



GCSE MARKING SCHEME

SCIENCE - PHYSICS

SUMMER 2011

INTRODUCTION

The marking schemes which follow were those used by WJEC for the Summer 2011 examination in GCSE SCIENCE - PHYSICS. They were finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conferences were held shortly after the papers were taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conferences was to ensure that the marking schemes were interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conferences, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about these marking schemes.

	Page
Physics 1 Foundation Tier	1
Physics 1 Higher Tier	4
Physics 2 Foundation Tier	7
Physics 2 Higher Tier	10
Physics 3 Foundation Tier	13
Physics 3 Higher Tier	15

Physics 1

Foundation Tier

F - tier		Answer / Explanatory Notes	Marks Available
1.	(a)	(i) Coal (1) (ii) Sunlight (1) (iii) Hydroelectric (1) (iv) Nuclear (1)	4
	(b)	Gas / Oil [accept petrol & diesel & peat] not: fossil fuel [Not wood / biomass / uranium]	1
			5
2.	(a)	(i) <u>watts</u> (1) (ii) <u>voltage</u> (1) (iii) <u>wires</u> (1) NB no credit if 2 words underlined	3
	(b)	National grid	1
			4
3.	(a)	Mercury	1
	(b)	(i) C [accept Venus]	1
		(ii) B [accept Jupiter]	1
	(iii) B [accept Jupiter]	1	
			4
4.	(a)	9000 [accept 1800× 5 outside the box]	1
	(b)	radio	1
	(c)	smallest power [or equiv.] [accept least amount of watts, 5 W, small or low power]	1
			3
5.	(a)	(i) A and C (1)	2
		(ii) A and D (1)	
	(b)	(i) 3 cm	1
		(ii) Speed = $\frac{48}{4}$ (1) = 12 cm/s (1)	2
		(iii) C	1
			6

Foundation Tier contd.

F - tier		Answer / Explanatory Notes	Marks Available
6.	(a)	(i) 20 °C (ii) 3 min [accept any answer in range 2.5 – 2.9] (iii) 20 °C	1 1 1
	(b)	(i) Absorbs [accepts takes in; not attracts] heat / light / infra red / radiation better [accept well or good] NB “Attracts” is neutral not s.i.f. [accept : black heats up more or well]	1
		(ii) Has a glass cover / in polystyrene box [which reduces heat loss]	1
(c)	The line is not straight / is a curve or w.t.t.e. or sensible use of numerical data	1	
			6
7.		LHS: RHS: [NB. Independent marks]	4 4
8.	(a)	Example of making the possible dangers obvious ,e.g. in manuals, large print, sticker on front panel [or equiv.]	1
	(b)	Mobile phones give out <u>microwaves</u> . [accept infra red]	1
	(c)	Use hands-free kits / blue tooth / earphones / speakers [Not thicker case/ just hold away from the body”/ only text]	1
			3
9.	(a)	Wind is variable / doesn’t always blow [or equiv.] [Accept : not enough wind but not inefficient or siting]	1
	(b)	%efficiency = $\frac{\text{useful power transfer}}{\text{total power input}} \times 100$:Accept energy	1
		[%] efficiency = $\frac{900}{1500} \times 100$ (1) = 60[%] (1) [subst 1, ans 1]	2
	(c)	[Ignore unit; 0.6 → 1] kW → s.i.f. for final mark. (i) CO ₂ is a greenhouse gas / contributes to global warming [Reduce carbon footprint ✓, not just damage environment, damage ozone layer → s.i.f.]	1
(ii)	900 × 430 (1) = 387 000 g (1)	2	
			7

Foundation Tier contd.

F - tier		Answer / Explanatory Notes	Marks Available
10.	(a)	(i) 7 000 J/s (ii) 800 J/s [accept 2000 – 1200]	1 1
	(b)	<u>Greatest</u> energy saving (1) [or equiv.] Suitable environmental benefit [e.g. lower CO ₂ emissions / less fossil fuel use] (1)	2 4
11.	(a)	(i) [Angle of incidence] greater than the critical angle [or > 42°] (ii) <u>Total internal reflection</u> [credit this if given in (a)(i)]	1 1
	(b)	Emergent ray ~ parallel to incident ray [must be above A] (1) Internal reflections correct and no emergent ray at the reflection (1+1) [arrowheads ignored]	2 _{max} 4

