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EDEXCEL COMBINED SCIENCE PHYSICS: QUESTIONS BY TOPIC

Electromagnetic Induction (13)

Combined Science Physics (Higher) Topic 13

1 questions · 11 marks · Mark schemes included

Pearson Edexcel Combined Science (9-1) Physics 1SC0, Higher 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. Q5 <i>also Topic 8</i>	Paper 2 June 2023	11	4



QUESTIONS

1 questions · 11 marks · lowest tariff first



11-MARK QUESTIONS

1 question in this booklet



- 5 (a) An electric car is travelling at a speed of 16.0 m/s .

The total mass of the car is 1200 kg .

- (i) Calculate the kinetic energy, in kJ , of the car.

(2)

kinetic energy = ... kJ

- (ii) On a journey, the car transfers energy from the battery at an average rate of 17.5 kW .

The battery in the car transfers a total of 126 MJ of energy before it becomes discharged.

Calculate the time taken for the battery to become discharged on this journey.

Give your answer in hours.

(2)

time taken = ... hours



- (iii) Figure 10 shows an electrical device connected to the wheels of an electric car.

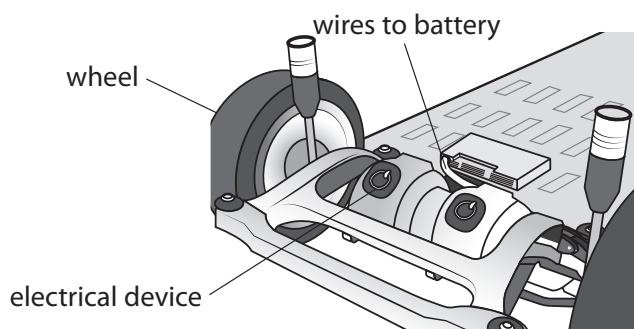


Figure 10

The electrical device is used as a motor when the car accelerates and as a dynamo when the car decelerates.

Explain how using the device can help to increase the time that the car can be driven before the battery becomes discharged.

(2)

.....

.....

.....

.....

- (b) The battery can be recharged at a charging point.

The charging point provides an average current of 15.0 A to the battery, at a potential difference (voltage) of 400 V.

It is claimed that 126 MJ of energy can be transferred to the battery in less than 6 hours.

- (i) Comment on this claim.

Use this equation to support your answer

$$t = \frac{E}{I \times V} \quad (3)$$

- (ii) Calculate the total charge that moves into the battery while it is being recharged.

Use the equation

$$E = Q \times V \quad (2)$$

charge = ... C

(Total for Question 5 = 11 marks)



MARK SCHEMES

official Pearson Edexcel mark schemes



Question number	Answer	Additional guidance	Mark
5 (a) (i)	selection and substitution (1) (KE =) $\frac{1}{2} \times 1200 \times 16(.0)^2$ evaluation in kJ (1) (KE =) 150 (kJ)	(KE =) $\frac{1}{2} \times 1200 \times 16(.0)^2 \times 10^{-3}$ accept any value that rounds to 150 e.g. 153.6 award full marks for correct answer without working. award 1 mark for 153.6 or 150 to any other power of ten	(2) AO2

Question number	Answer	Additional guidance	Mark
5 (a) (ii)	selection and substitution (1) $17.5 (x 10^3) = \frac{126 (x 10^6)}{t}$ re-arrangement and evaluation (1) (t=) 2(.0) (h)	alternative method selection and rearrangement (1) (t =) $\frac{E(nergy)}{P(ower)}$ or (t=) $\frac{126 (x 10^6)}{17.5 (x 10^3)}$ (substitution and) evaluation (1) (t=) 2(.0) (h) award full marks for correct answer without working. allow 1 mark for 7(.2) to any power of ten (incorrect time conversion) allow 1 mark for 2(.0) to any power of 10 (POT error)	(2) AO2



Question number	Answer	Additional guidance	Mark
5 (a) (iii)	an explanation linking (energy transfers when the car is decelerating) (from) kinetic energy (store) (1) (to) chemical energy (store) (1)	idea of energy that would be otherwise wasted uses an electrical pathway {electric current / electricity / emf} produced allow mechanical for kinetic in this context recharges battery increases available energy store of battery more useful energy available	(2) AO2

Question number	Answer	Additional guidance	Mark
5(b) (i)	either calculation of time: substitution (1) $(t =) \frac{126 \times 10^6}{15 \times 400 \times 3600}$ evaluation (1) (t=) 5.8(3) (h) conclusion (1) claim is justified as the time is less (than 6 hours) or calculation of energy: substitution (1) $6 \times 3600 = \frac{E}{15 \times 400}$ rearrangement and evaluation (1) E = 130 MJ conclusion (1) claim is justified as energy (in 6 hours) is more than (126 MJ) required.	accept correct time conversion e.g. 5h 50 min 350 min 21 000 s award 2 marks for correct answer without working. award 1 mark for answer of either 2.1 or 5.8(3) to any other power of ten allow relevant comment based on incorrectly calculated time (independent mark) accept 129.6 MJ accept 129 600 000 J allow relevant comment based on incorrectly calculated energy (independent mark)	(3) AO3



Question number	Answer	Additional guidance	Mark
5 (b) (ii)	substitution (1) $126 (\times 10^6) = Q \times 400$ re-arrangement and evaluation (1) $(Q =) 315\,000 \text{ (coulombs)}$	alternative method re-arrangement (1) $(Q =) \frac{E}{V}$ or $(Q =) \frac{126 (\times 10^6)}{400}$ (substitution and) evaluation (1) $(Q =) 315\,000 \text{ (coulombs)}$ accept answers rounding to 320 000 (coulombs) allow one mark for answers rounding to 3.2 to any other power of ten award two marks for correct answer without working.	(2) AO2

Total 11 marks