

Standard form

Foundation and Higher tiers | Total marks: 79

Marks

- M** Method mark, for a correct method. It can be implied by a correct answer.
- A** Accuracy mark, for a correct answer. It needs the method mark before it.
- B** A mark for a correct value or statement, with or without working.
- ft** Follow through: the mark is given for using an earlier wrong answer correctly.
- oe** Or equivalent.
- [a, b]** Any value from a to b inclusive.

Questions

Q	Skill	Spec	Tier	Grade	Calculator	Marks
1	Converting to and from standard form	N9	Foundation	3	No	2
2	Recognising standard form	N9	Foundation	3	No	2
3	Ordering and comparing in standard form	N9	Foundation	4	No	3
4	Multiplying in standard form	N9	Foundation	4	No	2
5	Adding in standard form	N9	Foundation	5	No	2
6	Dividing in standard form: spot the error	N9	Foundation	5	No	2
7	Standard form with units	N9	Foundation	5	No	3
8	Dividing in standard form in context	N9	Foundation	5	No	3
9	Powers and roots in standard form	N9 N6	Foundation	6	No	3
10	Standard form with an unknown power	N9 N7	Foundation	7	No	3
11	Calculating with standard form, rounding	N9 N15	Foundation	5	Yes	2
12	Population density in standard form	N9 R11	Foundation	5	Yes	3
13	Standard form with a rate and time	N9 R11	Foundation	5	Yes	3
14	Standard form in a practical problem	N9	Foundation	6	Yes	3
15	Standard form with a rate and a unit change	N9 R11	Foundation	6	Yes	3
16	Dividing in standard form with units	N9	Foundation	6	Yes	4

Q	Skill	Spec	Tier	Grade	Calculator	Marks
17	Percentages with standard form	N9 R9	Foundation	6	Yes	4
18	Comparing masses in standard form	N9 R9	Foundation	6	Yes	3
19	Very small quantities in standard form	N9	Foundation	7	Yes	4
20	A formula with standard form, used both ways	N9 A5	Foundation	7	Yes	5
21	Comparing volumes in standard form	N9 R12	Foundation	7	Yes	3
22	Standard form in a volume: units	N9 G17	Foundation	7	Yes	4
23	Large numbers in standard form	N9 N6	Foundation	7	Yes	4
24	Standard form with density and area	N9 R11 G16	Foundation	8	Yes	4
25	Standard form with sphere formulae	N9 G17	Foundation	8	Yes	5
	Total					79

Question 1 N9 · Foundation · Grade 3 · 2 marks

Q	Answer	Mark	Comments
1(a)	62 000	B1	
1(b)	5.9×10^{-4}	B1	

Question 2 N9 · Foundation · Grade 3 · 2 marks

Q	Answer	Mark	Comments
2(a)	2.3×10^5	B1	
2(b)	4.7×10^4	B1	

Question 3 N9 · Foundation · Grade 4 · 3 marks

Q	Answer	Mark	Comments
3(a)	Orchid, Poppy, Mustard, Sunflower	B1	
3(b)	$(5 \times 10^{-2}) \div (5 \times 10^{-4})$	M1	oe, or $0.05 \div 0.0005$
	100	A1	accept 10^2

Question 4 N9 · Foundation · Grade 4 · 2 marks

Q	Answer	Mark	Comments
4	12×10^3 or 12 000	M1	oe
	1.2×10^4	A1	

Question 5 N9 · Foundation · Grade 5 · 2 marks

Q	Answer	Mark	Comments
5	$36\,000 + 5\,200$ or 41 200	M1	oe, such as $3.6 \times 10^4 + 0.52 \times 10^4$
	4.12×10^4	A1	

Question 6 N9 · Foundation · Grade 5 · 2 marks

Q	Answer	Mark	Comments
6(a)	$0.4 \times 10^5 = 4 \times 10^4$, not 4×10^6	B1	oe, such as she should have taken 1 from the power, not added 1
6(b)	4×10^4	B1	

