Pearson Edexcel

Mark Scheme

Summer 2020

GCSE to A level Physics

Transition exam

Question Number	Answer	Additional guidance	Mark
1 (a) (i)	6 (m/s)		**(1)**

Question Number	Answer	Additional guidance	Mark
1 (a) (ii)	10 (s)		**(1)**

Question Number	Answer	Additional guidance	Mark
1 (b) (i)	Acceleration = **change in** velocity / time (taken)	allow accepted symbols	**(1)**

Question Number	Answer	Additional guidance	Mark
1(b)(ii)	substitution (1) (a =) 12/10 evaluation (1) 1.2 unit (1) m/s^2	 award 2 marks for correct answer without working ms^{-2} condone m/s/s	**(3)**

Question Number	Answer	Additional guidance	Mark
1(c)(i)	(average) speed = distance (moved) / time (taken)	allow accepted symbols	**(1)**

Question Number	Answer	Additional guidance	Mark
1(c)(ii)	substitution (1) (speed =) 390 ÷ 60 evaluation (1) 6.5 (m/s)	 award full marks for correct answer without working	**(2)**

Question Number	Answer	Additional guidance	Mark
1(d)	idea that distance is given by **area** under the graph (1) **comparison** of the two *areas (by eye or by calculation)* (1)	ignore steepness of lines, velocity, acceleration, width A statement such as The first 30s area is larger than the last 30s. scores both marks	**(2)**

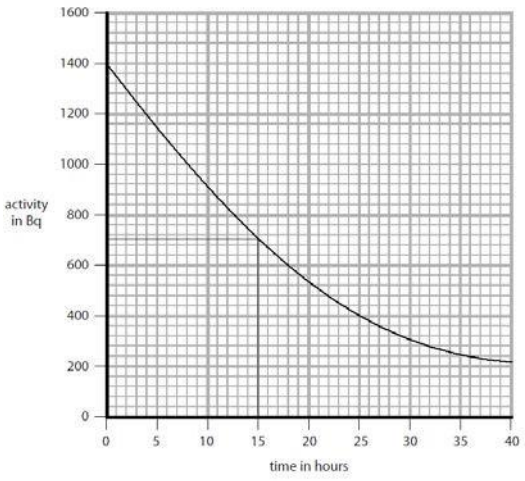
Total for Question 1 = 11 marks

Question Number	Answer	Additional guidance	Mark
2 (a)	(atoms / nuclei with the) same number of protons (1) different numbers of neutrons (1)	atomic number nucleon number, atomic mass, mass number ignore electrons / element	**(2)**

Question Number	Answer	Additional guidance	Mark
2 (b) (i)	electron(s) (1)	e^- or e^+ ignore properties of electrons e.g. speed	**(1)**

Question Number	Answer	Additional guidance	Mark
2(b)(ii)	Geiger(-Muller) tube/detector/counter	phonetic/incorrect spelling accept photographic film, zinc sulphide, gold leaf electroscope	**(1)**

Question Number	Answer	Additional guidance	Mark
2 (b)(iii)	beta penetrates paper(1) beta absorbed/stopped by lead and/or aluminium (1)	ignore all details of experimental setup do not accept bounced back for absorbed	**(2)**

Question Number	Answer	Additional guidance	Mark
2 (c)	line goes through 0,1400 and (first half-life plotted at) 15, 700 (1) line goes through/second half-life plotted at 30, 350 (1) a correctly **curved line** between 15 and 30 hours AND the line extends beyond 35 hours (1) example for full marks  	allow tolerance of +/- 1 square on the points throughout allow ecf from incorrect first half-life to 'correct' second half-life e.g. 800---400 ignore a *slight* upcurve at 35 to 40 hours ignore bar charts	**(3)**

Total for Question 2 = 9 marks

Question Number	Answer	Additional guidance	Mark
3(a)	substitution (1) (work =) 9500 x 10 X 18 evaluation (1) 1 710 000 (J) (1)	 1 710 kJ award full marks for correct answer without working allow 1 mark for evaluation of 2 375 000 (arising from using 25m for distance)	**(2)**

Question Number	Answer	Additional guidance	Mark
3 (b)	1 710 000 J (1)	allow ecf from 3 a	**(1)**

Question Number	Answer	Additional guidance	Mark
3 (c)	A description to include An energy transfer involving (gravitational) **potential energy** and **kinetic energy** (1) Correct direction of that transfer, i.e. potential energy increases / kinetic energy decreases (from C to D) (1) second mark point is dependent on first	 ignore heat / sound energy accept kinetic energy is transferred into potential energy for both marks	**(2)**

Question Number	Answer	Additional guidance	Mark
3(d)	substitution(1) 150 000 = 9 500 x v rearrangement(1) (v =)150 000 / 9 500 evaluation (1) 16 (m/s)	substitution and rearrangement can be in either order answers that round to 16 such as 15.8, 15.79 etc award full marks for correct answer without working	**(3)**

