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EDEXCEL COMBINED SCIENCE PHYSICS: QUESTIONS BY TOPIC

Forces and Their Effects (9)

Combined Science Physics (Foundation) Topic 9

2 questions · 24 marks · Mark schemes included

Pearson Edexcel Combined Science (9-1) Physics 1SC0, Foundation Tier, June 2018 - June 2025

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HOW TO USE THIS BOOKLET

Questions run from the lowest mark tariff to the highest, so similar questions sit together.

Click any row below to jump straight to that question.

On every question page, click ANSWER in the top-right corner to jump to its mark scheme.

Diagrams, graphs, tables and data are printed exactly as they appeared in the original papers.

QUESTION	SOURCE	MARKS	PAGE
1. Q3	Paper 2 June 2018	11	4
2. Q6	Paper 2 November 2020	13	8



QUESTIONS

2 questions · 24 marks · lowest tariff first



11-MARK QUESTIONS

1 question in this booklet



3 (a) (i) Which of these forces keeps the Moon moving around the Earth?

(1)

- ☒ A contact
- ☒ B electrostatic
- ☒ C gravitational
- ☒ D magnetic

(ii) Which of these is a scalar quantity?

(1)

- ☒ A velocity
- ☒ B momentum
- ☒ C energy
- ☒ D acceleration

(b) Figure 4 shows a box at rest on a floor.

The force that the floor exerts on the box is shown by the vector in Figure 4.

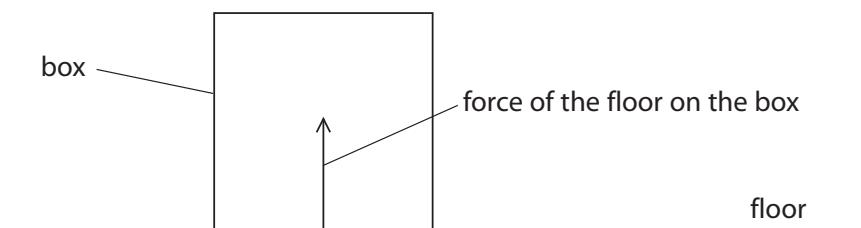


Figure 4

Add another vector to the diagram in Figure 4 to show the weight of the box.

(2)

(c) Figure 5 shows part of a cart.

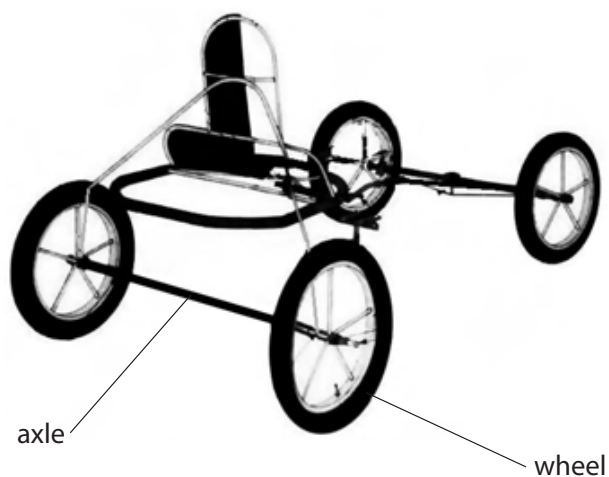


Figure 5

When the wheels turn the axles become warm.

(i) Explain why the axles become warm when the wheels turn.

(2)

.....

.....

.....

.....

(ii) Give **one** way of reducing the heating of the axles when the wheels turn.

(1)

.....

.....

- (d) (i) Complete the equation that relates efficiency, useful energy transferred by a device and total energy supplied to the device.

(1)

efficiency = _____

- (ii) In one second an engine has a total energy input of 7500 J.

In one second 3200 J is transferred to the surroundings as wasted energy.

Calculate the useful energy transferred by the engine.

(1)

useful energy transferred = ... J

- (iii) Calculate the efficiency of this engine.

(2)

efficiency of the engine = ...

(Total for Question 3 = 11 marks)

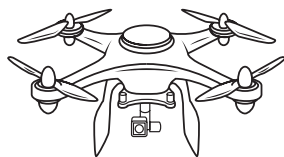


13-MARK QUESTIONS

1 question in this booklet



6 (a) Figure 13 shows a drone.



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Figure 13

The drone has four spinning blades.

The upward force produced enables the drone to rise in the air.

The speed at which the blades spin is measured in turns per minute.

Figure 14 shows how the upward force produced by the four blades depends on the speed at which the blades spin.

