

# 1.1 Measurements in Physics

## Question Paper

Course	DPIB Physics
Section	1. Measurement & Uncertainties
Topic	1.1 Measurements in Physics
Difficulty	Easy

**Time allowed:** 70  
**Score:** /54  
**Percentage:** /100


**Question 1a**

(a)

Match the correct quantity to the SI base unit

[3]

Length	kg
Mass	m
Current	s
Time	mol
Amount of a substance	K
Temperature	A



[3 marks]

**Question 1b**Newton's second law of motion describes the relationship between force,  $F$ , mass,  $m$ , and acceleration,  $a$ .

$$F = ma$$

The derived unit for force is the newton (N).

(b)

Using Newton's second law, determine the SI base units of force

[2]

[2 marks]

**Question 1c**

The kinetic energy equation describes the relationship between energy  $E$ , mass,  $m$ , and velocity,  $v$ .

$$E = \frac{1}{2}mv^2$$

The derived unit for energy is the joule (J).

(c)

Using the kinetic energy equation, determine the SI base units for energy

[2]

[2 marks]

**Question 1d**

The derived unit for power,  $P$ , is the watt (W).

(d)

Given that power is the energy transferred,  $E$ , per unit time,  $t$ , deduce the SI base units for power

[2]

[2 marks]

**Question 2a**

(a)

Outline the reason why scientists use scientific notation

[1]

[1 mark]

**Question 2b**

(b)

Express the following numbers in scientific notation

(i)

491

[1]

(ii)

54 070

[1]

(iii)

2 310 000

[1]

[3 marks]

**Question 2c**

(c)

Express the following numbers in scientific notation

(i)

0.011

[1]

(ii)

0.000503

[1]

(iii)

0.0000045

[1]

[3 marks]

**Question 2d**

(d)

Express the following numbers in their original form

(i)

$4.031 \times 10^3$

[1]

(ii)

$6.7 \times 10^6$

[1]

(iii)

$7.71 \times 10^{-5}$

[1]

**[3 marks]**

### Question 3a

(a)  
Complete the table by adding in the missing names of the unit prefixes and their corresponding metric multiplier:

Unit Prefix	Multiplier
tera	
	$10^9$
	$10^3$
centi	$10^{-2}$
milli	
micro	
	$10^{-9}$
pico	$10^{-12}$

[3]

[3 marks]

### Question 3b

(b)  
Convert the following measurements into SI units using scientific notation

(i)  
9.3 MJ to J

[1]

(ii)  
7.4 kW to W

[1]

(iii)  
10 mm to m

[1]

[3 marks]

### Question 3c

(c)

State the number of significant figures in the following measurements

(i)

93100 m

[1]

(ii)

4003 kg

[1]

(iii)

0.0052 J

[1]

**[3 marks]**

### Question 3d

(d)

State the measurement 103 660 pg to

(i)

4 significant figures

[1]

(ii)

2 significant figures

[1]

(iii)

1 significant figure

[1]

**[3 marks]**

### Question 4a

The distance from Earth to the edge of the observable universe is approximately  $4.40 \times 10^{26}$  m.

(a)

State the order of magnitude for this distance

[1]

**[1 mark]**



**Question 4b**

(b)

State the order of magnitude that is:

(i)

100 times larger than  $5.5 \times 10^2$ 

[1]

(ii)

1 000 000 times smaller than  $9.1 \times 10^4$ 

[1]

(iii)

1000 times larger than  $3 \times 10^{-20}$ 


[1]

**[3 marks]****Question 4c**

(c)

Match the description to the correct order of magnitude

5 orders of magnitude larger than $10^8$	$10^{-12}$
12 orders of magnitude larger than $10^{-24}$	$10^{13}$
50 orders of magnitude smaller than $10^{25}$	$10^{-25}$
10 orders of magnitude smaller than $10^{-30}$	$10^{-40}$



[3]

**[3 marks]**

### Question 4d

The radius of the Earth is approximately  $6.4 \times 10^6$  m.

(d)

Using an approximation for the typical arm span of a person, estimate the number of people it would take to circle the Earth holding hands.

[4]

**[4 marks]**

### Question 5a

(a)

Convert 1 year into seconds. Give your answer to 2 significant figures in scientific notation.

[3]

**[3 marks]**

### Question 5b

The wave equation describes the relationship between wave speed,  $c$ , frequency,  $f$ , and wavelength,  $\lambda$ .

$$c = f\lambda$$

UV rays travel at the speed of light and have a frequency of  $900 \times 10^{12}$  Hz.

(b)

Calculate the wavelength of the UV ray in nm.

[3]

[3 marks]

### Question 5c

UV rays travel from the Sun to the Earth in 500 ms.

(c)

State the relevant SI base unit for time and convert the given value to its SI base unit.

[2]

[2 marks]

### Question 5d

A light-year is the distance that light travels in a year.

(d)

Calculate the value of 1 light-year in km. You may use your answer from part (a) in your calculation.

[4]

[4 marks]

