Mark Scheme (Results)

January 2020

Pearson Edexcel International GCSE
in Physics (4PH1)
Paper 1PR

Question number	Answer	Notes	Marks
1 (a)	D – arrow S; A is incorrect as arrow P shows twice the amplitude B is incorrect as arrow Q shows the wavelength C is incorrect as arrow R shows half of the wavelength		1
(b)	B – arrow Q; A is incorrect as arrow P shows twice the amplitude C is incorrect as arrow R shows have of the wavelength D is incorrect as arrow S shows the amplitude		1
(c)	D – transverse; A is incorrect as water waves are not electromagnetic B is incorrect as gravitational waves are not detectable by water C is incorrect as the water molecules vibrate at right angles to the direction of travel of the wave.		1
(d)	substitution into given equation 'f= 1/T'; evaluation; e.g. frequency = 1/2.7 frequency = 0.37 (Hz)	accept any value that rounds to 0.37 Hz	2

Total for Question 1 = 5 marks

Question number	Answer	Notes	Marks
2 (a)	9 (kPa);		1
(b)	(liquid) pressure = depth (of liquid) × density × g;	accept d, h, height for depth rho, ρ for density g.f.s or gravitational field strength for g reject gravity for g	1
(c)	substitution; rearrangement; evaluation; e.g. pressure difference = 9 kPa $9\,000 = d × 960 × 10$ d = 9000 / (9600) d = 0.94 (m)	allow ecf from (a) allow use of g = 9.8(1) m/s^2 giving 0.96 m allow 0.937(5) POT error penalty of 1 mark, except if formula is incorrect i.e. no 'g'	3

Total for Question 2 = 5 marks

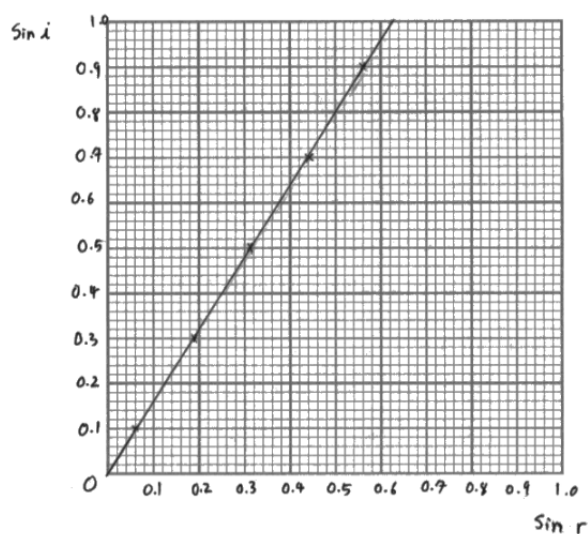| Question number	Answer	Notes	Marks
4	MP1 nebula/gas cloud; MP2 protostar; MP3 main sequence (then red supergiant); MP4 supernova; MP5 neutron star/ black hole;	1 mark penalty for any incorrect sequence	5

Total for Question 4 = 5 marks

Question number	Answer	Notes	Marks
5 (a)	substitution into given equation $v^2 = u^2 + (2 \times a \times s)$; evaluation of v^2; evaluation of v to 3sf or more i.e. 16.1 (m/s); e.g. $v^2 = u^2 + (2 \times a \times s)$ $v^2 = 0^2 + (2 \times 10 \times 13)$ $v^2 = 260$ $v = \sqrt{260} = 16.1$ (m/s)	accept $mgh = 1/2mv^2$ accept use of g = 9.8(1) m/s² giving v = 16.0, 15.97 etc.	3
(b)	any FIVE from: MP1 ball has weight; MP2 ball accelerates; MP3 drag increases (while accelerating); MP4 resultant force decreases; MP5 (so) acceleration decreases; MP6 drag = weight / resultant = 0 / forces balanced; MP7 terminal velocity/constant speed /acceleration=0;	allow 'has gravitational force' REJECT 'has gravity' REJECT 'balls slows down' allow 'air resistance' for 'drag'	5

