efficiency of the motorcycle		<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>3(b)(ii)</b>	<p>MP1 (bump produces) relative motion (1)</p> <p>MP2 (motion between magnet and coil) {induces / generates} voltage (1)</p>	<p>coil moves round magnet/magnet moves {into/out of} coil / coil {cuts / moves across} magnetic field</p> <p>ignore magnets slide inside a coil (see stem)</p> <p>electromagnetic induction</p> <p>condone {induces / generates }</p> <p>{current/electricity}</p> <p>ignore (see stem)</p> <p>electrical energy</p> <p>provides / produces</p>	<b>(2)</b>

Question Number	Answer	Acceptable answers	Mark
<b>3(b)(iii)</b>	<p>An explanation linking</p> <p>MP1 {more/frequent} bumps (1) (idea of shorter time / increased frequency)</p> <p>MP2 (bigger bumps produce) bigger amplitude / move more up and down (idea of bigger size) (1)</p> <p>MP3 (so) {induced voltage /voltage generated} is larger (1)</p>	<p>idea of up and down for bump (coil / magnets) move up and down {faster / more often}</p> <p>(coil/magnets) move {further/higher/bigger distance} (up and down)</p> <p>{induced current/current generated} is larger</p> <p>electromagnetic induction gives more voltage/current</p> <p>condone more electricity/electrical energy is {induced / generated}</p> <p>allow once for MP1 (if MP1 or MP2 is not scored): 'bumpier' 'go in and out more'</p>	<b>(3)</b>

**(Total for Question 3 = 10 marks)**

Question Number	Answer	Acceptable answers	Mark
<b>4 (a)</b>	<ul style="list-style-type: none"> <li>below 20 Hz (1)</li> <li>above {20 000 Hz / 20 kHz} (1)</li> </ul> <p>If Hz or kHz is not seen somewhere, the maximum score is 1 mark.</p>	<p>infrasound</p> <p>ultrasound</p> <p>(in either order)</p> <p>(no units needed for the names)</p>	<b>(2)</b>

Question Number	Answer	Acceptable answers	Mark
<b>4 (b) (i)</b>	C it is a longitudinal wave travelling faster than an S wave		<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>4 (b) (ii)</b>	<p>Explanation linking the following:-</p> <p>MP1 refraction /changing speed (1)</p> <p>MP2 (due to) changing {material/medium /rock type / density} (1)</p>	<p>ignore changes in direction/ bending (in this case)</p> <p>rock becomes {more / less} {dense / compact}</p>	<b>(2)</b>

Question Number	Answer	Acceptable answers	Mark
<b>4 (b) (iii)</b>	<p>Explanation linking the following:-</p> <p>MP1 (S / transverse waves) they cannot travel through liquid (1)</p> <p>MP2 Earth's core is (at least part) {liquid/molten} (1)</p> <p>MP3 (so) (S waves) they cannot travel through core (to other side of Earth) (1)</p>	<p>Check diagram for creditworthy points.</p> <p>they can only travel through solids</p> <p>may be stated in part (ii)</p> <p>(S / transverse waves) they cannot be detected on opposite side of the Earth to (collision site / earthquake)</p>	<b>(3)</b>

Question Number	Answer	Acceptable answers	Mark
<b>4 (b) (iv)</b>	<p>Suggestion to include any two from:</p> <p>MP1 idea that {kinetic energy/force/ momentum} of meteor might cause the earthquake (1)</p> <p>MP2 (earthquakes happen where) plates slide {past/over/under/away from/against} each other (1)</p> <p>MP3 (plates move) suddenly</p> <p>MP4 (meteor collision) starts seismic waves /P/S (1)</p>	<p>(meteor) it has large amount of kinetic energy</p> <p>(earthquakes happen where) plates collide rub/move for slide</p> <p>(earthquakes happen when) large amount of energy released in / near Earth's surface</p> <p>(plates) jolt/jerk</p> <p>vibrations passing through the Earth condone earthquake waves</p> <p>{kinetic energy/force /momentum} of meteor can cause the plates to slide past each other = 2</p>	<b>(2)</b>