Question 7 N9 · Foundation · Grade 5 · 3 marks

Q	Answer	Mark	Comments
7	6 cm = 0.06 m or 6×10^{-2} m	M1	oe, or 2×10^{-2} cm
	$(6 \times 10^{-2}) \div (2 \times 10^{-4})$	M1	oe, consistent units
	300	A1	accept 3×10^2

Question 8 N9 · Foundation · Grade 5 · 3 marks

Q	Answer	Mark	Comments
8	$(2.4 \times 10^{12}) \div (4 \times 10^9)$	M1	oe
	600 seconds	A1	oe, such as 6×10^2
	10	B1ft	ft their seconds $\div 60$

Question 9 N9 N6 · Foundation · Grade 6 · 3 marks

Q	Answer	Mark	Comments
9(a)	8×10^9	B1	
9(b)	16×10^8	M1	oe, or $\sqrt{1\,600\,000\,000} = 40\,000$
	4×10^4	A1	

Question 10 N9 N7 · Foundation · Grade 7 · 3 marks

Q	Answer	Mark	Comments
10(a)	8×10^{3n}	B1	
10(b)	0.5×10^{-n}	M1	oe, such as $\frac{1}{2} \times 10^{-n}$
	$5 \times 10^{-n-1}$	A1	oe, such as $5 \times 10^{-(n+1)}$

Question 11 N9 N15 · Foundation · Grade 5 · 2 marks

Q	Answer	Mark	Comments
11	5.02×10^8 or 3.1375×10^{12}	M1	oe, or 3 137 500 000 000
	3.14×10^{12}	A1	

Question 12 N9 R11 · Foundation · Grade 5 · 3 marks

Q	Answer	Mark	Comments
12	$(8.9 \times 10^6) \div (1.57 \times 10^3)$	M1	oe, or 5668.8...
	$(2.4 \times 10^6) \div (4.1 \times 10^2)$	M1	oe, or 5853.7...
	City B with 5669... and 5854...	A1	values may be truncated or rounded

Question 13 N9 R11 · Foundation · Grade 5 · 3 marks

Q	Answer	Mark	Comments
13	$(7.2 \times 10^{13}) \div (2.4 \times 10^9)$ or 30 000	M1	oe, the time in seconds
	their seconds $\div$ 3600	M1	oe
	8.3	A1	accept 8.3 or [8.33, 8.34]

Question 14 N9 · Foundation · Grade 6 · 3 marks

Q	Answer	Mark	Comments
14	$500 \times 9.7 \times 10^{-5}$ or 0.0485 m or 4.85 cm	M1	oe, the height of one ream
	$32 \div 4.85$ or $0.32 \div 0.0485$ or 6.59...	M1	oe, consistent units
	6	A1	

Question 15 N9 R11 · Foundation · Grade 6 · 3 marks

Q	Answer	Mark	Comments
15	$365 \times 24 \times 60 \times 60$ or 31 536 000	M1	oe, the seconds in a year
	$4.6 \times 10^{-9} \times 31\,536\,000$ or 0.145...	M1	oe, the growth in metres
	14.5	A1	accept 14.5 or [14.50, 14.51]

Question 16 N9 · Foundation · Grade 6 · 4 marks

Q	Answer	Mark	Comments
16(a)	25 000 g	B1	oe, or 6.7×10^{-7} kg for one grain
	$25\,000 \div (6.7 \times 10^{-4})$	M1	oe, or 37 313 432...
	3.7×10^7	A1	
16(b)	No, it is about 37 million	B1ft	oe, such as 4 million is 4×10^6 ; ft their (a)

Question 17 N9 R9 · Foundation · Grade 6 · 4 marks

Q	Answer	Mark	Comments
17(a)	$\frac{1.74 \times 10^6}{6.84 \times 10^7} \times 100$	M1	oe, or 0.0254...
	2.5	A1	accept 2.5 or [2.54, 2.55]
17(b)	$(1.74 \times 10^6) \div 1.14$	M1	oe, such as $1.74 \times 10^6 \div 114 \times 100$
	1.53×10^6	A1	