Question Number	Answer	Additional guidance	Mark
3(e)	An explanation linking any **two** from **EITHER** (larger distance) allows more time to stop (1) smaller rate of change of momentum / velocity (1) smaller force (on passengers) (1) **OR** Use of work done = force x distance (1) smaller force (on passengers) (1) to do work (required to bring car to a stop) (1)	slow down gradually owtte Note: takes "longer" without reference to time gets no credit for first MP(repeat of stem)	**(2)**

Total for Question 3 = 10 marks

Question Number	Answer	Additional guidance	Mark
4(a)(i)	any pair of coordinates selected from the line (1) value in range 0.6(0) to 0.7(0) (1)	e.g. 20 and (13 or 14) or 10 and (6 or 7) ignore any units given award full marks for correct answer without working	**(2)**

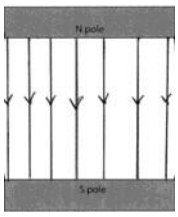
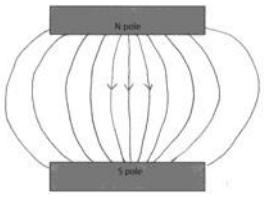
Question Number	Answer	Additional guidance	Mark
4(a)(ii)	an explanation linking: repeat (1) different angles / more values of X (1) for larger angles / values of X (1)	 allow 'more measurements' / 'repeat experiment' / collect more data > 20°	**(3)**

Question Number	Answer	Additional guidance	Mark
4(b)	substitution (1) $\frac{3.0 (\times 10^{8})}{5.8 (\times 10^{-7})}$ evaluation (1) 5.2×10^{14} unit (1) Hz	 answers that round to 5.2×10^{14} award 2 marks for correct answer without working allow 1 mark for answers that round to 5.2 to any power of ten independent mark accept hz or s^{-1} or per sec(ond) or hertz accept kHz, MHz etc with correct power (10^{11} kHz, 10^{8} MHz)	**(3)**

Total for Question 4 = 8 marks

Question Number	Answer	Additional guidance	Mark
5 (a) (i)	arrows on two or more {lines from N to S and/or clockwise on loops around wire}	accept arrows beside lines showing correct directions do not allow contradicting arrows	**(1)**

Question Number	Answer	Additional guidance	Mark
5 (a) (ii)	horizontal arrow (judge by eye) (1) pointing to the left (1)	accept arrow not passing through wire.	**(2)**

Question Number	Answer	Additional guidance	Mark
5 (b)	EITHER: **uniform field drawn** single straight line drawn perpendicular to and between poles (1) additional straight lines drawn either side that are parallel and evenly spaced (by eye) (1) OR **Non-uniform field drawn** central straight line(s) drawn perpendicular to and between poles (1) correctly curved lines drawn either side of the centre and drawn symmetrically (by eye) (1)	lines may start/end at faces or edges of poles. ignore all arrows on lines.   	**(2)**

Question Number	Answer	Additional guidance	Mark
5 (c)	a description that includes place compass around magnet and note / mark its direction(1) place compass in new position and note / mark its direction again (1) directions linked together to find a field line / pattern (1)	award marks if clear in diagram. if contradiction between words and diagram, go by the diagram . allow use of additional compass(es) ignore references to iron filings	**(3)**

Total for Question 5 = 8 marks

Question Number:	Answer	Additional Guidance	Mark
6(a)	recall and substitution (1) GPE = 750 x 10 x 1300 evaluation (1) (energy =) 9 800 000 (J)	 no power of ten 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)**

Question Number:	Answer	Additional Guidance	Mark
6 (b)(i)	recall efficiency equation (1) $\text{efficiency} = \frac{\text{useful output}}{\text{input}}$ rearrangement (1) output energy = 0.70 x 6500 recall power equation (1) $\text{power} = \frac{\text{energy}}{\text{time}}$ evaluation (1) (power =) 76 (kW)	$\text{efficiency} = \frac{\text{power output}}{\text{power input}}$ 4550 (kJ) seen scores 2 marks (from 0.7 x 6500 (kJ)) $\frac{4550}{60}$ accept ecf from output energy accept values that round up to 76 (kW) e.g. 75.8 award full marks for correct answer without working	**(4)**

Question Number:	Answer	Additional Guidance	Mark
6(b)(ii)	an explanation linking: (useful) output energy is less than input energy (1) some energy is transferred to less useful forms (1)	 input energy is greater than output energy (only) 70% of the input energy is useful energy is dissipated / wasted / lost (to surroundings) energy is lost / transferred as thermal / heat 30% is lost /dissipated / wasted / lost for 2 marks	**(2)**

