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GCSE (9-1) Grade 5

Standard Form

Instructions

Use **black** ink or ball-point pen.
Fill in the boxes at the top of this page with your name.
Answer **all** questions.
Answer the questions in the spaces provided
– there may be more space than you need.
Show all your working out

Information

The marks for **each** question are shown in brackets.
use this as a guide as to how much time to spend on each question.
Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed

Advice

Read each question carefully before you start to answer it
Attempt every question
Check your answers if you have time at the end

1. (a) Write the number 0.00037 in standard form.

(1)

3.7×10^{-4}

.....

(b) Write 8.25×10^3 as an ordinary number.

(1)

8250

.....

(c) Work out $(2.1 \times 10^8) \times (6 \times 10^{-5})$.
Write your answer in standard form.

$2.1 \times 6 = 12.6$

$10^8 \times 10^{-5} = 10^3$

12.6×10^3

1.26×10^4

(2)

.....

(4 marks)

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2. (a) Write 6.43×10^5 as an ordinary number.

643,000

.....

(1)

(b) Work out the value of $2 \times 10^7 \times 8 \times 10^{-12}$
Give your answer in standard form.

$2 \times 8 \times 10^7 \times 10^{-12} = 16 \times 10^{-5}$

1.6×10^{-4}

.....

(2)

(3 marks)

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3. (a) Write down the value of 10^0

1

.....

(1)

(b) Write 6.7×10^{-5} as an ordinary number.

0·000067

.....

(1)

(c) Work out the value of $(3 \times 10^7) \times (9 \times 10^6)$
Give your answer in standard form.

$3 \times 9 \times 10^7 \times 10^6 = 27 \times 10^{13}$

2.7×10^{14}

.....

(2)

(4 marks)

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4. (a) Write 8.2×10^5 as an ordinary number.

820,000

.....

(1)

(b) Write 0.000 376 in standard form.

3.76×10^{-4}

.....

(1)

(c) Work out the value of $(2.3 \times 10^{12}) \div (4.6 \times 10^3)$
Give your answer in standard form.

$\frac{2.3}{4.6} \times \frac{10^{12}}{10^3} = 0.5 \times 10^9$

5×10^8

.....

(2)

(4 marks)

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5. A floppy disk can store 1 440 000 bytes of data.

(a) Write the number 1 440 000 in standard form.

1.44×10^6

(1)

A hard disk can store 2.4×10^9 bytes of data.

(b) Calculate the number of floppy disks needed to store the 2.4×10^9 bytes of data.

$\frac{2.4}{1.44} \times \frac{10^9}{10^6} = 1.\dot{6} \times 10^3$

(3)

(4 marks)

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6. (a) (i) Write 40 000 000 in standard form.

4×10^7

(ii) Write 3×10^{-5} as an ordinary number.

0.00003

(2)

(b) Work out the value of

$$3 \times 10^{-5} \times (4 \times 10^7 \text{ or } 40\,000\,000)$$

Give your answer in standard form.

$3 \times 4 \times 10^{-5} \times 10^7 = 12 \times 10^2 = 1.2 \times 10^3$

(2)

(4 marks)

---

7. (a) Write the number 40 000 000 in standard form.

4×10^7

.....

(1)

(b) Write 1.4×10^{-5} as an ordinary number.

0.000014

.....

(1)

(c) Work out

$(5 \times 10^4) \times (6 \times 10^9)$

Give your answer in standard form.

$5 \times 6 \times 10^4 \times 10^9 = 30 \times 10^{13} = 3 \times 10^{14}$

.....

(2)

(4 marks)

---

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

$64,000$

.....

(1)

(b) Write 0.0039 in standard form.

3.9×10^{-3}

.....

(1)

(c) Write 0.25×10^7 in standard form.

2.5×10^6

.....

(1)

(d) Work out $(3.2 \times 10^5) \times (4.5 \times 10^4)$ in standard form.

$3.2 \times 4.5 \times 10^5 \times 10^4 = 14.4 \times 10^9 = 1.44 \times 10^{10}$

.....

(2)

(5 marks)

---

9. (a) (i) Write 7900 in standard form.

7.9×10^3

(ii) Write 0. 00035 in standard form.

