PEARSON EDEXCEL GCSE COMBINED SCIENCE (HIGHER) · 1SC0

PHYSICS



MARK SCHEME

TOPIC 9: FORCES AND THEIR EFFECTS (PAPER 2)

SCORE	PERCENTAGE
/92	%

STEMUP

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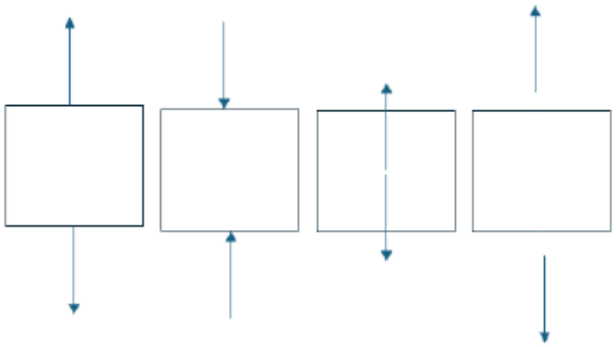
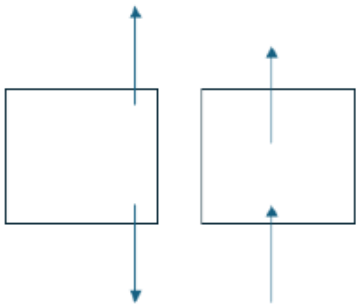
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Mark Scheme

Q1.

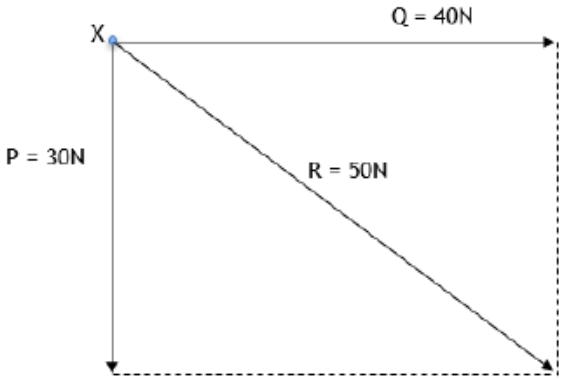
Question number	Answer	Additional guidance	Mark
(i)	relevant values from graph(1) 8 ($x10^{-2}$) and 3.6 seen substitution (1) (energy =) 0.5 x 3.6 x 8 ($x10^{-2}$) evaluation (1) (energy =) 0.14 (J)	 accept 8 ($x10^{-2}$) and values between 3.6 and 3.7 accept value between 0.14 and 0.15 (J) values between 0.14 and 0.15 (J) to any other power of ten scores 2 marks values between 0.28 and 0.30 (J) scores 2 marks values between 0.28 and 0.30 (J) to any other power of ten scores 1 mark award full marks for correct answer without working	**(3)** **AO2**

Question number	Answer	Additional guidance	Mark
(ii)	45 or 0.45 (1) **OR** 45 N/m or 0.45 N/cm (2)	allow values between 44 and 47 or between 0.44 and 0.47 allow full marks for values between 44 and 47 N/m or between 0.44 and 0.47 N/cm	**(2)** **AO2**

Question number	Answer	Additional guidance	Mark
(iii)	two straight vertical arrows in opposite directions and (if extended) go through centre of the box (judge by eye) (1)	examples  scores this mark  does not score this mark	**(2)** **AO1**
	label 5N on both arrows (1)	independent mark	

