1. **[4 marks]**

The table shows the populations of five countries.

Country	Population
The Gambia	1.4×10^6
Kenya	3.2×10^7
Mali	1.2×10^7
Nigeria	1.4×10^8
Swaziland	1.2×10^6

(a) Which of these countries has the largest population?

.....

(1)

(b) Calculate the difference between the population of Kenya and the population of Nigeria.
Give your answer in standard form.

.....

(2)

(c) The population of South Africa is 30 times the population of The Gambia.
Calculate the population of South Africa.
Give your answer in standard form.

.....

(1)

2. **[5 marks]**

The table shows the diameters, in kilometres, of five planets.

Planet	Diameter (km)
Venus	1.2×10^4
Jupiter	1.4×10^5
Neptune	5.0×10^4
Mars	6.8×10^3
Saturn	1.2×10^5

(a) Which of these planets has the smallest diameter?

.....

(1)

(b) Calculate the difference, in kilometres, between the diameter of Saturn and the diameter of Neptune.
Give your answer in standard form.

..... km

(2)

The diameter of the Moon is 3.5×10^3 km.
The diameter of the Sun is 1.4×10^6 km.

(c) Calculate the ratio of the diameter of the Moon to the diameter of the Sun.
Give your answer in the form $1 : n$

.....

(2)

3. **[4 marks]**

The table shows some information about the five Great Lakes in North America.

Name	Surface area (m^2)	Volume of water (m^3)
Lake Erie	2.57×10^{10}	4.80×10^{11}
Lake Huron	6.01×10^{10}	3.52×10^{12}
Lake Michigan	5.80×10^{10}	4.87×10^{12}
Lake Ontario	1.91×10^{10}	1.64×10^{12}
Lake Superior	8.21×10^{10}	1.22×10^{13}

(a) Work out the total surface area of the five Great Lakes.
Give your answer in standard form.

..... m^2

(2)

Loch Ness is the largest lake in Scotland.
The lake has a volume of water of 7.45×10^9 m^3

The volume of water in Lake Superior is k times the volume of water in Loch Ness.

(b) Work out the value of k.
Give your answer correct to 3 significant figures.

$k =$ .....

(2)

4. **[5 marks]**

The table gives the surface areas, in square kilometres, of five seas.

Sea	Surface area in square kilometres
Mediterranean Sea	2.97×10^6
East China Sea	1.25×10^6
Baltic Sea	4.22×10^5
Red Sea	4.38×10^5
Okhotsk Sea	1.59×10^6

(a) Write 1.59×10^6 as an ordinary number.

.....

(1)

(b) Work out the difference, in square kilometres, between the largest surface area and the smallest surface area for these five seas.
Give your answer in standard form.

..... km^2

(2)

The surface area of the East China Sea is k times the surface area of the Baltic Sea.

(c) Work out the value of k.
Give your answer to the nearest whole number.

$k =$ .....

(2)

5. **[7 marks]**

The table shows the annual world production of four foods.

Food	Annual world production, in tonnes
Cocoa	1.75×10^6
Coffee	1.85×10^6
Sugar	9.72×10^7
Wheat	4.98×10^8

(a) Calculate the total annual world production of coffee and sugar.

..... tonnes
(2)

(b) Brazil produces 9.7% of the world's sugar.
Calculate the annual production of sugar from Brazil.

..... tonnes
(2)

(c) Express the world production of wheat as a percentage of the total production of all four foods.

.....%
(3)

6. **[2 marks]**

Write as ordinary numbers

(i) 3.6×10^5

.....

(ii) 2.9×10^{-3}

.....

7. **[3 marks]**

The distance between the Earth and the Sun is 150 000 000 km.

(a) Write the number 150 000 000 in standard form.

.....

(1)

The distance between Neptune and the Sun is 30 times greater than the distance between the Earth and the Sun.

(b) Calculate the distance between Neptune and the Sun.
Give your answer in standard form.

..... km

(2)

8. **[3 marks]**

(a) Write the number 78 000 000 in standard form.

.....

(1)

(b) Write 4×10^{-3} as an ordinary number.

.....

(1)

(c) Work out the value of $\frac{3 \times 10^{-2}}{8 \times 10^{9}}$

Give your answer in standard form.

.....

(1)

9. **[4 marks]**

The table shows the population of each of three countries in 2012.

Country	Population
India	1.21×10^9
Turkey	7.48×10^7
Singapore	5.2×10^6

(a) Find the total population of India, Turkey and Singapore in 2012.
Give your answer in standard form.

.....

(2)

Population density is calculated by the formula

Population density = Population ÷ Land area

The land area of India is 3.29×10^6 km^2

(b) Calculate the population density of India in 2012.
Give your answer correct to 3 significant figures.

