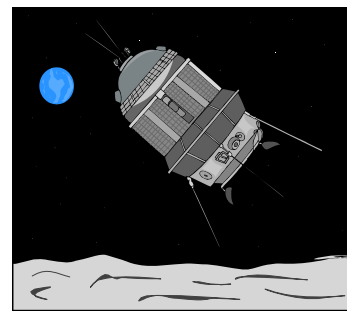


Your task is to design a space probe suitable for visiting the planet Venus.

Although Venus is further away from the Sun than Mercury, it is, in fact, hotter, with temperatures up to 474°C. Venus has many active volcanoes and these produce a thick atmosphere of carbon dioxide, trapping heat energy and causing global warming. The clouds on Venus are not made of water but of sulphuric acid!



The Russians tried sending probes to Venus, but the first seven 'Venera' probes all succumbed to the atmosphere. Venera 8 managed to send back some pictures and probes since have had more success.

What factors would you have to take into account when designing a probe to survive the conditions described above?

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Below is a table of some of the properties of some possible metals for the probe.

Metal	Melting point °C	Pauling number	Density g/cm ³	Cost \$/kg
lead	327	1.8	11.35	3
magnesium	639	1.2	1.74	4
aluminium	660	1.5	2.7	3
silver	962	1.9	10.5	600
gold	1064	2.4	19.32	40 000
nickel	1453	1.8	8.90	18
iron	1535	1.8	7.87	0.5
copper	1083	1.9	8.96	10
platinum	1722	2.2	21.4	50 000

The Pauling number is an indication of how reactive the metal is.

- Look at the figures above. Using your knowledge of reactivity, what is the relationship between the Pauling number and reactivity?

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Acids will react with metals with a Pauling number of 1.8 and below. Metals which are less reactive will only react with very strong acids such as concentrated nitric acid.

2. Which of the metals in the table above are unlikely to react with the atmosphere on Venus?

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3. Why might it be important to consider the melting point of the metal?

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4. Does this exclude any of the metals in your list above?

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5. Why might it be important to consider the density of the metal?

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6. Does this exclude any of the metals in your list above?

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7. Do you think the price of the metal will be an important consideration? Explain your answer. (Be careful here: the price may indicate the availability of the metal.)

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8. In fact, NASA used silver coated quartz tiles to reflect heat and silver/aluminium alloys to build the Magellan spacecraft to Venus. These alloys are much stronger than any pure metal.

What is an alloy?

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