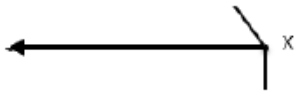
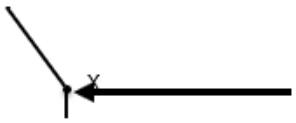
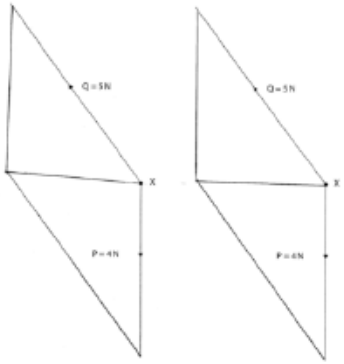
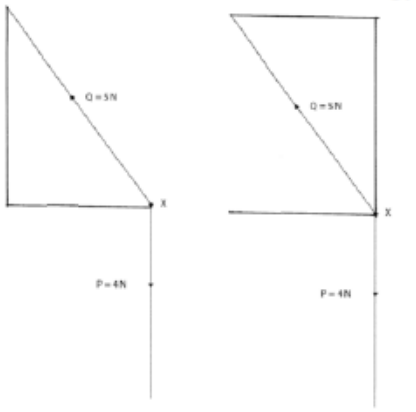
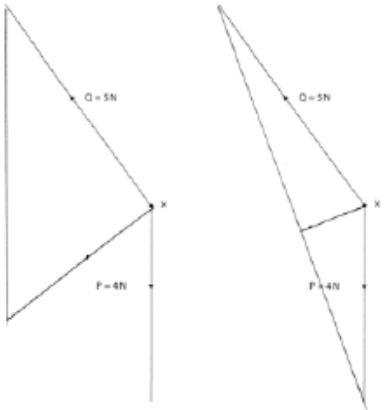
(**QU05b 1SC0/2PH, June 2025**)

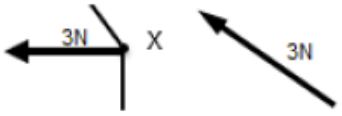
Q2.

Question number	Answer	Additional guidance	Mark
		independent marks	**(2)** **AO1**
	arrow (any length) (labelled R) in correct direction (judge by eye) (1)	 construction lines need not be shown arrow head must be present for MP1	
	(size of R =) 50N (1)	accept answers in range 48N to 52N obtained from scale drawing working need not be shown	

(**QU04c 1SC0/2PH, June 2023**)

Q3.

Question	Answer	Additional guidance	Mark
	correct direction (1) any size horizontal (judge by eye) arrow pointing left at point x  or  	if arrow missing or incorrect then allow attempt to find direction by construction of a suitable parallelogram or triangle e.g.  or  but not  	**(2)** **AO2**

	indication of size (1) drawn correctly, size judged by eye or any arrow labelled 3 (N) . Allow values between 2.5 and 3.5	independent mark  or  	

(**QU05c 1SC0/2PH, June 2025**)

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Q4.

Question number	Answer	Additional guidance	Mark
(i)	Recall GPE = m x g x Δh (1) Substitution = 400 x 9.8 x 1.5 (1) Evaluation = 5900 (J) (1) (which is nearly 6000 J)	 accept 5880 (J)	(3)

Question number	Answer	Additional guidance	Mark
(ii)	An explanation that combines identification – knowledge (1 mark) and reasoning (1 mark) • energy is dissipated/scattered (1) • into the surroundings (1)	 energy from a loss of ball's PE / its gain in KE ends up as (kinetic) energy of molecules (of ball / wall / air)	(2)

Question number	Answer	Mark
(iii)	B velocity	(1)

(**Q06a 1SC0/2PH/S2, SAM**)

Q5.

Question number	Answer	Additional guidance	Mark
	An answer that combines the following points of understanding to provide a logical description: named force (acting at a distance) (1) situation (1)	 e.g. magnetic force between two (magnetic) poles	(2)

(**Q05a 1SC0/2PF/S2, SAM**)

Q6.

Question number	Answer	Additional guidance	Mark
	An answer that combines the following points of understanding to provide a logical description: named force (acting at a distance) (1) situation (1)	 e.g. magnetic force between two (magnetic) poles	**(2)**

(**Q01a 1SC0/2PH/S2, SAM**)

Q7.

Question number	Answer	Additional guidance	Mark
	any **three** from	marks can be awarded from a correctly labelled diagram	**(3)** **AO1**
	magnetic **fields** interact (1)	magnets are in each other's magnetic **field**	
	(force due to) repulsion (between magnets) (1)	repel / push away	
	(repulsion) force upwards (on upper magnet) (1)		
	weight / gravitational force (downwards on upper magnet) (1)	accept gravity (acts downwards)	
	forces equal size / in equilibrium (1)	forces are balanced	
		ignore references to charge	

(**QU03b 1SC0/2PH, June 2023**)

Q8.