3.5×10^{-4}

(2)

(b) Work out $\frac{4 \times 10^3}{8 \times 10^{-5}}$

Give your answer in standard form.

$\frac{4}{8} \times \frac{10^3}{10^{-5}} = 0.5 \times 10^8$

5×10^7

(2)
(4 marks)

---

10. (a) Write 30 000 000 in standard form.

3×10^7

(1)

(b) Write 2×10^{-3} as an ordinary number.

0.002

(1)
(2 marks)

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11. (a) Write 5.7×10^{-4} as an ordinary number.

0.00057

(1)

(b) Work out the value of $(7 \times 10^4) \times (3 \times 10^5)$

Give your answer in standard form.

$7 \times 3 \times 10^4 \times 10^5 = 21 \times 10^9 = 2.1 \times 10^{10}$

(2)
(3 marks)

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12. Write the following numbers in order of size.
Start with the smallest number.

3.8×10^2

0.038×10^2 $\quad$ 3800×10^{-4} $\quad$ 380 $\quad$ 0.38×10^{-1}

3.8×10^0 $\quad$ 3.8×10^{-1} $\quad$ 3.8×10^{-2}

0.38×10^{-1}, 3800×10^{-4}, 0.038×10^2, 380

(2 marks)

13. The time taken for light to reach Earth from the edge of the known universe is 14 000 000 000 years.

1.4×10^{10}

Light travels at the speed of 9.46×10^{12} km/year.

Work out the distance, in kilometres, from the edge of the known universe to Earth.
Give your answer in standard form.



distance = speed x time

$1.4 \times 10^{10} \times 9.46 \times 10^{12}$

$13.24 \times 10^{22} = 1.324 \times 10^{23}$ km

(3 marks)

14. The surface area of Earth is 510 072 000 km^2.
The surface area of Jupiter is 6.21795×10^{10} km^2.

The surface area of Jupiter is greater than the surface area of Earth.
How many times greater?
Give your answer in standard form.

$$\frac{6.21795 \times 10^{10}}{510,072,000} = 121.9033$$

1.219033×10^2

(3 marks)

15. $p^2 = \dfrac{x - y}{xy}$

$x = 8.5 \times 10^9$
$y = 4 \times 10^8$

Find the value of p.
Give your answer in standard form correct to 2 significant figures.

$$p^2 = \frac{8.5 \times 10^9 - 4 \times 10^8}{(8.5 \times 10^9) \times (4 \times 10^8)} = 2.38 \times 10^{-9}$$

$$p = \sqrt{2.38 \times 10^{-9}} = 4.8809 \times 10^{-5}$$

4.9×10^{-5}

(4 marks)

---

16. $y^2 = \dfrac{ab}{a + b}$

$a = 3 \times 10^8$
$b = 2 \times 10^7$

Find y.
Give your answer in standard form correct to 2 significant figures.

$$y^2 = \frac{(3 \times 10^8) \times (2 \times 10^7)}{(3 \times 10^8) + (2 \times 10^7)}$$

$y^2 = 18750000$

$y = 4330.127$

$y = 4.3 \times 10^3$

(4 marks)

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17. A spaceship travelled for 6×10^2 hours at a speed of 8×10^4 km/h.

(a) Calculate the distance travelled by the spaceship.
Give your answer in standard form.

distance = speed × time

$= (6 \times 10^2) \times (8 \times 10^4) = 48 \times 10^6$

4.8×10^7 ..... km

(3)

One month an aircraft travelled 2×10^5 km.
The next month the aircraft travelled 3×10^4 km.

(b) Calculate the total distance travelled by the aircraft in the two months.
Give your answer as an ordinary number.

$(2 \times 10^5) + (3 \times 10^4) = (2 \times 10^5) + (0.3 \times 10^5)$

2.3×10^5 ..... km

(2)
(Total 5 marks)

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18. A nanosecond is 0.000 000 001 second.

(a) Write the number 0.000 000 001 in standard form.

1×10^{-9} .....

(1)

A computer does a calculation in 5 nanoseconds.

(b) How many of these calculations can the computer do in 1 second?
Give your answer in standard form.

$1 \div 5 \times 10^{-8} = 20,000,000$

2×10^7 .....

