National 5 Physics
Exam Skills
Skill 1: Significant Figures

Introduction

When stating final answers to calculation questions in the National 5 Physics exam, significant figures become important. Pupils often lose marks for using too many significant figures, but this can easily be avoided by being a bit more careful.

There are **four main rules** to decide whether a number is a significant figure:

- any non-zero digit and zero in between two non-zero digits is a significant figure e.g. 405 s has 3 significant figures.
- leading zeroes in a number (i.e. zeroes before a non-zero digit) are not counted as significant figures e.g. 0.005 A has 1 significant figure.
- trailing zeroes (i.e. zeroes after a non-zero digit) in a decimal number are counted as significant figures e.g. 7.00 m has 3 significant figures, but trailing zeroes in a number that is not a decimal do not count as significant e.g. 42 000 V has 2 significant figures.
- any number written in scientific notation is a significant figure e.g. 1.6×10^{-19} J has 2 sig figs.

When doing calculations, your final answer should be stated using an appropriate number of significant figures. As a general rule, your answer should have **no more significant figures than the least accurate value in the question**. You will, however, get away with **two more or one less** than the least accurate value in the question.

Practice Questions

1. In each of the following cases, the stated value has too many significant figures. The appropriate number of significant figures is stated in brackets after the quantity.

Round each quantity to the correct number of significant figures.

(a) 11.85467 V (2 s.f.) **1**

(b) 50.7835 Hz (3 s.f.) **1**

(c) 0.000000712 m (2 s.f.) **1**

(d) 2.998×10^{8} ms^{-1} (1 s.f.) **1**

2. A physics pupil tackles the following question:

'Calculate the activity of a sample of uranium if 2.32×10^{7} nuclei decay in a time of 15 minutes.'

Using the equation A = N/t , they obtain an answer on their calculator of 25777.77778 Bq.

(a) What is the least accurate value in the question (i.e. the least number of significant figures)? **1**

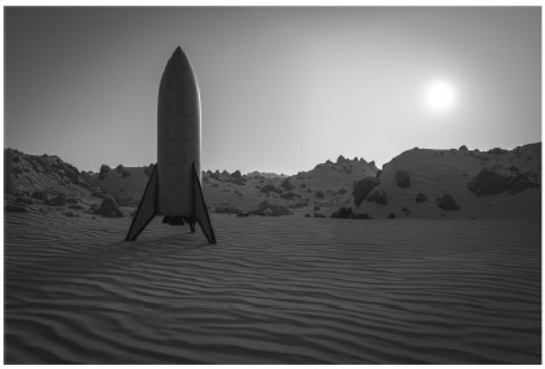
(b) Write the final answer using an appropriate number of significant figures. **1**

3. A resistor has a current of 25 mA flowing through it when the voltage across it is 8.95 V.

Calculate the resistance of the resistor, writing your final answer with an appropriate number of significant figures. **3**

For the following questions (Q4, 5 and 6), state your final answers to an appropriate number of significant figures.

4. A spaceship on Mars is being prepared for the return journey to Earth.



(a) The mass of the spaceship including fuel and crew is 1.3×10^6 kg.

The rocket engines on the spaceship produce a constant upward thrust of 1.2×10^7 N.

(i) Calculate the weight of the spaceship on Mars. **3**

5. A lifeboat crew is made up of local volunteers. When there is an emergency they have to get to the lifeboat quickly.

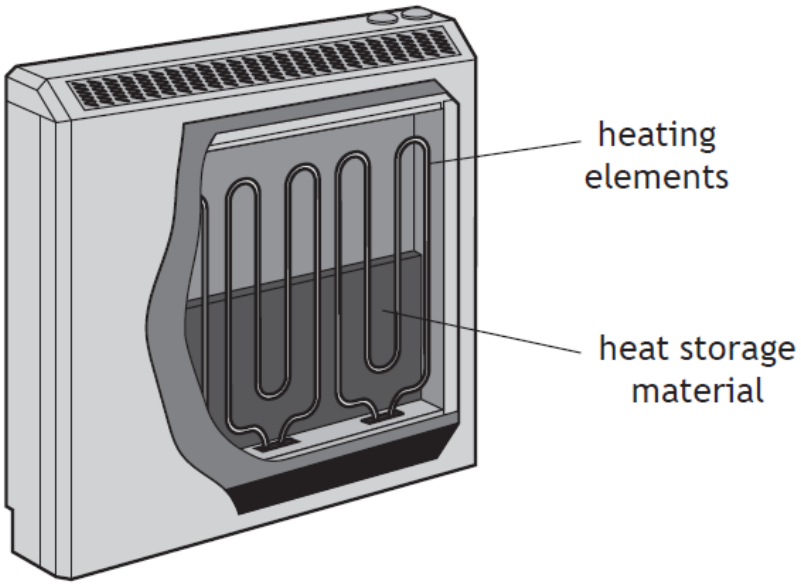
The lifeboat crew members are alerted to an emergency using a pager.

Text messages are sent to the pager using radio waves.

(a) The radio waves have a frequency of 153 MHz.

Calculate the wavelength of the radio waves. **3**

6. A storage heater heats a material overnight then allows the material to radiate this heat during the day.



A manufacturer is testing heat storage materials with different specific heat capacities.

In each test the temperature of 2·5 kg of material is raised from 22 °C to 250 °C.

(a) One of the materials being tested by the manufacturer is clay brick.

Clay brick has a specific heat capacity of 810 J kg^{-1} $°C^{-1}$.

Calculate the minimum energy required to heat 2·5 kg of clay brick from 22 °C to 250 °C. **3**

Total Marks: 18