Mark Scheme (Standardisation)

Summer 2017

Pearson Edexcel GCSE

In Physics (5PH2H) Paper 2H

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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.
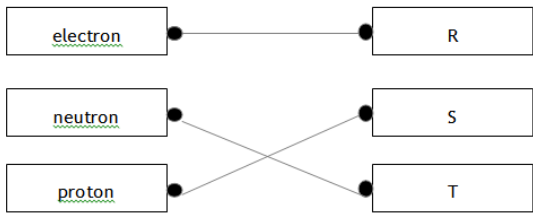
Question number	Answer	Acceptable answers	Marks
1 (a) (i)	**A** a turbine and a generator **The only correct answer is A** **B** is not correct because a moderator does not produce thermal energy and a turbine produces kinetic energy **C** is not correct because a moderator does not produce thermal energy **D** is not correct because a transformer does not produce electrical energy from kinetic energy		**(2)**

Question number	Answer	Acceptable answers	Marks
1 (a) (ii)	One mark for each correct line Neutron(s) (1) Daughter nucleus/nuclei (1) (Thermal)Energy (1)	 barium / krypton / two <u>smaller</u> nuclei/isotopes Award 2 marks for Barium AND Krypton on separate lines Em/ γ radiation Mark each line independently. Correct answers may appear in any order.	 **(3)**

Question number	Answer	Acceptable answers	Marks
1 (a) (iii)	A description including Neutron (released from fission) (1) Collides with a (further) U-235/nucleus (1)		(2)

Question number	Answer	Acceptable answers	Marks
1 (b)	An explanation linking Large <u>kinetic</u> energy required (1) To overcome (electrostatic) repulsion (1)	High (collision) speed required <u>very</u> high temperature	(2)

(Total for Question 1 = 8 marks)

Question number	Answer	Acceptable answers	Marks
2 (a) (i)	 Allow 1 mark for one correct line only		(2)

Question number	Answer	Acceptable answers	Marks
2 (b)	**C** negative charge flows towards the positive terminal of the battery **The only correct answer is C** **A** is not correct because positive charge does not flow **B** is not correct because positive charge does not flow **D** is not correct because negative charge would be repelled by the negative terminal of the battery		(1)

Question number	Answer	Acceptable answers	Marks
2 (c) (i)	An explanation linking Electrons/**negative charges** move / transferred (1) From PET to PVC (1)	PET loses electrons PVC gains electrons	(2)

Question number	Answer	Acceptable answers	Marks
2 (c) (ii)	An explanation linking (Force of) attraction (1) Between opposite charges (1)	PVC is attracted to positive charge for 2 marks	**(2)**

Question number	Answer	Acceptable answers	Marks
2 (c) (iii)	A suggestion to include discharge {chips/drum/bins} (1)	To prevent a build up of charge/sparking/shock	**(1)**

(Total for Question 2 = 8 marks)

Question number	Answer	Acceptable answers	Marks
3 (a)	Substitution (1) 13 = 29 ÷ t Rearrangement and Evaluation (1) 2.2 (s)	t = 29 ÷ 13 Values which round to 2.2 e.g. 2.23076 Allow correct value with no working shown for 2 marks	**(2)**

Question number	Answer	Acceptable answers	Marks
3 (b)	A suggestion to include any two of gravitational potential energy (GPE) energy is transferred {to Kinetic energy (KE)} / {between cabins} (1) The gravitational potential energy (GPE) of descending/top cabin decreases (1) (transferred into/ increases) KE/GPE of bottom cabin (1)		**(2)**

Question number	Answer	Acceptable answers	Marks
3 (c) (i)	510 000 (J)	510 kJ	**(1)**

Question number	Answer	Acceptable answers	Marks
3 (c) (ii)	Substitution 510 000 = ½ x 1400 x v^2 (1) Transposition v^2 = 2 x 510 000 / 1400 (1) Evaluation (v =) 27 (m/s) (1)	Allow ECF from ci v = √730 for 2 marks Values which round to 27 e.g. 26.992 Allow correct value with no working shown for 3 marks	**(3)**

