Q1.   Work out $(8 \times 10^6) \div (2 \times 10^{18})$.
        Give your answer in standard form.

....
(Total 2 marks)

Q2.   (a)   Write the number 45 000 in standard form.

....
(1)

(b)   Write 6×10^{-2} as an ordinary number.

....
(1)
(Total 2 marks)

Q3.   Work out $(6.4 \times 10^5) \times (5 \times 10^4)$.

        Give your answer in standard form.

....

(Total 2 marks)

Q4. Work out $(3 \times 10^6) \times (5 \times 10^{-4})$.

Give your answer in standard form.

....

(Total 2 marks)

Q5. Work out $(2.5 \times 10^9) \div (5 \times 10^3)$.
Give your answer in standard form.

....

(Total 2 marks)

Q6.   The number of atoms in one kilogram of helium is 1.51×10^{26}

Calculate the number of atoms in 20 kilograms of helium.
Give your answer in standard form.

....

(Total 2 marks)

Q7.   (a)   Write 6.4×10^4 as an ordinary number.

....

(1)

(b)   Write 0.0039 in standard form.

....

(1)

(c)   Write 0.25×10^7 in standard form.

....

(1)
(Total 3 marks)

Q8.   (a)   Write the number 39 000 in standard form.

....

(1)

(b)   Write 7.21×10^{-3} as an ordinary number.

....

(1)
(Total 2 marks)

Q9.   (a)   Write 64 000 in standard form.

....

(1)

(b)   Write 156×10^{-7} in standard form.

....

(1)
(Total 2 marks)

Q10.   The population of Algeria is 34 million.

(a)   Write 34 million in standard form.

....

(1)

The total land area of Algeria is 2.4×10^{12} m^2.
5% of the total land area is used to grow crops.

(b)   Work out the area of land in Algeria which is used to grow crops.
         Write your answer in standard form, in km^2.

.... km^2

(2)
(Total 3 marks)

M1.

Working	Answer	Mark	Additional Guidance
$8 \div 2 = 4$ $10^6 \div 10^{18} = 10^{-12}$	4×10^{-12}	2	**B2** for 4×10^{-12} (**B1** for sight of 4×10^{n} or $n \times 10^{-12}$)
			Total for Question: 2 marks

M2.

	Answer	Mark	Additional Guidance
(a)	4.5×10^{4}	1	**B1** for 4.5×10^{4} cao
(b)	0.06	1	**B1** for 0.06 cao
			Total for Question: 2 marks

M3.

Answer	Mark	Additional Guidance
3.2×10^{10}	2	**B2** cao (**B1** 3.2×10^{n}, n an integer $\neq 10$, or 32×10^{9} or 32 000 000 000 or 3.2 exp10 or 3.2×10^{16} seen)

	Total for Question: 2 marks

M4.

Answer	Mark	Additional Guidance
1.5×10^3	2	**B2** for 1.5×10^3 cao (**B1** for $a \times 10^3$, $a \neq 1.5$ or 1.5×10^b, $b \neq 3$ or 15×10^2 or 1500)
		Total for Question: 2 marks

M5.

Working	Answer	Mark	Additional Guidance
0.5×10^6	5×10^5	2	**M1** for 0.5×10^6 or 500000 or $2.5 \div 0.5 \times 10^6$ or $0.5 \times 10^{9-3}$ **OR** $2500000000 \div 5000$ **A1** cao
			Total for Question: 2 marks

M6.

Working	Answer	Mark	Additional Guidance
$20 \times 1.51 \times 10^{26}$	3.02×10^{27}	2	**M1** $20 \times 1.51 \times 10^{26}$ or 3.02×10^{n} or 30.2×10^{26} where n is a positive integer **A1** cao
			Total for Question: 2 marks

M7.

	Answer	Mark	Additional Guidance
(a)	64000	1	**B1** for 64000
(b)	3.9×10^{-3}	1	**B1** for 3.9×10^{-3}
(c)	2.5×10^{6}	1	**B1** for 2.5×10^{6}
			Total for Question: 3 marks

M8.

	Answer	Mark	Additional Guidance
(a)	3.9×10^{4}	1	**B1** cao
(b)	0.00721	1	**B1** cao
			Total for Question: 2 marks

M9.

	Answer	Mark	Additional Guidance
(a)	6.4×10^4	1	**B1** cao
(b)	1.56×10^{-5}	1	**B1** cao
			Total for Question: 2 marks

M10.

	Working	Answer	Mark	Additional Guidance
(a)		3.4×10^7	1	**B1** cao

(b)

1.2×10^5

2

Total for Question: 3 marks

E1.   In this question both marks were scored by just over half of candidates. Seemingly, few candidates were able to use their calculator efficiently. Working seen indicated that many candidates had converted the calculation to one involving ordinary numbers before working out their answer. Common incorrect answers which scored one mark included 4×10^{12} and 4×10^{24}. Unfortunately it was not uncommon to see answers expressed as powers of 4 or 40. 4^{-12} was often seen.

E2.   Again a question where candidates knew what they had to do but unfortunately many candidates could not cope with the negative index in part (b) though part (a) was mostly correct.

E3.   Standard form is almost always tested on this paper and it was well understood with 55% of candidates obtaining both marks for a correct answer. A further 15% gained one mark for an incomplete attempt to write the answer correctly with answers of 32×10^9 or 32 000 000 000.

A surprising 30% of candidates gained no marks.

E4.   This question proved to be a good discriminator with each of the marks 2, 1 and 0 being awarded to about one third of the candidates.

Of the two thirds of candidates who could not be awarded full marks, about half were able to use their calculator correctly to evaluate the product (but were unable to give their answer in correct standard form) or give a partially correct answer in the form $1 \cdot 5 \times 10^n$ ($n \neq 3$).

The responses 1500, $1 \cdot 5 \times 10^{11}$ and $1 \cdot 5 \times 10^2$ were commonly seen.

##

Candidates had great difficulty with division even where they used the common strategy of rewriting the calculation using ordinary numbers. Few dealt with the integers and powers of 10 separately but where they did do so, the errors 2.5/5=2 and 5/2.5 were seen. Although the question asked candidates to give their answer in standard form, 0.5×10^6 was often seen along with an incorrect final step giving 5×10^7.

E6.   Candidates who understand standard form were successful as the task was straightforward. A number of candidates changed the number of atoms to an ordinary number and then multiplied by 20, but generally miscounted the number of zeros either when converting or in their answer. An answer of 1.51×10^{520}, or 3.02×10^{520} coming from 26×10 was often seen.

E7.   In part (a), many candidates were able to write the number in standard form as 64 000. Common incorrect answers here were 640 000 (mostly) and 6400. In part (b), many candidates were able to write the number in standard as 3.9×10^{-3}. Common incorrect answers here were 3.9×10^{-4} (mostly) and 3.9×10^{3}. Candidates were less successful in part (c) where the most popular incorrect answer was 2.5×10^{8}.

E8.   Many candidates clearly had no understanding of standard form and were unable to answer this question. Of those candidates who did, 39×10^{3} and 0.000721 were the most common incorrect answers seen in part (a) and part (b) respectively.

E9. In part (a) almost 70% of the candidates were able to write 64 000 in standard form. The success rate in part (b) was much lower with just over 30% able to write 156×10^{-7} in standard form. Here, 1.56×10^{-9} was a common incorrect answer. Many candidates, though, wrote the answer as an ordinary number.