

# Physics Induction Activity

---

## Mathematical Skills for Physics

June 2017

Section:	Mark Achieved:
A	/20
B	/20
C	/10
D	/8
E	/7
F	/6
G	/4
<b>TOTAL</b>	<b>/75</b>

Unsatisfactory	38 - 44	D
Satisfactory	45 - 52	C
Good	53 - 59	B
High Quality	60 - 75	A

**A. Large and small numbers and standard form:**

1. Write 100 as a power of 10  
.....
2. Write 100 000 as a power of 10  
.....
3. Write 10 as a power of 10  
.....
4. Write 1 000 000 000 as a power of 10  
.....
5. Write 0.1 as a power of 10  
.....
6. Write 0.001 as a power of 10  
.....
7. Write 0.000000001 as a power of 10  
.....
8. Write 1 as a power of 10  
.....
9. Write 280 in standard form  
.....
10. Write 2530 in standard form  
.....
11. Write 0.77 in standard form  
.....
12. Write 0.0091 in standard form  
.....
13. Write 1 872 000 in standard form  
.....
14. Write 12.2 in standard form  
.....
15. Write  $2.4 \times 10^2$  as a normal number  
.....
16. Write  $3.505 \times 10^1$  as a normal number  
.....
17. Write  $8.31 \times 10^6$  as a normal number  
.....
18. Write  $6.002 \times 10^{-2}$  as a normal number  
.....
19. Write  $1.5 \times 10^{-4}$  as a normal number  
.....
20. Write  $4.3 \times 10^{-1}$  as a normal number  
.....

**B. Prefixes for units**

1. How many metres in 2.4 km?  
.....
2. How many joules in 8.1 MJ?  
.....
3. Convert 326 GW into W  
.....
4. Convert 54 600 mm into m  
.....
5. How many metres in 1 $\mu$ m?  
.....
6. How many grams in 240 kg?  
.....
7. Convert 0.18 nm into m  
.....
8. Convert 0.096 mJ into J  
.....
9. How many eV in 125 GeV?  
.....
10. How many  $\Omega$  in 470 M $\Omega$ ?  
.....
11. Convert 632 nm into m. Express in standard form.  
.....
12. Convert 1002 mV into V. Express in standard form.  
.....
13. How many eV in 0.511 MeV? Express in standard form  
.....
14. How many  $\Omega$  in 11 k $\Omega$ ? Express in standard form  
.....
15. Convert 9212 km into m. Express in standard form  
.....
16. Convert 1.385kg into g. Express the answer in standard form  
.....
17. Write  $2.3 \times 10^2 \mu\text{m}$  in m. Express in standard form  
.....
18. Write  $0.55 \times 10^4 \text{ km}$  in m. Express in standard form  
.....
19. Write  $4.61 \times 10^{-2} \text{ mm}$  in m. Express in standard form  
.....
20. Write  $0.062 \times 10^{-5} \text{ MJ}$  in J. Express in standard form.  
.....

**C. Using your calculator** (express your answer in standard form to three decimal places)

1. Calculate  $423 \times 319$   
.....  
.....
2. Calculate  $12\,453.8 / 0.07$   
.....  
.....
3. Calculate the number of seconds in the day  
.....  
.....
4. The charge of an electron is  $1.6 \times 10^{-19}$  coulombs. Calculate the total charge of one mole of electrons. (1 mole of electrons contains  $6.02 \times 10^{23}$  electrons)  
.....  
.....
5. Calculate  $3.6 \times 10^5 \times 7.2 \times 10^7$   
.....  
.....
6. Calculate  $2.46 \times 10^{-5} \times 1.06 \times 10^6$   
.....  
.....
7. Calculate  $(1 \times 10^{-3})^2 \times 3.14 / 4$   
.....  
.....
8. Calculate  $(1.4 \times 10^3 + 2.12 \times 10^2)$   
.....  
.....
9. Calculate  $5.11 \times 10^5 \times 1.6 \times 10^{-19} / (3.0 \times 10^8)^2$   
.....  
.....
10. Calculate  $2^{41} \times 7 \times 10^9$   
.....  
.....

**D. Rearranging equations**

1.  $u^2 = v^2 - 2as$  (make  $s$  the subject)  
.....  
.....
2.  $A = \pi r^2$  (make  $r$  the subject)  
.....  
.....
3.  $v = s/t$  (make  $s$  the subject)  
.....  
.....
4.  $F = ma$  (make  $a$  the subject)  
.....  
.....
5.  $P = E/t$  (make  $E$  the subject)  
.....  
.....
6.  $E = mc^2$  (make  $m$  the subject)  
.....  
.....
7.  $v^2 = u^2 + 2as$  (make  $a$  the subject)  
.....  
.....
8.  $F = GMm/r^2$  (make  $M$  the subject)  
.....  
.....



**F. Trigonometry for Physics** (use your prior maths knowledge and SOH CAH TOA to solve these questions)

1. A man tries to row directly across a river. He rows with a velocity of  $3.0 \text{ ms}^{-1}$ . The river has a velocity parallel to the bank of  $4.0 \text{ ms}^{-1}$ . Calculate:

The size of the resultant velocity of the boat

.....  
.....  
.....  
.....

The direction of the resultant velocity to the bank

.....  
.....  
.....  
.....

(\*HINT\* first draw his rowing velocity as an arrow away from the bank. Then, starting from the end of the first arrow, draw an arrow showing the velocity of the river. The resultant velocity is found by drawing an arrow from the start of the first arrow, to the end of the second arrow)

2. A tennis player hits a ball at  $10 \text{ ms}^{-1}$  at an angle of  $30^\circ$  to the ground. What is the initial:

Horizontal component (part) of the velocity

.....  
.....  
.....  
.....  
.....

Vertical component (part) of the velocity

.....  
.....  
.....  
.....  
.....

3. Two tug boats are pulling a ship into harbour. One tug pulls in a south east direction. The other pulls in a south west direction. Each tug pulls with a force of  $8.0 \times 10^4 \text{ N}$ . What is the resultant force on the ship?

.....  
.....  
.....  
.....  
.....