Question number	Answer	Acceptable answers	Marks
3 (c) (iii)	Substitution 510 000 = 15 000 x d (1) Transposition and evaluation (d =) 34 (m) (1)	 Allow correct value with no working shown for 2 marks	**(2)**

(Total for Question 3 = 9 marks)

Question number	Answer	Acceptable answers	Marks
4 (a) (i)	**A** 1.5 joules per coulomb **The only correct answer is A** **B** is not correct because one volt is not equivalent to one joule per ohm **C** is not correct because one volt is not equivalent to one amp per coulomb **D** is not correct because one volt is not equivalent to one volt per joule		**(1)**

Question number	Answer	Acceptable answers	Marks
4 (a) (ii)	An ammeter connected in series with lamp and power supply (1)	Ignore line through symbol	**(1)**

Question number	Answer		Acceptable answers	Marks
4 (a) (iii)	Substitution 1.5 = 0.18 x R	(1)	Substitution and transposition can be in either order	
	Transposition R = 1.5/0.18	(1)		
	Evaluation 8.3 (ohms)	(1)	Give full marks for correct answer with no working shown	**(3)**

Question number	Answer	Acceptable answers	Marks
4 (b) (i)	Substitution (P =) 12 (v) x 800 (mA) (1) Unit conversion and evaluation 9.6 (W) (1)	Ignore unit conversion until evaluation stage 9600 <u>mW</u> Give full marks for correct answer with no working shown Allow 1 mark for POT error even with no working shown	**(2)**

Question number	Answer	Acceptable answers	Marks
4 (b) (ii)	An explanation to include In the 6V circuit…. Resistance (in the circuit) has changed (1) Temperature of filament is lower / Fewer collisions (in the lattice) (1) Current is more than 400 mA (conditional on first MP) OR Current is not proportional to voltage (1)	Reverse argument for 12V circuit Bulb/lamp is less bright Current is more than 0.4 A/ expected	**(3)**

(Total for Question 4 = 11 marks)

Question number	Answer	Acceptable answers	Marks
5 (a)	**B** 8.0 kg **The only correct answer is B** **A** is not correct because 0.8 kg has a weight of 8 N **C** is not correct because 80 kg has a weight of 800N **D** is not correct because 800 kg has a weight of 8,000 N		**(1)**