Higher Tier

H - tier		Answer / Explanatory Notes	Marks Available
1.	(a)	Wind is variable / doesn't always blow [or equiv.] [Accept : not enough wind but not inefficient or siting]	1
	(b)	$\% \text{ efficiency} = \frac{\text{useful power transfer}}{\text{total power input}} \times 100$: Accept energy	1
		$[\%] \text{ efficiency} = \frac{900}{1500} \times 100 (1) = 60[\%] (1)$ [subst 1, ans 1]	2
	(c)	[Ignore unit; 0.6 → 1] kW → s.i.f. for final mark.	
	(i)	CO ₂ is a greenhouse gas / contributes to global warming [Reduce carbon footprint ✓, not just damage environment, damage ozone layer → s.i.f.]	1
	(ii)	900 × 430 (1) = 387 000 g (1)	2
			7
2.	(a)	(i) 7 000 J/s	1
		(ii) 7 kW e.c.f. from (i)	1
		(iii) 800 J/s	1
	(b)	<u>Greatest</u> energy saving (1) [or equiv.] Suitable environmental benefit [e.g. lower CO ₂ emissions / less fossil fuel use] (1)	2
	(c)	air is trapped [in the foam] [accept air pockets][not traps heat] (1) Foam /air is a good insulator / reduces conduction or reduces convection (1)	2
(d)	Any 2 × (1) from: <ul style="list-style-type: none"> • [There will be a reduced] temperature <u>difference</u> between the inside and the outside ✓ • which will reduce the [rate of]heat loss from the house ✓ • Less energy / fuel used for heating / less heating ✓ 	2	
			9
3.	(a)	(i) [Angle of incidence] greater than the critical angle [or > 42°]	1
		(ii) <u>Total internal reflection</u> [credit this if given in (a)(i)]	1
	(b)	Emergent ray ~ parallel to incident ray [must be above A] (1) Internal reflections correct and no emergent ray at the reflection (1+1) [arrowheads ignored]	2 _{max}
			4

Higher Tier contd.

H - tier		Answer / Explanatory Notes	Marks Available
4.	(a)	Gas [or its] <u>costs</u> fall [in 2006] [ignore reference to Electric cost up]	1
	(b)	(i) 2005 Bill 2006 Bill Or gas cost change by £100; Electricity change by £ 20 (✓) Saving Payback period = $\frac{2520}{80} = 31.5$ years (1 – subst or ans) e.c.f. NB Correct answer [31.5 or 32 → 3 marks; 31 on its own → 2 marks]	3
		(ii) 2 × (1) <ul style="list-style-type: none"> • Increase in gas unit costs / tariff ✓ • Increase sunlight / solar panel increased energy ✓ • [Accept] reduced electricity costs [however expressed] ✓ 	2
	(c)	Use of 20 (1) divide by 0.09 (1) → correct answer 222.2 / 222 / 220 (1) Aternatively : 520 / 0.09 ✓, 500 / 0.09 ✓, Subtracting → correct answer ✓	3
			9
5.	(a)	(i) Galaxies [accept “they”] are moving away or universe has expanded [since radiation was emitted]. (ii) Galaxies that are further away (1) are moving [away] faster (1) [or universe has expanded more (✓) in the time that light from further galaxies has taken to reach us (✓)]	1 2
	(b)	The universe [accept “everything”] is expanding / all galaxies moving apart (1) and so at one time in the past all the galaxies / all matter [accept “everything”] must have been concentrated at one point [or the universe started with an explosion at one point] (1) [For 2 marks, explanation must include “galaxies” or “the universe”; planets → s.i.f.]	2
			5

Higher Tier contd.