Total for Question 6 = 8 marks

Question Number:	Answer	Additional Guidance	Mark
7(a)	(distance) increases	gets bigger	**(1)**

Question Number:	Answer	Additional Guidance	Mark
7(b)(i)	an explanation linking <u>particles</u> with: collide with walls / container (1) exert a force (1) pressure = force / area (1)	atoms / molecules no reference to particles (or alt.) scores no marks hit, bombard, bounce off in the absence of any of these three marks award 1 for any reference to particles moving	**(3)**

Question Number:	Answer	Additional Guidance	Mark
7(b)(ii)	an explanation linking (as) temperature rises particles move faster/ have more <u>kinetic</u> energy (1) hit the walls more frequently / harder (1)	(accept answer in terms of change of momentum) ignore 'move around more' accept more collisions / greater force	**(2)**

Question Number:	Answer	Additional Guidance	Mark
7(c)(i)	Adds 101 kPa to 5 x 101 kPa, giving <u>606</u> kPa = <u>6.06</u> x 10^5 Pa	Award the mark for 6.06 x 10^5 Pa seen anywhere by itself Beware of conjuring with numbers to come up with 6.06 x 10^5	**(1)**

Question Number:	Answer	Additional Guidance	Mark
7(c)(ii)	substitution (1) $6.06 \times 10^5 \times 1.25 \times 10^{-6} = V_2 \times 1.01 \times 10^5$ rearrangement (1) $\frac{6.06 \times 10^5 \times 1.25 \times 10^{-6}}{1.01 \times 10^5} = (V_2)$ evaluation (1) $7.5(0) \times 10^{-6}$ (m^3)	rearrangement or substitution in either order allow ecf from here for sensible value of pressure* $V2 = \frac{P1 \times V1}{P_2}$ using 6×10^{-5} gives $7.4(3) \times 10^{-6}$ (m^3) accept 7.42×10^{-6} also * Using $p = 5.05 \times 10^5$ => 6.25×10^{-6}(m^3) scores 2 marks power of ten error loses a mark correct answer by itself scores 3 marks	**(3)**

Total for Question 7 = 10 marks

Question Number:	Answer	Additional Guidance	Mark
8(a)(i)	1.5 (V)	accept $\frac{12}{8}$ or $\frac{3}{2}$ or 1½	**(1)**

Question Number:	Answer	Additional Guidance	Mark
8(a)(ii)	recall and substitution (1) $0.75 = I \times 1.5$ rearrangement (1) $(I =) \frac{0.75}{1.5} (= 0.5)$ recall, substitution and rearrangement (1) $R = \frac{1.5}{0.5}$ evaluation (1) (R =) 3.0 (Ω)	allow ecf from a(i) for all marking points substitution and rearrangement in either order allow ecf of current from MP2 for this mark point only allow other approaches such as $P = \frac{V^2}{R}$ scores 1 mark $0.75 = 1.5^2 R$ scores 2 marks $R = \frac{(1.5)^2}{0.75}$ scores 3 marks award full marks for correct answer without working	**(4)**

Question Number:	Answer	Mark
8(b)	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. AO1(6 marks) Circuit diagram including • power supply • ammeter • voltmeter • filament lamp • means of varying potential difference Description of method • measure current with ammeter • measure potential difference with voltmeter • vary the potential difference • calculate the resistance • repeat and compare	**(6)**

Mark	Descriptor
0	• No rewardable material.
1-2	• An explanation that demonstrates elements of physics understanding, some of which is inaccurate. Understanding of scientific, enquiry, techniques and procedures lacks detail. (AO1) • Presents an explanation that is not logically ordered and with significant gaps. (AO1)
3-4	• An explanation that demonstrates physics understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas, enquiry, techniques and procedures is not fully detailed and/or developed. (AO1) • Presents an explanation of the procedure that has a structure, which is mostly clear, coherent and logical with minor steps missing. (AO1)
5-6	• An explanation that demonstrates accurate and relevant physics understanding throughout. Understanding of the scientific ideas, enquiry, techniques and procedures 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 A relevant explanation of the procedure but with gaps or errors	Possible candidate responses **either** circuit diagram showing power source, lamp, ammeter and voltmeter **or** what readings should be taken **or** how to vary the p.d. across the lamp (in description or in diagram)
Level 2	3–4	Additional guidance A relevant explanation of techniques and procedures but with minor errors or gaps	Possible candidate responses circuit diagram showing power source, lamp, ammeter and voltmeter wired correctly **and** says what readings should be taken **or** how to vary the p.d. across the lamp (here or diagram) **or** method to find / calculate resistance(s) from results
Level 3	5–6	Additional guidance A relevant explanation of techniques and procedures which are detailed and fully developed	Possible candidate responses power source, lamp, ammeter and voltmeter wired correctly **and** says what readings should be taken **and** how to vary the p.d. across the lamp (here or diagram) **and** method to find / calculate resistance(s) from results