**(Total for Question 4 = 10 marks)**

Question Number	Answer	Acceptable answers	Mark
<b>5(a)</b>	<p>An explanation linking any two of:</p> <p>MP1 magnify (1)</p> <p>with one of:</p> <p>MP2 the (real) image from objective (lens) (1)</p> <p>MP3 to provide greater detail (1)</p>	<p>enlarges / bigger ignore zooming</p> <p>the real image (in the telescope) / image at focal point</p> <p>ignore make it clearer inversion of image focuses image</p>	<b>(2)</b>

Question Number	Answer	Acceptable answers	Mark
<b>5(b)</b>	<p>One sensible suggestion, such as</p> <ul style="list-style-type: none"> <li>made recording results {easier /quicker} (1)</li> <li>results more convincing to other people (1)</li> <li>photograph is to scale (1)</li> </ul>	<p>For example, don't have to keep looking through telescope</p> <p>would be (better) proof / evidence (i.e. between geo- and helio-centric models) (eg multiple photographs would prove movement/orbit of moons)</p> <p>(photograph) is more {accurate / precise / reliable}/ can measure (relative) separations of moons (from planet) better</p> <p>ignore more detail/clearer/zooming</p>	<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
5(c)	Substitution (1) $3.0 \times 10^8 = 4.3 \times 10^{14} \times \lambda$ Transposition (1) $(\lambda =) \frac{3.0 \times 10^8}{4.3 \times 10^{14}}$ Evaluation (1) $6.98 \times 10^{-7} \text{ (m)}$	Substitution and transposition in either order Ignore triangle  correct answer no working = 3 power of ten error = 2 to at least 2sf (eg 7.0/6.97.....)x10 <sup>-7</sup> Ignore powers of 10 until evaluation	(3)

Question Number		Indicative content	Mark
QWC	*5(d)	<p>A description to include some of the following points</p> <p>description of models</p> <ul style="list-style-type: none"> <li>• geocentric</li> <li>• heliocentric</li> </ul> <p>description of one set of observations of Jupiter's moons</p> <p>explanation of how observation contradicts geocentric but does not prove the other</p> <p>NB beware that you do not reward repetitions of the question stem</p>	(6)
Level	0	no rewardable material	
1	1-2	<ul style="list-style-type: none"> <li>• a limited explanation of the geocentric <b>AND</b> the heliocentric model such as <i>geocentric model said everything orbited the Earth while the other was for everything going round the Sun.</i> <b>OR</b> clearly explains the one model and describes Galileo's observations eg <i>geocentric model said everything orbited the Earth but Galileo observed that Jupiter had moons going around it</i></li> <li>• the answer communicates ideas using simple language and uses limited scientific terminology e.g. allow confusion between geocentric and heliocentric</li> <li>• spelling, punctuation and grammar are used with limited accuracy</li> </ul>	
2	3-4	<ul style="list-style-type: none"> <li>• a simple explanation of geocentric <b>AND</b> heliocentric models <b>AND</b> Galileo's observations of Jupiter's moons/explains heliocentric not proved e.g. <i>The geocentric model said everything orbited the Earth while the heliocentric was for everything orbiting the Sun. Galileo observed that Jupiter had moons orbiting around it.</i></li> <li>• the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately e.g. correct use geocentric and heliocentric</li> <li>• spelling, punctuation and grammar are used with some accuracy</li> </ul>	
3	5-6	<ul style="list-style-type: none"> <li>• a detailed explanation of geocentric <b>AND</b> heliocentric models <b>AND</b> the role of Galileo in providing evidence against the geocentric <b>BUT</b> not enough for the heliocentric such as <i>The geocentric model said everything orbited the Earth while the heliocentric was for everything orbiting the Sun. Galileo's observations that Jupiter had moons orbiting arou(nd it showed that the geocentric model was wrong <b>but not</b> that Jupiter or anything else went around the Sun.</i></li> <li>• the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately e.g. distinguishes between the necessary and insufficient conditions</li> <li>• spelling, punctuation and grammar are used with few errors</li> </ul>	

(Total for Question 5 = 12 marks)

