Mark Scheme (Results)

January 2019

Pearson Edexcel International GCSE

In Physics (4PH0) Paper 2P

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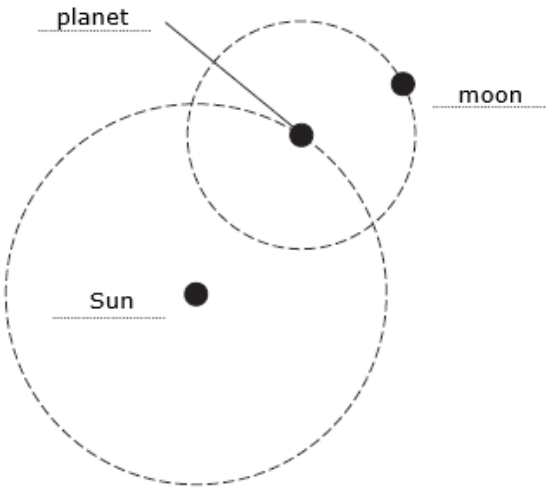
General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Question number	Answer	Notes	Marks
1 (a)	gravitational (force);	allow gravity, gravitational pull, gravity pull ignore centripetal force reject gravitational potential, gravitational field strength	1
(b) (i)	 any 1 correct label; all three correct;;	allow Earth for planet allow star for Sun	2
(ii)	time period of moon is shorter; idea that it travels a shorter distance / orbital radius is smaller;	however expressed allow RA ignore 'moon travels faster' allow RA allow 'orbit of moon is smaller' ignore unqualified 'smaller circumference', 'smaller radius/diameter'	2

Total for question 1 = 5 marks

<table>
<tr><th>Question number</th><th>Answer</th><th>Notes</th><th>Marks</th></tr>
<tr><td>2 (a)</td><td>a quantity with magnitude / size;

(and) direction;</td><td>allow ‘amount’ for magnitude</td><td>2</td></tr>
<tr><td>(b)</td><td>
<table>
<tr><th>Quantity</th><th>Scalar</th><th>Vector</th></tr>
<tr><td>energy</td><td>✓</td><td></td></tr>
<tr><td>speed</td><td>✓</td><td></td></tr>
<tr><td>weight</td><td></td><td>✓</td></tr>
<tr><td>acceleration</td><td></td><td>✓</td></tr>
<tr><td>charge</td><td>✓</td><td></td></tr>
<tr><td>moment</td><td></td><td>✓</td></tr>
</table>

one or two correct ticks = 1 mark ;
three or four correct ticks = 2 marks;;
all five correct ticks = 3 marks;;;</td><td>reject any row with two ticks</td><td>3</td></tr>
</table>

Total for question 2 = 5 marks

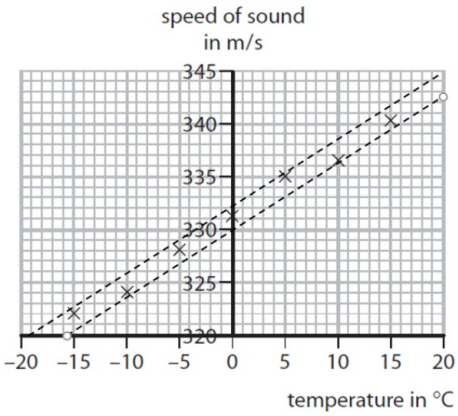
Question number	Answer	Notes	Marks
3 (a)	B; C;	reject if more than one letter given reject if more than one letter given	2
(b)	substitution; rearrangement; evaluation; e.g. $380\,000 = m \times 10 \times 45$ (m =) $380\,000 / (10 \times 45)$ (m =) 840 (kg)	 -1 for POT error allow 844, 844.4...(kg) 862 (kg) if g=9.8 861 (kg) if g=9.81	3

Total for question 3 = 5 marks

Question number	Answer	Notes	Marks
4 (a) (i)	0.717; N;	allow 0.7, 0.72, 0.70, 0.703... allow newton(s) condone n marks are independent	2
(ii)	density = mass / volume;	allow symbols, e.g. ρ = m/V, d = m/V or rearrangements	1
(iii)	substitution OR rearrangement; evaluation; e.g. 8960 = 0.0717 / V OR V = m / ρ (V =) 8.00 × 10^{-6} (m^3)	 -1 for POT error allow 8 × 10^{-6}, 8.002... × 10^{-6} answer does not need to be in standard form e.g. 0.000008 (m^3) gets both marks	2
(b) (i)	bar chart / bar graph;	accept column graph condone histogram	1
(ii)	steel is more dense; OR granite is less dense; steel is (approximately) 3× denser;	 allow ratio of densities in range 2.8-3.1 ignore comparison of masses accept correct values of both densities for 2 marks e.g. steel = 7900 kg/m^3 granite = 2700 kg/m^3 tolerance ±100 on each	2