H - tier	Answer / Explanatory Notes	Marks Available
6. (a)	Satellite orbits (✓) in the same time / 24 hours (1) that it takes the earth to spin [once] (✓). The satellite is above the equator / in equatorial orbit (✓) Period → 1 mark + any 2 × (1)	3
	(b) (i) 2 extra lines drawn to top right Earth station – one from each of the 12 o'clock and 4 o'clock satellites – additional lines s.i.f.	1
	(ii) Equation: $\text{time} = \frac{\text{distance}}{\text{speed}}$ in any form. Time = $3.6 \times 10^7 / 3 \times 10^8$ (1) → 0.12 s (1) × 4 at any stage in correct calculation → 0.48 s (1)	1 3
7. (a)	Gas and dust close to [new] star / the Sun acted upon by radiation / pressure (1). Gas is pushed further out than solid matter (1). Any 2 × (1) from <ul style="list-style-type: none"> • Solids in inner solar system pulled together / stick by collision [accept come together] to form solid planets (✓) • Gas in outer solar system are pulled together to form gas planets (✓) • Appropriate use of the word “gravity” (✓) 	4
	(b) (i) Any 2 × (1) from Orbits: Comets [highly] elliptical /eccentric; [planets [almost] circular] ✓ Orbits (2): Orbit can be at a large angle to the plane of the solar system [however expressed] ✓ Composition: Comets ice and dust / dirty snowball; [Planets – rock/ solid and or gas.] ✓ Size or Shape: Comets are smaller / can have irregular shape ✓ [accept comets can leave the solar system ✓] Speed: Comets speed variable ✓ Note: Accept statement either about comets or planets with implied converse, but potential for s.i.f.	2
	(ii) Radiation [pressure] from sunlight / solar wind / heat from the sun (1); ice is vaporised(1)	2
		8

Physics 2

Foundation Tier

Question		Answer / Explanatory Notes	Marks Available					
1.		<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>b</td> <td>a</td> <td>e</td> <td>(f)</td> <td>d</td> </tr> </table> <p style="text-align: center;">All correct 3; 2 or 3 correct 2; 1 correct 1.</p>	b	a	e	(f)	d	3 3
b	a	e	(f)	d				
2.	(a)	<p>Live – carry high voltage; Earth – protect user from shock Fuse – protect from overheating Insulation – prevent short circuits or to prevent user from shock Additional lines –1 per line</p>	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>4 correct → (3) 2 or 3 correct → (2) 1 correct → (1)</td> </tr> </table>	4 correct → (3) 2 or 3 correct → (2) 1 correct → (1)	3			
4 correct → (3) 2 or 3 correct → (2) 1 correct → (1)								
	(b)	<p>Ticks next to quicker acting (1), detects small changes in current (1) 4 boxes ticked → 0; 3 boxes ticked → 1 max</p>	2					
			5					
3.	(a)	<p>(i) Decay of uranium (ii) Different rocks / concentrated in part of the country rich in granite (iii) Space/food/nuclear power/medical etc cosmic ok, not X-rays</p>	1 1 1					
	(b)	<p>(i) 200 (ii) Seal <u>floor</u> cracks put in membrane in floor[or foundation]/improve ventilation not insulation [accept: open windows] (iii) <u>Alpha particles</u> can't escape the body / absorbed in the body/damage/ionise/kill cells. Neutral:harmful or cause cancer</p>	1 1 1					
			6					
4.	(a)	<p>(i) [Pu-]241 (ii) [Pu-]242 (iii) [Pu-]241</p>	1 1 1					
	(b)	<p>(i) 88 (y) (ii) 25 (units)</p>	1 1					
			5					

Foundation Tier contd.

Question			Answer / Explanatory Notes	Marks Available
5.	(a)	(i)	20 000(J)	1
		(ii)	Been converted to PE [accept: converted to heat / because of friction] Accept: <u>Gravity slows it down</u> [must have “gravity” and “slow down”]	1
(iii)		60 000 (J)	1	
	(b)		Subs (1) answer of 3000(N) (1) [no e.c.f]	2
				5
6.	(a)		Dangerous emissions [or radiation]/stays radioactive / has to be stored for long time [“Dangerous” on its own not enough]	1
	(b)	(i)	Corrosion// leaks / enter food chain [not just: pollute the sea or kill wildlife; not “cost”]	1
		(ii)	Danger of explosion [at take off]/ re-enter atmosphere. [Not “cost”]	1
		(iii)	Containment [leaks] / security from terrorists / [accept earthquakes if qualified] [not “cost” or takes up a lot of space, not just “gives out rad ⁿ ”] [Must be waste, not radiation that gets out]	1
				4
7.	(a)	(i)	Voltmeter in parallel across coil , Ammeter in series with coil Both correct symbols correctly positioned → 2 Incorrect symbols but correctly positioned → 1 [allow line through]	2
		(ii)	To vary <u>current</u> or <u>voltage</u> / allow series of readings to be taken	1
	(b)	(i)	resistance = $\frac{\text{voltage}}{\text{current}}$ shown [(1), substitution (1), answer 460 (Ω) (1)	3
		(ii)	power= voltage× current shown (1), substitution (1) , ans 115(W) (1)	3
	(c)		30(A)	1
8.	(a)		$\frac{30}{0.2}$ (1) = 150 (m/s ²) (1)	2
	(b)	(i)	force decreases [accept converse]	1
		(ii)	$\frac{12000}{150(\text{ecf})}$ (1) = 80 kg (1)	2
	(c)		Increase braking time / smaller deceleration / braking distance increases (1), so less force on passenger (1) Not: crumple zone absorbs energy or force	2
				7

Foundation Tier contd.