..... people/km^2

(2)

10. **[6 marks]**

The table gives the populations of each of five countries in 2014

Country	Population
China	1.4×10^9
India	1.3×10^9
USA	3.2×10^8
Ethiopia	9.7×10^7
Mexico	1.2×10^8

(a) Write 9.7×10^7 as an ordinary number.

.....

(1)

The population of Russia in 2014 was 140 000 000

(b) Write 140 000 000 in standard form.

.....

(1)

In 2014, there were more people living in China than were living in the USA.

(c) How many more?
Give your answer in standard form.

.....

(2)

In 2014, the population of India was k times the population of Mexico.

(d) Work out the value of k.
Give your answer to the nearest whole number.

$k =$ .....

(2)

11. **[4 marks]**

(a) Write as an ordinary number

(i) 4.2×10^{6}

.....

(ii) 3.82×10^{-4}

.....

(2)

(b) Here are three numbers written in standard form.
Arrange these numbers in order of size.
Start with the smallest number.

5.6×10^{-7} 8.6×10^{-9} 5.64×10^{-8}

.....

(2)

12. **[4 marks]**

1 astronomical unit = 150 million kilometres.

(a) Write the number 150 million in standard form.

.....

(2)

The distance from Venus to the Sun is 108 million kilometres.

(b) Express 108 million kilometres in astronomical units.
Give your answer in standard form.

..... astronomical units

(2)

13. **[4 marks]**

(a) a, b and c are positive numbers such that $1 \leqslant ab < 10$ and $1 \leqslant c < 10$

$(a \times 10^4) \times (b \times 10^7) = c \times 10^m$

(i) Write down the value of m.

$m =$ .....

(ii) Find an expression for c in terms of a and b.

$c =$ .....

(2)

(b) $N = (3.2 \times 10^p) \times (4.5 \times 10^q)$, where p and q are integers.
Express N in terms of p and q.
Give your answer in standard form.

$N =$ .....

(2)

14. **[4 marks]**

(a) Write 0.000 076 in standard form.

.....

(1)

The area covered by the Pacific Ocean is 1.6×10^8 km^2
The area covered by the Arctic Ocean is 1.4×10^7 km^2

(b) Write 1.6×10^8 as an ordinary number.

.....

(1)

The area covered by the Pacific Ocean is k times the area covered by the Arctic Ocean.

(c) Find, correct to the nearest integer, the value of k.

$k =$ .....

(2)

15. **[6 marks]**

(a) Work out $(9 \times 10^8) \times (4 \times 10^6)$
Give your answer in standard form.

.....
(1)

(b) $x = 7 \times 10^m$ and $y = 5 \times 10^n$, where m and n are integers.

(i) It is given that $xy = 3.5 \times 10^{12}$
Show that $m + n = 11$

(ii) It is also given that $\frac{x}{y} = 1.4 \times 10^{27}$

Find the value of m and the value of n.

m = ...

n = ...
(5)

16. **[5 marks]**

(a) $x = 9 \times 10^{2m}$ where m is an integer.

Find, in standard form, an expression for $\sqrt{x}$

.....

(2)

(b) $y = 9 \times 10^{2n}$ where n is an integer.

Find, in standard form, an expression for $y^{\frac{3}{2}}$

Give your answer as simply as possible.

.....

(3)

17. **[3 marks]**

$x = a \times 10^n$ where n is an integer and $\sqrt{10} \leqslant a < 10$

Find, in standard form, an expression for x^2.
Give your expression as simply as possible.

18. **[5 marks]**

(a) Evaluate $5 \times 10^{12} + 9 \times 10^{12}$
Give your answer in standard form.

.....

(2)

(b) Each of the numbers p, q and r is greater than 1 and less than 10

$p \times 10^{15} + q \times 10^{15} = r \times 10^{n}$
$p + q > 10$

(i) Find the value of n.

$n =$ .....

(ii) Find an expression for r in terms of p and q.

$r =$ .....

(3)

19. **[4 marks]**

(a) Work out $5.2 \times 10^2 + 2.3 \times 10^4$
Give your answer in standard form.

.....

(2)

(b) $a \times 10^2 + b \times 10^4 = c \times 10^4$

Express c in terms of a and b.

$c =$.....

(2)

20. **[5 marks]**

(a) Each of the numbers x, y and z is greater than 1 and less than 10

$x \times 10^5 + y \times 10^4 = z \times 10^5$

Find an expression for z in terms of x and y.
Give your answer as simply as possible.

$z =$ .....

(2)

(b) Each of the numbers 3×10^n, 4×10^m and $a \times 10^p$ is in standard form.

$$\frac{3\times10^n}{4\times10^m} = a\times10^p$$

(i) Find the value of a.

$a =$ .....

(ii) Find an expression for p in terms of n and m.

$p =$ .....

(3)