edexcel

Mark Scheme (Results)

January 2012

International GCSE Physics (4PH0)
Paper 1P
Science Double Award (4SC0) Paper 1P

Edexcel and BTEC Qualifications
Edexcel and BTEC qualifications come from Pearson, the world's leading learning company. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information, please call our GCE line on 0844 576 0025, our GCSE team on 0844 576 0027, or visit our qualifications website at www.edexcel.com. For information about our BTEC qualifications, please call 0844 576 0026, or visit our website at www.btec.co.uk.

If you have any subject specific questions about this specification that require the help of a subject specialist, you may find our Ask The Expert email service helpful.

Ask The Expert can be accessed online at the following link:

http://www.edexcel.com/Aboutus/contact-us/

Alternatively, you can speak directly to a subject specialist at Pearson about Edexcel qualifications on our dedicated Science telephone line: 0844 576 0037

Pearson: helping people progress, everywhere
Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for raising achievement through innovation in education. Find out more about how we can help you and your students at: www.pearson.com/uk

January 2012
Publications Code UG030801

INTERNATIONAL GCSE PHYSICS 4PH0 4SC0 / 1P – JANUARY 2012

Question number	Answer	Notes	Marks
1 (a) (i)	A		1
(ii)	B		1
(b) (i)	C		1
(ii)	nearest above (DOP)		1
(iii)	Comment on device –		1
	(plastic) insulator / does not conduct;	(double) insulated / no current (through) / cannot become live	1
	Comment on user -		
	no risk of shock / electrocution;	No electricity reaches user / person cannot touch live parts	

<table>
<tr><th>Question number</th><th>Answer</th><th>Notes</th><th>Marks</th></tr>
<tr><td>2 (a)</td><td>density = mass/volume</td><td>ACCEPT equivalent rearrangement
ACCEPT suitable abbreviations e.g. = m/v or d = m/v
REJECT equation ‘triangles’ alone</td><td>1</td></tr>
<tr><td>(b)</td><td>D</td><td></td><td>1</td></tr>
<tr><td>(c)</td><td><table><tr><th>Measuring instrument</th><th>Quantity measured</th></tr><tr><td>measuring cylinder</td><td>volume</td></tr><tr><td>electronic balance</td><td>mass</td></tr></table></td><td>Reject weight</td><td>1</td></tr>
</table>

Question number	Answer	Notes	Marks
2 (d)	MAX TWO FOR EACH measuring cylinder – eyes to water level / perpendicular view; to avoid parallax; measurement at bottom of meniscus; measuring cylinder on flat surface / clean cylinder; electronic balance – place on stable surface /avoid disturbing balance; set to zero / check zero; finding mass without an with water – (tare or subtraction);	 Ignore repetition wherever seen Ignore clean balance	4
(e) (i)	temperature / type of water (e.g. salinity, not 'heavy')	DO NOT ACCEPT answers referring to keeping the apparatus the same	1
(ii)	can also affect the density / volume (DOP)	ACCEPT arguments that follow through e.g. increasing temperature will increase the volume, therefore decreasing the density REJECT idea that mass is affected by change in temperature	1

Question number	Answer	Notes	Marks
3 (a)	(stopping distance =) thinking distance + braking distance	Could be reversed	1
(b)	Any two of: as speed increases / car goes faster, the (thinking/braking/stopping) distance increases; as thinking distance increases so does braking distance; difference in pattern between thinking/braking distances identified; e.g: increase in thinking distance < increase in braking distance / increase in thinking distance is linear or proportional / increase (in braking / stopping) is non linear / WTTE	Ignore references to time Allow use of values from graph Reject: thinking distance proportional to braking distance	2
(c)	30 (m)	ALLOW any value from 28 to 32 m	1

Question number	Answer	Notes	Marks
3 (d)	use the minimum / lowest values obtained	REJECT find the average	1
(e) (i)	thinking distance – no change; depends on speed/ driver / reaction (time)		2
(ii)	braking distance – increase; less friction/ less grip	Ignore reference to time e.g. takes longer Ignore skidding, sliding, slippery road	2

Question number	Answer	Notes	Marks
4 (a)	change in direction of waves at a boundary	ALLOW change in speed ALLOW idea of 'boundary' such as changing medium, or examples such as 'going from air into a glass block'	1
(b)	correct label for *i* correct label for *r*	ALLOW labels written out in full as "incidence" or "angle of incidence" etc REJECT if angles are the wrong way around	2
(c) (i)	refractive index = sin *i* / sin *r*	ALLOW 'n' for refractive index REJECT speed in 1/speed in 2	1
(ii)	Method max 4 marks: draw around block; mark positions of incident and emergent rays; (remove block and) draw refracted ray; measure i; measure r; measure angle(s) to the normal; range of values; Data max 2 marks: (graph of) sin i against sin r; graph is straight line; DOP gradient gives refractive index; DOP	Accept pin or pencil method Ignore mention of protractor i.e. different values of i not just repeating	MAX 6