Question			Answer / Explanatory Notes	Marks Available
9.		(i)	5 m/s	1
		(ii)	2 max for each section to include:- Accelerating / speeding up ✓ + numerical data with correct unit (e.g. from 5 m/s to 20 m/s or for 10s, 1.5 m/s ²) ✓, constant speed ✓, + numerical data with correct unit (e.g. 20 m/s or 10 s)✓ [Any reference to 1 st and last 10 s neutral]	4 5
			Total	50

Higher Tier

Question			Answer / Explanatory Notes	Marks Available
1.	(a)	(i)	Voltmeter in parallel across coil , Ammeter in series with coil Both correct symbols correctly positioned → 2 Incorrect symbols but correctly positioned → 1 [allow line through]	2
		(ii)	To vary <u>current</u> or <u>voltage</u> / allow series of readings to be taken	1
	(b)	(i)	resistance = $\frac{\text{voltage}}{\text{current}}$ shown [(1), substitution (1), answer 460 (Ω) (1)	3
		(ii)	power= voltage× current shown (1), substitution (1) , ans 115(W) (1)	3
				9
2.	(a)	(i)	R	1
		(ii)	Connected to the metal / base	1
		(iii)	Any 2× (1) from Identified fault, e.g. if the case becomes live / contact between live and case ✓ Low resistance / safe path for current ✓ large current blows fuse / mcb / elcb / rcd ✓	2
	(b)	(i)	brown	1
		(ii)	High voltage wire [accept: live carries current into the appliance] (1), so appliance <u>is not still</u> live / isolates the appliance if the fuse melts (1)	2
	(c)		Complete circuit [however expressed, e.g. return path, takes the current]	1
				8
3.			2 max for each section to include:- Accelerating / speeding up ✓ + numerical data with correct unit (e.g. from 5 m/s to 20 m/s or for 10s, 1.5 m/s ²) ✓, constant speed ✓, + numerical data with correct unit (e.g. 20 m/s or 10 s)✓ [Any reference to 1 st and last 10 s neutral]	4
				4
4.	(a)		Use of an appropriate pair used in calculations (1) e.g. $\frac{30}{0.2}$ (1) = 150 (m/s ²) (1); $\frac{12000}{150(\text{ecf})}$ = 80 kg (1)	4
	(b)		Increase braking time / smaller deceleration / braking distance increases (1), so less force on passenger (1) Not: crumple zone absorbs energy or force	2
				6

Higher Tier continued

Question			Answer / Explanatory Notes	Marks Available
5.	(a)	(i)	Imbalance in proton and neutron number; too many / few neutrons / protons Electrons mention → s.i.f.	1
		(ii)	Not blocked by smoke / beta particles do not ionise air as much [Harmful to humans – not enough, but neutral]	1
	(b)	Alpha particles unable to reach/enter body in normal use (1), internally particles unable to escape/ enter living cells (1) ionise cells / ionise or damage DNA(1)	3	
				5
6.	(a)	(i)	Subs : $PE = 500 \times 10 \times 30$ (1) = answer 150 000 (J) (1)	2
		(ii)	100 000 (J) (ecf)	1
		(iii)	$\frac{1}{2} 500 \times v^2 = 100\,000$ (ecf) J(1 – subs or manip), $v = 20$ m/s (1 - ans)	2
	(b)	Work done (1), against friction/air resistance (1) [no wind]	2	
(c)	subs/manip (1), ans 2500(N) (1)	2		
				9
7.	(a)		Active for long time (1), needs containment(1), security / need to monitor (1)	3
	(b)	(i)	4800 (1 - conversion) \times 0.5 (1), = 2400(W)	2
		(ii)	Calculation of 3 half lives (1 – ecf on initial power), \times 88 (1) = 264(y) (1)	3
(iii)		0.6(kg) allow ecf	1	
				9
Total				50