Question number	Answer	Additional guidance	Mark
	(upward) force increases with speed (1)	allow reverse argument	**(2)**
	relationship is non-linear (1)	changing rate / increases exponentially/ initially no upward force (until 1000 turns per minute)	

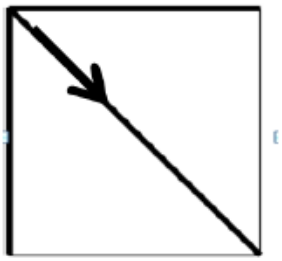
(**Q06a 1SC0/2PF, Nov 2020**)

Q9.

Question number	Answer	Additional guidance	Mark
	(upward) force increases with speed (1) relationship is non-linear (1)	allow reverse argument changing rate / increases exponentially/ initially no upward force (until 1000 turns per minute)	**(2)**

(**Q02a 1SC0/2PH, Nov 2020**)

Q10.

Question number	Answer	Additional guidance	Mark
	Scale drawing two lines at right angles (1) a correct scaling (for example 10kN equivalent to 1 cm) / a completed square or triangle(1) diagonal in correct direction (1) 28 kN (1)	 judge by eye accept answers from 25kN to 30 kN accept use of Pythagoras award full marks for correct answer without working.	**(4)**

(**Q06b 1SC0/2PH, Nov 2020**)

Q11.

Question number	Answer	Mark
(i)	• two vector arrows at rights angles representing the forces (1) • two vector arrows in proportion (1) examples: 	(2)

Question number	Answer	Additional guidance	Mark
(ii)	• drawing shows a completed triangle or parallelogram (1)  • Evaluation 3.6 N (1)	±0.2 N may be calculated using Pythagoras theorem	(2)

(**Q03d 1SC0/2PH/S2, SAM**)

Q12.

Question number	Indicative content	Mark
	Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive, and candidates are not required to include all the material which is indicated as relevant. Additional content included in the response must be scientific and relevant. A01 **Horizontal forces** • tension in the string/pull of the string • tension is one of the horizontal forces acting on the wooden block • friction between the table and the wooden block • friction acts in the opposite direction to the tension • friction opposes motion • the force due to friction is equal to the force provided by the tension • the forces are balanced /equal and opposite • no resultant force, so the block moves at a constant (horizontal) velocity **Vertical forces** • (normal) reaction (force) upwards between the table and the wooden block • contact force • weight of block downwards • the weight (force of gravity) and the (normal) reaction are equal and opposite / balanced • the block does not move up or down • tension caused by the force due to gravity on the weight • vertical forces on the block do not affect horizontal velocity. labels on the diagram should be considered when marking candidates do not have to indicate the forces as horizontal and vertical	**(6)**

Level	Mark	Descriptor
	0	• No rewardable material.
Level 1	1-2	• Demonstrates elements of physics understanding, some of which is inaccurate. Understanding of scientific ideas lacks detail. (AO1) • Presents an explanation with some structure and coherence. (AO1)
Level 2	3-4	• Demonstrates physics understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas is not fully detailed and/or developed. (AO1) • Presents an explanation that has a structure which is mostly clear, coherent and logical. (AO1)
Level 3	5-6	• Demonstrates accurate and relevant physics understanding throughout. Understanding of the scientific ideas is detailed and fully developed. (AO1) • Presents an explanation that has a well-developed structure which is clear, coherent and logical. (AO1)

Level	Mark	Additional Guidance	General additional guidance – the decision within levels e.g. - At each level, as well as content, the scientific coherency of what is stated will help place the answer at the top, or the bottom, of that level.
	0	No rewardable material.	
Level 1	1–2	Additional guidance Elements of physics present i.e. isolated knowledge of principles **two** unconnected statements from any section	Possible candidate responses contact force weight pulls block friction tension in string weight acts downward reaction
Level 2	3–4	Additional guidance Some knowledge of principles with a logical connection made in one section and statement from the other section OR Detailed knowledge of principles with logical connections made in one section	Possible candidate responses There is friction between the table and the block and this opposes motion weight of block acts downwards
Level 3	5–6	Additional guidance Detailed knowledge of principles with logical connections made in one section and statement from the other section	Possible candidate responses Friction and tension are equal and opposite there is no resultant /no acceleration The weight (of the block) and the(normal) reaction are equal and opposite

(**Q06c 1SC0/2PH, Nov 2020**)

Q13.