Question number	Answer	Notes	Marks
5 (a)	D		2
	parallel field (DOP)	ACCEPT equally spaced and straight / equally spaced and do not change direction	
(b)	two (permanent / bar) magnets	ACCEPT points made on an annotated diagram	3
	pole pieces arranged correctly e.g. North facing South	REJECT description of poles as positive / negative	
	idea of magnets being the correct distance apart	ACCEPT “close together”, “not touching” ACCEPT idea that field is produced in the space between the N pole of one magnet and the S pole of the other REJECT answers that are clearly referring to electromagnets	

Question number	Answer	Notes	Marks
6 (a) (i)	rocks / radon (gas) / space / cosmic / Sun / medical sources / from carbon atoms in living things	REJECT named radiation e.g. gamma	1
(ii)	Any three from Remove source / with no source present; measure background / count; repeat / find mean / average value; subtract (background value) from experimental values (with source);	 ACCEPT take readings (of background) / read background	Max 3
(b) (i)	GRAPH S A P P L	 Orientation unimportant Quantity and unit on both axes Single smooth curve	5
(ii)	value consistent with graph (should be 0.9 – 1.4 minutes)		1
(c)	(gamma) can be detected outside the body /can pass through; half life related to use – long enough to get around the body (for use as tracer); half life related to patient safety - falls to low levels soon after use;	Ignore ionising ability Reject “cause less damage” without reference to activity or time	3

<table>
<tr><th>Question number</th><th>Answer</th><th>Notes</th><th>Marks</th></tr>
<tr><td>7 (a)</td><td>ANY THREE
vibration / oscillation of (air) molecules / particles;
longitudinal;
directions of vibration and propagation are parallel;
compression / rarefaction /pressure wave;</td><td>
need to include what is vibrating

no need to mention molecules / particles</td><td>3</td></tr>
<tr><td>(b) (i)</td><td>0.01 s</td><td>ALLOW 2 s.f. / 2 sig figs / 2 significant figures</td><td>1</td></tr>
<tr><td>(ii)</td><td>speed = distance / time</td><td>ACCEPT equivalent rearrangement
ACCEPT suitable abbreviations e.g. s = d/t or v = s/t
REJECT equation ‘triangles’ alone</td><td>1</td></tr>
<tr><td>(iii)</td><td><table><tr><th>Student</th><th>Mean time in s</th><th>Speed of Sound in m/s</th></tr><tr><td>Andrew</td><td>0.45</td><td>330</td></tr><tr><td>Kefe</td><td>0.5</td><td>300</td></tr></table></td><td>1 mark each correct COLUMN (ignoring sf);;
mean time values as shown in mark scheme
speed = 150/mean time (allow ecf)

1 mark for all significant figures correct;
(i.e. 2 s.f. in first row, 1 s.f. in second row)</td><td>3</td></tr>
</table>

Question number	Answer	Notes	Marks
7 (c)	ANY 5 relevant points, e.g. Explanation of what reaction time is; Reaction time affects readings / reaction time does matter; Reaction times vary; Reaction times do not cancel out; Reaction time should be considered / allowed for; Kefe is right (about reaction times); reaction time typically at least 0.1 s; which is large compared to measured times / large % error; time should only be to 1 s.f.; so final value should also be to 1 s.f. / Kefe's value more suitable; 3 s.f. inappropriate; closer to accepted value does not mean more accurate;	Answers should ideally relate to how *appropriate* the precision of the measurements was, linking this to the number of significant figures merited Consideration of reaction time and its measurement may score a number of marks	MAX 5

Question number	Answer	Notes	Marks
8 (a) (i)	voltage = current x resistance	ACCEPT equivalent rearrangement ACCEPT suitable abbreviations e.g. V = I x R REJECT V = I x REJECT equation 'triangles' alone	1
(ii)	1.2 x 4.0; 4.8 (V);		2
(iii)	12 – 4.8; 7.2 (V);	ECF on (ii)	2
(iv)	E = VIt (NO MARK) time conversion to seconds (5.0 x 60); 7.2 x 1.2 x (5.0 x 60); 2600 (J);	ECF on (iii) Allow 2592 or 2590 ALLOW 2500/2520 (J) for full marks (using 7 V) ALLOW 42 (J) or 43.2 (J) for 2 marks (using 5 mins)	3
(v)	idea of energy losses rate of energy loss = rate of energy supply (at steady temp)	 NB this statement alone scores (2) as it includes idea of energy loss	2