Physics 3

Foundation Tier

Question			Answer / Explanatory Notes	Marks Available
1.	(a)	(i)	4 V	1
		(ii)	0.4 s	1
		(iii)	$f = \frac{1}{0.4} = 2.5 \text{ Hz}$ [subst or ans]	1
	(b)	(i)	Frequency increases [or equiv, e.g. bigger/larger; not faster]	1
		(ii)	Voltage increases	1
				5
2.		(i)	C (1)	4
		(ii)	A (1)	
		(iii)	B (1)	
		(iv)	D (1)	
				4
3.	(a)		More primary turns on ‘step-down’ than secondary turns, or equiv. [Accept: A step-up transformer increases the voltage – or decreases the current]	1
	(b)	(i)	C and D	1
		(ii)	Enhance field [however expressed] or to link the field to secondary	1
		(iii)	Transformers require changing <u>field</u> / d.c. has steady field	1
				4
4.	(a)		In transverse waves the vibrations are at right angles (1) to the direction of travel / propagation (1) of the wave [or in longitudinal the vibrations and travel(1) are in the same direction(1)].	2
	(b)		Ultrasound → box 2 γ radiation → box 1 Seismic waves → box 3 Water waves → box 1 4 × (1) [More than 1 line from a list A box → 0]	4
				5

Foundation Tier contd.

Question			Answer / Explanatory Notes	Marks Available
5.		(i)	$v = 0 + 32 \times 2.5$ (1 – subs) = 80 m/s (1 – ans)	4 4
		(ii)	$x = \frac{0 + 80(1)[ecf]}{2} \times 2.5$ (1 – subs) = 100 m (1 – ans) [ignore unit]	
6.			Nucleus and electrons outside nucleus clearly shown (1) 8 neutrons and 6 protons in nucleus (1) 6 electrons orbiting (1) [NB. Labels not required if symbols are as the key]	3 3
7.	(a)		Any 2 × (1) from <ul style="list-style-type: none"> • Narrow beams ✓ • Penetrate greater depths ✓ • Good detail / small objects detected ✓ N.B. “Cannot hear” is a neutral statement – not credited.	2
	(b)		One from fish – other from seabed [or objects at different depths](1) Fish nearer so give first echo [or equiv] (1)	2 4
8.	a	(i)	Change of momentum of B = [–]36 000 kg m/s [ans]	1
		(ii)	Has greater momentum [or mass] than A	1
	(b)	(i)	Gradient = $\frac{[-]20}{40}$ (1 – subs) = 0.5 m/s ² (1 – ans)	2
		(ii)	Smaller gradient / slope [accept: it / B takes longer to stop]	1 5
9.	(a)	(i)	Distance travelled (1) in the first 30 seconds (1) [answer] [NB 1 st mark required for 2 nd mark to be awarded]	2
	(b)	(i)	Area = 35×30 (1) + $\frac{1}{2} \times 35 \times (50 - 30)$ (1) [or 1050 (✓) + 350 (✓)] = 1400 m (1 – ans)	4 6
		(ii)	Mean speed = $\frac{1400(ecf)}{50}$ = 28 m/s (1 – ans) Marks 1 and 2 in (ii) can be credited in answer to (ii)	

Foundation Tier contd.

Question			Answer / Explanatory Notes	Marks Available
10.	(a)		Raising boron rods [accept: reduce no. of boron rods](1) [results in] fewer neutrons being absorbed (1) [so increases rate of fission] NB. Independent marks.	2
	(b)	(i)	<u>Capturing / absorption</u> of <u>slow</u> neutrons	1
		(ii)	Graphite slows down the neutrons [produced by fission which allows further fission reactions to occur].	1
				4
11.	(a)	(i)	Time delay = [460 – 300 =] 160 s [accept 150 s]	1
		(ii)	P-waves have a greater speed than S-waves [Accept: they travel at different speeds]	1
	(b)	(i)	The graph for surface waves is a straight line	1
		(ii)	P & S waves travel through different materials (1). The stiffness [or density] of the rocks changes and this changes the speed. (1)	2
				5
Total				50