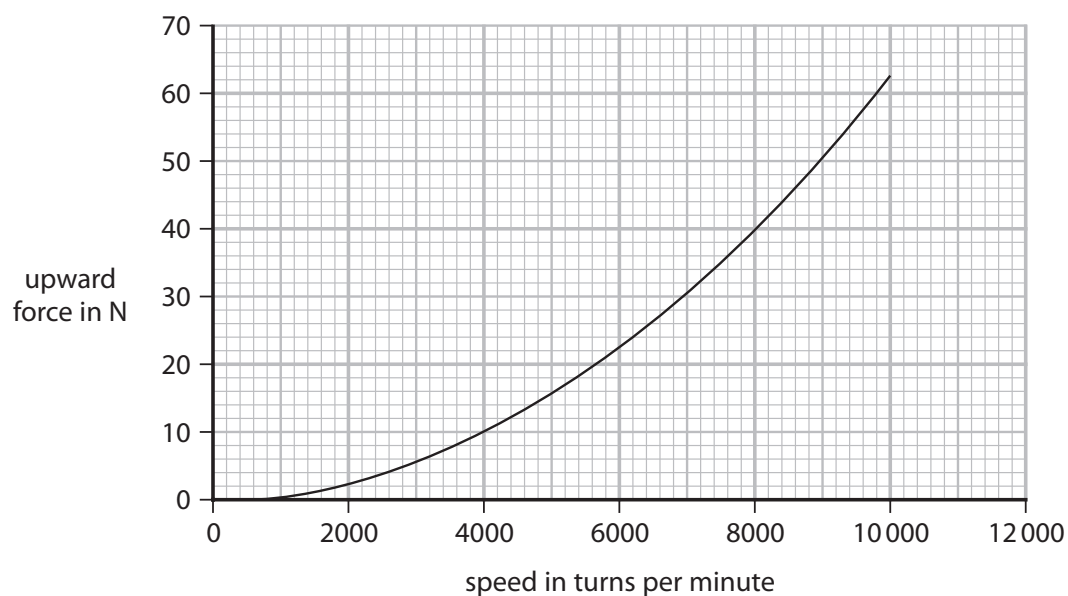


Figure 14

Describe the relationship between upward force and speed shown by this graph.

(2)

.....

.....

.....

.....

- (b) A different drone has a mass of 4.5 kg.

This drone rises from the ground to a height of 20 m.

- (i) Calculate the change in gravitational potential energy when the drone rises through a height of 20 m.

The gravitational field strength $g = 10 \text{ N/kg}$.

(2)

change in gravitational potential energy = ... J

- (ii) State the amount of useful work done by the blades as the drone rises through 20 m.

(1)

useful work done = ... J

- (iii) It takes 4 s for the drone to rise through 20 m.

Calculate the useful power developed by the blades in this time of 4 s.

(2)

useful power developed = ... W



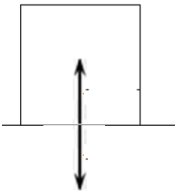
MARK SCHEMES

official Pearson Edexcel mark schemes



Question Number:	Answer	Mark
3(a)(i)	C gravitational The only correct answer is C <i>A is not correct as the moon does not touch the Earth</i> <i>B is not correct as the Earth does not carry a charge</i> <i>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</i>	(1) AO 2 1

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

Question Number:	Answer	Additional guidance	Mark
3(b)	 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

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

Question Number:	Answer	Mark
3(d)(i)	efficiency = $\frac{\text{useful (energy transferred by the device)}}{\text{total (energy supplied to the device)}} \times 100$	(1) AO 1 1

Question Number:	Answer	Additional guidance	Mark
3(d)(ii)	determine useful energy (1) $7500 - 3200 = 4300$		(1) AO 2 1

Question Number:	Answer	Additional guidance	Mark
3(d)(iii)	substitution (1) efficiency = $\frac{4300}{7500}$ evaluation (1) 0.57	allow ECF from (i) and/ or (ii) for 1 mark maximum accept 57(.33)(%), 0.6, 60(%) award full marks for the correct answer without working	(2) AO 2 1

(Total for Question 3 = 11 marks)



Question number	Answer	Additional guidance	Mark
6 (a)	(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)

Question number	Answer	Additional guidance	Mark
6 (bi)	recall and substitution into (1) $\text{gpe} = m \times g \times h$ $(\text{gpe}) = 4.5 \times 10 \times 20$ evaluation (1) 900(J)	allow 90(J) for 1 mark award full marks for the correct answer without working	(2)

Question number	Answer	Additional guidance	Mark
6bii	900(J)	allow ecf from bi	(1)

Question number	Answer	Additional guidance	Mark
6biii	recall and substitution (1) power = work done / time taken $(\text{power} =) 900 / 4$ evaluation (1) 200 (W)	allow ecf from bi or bii 230(W) 225(W) award full marks for the correct answer without working	(2)

Question number	Indicative content	Mark
*6(c)	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. • Chemical energy stored in battery • Transferred to KE in motors • Transferred to GPE as it rises • Thermal energy wasted (at each stage) • Energy transferred to surroundings (at each stage)	(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)



Summary for guidance

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	<u>Additional guidance</u> Isolated fact e.g. a description of least one energy store or interpretation of diagram without mentioning energy stores or types	<u>Possible candidate responses</u> Chemical energy stored in the battery or energy transferred from the battery to the motors and then to the blades. Some energy is lost at each stage.
Level 2	3–4	<u>Additional guidance</u> Description of at least one energy transfer	<u>Possible candidate responses</u> KE (of blades) is transferred to GPE (as the drone rises) or (thermal) energy is transferred to the surroundings
Level 3	5–6	<u>Additional guidance</u> Description of two or more energy transfers	<u>Possible candidate responses</u> Chemical energy in the battery is transferred to KE of the blades AND Thermal energy is wasted in the motors when they turn.

Question 6 = 13 marks