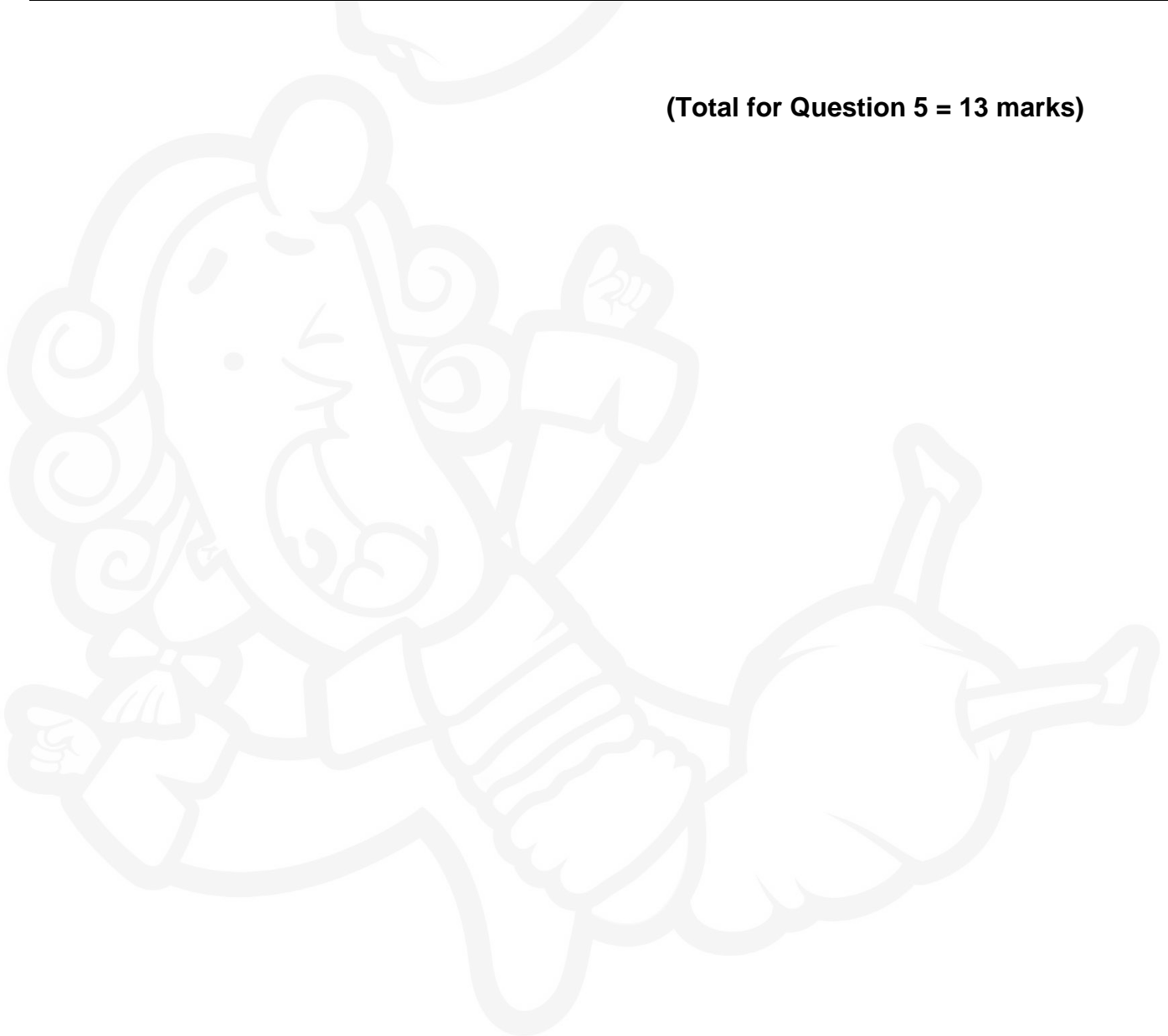| Question number	Answer	Acceptable answers	Marks
5 (b)	Substitution $10 = v / 1.2$ 　　　　　　　　(1) Transposition $V = 10 \times 1.2$ 　　　　　　　　(1) Evaluation 12 (m/s) 　　　　　　　　(1)	Transposition and substitution can be in either order Give full marks for correct answer with no working shown	**(3)**

Question number	Answer	Acceptable answers	Marks
5 (c)	**B** 25 N upwards **The only correct answer is B** **A** is not correct because although the value of 25N is correct, it is in the wrong direction **C** is not correct because the forces must be subtracted from each other **D** is not correct because the forces must be subtracted from each other		**(1)**

Question number	Answer	Acceptable answers	Marks
5 (d) (i)	a description to include air resistance / drag increases with (increase in) velocity (1) relationship is non-linear (1)	positive correlation increases more for higher velocities not (directly) proportional rate of change/ gradient changes	**(2)**