Question Number	Answer	Additional guidance	Mark
(i)	substitution with conversion (2) $(m =) \frac{4.1}{10 \times 0.26}$ (=1.58)	accept 9.8(1) instead of 10 for g throughout alternative method substitution and rearrangement with conversion (2) e.g. $\Delta gpe = 10 \times 0.26 \times 1.6$ (=4.1) Allow for 1 mark: $(m =) \frac{4.1}{10 \times 26}$ allow 26 to any power of 10 for this mark OR $\Delta gpe = 10 \times 26 \times 1.6$ allow 26 to any power of 10 for this mark OR height converted to m 0.26 (m) or 26×10^{-2} (m)	**(2)** **AO 2.1**

Question Number	Answer	Additional guidance	Mark
(ii)	substitution (1) $(v^2 =) \frac{2 \times 4.1}{1.6}$ evaluation of v^2 (1) 5.1(25) evaluation of v (1) 2.3 (m/s)	ecf from part a(i) throughout accept use of 1.58 accept 5.2 (use of 1.58) accept values that round to 2.3 e.g. 2.264 award full marks for the correct answer without working	**(3)** **AO2.1**

Question Number	Answer	Additional guidance	Mark
(iii)	addition of any lubricant / oil / grease	make runway steep(er) use an air track instead streamline trolley	(1) **AO 3.3b**

(**QU05a 1SC0/2PF, June 2025**)

Q14.

Question Number	Answer	Additional guidance	Mark
(i)	substitution with conversion (2) (m =) $\frac{4.1}{10 \times 0.26}$ (=1.58)	accept 9.8(1) instead of 10 for g throughout alternative method substitution and rearrangement with conversion (2) e.g. $\Delta gpe = 10 \times 0.26 \times 1.6$ (=4.1) Allow for 1 mark: (m =) $\frac{4.1}{10 \times 26}$ allow 26 to any power of 10 for this mark OR $\Delta gpe = 10 \times 26 \times 1.6$ allow 26 to any power of 10 for this mark OR height converted to m 0.26 (m) or 26×10^{-2} (m)	(2) **AO 2.1**

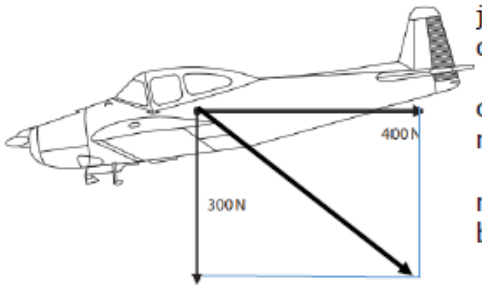
Question Number	Answer	Additional guidance	Mark
(ii)	substitution (1) $(v^2=)\ \frac{2 \times 4.1}{1.6}$ evaluation of v^2 (1) 5.1(25) evaluation of v (1) 2.3 (m/s)	ecf from part a(i) throughout accept use of 1.58 accept 5.2 (use of 1.58) accept values that round to 2.3 e.g. 2.264 award full marks for the correct answer without working	**(3)** **AO2.1**

Question Number	Answer	Additional guidance	Mark
(iii)	addition of any lubricant / oil / grease	make runway steep(er) use an air track instead streamline trolley	**(1)** **AO 3.3b**

(**QU01a 1SC0/2PH, June 2025**)

Q15.