Question Number	Answer	Acceptable answers	Mark
<b>6 (a)(i)</b>	A a black hole (1)		<b>(1)</b>

Question Number	Answer	Acceptable answers	Mark
<b>6 (a)(ii)</b>	<p>A description including three from:</p> <p>MP1 in a nebula (1)</p> <p>MP2 (particles) attracted / come together by (force of) gravity (1)</p> <p>MP3 pe/ke transferred to thermal/heat energy (gas begins to glow and forms protostar) (1)</p> <p>MP4 until {hot / pressure / dense} enough to start nuclear reaction /fusion (1)</p>	<p>gas / gas and dust</p> <p>core becomes hot / pressure increases / density increases</p> <p>until fusion of hydrogen starts hydrogen starts to become helium condone "hydrogen burning"</p>	<b>(3)</b>

Question Number	Answer	Acceptable answers	Mark
<b>6 (a)(iii)</b>	<p>A suggestion involving two from:</p> <p>MP1 the oldest star had not yet appeared when the {Big Bang happened / universe started}(1)</p> <p>MP2 the Universe is older than the oldest star</p> <p>MP3 star takes time to form (1)</p> <p>MP4 can't be certain of this time (1)</p>	<p>stars formed after the Big Bang</p> <p>the age of the oldest star is the minimum age of the Universe</p> <p>estimation is not the same as accurate measurement can't be sure there isn't an older star</p>	<b>(2)</b>

Question Number		Indicative Content	Mark
<b>QWC</b>	<b>* 6(b)</b>	<p>An explanation including some of the following points</p> <ul style="list-style-type: none"> <li>• light shifted to red end of spectrum</li> <li>• light waves are stretched so wavelength increases</li> <li>• reference to black or spectral lines moving to 'red end' (of absorption spectrum)</li> <li>• frequency of wave from a moving source changes</li> <li>• decrease in frequency means source moving away</li> <li>• increase in frequency means source moving towards us</li> <li>• red shift shows galaxies are moving away from us</li> <li>• greater red shift indicates galaxy moving away faster</li> <li>• further away galaxies give greater red shift</li> <li>• (nearly) all galaxies show red-shift</li> <li>• red shift shows decrease in frequency</li> <li>• blue shift shows increase in frequency</li> <li>• therefore galaxies are moving apart</li> <li>• [mention of Doppler effect]</li> <li>• [outline of Doppler effect]</li> </ul>	<b>(6)</b>

<b>Level</b>	<b>0</b>	No rewardable content
<b>1</b>	<b>1 - 2</b>	<ul style="list-style-type: none"> <li>• a limited explanation e.g. (light from) {galaxy / planet /object} moving away from us is shifted to red end of the spectrum OR red shift means {galaxy / planet /object} is moving away from us</li> <li>• the answer communicates ideas using simple language and uses limited scientific terminology e.g. correct use of change of colour and movement</li> <li>• spelling, punctuation and grammar are used with limited accuracy</li> </ul>
<b>2</b>	<b>3 - 4</b>	<ul style="list-style-type: none"> <li>• a simple explanation involving detail of meaning of different red shifts OR involving frequency / wavelength e.g. red shift shows galaxies moving away from us. More distant galaxies give greater red shift showing they are travelling faster away. OR light from galaxies/stars moving away is shifted to red end of the spectrum because of an (apparent) {increase in the wavelength/decrease in the frequency} (of light).</li> <li>• the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately e.g. correct use of the terms galaxy/star, frequency, wavelength</li> <li>• spelling, punctuation and grammar are used with some accuracy</li> </ul>
<b>3</b>	<b>5 - 6</b>	<ul style="list-style-type: none"> <li>• a detailed explanation correctly interpreting the (apparent) drop in frequency / increase in wavelength e.g. light from (most) galaxies is shifted towards the red end of the spectrum because of an {increase in the wavelength/decrease in the frequency}. This indicates that (most) galaxies are moving away from us, hence showing the Universe is expanding</li> <li>• the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately e.g. linkages must be clear between red-shift, movement and expansion of the Universe</li> <li>• spelling, punctuation and grammar are used with few errors</li> </ul>

(Total for Question 6 = 12 marks)