Higher Tier

Question			Answer / Explanatory Notes	Marks Available
1.	(a)	(i)	Distance travelled (1) in the first 30 seconds (1) [answer] [NB 1 st mark required for 2 nd mark to be awarded]	2
	(b)	(i)	Area = 35×30 (1) + $\frac{1}{2} \times 35 \times (50-30)$ (1) [or 1050 (✓) + 350 (✓)] = 1400 m (1 – ans)	
		(ii)	Mean speed = $\frac{1400(\text{ecf})}{50} = 28 \text{ m/s}$ (1 – ans) Marks 1 and 2 in (ii) can be credited in answer to (ii)	4
				6
2.	(a)		Raising boron rods [accept: reduce no. of boron rods](1) [results in] fewer neutrons being absorbed (1) [so increases rate of fission] NB. Independent marks.	2
	(b)	(i)	<u>Capturing / absorption</u> of <u>slow</u> neutrons	1
		(ii)	Graphite slows down the neutrons [produced by fission which allows further fission reactions to occur].	1
				4
3.	(a)	(i)	Time delay = [460 – 300 =] 160 s [accept 150 s]	1
		(ii)	P-waves have a greater speed than S-waves [Accept: they travel at different speeds]	1
	(b)	(i)	The graph for surface waves is a straight line	1
		(ii)	P & S waves travel through different materials (1). The stiffness [or density] of the rocks changes and this changes the speed. (1)	2
(c)		2 _{max} for diagram, 3 _{max} for comment Diagram: Curved paths (correct sense) ✓ Refraction of P waves at mantle-core boundary ✓ Defined shadow zone ✓ Comment on: nature of P & S waves ✓ layered structure to explain refraction ✓ liquid core to explain S shadow zone ✓	4	
				9

Higher Tier contd.

Question		Answer / Explanatory Notes	Marks Available
4.	(a)	Voltage depends on flux cut [or [field] lines](1) per second. Coil cuts different amounts of flux [per second] in different orientations (1) Mention of rate / per second once (1)	3
	(b)	(i) B or F	1
		(ii) [Coil vertical with] X at the bottom	1
(c)	Higher frequency shown (1) Higher voltage shown (1) $T = 0.2 \text{ s}$ (1); $V_{\text{max}} = 8 \text{ V}$ (1) [± 1 square]	3 _{max} 8	
5.	(a)	(i) [In an interaction between 2 or more objects with no external forces] the momentum before the interaction is the same as the momentum afterwards. (1) $2 \text{ m/s} \rightarrow$ (2); 3 m/s or $6 \text{ m/s} \rightarrow$ (1) otherwise (0)	3
		(ii) $F = \frac{5000 \times 2(\text{ecf}) - 5000 \times (-2)}{0.4}$ (1 – subst) $F = 50\,000 \text{ N}$ (1 – ans) [Accept calculation based upon the momentum change of A, i.e. $F = \frac{5000 \times 1 - 5000 \times 5}{0.4}$ - ignore \pm in answer]	2
	(b)	(i) KE lost by A = $\frac{1}{2}5000 \times 5^2 - \frac{1}{2}5000 \times 1^2$ (1) = $62\,500 - 2\,500 = 60\,000 \text{ J}$ (1)	2
		(ii) Some converted to heat and/or sound. (\checkmark) [Accept: Used to give KE to B]	1
6.	(a)	(i) Any 3 \times (1) from: Charge: I has 53 + charges; Xe has 54 [accept Xe has 1 more charge] (1) Mass: Both have a mass of 131 /same mass (1) Particles: I has 53p – Xe has 54p / Xe has 1 more proton. (1) I has 78 n and Xe has 77 n / Xe has 1 fewer n (1) [mention of electrons in nucleus s.i.f.]	3
		(ii) 3 rd line: 214 (1) 4 th line: 83 (1) and β (1) 5 th lines: 214 (1)	4
	(b)	(i) Same atomic / proton number but different mass / nucleon number [or same number of protons / same element but different numbers of neutrons [in nucleus]]	1
			9

Foundation Tier contd.

Question		Answer / Explanatory Notes	Marks Available
7.	(a)	$x = ut + \frac{1}{2} at^2$ (1 – equation) $= 1.5 \times 3 (1 - \text{subs}) + \frac{1}{2} \times 1.6 \times 9 (1 - \text{subs}) / 4.5 (\checkmark) + 7.2 (\checkmark)$ $= 11.7 \text{ m}$	3
	(b)	(i) 2 nd column in table: 2.3 m moved and 9.4 m above surface 3 rd column in table: 6.2 m moved and 5.5 m above surface Plot of 1 correct point [from table] on graph (e.c.f.) (1) Line from correctly plotted points from table (e.c.f.) (1)	4
Total			7
Total			50



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