Question Number:	Answer	Additional guidance	Mark
(i)	0.9 (k N) (1) up / upwards / ascending (1)	accept .9 or 0.90 north N ↑	**(2)** AO 3 2a AO 3 2b

Question Number:	Answer	Additional guidance	Mark
(ii)		judge length and direction by eye construction lines need not be shown magnitude need not be stated allow missing arrowhead if direction and length are correct reject answers which have any additional vectors drawn	**(1)** AO 3 2b

Question Number:	Answer	Additional Guidance	Mark
(iii)	recall and substitution (1) GPE = 750 x 10 x 1300 evaluation (1) (energy =) 9 800 000 (J)	 no POT error (could have missed out g) allow answers in standard form 9.8×10^6 allow answers that round to 9 800 000 e.g. 9 750 000 J allow 9800 kJ or 9.8MJ allow 9 555 000 J allow negative values award full marks for correct answer without working	**(2)** AO 2 1

(**Q10 1SC0/2PH, June 2018**)

Q16.

Question Number:	Answer	Mark
(i)	C gravitational **The only correct answer is C** ***A*** *is not correct as the moon does not touch the Earth* ***B*** *is not correct as the Earth does not carry a charge* ***D*** *is not correct as the Earth has a magnetic field but it does not extend far enough to have any effect on the moon*	**(1)** AO 2 1

Question Number:	Answer	Mark
(ii)	C energy **The only correct answer is C** ***A*** *is not correct as velocity is a vector quantity* ***B*** *is not correct as momentum is a vector quantity* ***D*** *is not correct as acceleration is a vector quantity*	**(1)** AO 1 1

(**Q09 1SC0/2PF, June 2018**)

Q17.

Question Number	Answer	Acceptable answers	Mark
(i)	force (1)	If than one word given then 0 marks.	**(1)**

Question Number	Answer	Acceptable answers	Mark
(ii)	B 0.07kg		**(1)**

Question Number	Answer	Acceptable answers	Mark
(iii)	Arrow pointing (vertically) upwards (1) Value of 1.2 (N) (written near to arrow) (1)	Marks are independent of each other	**(2)**

(**Q02 1SC0/2PH, June 2015**)

Q18.

Question number	Answer	Additional guidance	Mark
(i)	D R and S A, B and C are incorrect because the difference in vertical positions are all less than that shown by R and S		**(1)** **AO1**

Question number	Answer	Additional guidance	Mark
(ii)	recall (1) work done = force x distance substitution and evaluation (1) (work done =) 14,000 (J)	(work done) = 700 x 20 award full marks for the correct answer without working	**(2)** **AO1**

Question number	Answer	Additional guidance	Mark
(iii)	substitution (1) 11250 = m x 10 x 15 rearrangement and evaluation (1) (mass=) 75 (kg)	 award full marks for the correct answer without working. if no other marks scored then award 1 mark for answers of 0.013 (substitution mark using h = 15)	**(2)** **AO2**

Question number	Answer	Additional guidance	Mark
(iv)	An explanation linking some work is done to overcome friction/air resistance (1) energy is dissipated /transferred to the environment (1)	 allow energy is lost thermal energy	**(2)** **AO1**

Question number	Answer	Additional guidance	Mark
(v)	C increase the efficiency of the cyclist and bicycle A is incorrect because lubrication has no effect on work done against gravity B is incorrect because lubrication will increase efficiency D is incorrect because the overall energy transfer will not increase		**(1)** **AO1**

(**Q04a 1SC0/2PH, Nov 2021**)

Q19.

Question number	Answer	Mark
	An answer that combines points of interpretation/evaluation to provide a logical description: Use of lubrication / oil (1) To reduce friction (between parts) (1)	**(2)**

(**Q03a 1SC0/2PH/S2, SAM**)

Q20.

Question number	Answer	Mark
(i)	B	(1)

Question number	Answer	Mark
(ii)	vertical arrow, acting downward through the suitcase	(1)

(**Q03a 1SC0/2PF, SAM 2016**)

Q21.

Question number	Answer	Mark
	An explanation identifying the fact that the forces shown are acting on two different bodies / they are not acting on the same body (1)	(1)

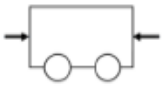
(**Q03c 1SC0/2PH/S2, SAM**)

Q22.

