Marks 8

- One of the causes of acid rain is a reaction occurring in the upper atmosphere between gaseous NO_2 and water to produce nitric acid and gaseous NO. Write a balanced chemical equation for this reaction.

As part of their school project on acid rain, some high school students collected a sample of rain (220 mL) and measured the pH value of the solution, reporting the value as pH = 3.9. Assuming that the rain sample does not contain any acids other than nitric acid, calculate the volume of gaseous NO_2 that would have been consumed in the upper atmosphere (where temperature = –56 °C and pressure = 11.6 kPa) to produce the sample of rain collected by the students.

ANSWER:

	Marks
Given that haemoglobin contains 4 Fe atoms per molecule and its concentration in blood is 15 g per 100 mL, calculate the total mass of Fe in the patient's blood *before* being treated with Desferal. (The molar mass of haemoglobin is 6.45×10^4 g mol^{-1}.)	**4**

ANSWER:

THE REMAINDER OF THIS PAGE IS FOR ROUGH WORKING ONLY

- Human haemoglobin has a molar weight of 6.45×10^4 g mol^{-1} and contains 3.46 g of iron per kg. Calculate the number of iron atoms in each molecule of haemoglobin.

3

Answer:

	Marks
• If 50 mL of a 0.10 M solution of $AgNO_3$ is mixed with 50 mL of a 0.040 M solution of $BaCl_2$, what mass of AgCl(s) will precipitate from the reaction?	**3**
Answer:	
What is the concentration of NO_3^- ions in the final solution from the reaction above?	
Answer:	

- Desferal is a siderophore-based drug that is used in humans to treat iron-overload. One molecule of Desferal (molecular formula: $C_{25}H_{48}O_8N_6$) can bind one Fe^{3+} ion. A patient with an iron-overload disease had an excess of 5.34×10^{-4} M Fe^{3+} in her bloodstream. Assuming the patient had a total blood volume of 4.84 L, what mass of Desferal would be required to complex all of the excess Fe^{3+}?

2

Answer:

- Many gases are available for use in compressed gas cylinders, in which they are stored at high pressures. Calculate the mass of oxygen gas that can be stored at 20 °C and 170 atm pressure in a cylinder with a volume of 60.0 L.

2

Answer:

Marks 6

- If 20.0 mL of a 0.100 M solution of sodium phosphate is mixed with 25.0 mL of a 0.200 M solution of zinc chloride, what mass of zinc phosphate will precipitate from the reaction?

Answer:

What is the final concentration of zinc ions in solution after the above reaction?

Answer:

What is the final concentration of sodium ions in solution after the above reaction?

Answer: