PEARSON EDEXCEL GCSE PHYSICS (HIGHER) · 1PH0

PHYSICS



MARK SCHEME

TOPIC 9: FORCES AND THEIR EFFECTS (PACK 1)

SCORE	PERCENTAGE
/78	%

STEMUP

These questions belong to Pearson Edexcel, not to us.

The examination questions, mark schemes and examiner comments in this pack were written and published by Pearson Edexcel. They are past assessment materials, reproduced here so that students can revise from them.

What we do not own

STEMUP is not affiliated with Pearson Edexcel and does not own, and makes no claim to own, any of the question, mark scheme or examiner report material in this pack. Pearson Edexcel has not endorsed, approved or been involved in the production of it. Pearson Edexcel and the qualification titles used here belong to their respective owners and appear for identification only.

Where to find the originals

Pearson Edexcel publishes its past papers, mark schemes and examiner reports. Always check the current specification at qualifications.pearson.com before you revise, because content and wording can change between series.

If you hold the rights to any material in this pack and would like it amended or removed, contact admin@stemup.co.uk and we will act on it.

Mark Scheme

Q1.

Question number	Answer	Additional guidance	Mark
a	recall and substitution (1) (force x 12.0 =) 0.050 x 8.4 rearrangement (1) (force =) $\frac{0.050 \times 8.4}{12.0}$ evaluation (1) (force =) 0.035 (N)	allow substitution and rearrangement in either order award full marks for the correct answer without working. if no other marks scored then award 1 mark for answers that round to 29 (eg 28.57) (substitution mark)	**(3)** **AO2**

Question number	Answer	Additional guidance	Mark
b	a description to include **four** of the following measure the value of current (1) measure force or distance(1) vary the current (1) restore equilibrium of system (1) calculate ratio between force and current or distance and current (1) if ratio is the same then they are proportional (1)	 accept calculate for measure increase weight or move (existing) weight to new position plot a graph of force / distance against current graph would be a straight line (through the origin)	**(4)** **AO3**

Q2.

Question number	Answer	Additional guidance	Mark
	counting teeth on the pinion (1) evaluation (1) 1.6 (m)	allow between 18 and 22 inclusive 20 x 0.08 ecf number of teeth answer in range 1.44 to 1.76 scores 2 marks award full marks for the correct answer without working power of 10 error scores 1 mark maximum	**(2)** **AO3.1**

Q3.

Question number	Answer	Additional guidance	Mark
	any correct moment (1) 450 x 0.50 or 225 or 0.80 x F_2 substitution into prin. of moment equation (1) 450 x 0.50 = 0.80 x F_2 evaluation (1) 280 (N) (for question at end)	 allow 450 x 0.3 moment taken about B allow statement of prin. of moments accept numbers which round to 280 such as 281.25 award full marks for correct answer without working.	**(3)**

Q4.

Question Number	Answer	Additional guidance	Mark
(i)	(In every second), distance moved by chain around large gear = distance moved by chain around small gear (1) 2 x 48 = turns x 12 rearrangement and evaluation (1) 8 (turns each second)	accept use of gear ratio seen or implied e.g. 4:1 or 4/1 or 48:12 or 48/12 or converse e.g. 1:4 award full marks for the correct answer without working	**(2)**

Question Number	Answer	Additional guidance	Mark
(ii)	An explanation linking reduces friction/amount of thermal energy transferred (1) extra useful energy is available/less input energy is required (1) efficiency = useful energy transferred (by the bicycle) ÷ total energy supplied (to the bicycle) (1)	 (oil provides) lubrication less energy wasted allow for the last **two** mark points; **either** less input energy is required to produce the same output for **2** marks **or** more output energy is available for the same input energy for **2** marks	**(3)**

Q5.

Question number	Answer	Additional guidance	Mark
(i)	substitution and rearrangement (1) (force = $\frac{\text{moment}}{\text{distance}}$) = $\frac{0.6}{3(\times 10^{-1})}$ evaluation (1) 2(.0) (N)	 reject 0.6 x 3 = 1.8 award full marks for the correct answer without working ignore significant figures 2(.0) to any other power of ten scores 1 mark maximum	**(2)** **AO2.1**

Question number	Answer	Additional guidance	Mark
(ii)	 correct calculation of one moment (1) correct calculation of second moment and adding of moments seen (1)	**show that** question either 2x0.1 or 1x0.5 seen 2(.0)x0.1(0) + 1(.0)x0.5 scores 2 marks 0.2+0.5 scores 2 marks accept calculations in alternative units (e.g. N cm) if correct conversion(s) seen if no other marks scored, the addition of two other moments can score 1 mark maximum	**(2)** **AO2.1**

Question number	Answer	Additional guidance	Mark
(iii)	explanation linking **three** from: **{sum** of / **total }** clockwise moments = **{sum** of / **total }** anticlockwise moments (1) for a system in equilibrium / balance (1) clockwise and anticlockwise moments compared (1) **so** rod not in equilibrium (1)	about the same point / about a point e.g. clockwise moment > anticlockwise moment or reverse argument 0.7 > 0.6 0.7 ≠ 0.6 rod will **rotate clockwise** MP4 can only be scored if MP3 awarded	**(3)** **AO3.2**

Q6.

Question Number:	Answer	Additional Guidance	Mark
	recall clockwise moment = anticlockwise moment (1) moment = force x (perpendicular) distance (1) substitution (1) $m \times 17 = (6 \times 15) + (4.6 \times 10)$ rearrangement and evaluation (1) m = 8.0 (g)	calculations need not include g (which cancels out from all terms) substitution and rearrangement in either order $m \times 17 = 90+46$ $m = \frac{(6\times15)+(4.6\times10)}{17}$ $m = 136/ 17$ award full marks for correct answer without working	**(4)** AO 1 1 AO 2 1

Q7.

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)**

Q8.

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)**

Q9.

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)**

Q10.

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)**

Q11.

Question number	Answer	Additional guidance	Mark
	move the (position of) the (0.050 N) weight (1) to the other side of the pivot/3.6 cm from the magnet (1)	adjust mass of modelling clay reduce (mass of modelling clay) by taking some away add (additional) weight between pivot and magnet scores 2 marks	**(2)** **AO3**

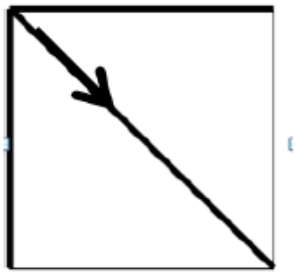
Q12.

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)**

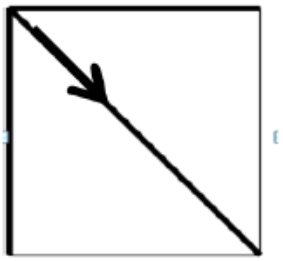
Q13.

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)**

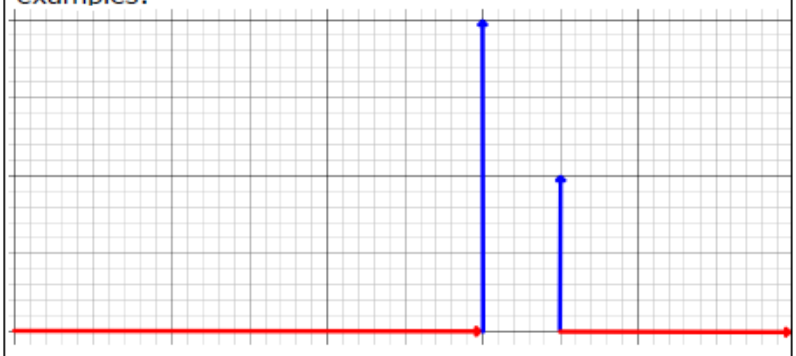
Q14.

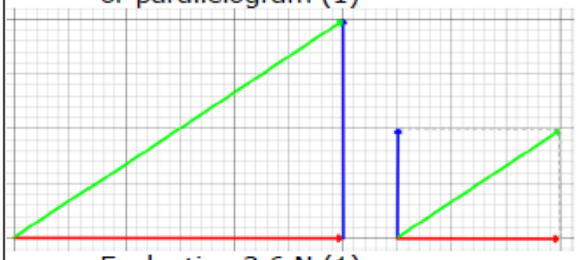
Question number	Answer	Additional guidance	Mark
	Scale drawing two lines at right angles (1) a correct scaling (for example 10kN equivalent to 1 cm) / a completed square or triangle(1) diagonal in correct direction (1) 28 kN (1)	 judge by eye accept answers from 25 kN to 30 kN accept use of Pythagoras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

Q15.

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)**

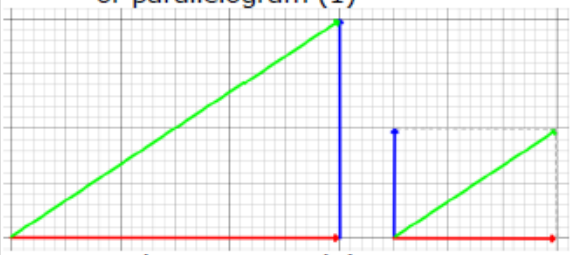
Q16.

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)

Q17.

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)

Q18.

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	(6)

	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	

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

Q19.

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