Question number	Answer	Mark
	C a javelin moves through the air after leaving an athlete's hand	(1)

(**Q03b 1SC0/2PH/S2, SAM**)

Q23.

Question number	Answer	Mark
	B  A, C and D are incorrect because they all show a resultant force which would cause the trolley to accelerate	**(1)**

(**Q06a 1SC0/2PH, Nov 2020**)

Q24.

Question number	Answer	Additional guidance	Mark
	D 6 N up A and C are incorrect because the force is upwards B is incorrect because the force is the sum of the two weights given.		**(1)** **AO3**

(**QU04b 1SC0/2PH, June 2023**)

Q25.

Question number	Answer	Additional guidance	Mark
(i)	An explanation that combines identification – application of knowledge (1 mark) and reasoning/justification – application of understanding (1 mark): • frictional forces increase as more trucks are added (1) Plus **one** from: • hence, in order to keep constant speed, the student must increase the force she applies to **Z** (1) • when **Y** and **Z** separate, the frictional forces (to the left) are more than magnetic attraction between **Y** and **Z** (1)		**(2)**

Question number	Answer	Mark
(ii)	An answer that combines the following points to provide a plan: • use of a Newton meter used horizontally (1) • record largest force observed (1) • repeat readings several times under same conditions (1)	**(3)**

Question number	Answer	Mark
(iii)	An explanation that combines identification – understanding (1 mark) and reasoning/justification – understanding (1 mark): • the applied force must be resolved horizontally to determine the force that separates the engine from the trucks • and since the (size of) the resolved force is always less than the (size of) the actual force then a larger force (applied at an angle) is needed to separate the trucks from the engine	**(2)**

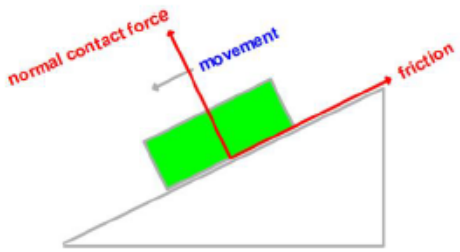
(**Q06c 1SC0/2PH, SAM 2016**)

Q26.

	Answer	Acceptable answers	Mark
(i)	B to the left ←		**(1)**
(ii)	A accelerating		**(1)**
(iii)	substitution 625 × 10 (1) Evaluation 6250 (N) (1)	625 × 9.8 6125 (N) give full marks for correct answer, no working	**(2)**

(**Q01 1SC0/2PH, Mar 2013**)

Q27.

Question number	Answer	Additional guidance	Mark
	• An arrow showing the 'normal contact force' - from between the two surfaces, acting upwards (1)	generally upwards / away from the surface	**(3)**
	• An arrow showing the 'friction' force – from between the two surfaces (1)	can be to the left or to the right	
	• Both forces in the correct directions, as shown (1) 	they do not need to start from the same point	

(**Q03e 1SC0/2PH/S2, SAM**)

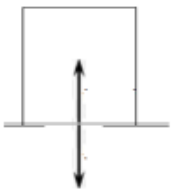
Q28.

Question Number:	Answer	Additional guidance	Mark
(i)	an explanation linking: wheel rubs on axle (as it rotates) OR friction (between the wheel and the axle) (1) causes heating/transfer of (thermal) energy/ work being done (1)	 allow generates heat	**(2)** AO 1 1

Question Number:	Answer	Additional guidance	Mark
(ii)	any one from: lubrication/oil (1) (ball) bearings / ball-race (1) go slower (1)	 anything that lubricates – grease etc.	**(1)** AO 1 1

(**Q11 1SC0/2PF, June 2018**)

Q29.

Question Number:	Answer	Additional guidance	Mark
	 arrowed line vertically downwards (anywhere) (1) same length as vertical arrow upwards (1)	 more than one line drawn 1 mark maximum judge by eye	**(2)** AO 1 1

(**Q10 1SC0/2PF, June 2018**)