Total for Question 5 = 8 marks

Question number			Answer	Notes	Marks
7	(a)	(i)	B – joule per coulomb; A is incorrect because this is not a correct unit for volt C is incorrect because this is not a correct unit for volt D is incorrect this is not a correct unit for volt		1
		(ii)	energy (transferred) = charge × voltage;	allow standard symbols and rearrangements	1
		(iii)	substitution; conversion of kV to V; evaluation; e.g. energy = $1.6 \times 10^{-19} \times 150 \times 10^3$ energy = 2.4×10^{-14} (J)		3
	(b)	(i)	charge = current × time;	allow standard symbols and rearrangements	1
		(ii)	substitution and re-arrangement; conversion of ms to s; evaluation; e.g. charge = current × time current = 2.9×10^{-8} / 0.68×10^{-3} current = 4.3×10^{-5} (A)	accept conversion to microamps or milliamps provided micro- (μ) or milli- (m) clear on answer line allow 4.265×10^{-5} (A)	3

Total for Question 7 = 9 marks

(b)	(i)	any FOUR from: MP1 any method of recording an incident ray;	accept marks on a clear, labelled diagram	4
		MP2 any method of recording a refracted ray;		
		MP3 range of angle of incidences;		
		MP4 normal lines drawn;		
		MP5 angles measured using a protractor;		
	(ii)	axes labelled; appropriate scale with data enclosed by 3 x 3 grid or larger; points plotted correctly within ½ a square;		3
	(iii)	best fit straight line drawn with ruler;	judge by eye	1
	(iv)	evidence of gradient triangle used; evaluation of 1.6;	accept markings on graph or evidence of a gradient calculation. accept answer in range 1.55 – 1.65 consistent with candidate's LoBF allow ecf from candidate's LoBF	2

Total for Question 10 = 16 marks

Question number	Answer	Notes	Marks
11 (a)	any THREE from: MP1 walls further apart; MP2 fewer collisions between particles and walls per second/lower frequency of collisions; MP3 means (average) force on walls lower; MP4 lower force means lower pressure for same wall surface area;	reject unqualified 'fewer collisions' accept idea that force per collision is the same ignore references to particles colliding with each other accept	3
(b)	substitution into given equation "$p_1 \times V_1 = p_2 \times V_2$"; rearrangement to give p_2; evaluation of p_2; e.g. $101 \times 110 = p_2 \times 140$ $p_2 = 101 \times 110 / 140$ $p_2 = 79\,000$ (Pa)	allow 79357.1… (Pa), 79(.4) kPa , standard form	3
(c)	any THREE from: MP1 pressure outside balloon is lower than inside balloon; MP2 pressure difference causes a force; MP3 force is outwards on balloon; MP4 force causes extension of balloon;	accept 'stretching'	3

Total for Question 11 = 9 marks

Question number		Answer	Notes	Marks
12	(a)	A – arrangement W; B cannot be correct as arrangement X would give a downwards force C and D cannot be correct because at the position of the wire, the magnetic field is zero, so there cannot be a magnetic force on the wire		1
	(b) (i)	substitution into "W = mg"; evaluation; e.g. W = 0.0065 × 10 W = 65 (mN)	ignore POT for this mark accept use of g = 9.8(1) m/s^2 giving 63.7 or 63.8 (mN)	2
	(ii)	resultant force is difference between weight and magnetic force; resultant force = 31 mN; substitution in "F=ma"; re-arrangement; evaluation; e.g. resultant force = 65 – 34 = 31 mN resultant force = 31 × 10^{-3} = 6.5 × 10^{-3} × a a = 31 × 10^{-3} / 6.5 × 10^{-3} a = 4.8 (m/s^2)	allow ecf from (b)(i) POT error gives 1 mark penalty 5.2(3) scores 3 MAX (no evidence of resultant idea) allow 4.76(9) (m/s^2) use of g = 9.81 m/s^2 gives 4.57 (m/s^2)	5
	(iii)	EITHER • increase the current; • by increasing the voltage of power supply; OR • increase the magnetic field strength; • by using stronger magnets/moving the poles closer together;	ignore unqualified reference to increasing the turns/creating a coil	2
	(iv)	use a.c. rather than d.c.; since a.c. current has alternating/changing current direction;		2

Total for Question 12 = 12 marks