Question Number		Indicative Content	Mark
QWC	***5dii**	An explanation to include some of the following points at some different stages during the decent • Initially downward acceleration • initially only gravitational force acting • initial downwards resultant force • downward acceleration decreases because.. • air resistance increases with speed • reduces resultant force • possibly the gravitational and air resistance forces balance/ become equal • zero resultant force • reaches terminal velocity • when parachute opens air resistance provides upwards force • relevant numerical values from graph / diagram • to start with, air resistance is very large • so large upward resultant force • causes velocity of parcel to decrease • eventually air resistance = weight of food parcel • no resultant force • reached terminal velocity • hits ground with terminal velocity • this will be 9.6 m/s Credit can be gained from points made on labelled diagram or graph	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• A limited explanation which refers to the change in velocity in at least 2 stages OR which links the change in velocity in one stage with a resultant force which cause this change. e.g. before the parachute opens the parcel accelerates; after the parachute opens the parcel reaches terminal velocity • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	

2	**3- 4**	• A simple explanation which refers to the change in velocity in at least
		  2 stages and links this with the forces causing the change in one of those stages
		  e.g. before the parachute opens the parcel accelerates; after the	

		parachute opens the parcel reaches terminal velocity because air resistance is equal to weight • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy
3	5- 6	• A detailed explanation linking the change in velocity with the forces causing this for at least 2 stages e.g. after the parachute opens air resistance is greater than the weight so it slows down. Eventually it reaches terminal velocity when the air resistance and weight are equal and so resultant force is zero • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors

(Total for Question 5 = 13 marks)

Question number	Answer	Acceptable answers	Marks
6 (a) (i)	(nuclei) having the same number of protons but different number of neutrons	Same atomic number but different mass number Same element but different number of neutrons	(1)

Question number	Answer	Acceptable answers	Marks
6 (a) (ii)	A comparison linking • Activity of thorium is lower (1) Linked to **one** of • thorium decays more slowly (1) • half-life of thorium is longer (1) • takes longer for the same number of thorium atoms to decay (1) • the rate of decay for thorium is less than the rate of decay of radium (1)	Reverse argument for radium	(2)

Question number	Answer	Acceptable answers	Marks
6 (a) (iii)	B is highly ionising **The only correct answer is B** **A** is not correct because alpha radiation cannot penetrate aluminium **C** is not correct because alpha radiation consists of particle, not electromagnetic radiation **D** is not correct because alpha radiation has a positive charge		**(1)**

Question number	Answer	Acceptable answers	Marks
6 (b) (i)	**C** we understand more about the effects of radiation **The only correct answer is C** **A** is not correct because better measurement of half-life does not give information about the hazards of radiation **B** is not correct because radioactivity decreases with time. **D** is not correct because training of doctors does not have any bearing on laws dealing with the hazards of radioactive materials.		**(1)**

Question Number		Indicative Content	Mark
QWC	*6bii	A discussion to include some of the following points Possible hazards • thorium is radioactive/ emits alpha radiation • alpha radiation is highly ionising • radiation can damage DNA / cause cancer Factors reducing risk • alpha stopped by tube • so radiation from toothpaste in tube unlikely to affect people • thorium has low activity • only small amount of thorium Factors increasing risk • radium has high activity • if ingested then alpha almost certain to reach cells • radon released (when tube is opened / left open) • radon has a very high activity / very short half-life/ high chance of decay while in the body • valid environmental considerations e.g. waste toothpaste	**(6)**
Level	**0**	No rewardable content	
1	1 - 2	• A limited discussion of the dangers which might include some of the hazards e.g. The alpha radiation from the toothpaste is ionising and can cause cancer. • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	3- 4	• A simple discussion of the dangers including some of the hazards and factors increasing OR reducing risk e.g. The ionising radiation from the toothpaste could cause cancer in people using because when it is inside your body, the alpha radiation can cause mutations of cells • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	5 - 6	• A detailed discussion of the dangers including most of the hazards and the factors affecting the balance of risk e.g. The ionising radiation from the toothpaste could cause cancer in people using because when it is inside your body, the alpha radiation can cause mutations of cells. However, while it is in the tube, the alpha radiation could not escape and so the toothpaste is not very dangerous. • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

(Total for Question 6 = 11 marks)