NZQA

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

Level 2 Science, 2009

90766 Describe the chemical properties and effects of fertilisers

Credits: Four

2.00 pm Wednesday 2 December 2009

Check that the National Student Number (NSN) on your admission slip is the same as the number at the top of this page.

You should answer ALL the questions in this booklet.

If you need more space for any answer, use the page(s) provided at the back of this booklet and clearly number the question.

Check that this booklet has pages 2–7 in the correct order and that none of these pages is blank.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.

For Assessor's use only	Achievement Criteria		
	Achievement	**Achievement with Merit**	**Achievement with Excellence**
	Describe the properties and effects of fertilisers.	Explain the effects of fertilisers in terms of their properties.	Discuss the effects of fertilisers in terms of their properties.
	Overall Level of Performance		

You are advised to spend 35 minutes answering the questions in this booklet.

QUESTION ONE

The NPK rating of a fertiliser gives the percentage of nitrogen, phosphorus and potassium in the mixture.

Calcium phosphate ($Ca_3(PO_4)_2$) and calcium dihydrogen phosphate ($Ca(H_2PO_4)_2$) are two components of superphosphate.

(Atomic masses: Ca = 40.0, P = 31.0, O = 16.0, H = 1.0)

(a)   Calculate the % composition of phosphorus in calcium phosphate and compare with the % of phosphorus in calcium dihydrogen phosphate (phosphorus = 26.5%) to explain which component of superphosphate provides the most phosphorus to a fruit crop.

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(b)   Explain why phosphorus is an essential element for a plant's ability to grow and fruit well.

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Orange trees require acidic soil.

(c)   Describe how soil scientists would define an acidic soil in terms of hydrogen ion concentration.

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(d) Explain how an orange tree grower could ensure that the soil in which their orange trees are grown is kept acidic over time.

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(e) Most plants require soil less acidic than that required by orange trees. It is common practice to add a fertiliser such as slaked lime $(Ca(OH)_2)$ to raise the soil pH.

Discuss how slaked lime $(Ca(OH)_2)$ raises the soil pH. Use an equation to support your answer.

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QUESTION TWO

Lake Ellesmere (Te Waihora) is New Zealand's fifth largest lake. A 2007 Environment Court decision described the lake as eutrophic – so polluted by nitrates and phosphates that algal blooms are a continuing problem. This gives much of Lake Ellesmere a grey green colour.
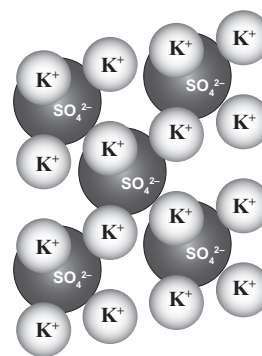
Discuss how nutrient run-off can be minimised to help reverse the eutrophication of Lake Ellesmere.

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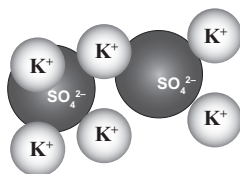_____

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QUESTION THREE:

Potassium sulfate (K_2SO_4) can be used as a source of potassium for crops.

Discuss how potassium sulfate dissolves in water.
Use a diagram to aid your answer.

QUESTION FOUR

Boron is a micronutrient which occurs in the soil in its ionic form B^{3+}. Micronutrients are essential for plants and are required in small amounts. They are available to plants in a very narrow pH range.

Discuss how the concentration of H^+/OH^- ions present in the soil at very low pH, differs from the concentration of H^+/OH^- ions present with very high pH, AND **explain** how this affects the availability of boron to plants.

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Extra paper for continuation of answers if required.
Clearly number the question.

Question
number