Total for Question 8 = 11 marks

Question Number:	Answer	Additional Guidance	Mark
9(a)(i)	moment = force × (perpendicular) distance (from pivot) (1)	M= F x d M = F x S	**(1)**

Question Number:	Answer	Additional Guidance	Mark
9(a)(ii)	total distance hand to pivot calculated (1) (d) = 0.6 + 0.8 = 1.4 (m) substitution showing at least one correct moment (1) 470 x 0.6 or F x 1.4 principle of moments (stated or implied)(1) e.g. (total) clockwise (moment) = (total) anticlockwise (moment) final rearrangement and evaluation(1) F = 470 × 0.6 / 1.4 = 200 (N)	1.4 or 0.6 + 0.8 seen in working 282 seen in working 470 × 0.6 = F × 1.4 allow 201, 201.43 award full marks for correct answer without working 350, 352, 353, 352.5 gets 2 marks	**(4)**

Total for Question 9 = 5 marks

Question Number:	Answer	Additional Guidance	Mark
10 (a)	same number of protons (1) different number of neutrons (1)	allow same atomic number, same element allow different nucleon number, different mass number, different atomic mass	**(2)**

Question Number:	Answer	Additional Guidance	Mark
10 (b)	fission is the **splitting** of a nucleus (1) fusion is the **joining** of two nuclei (1)	allow "breaking down" for splitting allow "fusing", "combining" for joining	**(2)**

Question Number:	Answer	Additional Guidance	Mark
10 (c)	star / fusion reactor / hydrogen bomb / red giant / supernova (1)	allow any named star or fusion reactor e.g. Sun, JET, ITER reject protostar, white dwarf	**(1)**

Question Number	Answer	Additional Guidance	Mark
10(d)	any two from: muclei move (too) slowly at low temperature (1) nuclei interact/collide less often at low pressure (1) nuclei repel each other (1) nuclei cannot get close enough / don't have chance to undergo fusion (1)	 allow nuclei not having enough KE allow atoms/particles for nuclei allow atoms/particles for nuclei allow reverse argument in terms of high temperature and high pressure	**(2)**

Total for Question 10 = 7 marks

Question Number	Answer	Additional Guidance	Mark
11(a)	an explanation linking two from (so that they) decrease the (high) voltages (1) high voltages used for efficiency / energy saving (1) (step-down transformers) used {near / for} {homes / factories/appliances} (1) (so that it is) safer (1)	 stepping down voltage reducing from {high/eg 200 000 V} to {low /e.g.230 V} voltage low current used for efficiency/ energy saving less risk of electrocution high voltages are dangerous	**(2)**

Question Number	Answer	Additional Guidance	Mark
11(b)	one line / curve above **and** below x-axis (1) two complete cycles in the 1.0 s (1)	 one complete cycle in 0.5 s	**(2)**

Question Number	Answer	Additional Guidance	Mark
11(c)	rearrangement (1) $V_s = V_p \times n_s/n_p$ substitution (1) $(V_s =) \frac{12 \times 100}{2400}$ evaluation (1) 0.5 (V)	substitution and rearrangement may be in either order $\frac{12}{V_s} = \frac{2400}{100}$ Calculation may be done using turns ratio award full marks for correct answer without working	**(3)**

Total for Question 11 = 7 marks

Question Number	Answer	Additional Guidance	Mark
12(a)	gravitational pull (1)	accept gravity gravitational do not award if energy or potential is mentioned do not award if anti-gravity	(1)

Question Number	Answer	Additional Guidance	Mark
12(b)	an explanation linking Earth is always (roughly) at centre of Moon's orbit (1) Earth and Jupiter are sometimes at {same side / opposite sides} of orbit (around Sun) (1)	 Moon's orbit is (nearly) circular Earth and Jupiter orbit the Sun at different speeds/radii the two points can be scored by a suitably labelled diagram Moon orbits Earth and Jupiter orbits Sun = 1 mark if no other scored	(2)

Question Number	Answer	Additional Guidance	Mark
12(c)(i)	Moon orbits Earth (1)	Moon's orbit is circular planets' orbits are circular accept named planet accept correct order for relative orbital radii of named planets all planets are orbiting a central body	(1)

Question Number	Answer	Additional Guidance	Mark
12(c)(ii)	any **two** from Sun placed at centre (1) Earth placed where Sun is (1) Moon moved to new Earth position (1) idea of ellipses (1) add more planets / moons / asteroids /comets etc (1)	scale of orbits/planet's size allow orbits should be ***slightly*** oval swap Sun and Moon scores 2 marks	**(2)**

Total for Question 12 = 6 marks