Question number	Answer	Notes	Marks
8 (b) (i)	X – series, Y – parallel	BOTH REQUIRED for the mark	1
(ii)	THREE SUITABLE, e.g.- series advantage – fewer wires; series advantage – lower resistance values; series disadvantage – one fails, circuit fails; series disadvantage – no independent control;	ALLOW REVERSE ARGUMENTS in terms of parallel circuits but do not award the same mark twice IGNORE refs to efficiency ACCEPT correct answers that link to battery voltage / current, etc	Max 3

Question number	Answer	Notes	Marks
9 (a)	gravity		1
(b) (i)	6960 (km)		1
(ii)	equation quoted (NO MARK) conversion of km OR min; v = (2 x π x 6 960 000) / (96 x 60); 7600;	 ECF on (i) Allow for rounding errors	3
(c)	EITHER grav pe reduces when closer; (so) ke increases; because total energy conserved; OR gravitational attraction / field strength increases when closer; mass remains constant; so accelerates;	 Grav force increases so ke increases = 1 (mixing arguments) REJECT 'gravity higher' 'gravity stronger' ACCEPT 'pull of gravity' 'force of gravity'	3
(d) (i)	electromagnetic (spectrum)	Accept transverse (waves)	1
(ii)	Any two from X-rays have shorter wavelength; ORA X-rays have higher frequency; ORA X-rays have higher energy; ORA X-rays have greater penetration range; ORA X-rays have greater effects on living tissue; ORA	Idea of comparison must be there REJECT 'visible light can be seen' / eq	2

Question number	Answer	Notes	Marks
10 (a) (i)	GPE = mass x g x height	ACCEPT equivalent rearrangement ACCEPT suitable abbreviations e.g. GPE = mgh ACCEPT 'gravity' or 'gravitional field strength' or 'acceleration due to gravity' for g	1
(ii)	78 x 10 x 5; 3900 (J);		2
(iii)	3900; J / joule;	Accept 4000 J REJECT 'Nm' for 'J' ALLOW kJ only if it matches the value (i.e. 3.9)	2
(b) (i)	efficiency = useful energy output / total energy input	ALLOW 'power' for 'energy'	1

(ii)	in one second –
	useful energy out = (30 x 3900) / 60;
	efficiency = 1950 / 7500;
	0.26 / 26%
		Allow
		useful energy out = (30 x 4000) / 60;
		efficiency = 2000 / 7500;
		0.27 / 27%
		
		CQ on a(ii)
			3

(c)	right general shape reasonably correct proportions / 3kW and 12 kW seen correctly labelled	 ACCEPT "input / waste / useful" or "electrical / kinetic or GPE / waste heat or sound"	3

Question number	Answer	Notes	Marks
11 (a)	78 seen; = 78 / 60; 1.3;	 acceleration = (final v – starting v)/time; CORRECT ANSWER WITH NO WORKING = (3)	3
(b)	air resistance (when moving); increases as velocity / speed increases; reducing resultant force;	ACCEPT drag IGNORE wind resistance IGNORE friction with ground 'friction' alone needs qualification REJECT 'reaches terminal velocity'	3

Question number	Answer	Notes	Marks
12 (a)	ANY FOUR – Conduction from hot plate to pan; conduction through pan; conduction from pan to water; convection in the water; conduction from water to potato; conduction through potato;		Max 4
(b)	ANY THREE – microwaves are electromagnetic waves; penetrate (a few cm) into the food; cause water molecules to vibrate more / heat water; conduction through the rest of the potato	no marks for whether or not the statement is true needs ref to water, not just particles / molecules needs conduction ref, not just spreads out	Max 3
(c)	Any five from Electromagnetic induction; coil creates magnetic field around it; which cuts through the metal pan; field alternates / changes; inducing a voltage in the pan; causing a current in the pan; current makes the pan get hot; which heats the water by conduction; water convects energy to potato;	Effect named – not just 'induction' (given in question) Pan heating must be linked to current, not just 'the pan gets hot'	Max 5

PAPER TOTAL: 120 MARKS

Further copies of this publication are available from
Edexcel Publications, Adamsway, Mansfield, Notts, NG18 4FN

Telephone 01623 467467
Fax 01623 450481
Email publication.orders@edexcel.com

Order Code xxxxxxxx January 2012

For more information on Edexcel qualifications, please visit
www.edexcel.com/quals

Pearson Education Limited. Registered company number 872828
with its registered office at Edinburgh Gate, Harlow, Essex CM20 2JE

Ofqual

Llywodraeth Cynulliad Cymru
Welsh Assembly Government

Rewarding Learning