Total for question 4 = 8 marks

Question number	Answer	Notes	Marks
5 (a)	MP1. measure time for a set distance; MP2. realistic values suggested for experiment to work; MP3. suitable measuring instrument named; MP4. further detail of setup; MP5. idea of repeats and average; MP6. reference to speed = distance / time;	allow measuring wavelength for a known frequency e.g. • greater than 1m for microphones and oscilloscope method • greater than 100m for seeing and hearing a clap method • greater than 50m for wall and echo method • wavelength measured greater than 10cm e.g. stop clock, stopwatch, ruler, tape measure, oscilloscope e.g. • two microphones on bench connected to oscilloscope • start timing when see a clap and stop when hear it • clap by wall and time how long for clap to come back • moving a microphone until waveforms line up on oscilloscope allow speed = frequency × wavelength	6

(b)	(i)	straight line of best fit drawn within indicated area;  	line does not need to be extended beyond data range for this mark	1
	(ii)	line of best fit extended as a straight line to 20°C; student's own value from graph ± half a square;	condone straight line extension of dot to dot line allow range of 342-345 (m/s) allow ecf from line drawn in (i)	2
	(iii)	speed (of sound) decreases (with temperature); so wavelength decreases (with temperature);	allow 'sound slows down' ignore references to particle speed allow λ is smaller	2

Total for question 5 = 11 marks

Question number	Answer	Notes	Marks	
6	any **two** advantages: MP1. idea that fuel will last for a long time; MP2. high energy density of fuel; MP3. no CO_2 emissions / no greenhouse gases / does not contribute to global warming / does not produce acid rain; MP4. reliable electricity output / does not depend on weather; any **two** disadvantages: MP5. waste products are radioactive / difficult to dispose of; MP6. chance of nuclear accident; MP7. high security risk; MP8. high construction / decommissioning cost;	 ignore idea that fuel is limitless / will not run out allow idea that a small amount of fuel yields a lot of energy allow idea that it can supply electricity / energy constantly ignore unqualified 'it is reliable' e.g. nuclear meltdown, risk from tsunamis etc. ignore unqualified 'it is expensive'	4	exp

Total for question 6 = 4 marks

Question number	Answer	Notes	Marks
7 (a)	fewer turns on the secondary;	allow RA	1
(b) (i)	word equation or $V_p I_p = V_s I_s$;	Vp/Vs = Is/Ip or Vs/Vp = Ip/Is or $I_1V_1 = I_2V_2$	1
(ii)	correct equation substituted OR rearranged; evaluation; e.g. $230 \times I_p = 5.5 \times 1.0$ OR $I_p = V_s I_s / V_p$ (I_p =) 0.024 (A)	 allow 0.0239...(A) allow 0.02 (A) if supported by working	2
(c)	any two from: MP1. input power increases; MP2. (input) voltage remains the same; MP3. (input) current increases;	 allow energy for power	2

Total for question 7 = 6 marks

Question number	Answer	Notes	Marks
8 (a)	weight of crane arm;	allow weight of arm, weight of crane	1
(b) (i)	moment = force × (perpendicular) distance (from pivot);	allow symbols, e.g. M = F × d or rearrangements	1
(ii)	substitution; evaluation; e.g. (moment =) 150 000 × 1.2 (moment =) 180 000 (Nm)	-1 for POT error	2
(c) (i)	(at equilibrium) (sum of) clockwise moment(s) = (sum of) anticlockwise moment(s);	allow in correct symbols	1
(ii)	correct expression for moment of weight of rock or weight of crane arm seen; correct use of principle of moments; evaluation; e.g. F × 6.8 OR 18(000) × 2.8 180 000 = (18000 × 2.8) + (F × 6.8) F = 19 000 (N)	allow ecf from (b) -1 for POT error 19058.8...(N)	3

Total for question 8 = 8 marks

Question number	Answer	Notes	Marks
9 (a) (i)	momentum = mass × velocity;	allow rearrangements and standard symbols e.g. p = m × v reject m for momentum	1
(ii)	substitution and evaluation; e.g. (p =) 0.039 × 0.56 (p =) 0.022 (kgm/s)	0.02184 (kgm/s) allow 0.02 (kgm/s) if supported by working	1
(iii)	use of conservation of momentum; evaluation of total mass; evaluation of mass of truck; e.g. 0.022 = m × 0.26 total mass = 0.084 mass of truck = (0.084 – 0.039 =) 0.045 (kg)	allow 'momentum before = momentum after' seen anywhere can also be implied from calculation allow ecf from (ii) allow 0.0846...(kg) allow 0.0456...(kg)	3
(b)	total mass (of system) is now greater; total momentum is the same as before; velocity will be lower than before;	allow "momentum is conserved" calculation of new velocity = 0.169... m/s scores all 3 marks	3

Total for question 9 = 8 marks

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