(2)
(Total 3 marks)

19. The mass of 6.02×10^{23} atoms of carbon is 12 grams.

(a) Calculate the mass of 1 atom of carbon.
Give your answer in standard form correct to 3 significant figures.

$12 \div 6.02 \times 10^{23} = 1.993 \times 10^{-23}$

1.99×10^{-23} ..... g

(2)

(b) Calculate the number of atoms in 100 grams of carbon.
Give your answer in standard form correct to 3 significant figures.

$(100 \div 12) \times (6.02 \times 10^{23})$

$= 5.02 \times 10^{24}$

5.02×10^{24} .....

(2)

(Total 4 marks)

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20. When you are h feet above sea level, you can see d miles to the horizon, where

$$d = \sqrt{\frac{3h}{2}}$$

(a) Calculate the value of d when $h = 8.4 \times 10^3$
Give your answer in standard form correct to 3 significant figures.

$d = \sqrt{\frac{3 \times 8.4 \times 10^3}{2}} = 112.249$

$d =$ 1.12×10^2 .....

(2)

21. In 2003 the population of Great Britain was 6.0×10^7
In 2003 the population of India was 9.9×10^8

(a) Work out the difference between the population of India and the population of Great Britain in 2003.
Give your answer in standard form.

$(9.9 \times 10^8) - (6 \times 10^7) = (9.9 \times 10^8) - (0.6 \times 10^8)$

$= 9.3 \times 10^8$

.....

(2)

In 1933 the population of Great Britain was 4.5×10^7

(b) Calculate the percentage increase in the population of Great Britain from 1933 to 2003.
Give your answer correct to one decimal place.

$\frac{6 \times 10^7}{4.5 \times 10^7} = 1.\dot{3} = 133.\dot{3}\%$

$33.\dot{3}$ .....%

(3)
(Total 5 marks)

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22. Work out $\frac{4 \times 10^3}{8 \times 10^{-5}}$

Give your answer in standard form.

$\frac{4 \times 10^3}{8 \times 10^{-5}} = 0.5 \times 10^{3--5} = 0.5 \times 10^8$

5×10^7

.....

(2)
(Total 4 marks)

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23. Work out

$$\frac{2 \times 2.2 \times 10^{12} \times 1.5 \times 10^{12}}{2.2 \times 10^{12} - 1.5 \times 10^{12}}$$

Give your answer in standard form correct to 3 significant figures.

9.42857×10^{12}

9.43×10^{12}

.....

(Total 3 marks)

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24. 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.

$20 \times 1.51 \times 10^{26}$

$2 \times 10 \times 1.51 \times 10^{26} = 3.02 \times 10^{27}$

3.02×10^{27}

.....

(Total 2 marks)

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25. Work out $(3.4 \times 10^{12}) \div (1.2 \times 10^{-3})$
Give your answer in standard form, correct to 3 significant figures.

2.58×10^{15}

.....

(Total 2 marks)

26. (a) Write 5 720 000 in standard form.

5.72×10^6

(1)

$p = 5\ 720\ 000$
$q = 4.5 \times 10^5$

(b) Find the value of $\dfrac{p-q}{(p+q)^2}$

Give your answer in standard form, correct to 2 significant figures.

1.4×10^{-7}

(Total 2 marks)

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27. (a) Write 0.000 000 000 054 in standard form.

5.4×10^{-10}

(1)

$$S = 12.6\ R^2$$

$R = 0.000\ 000\ 000\ 054$

(b) Use the formula to calculate the value of S.
Give your answer in standard form, correct to 3 significant figures.

$12.6 \times (5.4 \times 10^{-11})^2 = 3.67 \times 10^{-20}$

$S = 3.67 \times 10^{-20}$

(2)
(Total 3 marks)

28.

$$x = \sqrt{\frac{p+q}{pq}}$$

$p = 4 \times 10^8$
$q = 3 \times 10^6$

Find the value of x.
Give your answer in standard form correct to 2 significant figures.

$$x = \sqrt{\frac{(4 \times 10^8) + (3 \times 10^6)}{(4 \times 10^8) \times (3 \times 10^6)}} = 5.8 \times 10^{-4}$$

$x =$ 5.8×10^{-4}

(Total 3 marks)