Question 18 N9 R9 · Foundation · Grade 6 · 3 marks

Q	Answer	Mark	Comments
18	$0.0123 \times 5.97 \times 10^{24}$ or 7.34×10^{22}	M1	oe, the mass of the Moon
	$(6.42 \times 10^{23}) \div$ their mass of the Moon	M1	
	8.7	A1	accept 8.7 or [8.74, 8.75]

Question 19 N9 · Foundation · Grade 7 · 4 marks

Q	Answer	Mark	Comments
19(a)	$18 \div (6.02 \times 10^{23})$	M1	oe
	2.99×10^{-23}	A1	
19(b)	$(1.7 \times 10^{21}) \times$ their (a) or 0.0508... g	M1	oe, or $\frac{1.7 \times 10^{21}}{6.02 \times 10^{23}} \times 18$
	51	A1	accept [50.6, 51.0] from a rounded (a)

Question 20 N9 A5 · Foundation · Grade 7 · 5 marks

Q	Answer	Mark	Comments
20(a)	$4.7 \times 10^{-6} \times (2.998 \times 10^8)^2$	M1	oe
	4.22×10^{11}	A1	
20(b)	$m = \frac{E}{c^2}$	M1	oe, rearranged or with values
	$(3.6 \times 10^{14}) \div (2.998 \times 10^8)^2$ or 0.00400...	M1	oe, the mass in kg
	4.0	A1	

Question 21 N9 R12 · Foundation · Grade 7 · 3 marks

Q	Answer	Mark	Comments
21	$(3.3 \times 10^{-5}) \div (1.4 \times 10^{-7})$ or 235.7...	M1	oe, or one volume such as $1.88 \times 10^{-14} \text{ m}^3$
	$235.7...^3$	M1	oe, or the two volumes divided
	1.3×10^7	A1	

Question 22 N9 G17 · Foundation · Grade 7 · 4 marks

Q	Answer	Mark	Comments
22	$7.5 \times 10^{-5} \text{ cm}$	B1	oe, or $4.5 \text{ cm} = 0.045 \text{ m}$
	$4 \times \pi \times 4.5^2$ or 254.4...	M1	oe, the surface area
	their area $\times$ their thickness	M1	consistent units, or $\times 10^6$ from m^3
	1.9×10^{-2}	A1	

Question 23 N9 N6 · Foundation · Grade 7 · 4 marks

Q	Answer	Mark	Comments
23	$2^{64} - 1 = 1.84... \times 10^{19}$	M1	oe, seen or used
	their $1.84... \times 10^{19} \times 2.5 \times 10^{-5} \div 1000$	M1	oe, 4.61×10^{11} tonnes
	their tonnes $\div (5.2 \times 10^8)$	M1	oe, consistent units
	890	A1	accept 886.9...

Question 24 N9 R11 G16 · Foundation · Grade 8 · 4 marks

Q	Answer	Mark	Comments
24	$0.001 \div (1.93 \times 10^4)$ or $5.18 \times 10^{-8} \text{ m}^3$	M1	oe, the volume, or $1 \div 19.3 = 0.0518... \text{ cm}^3$
	their volume $\div (1.2 \times 10^{-7})$	M1	oe, the area: 0.4318 m^2 or 4318 cm^2
	$\sqrt{(\text{their area})}$	M1	or 0.6571 m
	66	A1	

Question 25 N9 G17 · Foundation · Grade 8 · 5 marks

Q	Answer	Mark	Comments
25	$r^2 = \frac{6.09 \times 10^{12}}{4\pi}$	M1	oe
	$r = 6.96 \times 10^5 \text{ km}$	A1	accept $[6.96 \times 10^5, 6.97 \times 10^5]$
	$\frac{4}{3} \times \pi \times \text{their } r^3$ or $\frac{4}{3} \times \pi \times (6.37 \times 10^3)^3$	M1	oe, one volume
	their volume of the Sun $\div$ their volume of the Earth	M1	oe, or $(\text{their } r \div 6370)^3$
	1.3×10^6	A1	