Centre Number ... Candidate ...

Candidate Name ____________________

International General Certificate of Secondary Education
CAMBRIDGE INTERNATIONAL EXAMINATIONS

CO-ORDINATED SCIENCES 0654/5

PAPER 5 Practical Test

OCTOBER/NOVEMBER SESSION 2002

2 hours

Candidates answer on the question paper.
Additional materials:
As listed in Instructions to Supervisors.

TIME 2 hours

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided on the question paper.

You will need to set up the experiment for Question 1 at the start of the examination. While the experiment is left for at least 30 minutes you are advised to proceed with another question.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question.

Chemical practical notes for this paper are printed on page 12.

FOR EXAMINER'S USE	
1	
2	
3	
TOTAL	

This question paper consists of 10 printed pages and 2 blank pages.

Before you begin the examination please make sure you have read the instructions on the front cover of the question paper.

1 This question is about osmosis. Osmosis is the net (overall) movement of water from a solution of higher water potential into a solution of lower water potential through a partially permeable membrane.

Prepare four chips, from the potato provided, of length 8.0 cm and approximately 0.5 cm wide (see Fig. 1.1). Use a sharp knife or scalpel and a suitable cutting surface. You must cut the **length** as accurately as you can to 8.0 cm.

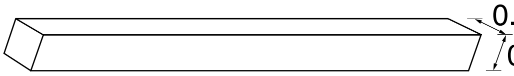

Fig. 1.1

- Put four test-tubes into a test-tube rack.
- Put each chip into a separate test-tube.
- Add solution **A** to your first two test-tubes. Add enough of the solution to cover your chips. Do not worry if your chips float. Label these tubes with the letter **A**.
- In the same way add solution **B** to your remaining two test-tubes. Label these tubes with the letter **B**.

> - You must leave these chips for **at least 30 minutes**. It does not matter if they are left for longer than this. During this time move on to another question.

(a) After at least 30 minutes remove your chips from solution **A**, quickly dry them with a paper towel, and measure their new length.

(i) new length of first chip ....cm

new length of second chip ....cm [2]

(ii) Work out the average length of the chips after being in solution **A**.

....

....[1]

(iii) Using this average length, calculate the percentage change in size.

....

....

....

....[1]

(b) Now remove your chips from solution **B**. Dry them quickly with a paper tow[el and] carefully measure their length.

new length of third chip ....cm

new length of fourth chip ....cm [2]

(c) **(i)** Using your knowledge of osmosis, and the results of your experiment, decide how the water potentials of the solutions **A** and **B** compare with the water potentials of the potato cells. Give your reason in each case.

solution **A**

....

....

....

solution **B**

....

....

....[4]

(ii) Use the results of your experiment to explain why soil water should always have a higher water potential than plant cells in a root.

....

....

....[2]

For Examiner's Use

(d) **(i)** Take one of your chips that was immersed in solution **A** and one from sol
Try to bend them but do not break the chips. In the space below, draw a l
sketch of your chips to show the maximum bending you can achieve with ea
chip.

chip from solution **A** | chip from solution **B** [1]

(ii) Use your observation to explain why a plentiful supply of water is needed for the mechanical support of a plant.

....

....

....[2]

2 You are going to find the energy change when a certain mass of solid **Z** dissolves in w[...] a beaker. The first step is to find how much heat is stored by the 100 cm^3 glass beaker.

(a) (i) Weigh the 100 cm^3 glass beaker to the nearest gram. Record the mass in the space provided and convert this mass into kilograms.

mass of beaker in grams = ...g

mass of beaker in kilograms =....................................kg [1]

(ii) Multiply the mass of the beaker in kg by 670. This gives the heat energy, **X** joules, for each degree Celsius change.

X = ...J / °C [1]

(b) (i) Weigh between 2.5 g and 3.5 g of solid **Z**. This must be accurately weighed to the nearest 0.1 g. Write down all weighings you make and record the accurate mass of **Z**.

mass of **Z** = ...g [2]

(ii) Using a measuring cylinder, measure out 25 cm^3 of cold water and pour into the 100 cm^3 beaker.

Measure and record the temperature T_1 of this water, to the nearest 0.5 °C.

T_1 ....°C

Add the weighed solid **Z** to the water and stir until it completely dissolves.

Read and record T_2, the lowest temperature reached.

T_2 ....°C

Calculate the temperature change, ΔT.

ΔT = ...°C [4]

(iii) Use your results from **(a)(ii)** and **(b)(ii)** to calculate the total number o[f joules] absorbed by the dissolving of **Z** in water, using the formula below.

total heat energy absorbed = ΔT (**X** + 105)

..........................J [1]

(c) Suggest **one** way in which you could improve the experiment.

....

....[1]

(d) Is the dissolving of **Z** in water endothermic or exothermic? Explain your answer.

....

....[1]

(e) **(i)** Empty and rinse the beaker. Measure out 20 cm^3 of the liquid **L** into the same beaker. Measure its temperature, T_3, as accurately as you can and record its value.

T_3 = ...°C

You are now required to pour into this liquid 50 cm^3 of water at exactly 60 °C, and stir thoroughly. Record the final temperature, T_4, of the mixture. The way in which you make the temperature of the water exactly 60 °C is for you to decide.

T_4 = ...°C [2]

(ii) Describe how you made the temperature of the 50 cm^3 of water exactly 60 °C.

....

....

....

....

....[2]

3 You are going to find out how the time taken for a reaction varies with temperatu[re. The] reaction produces a precipitate which will make the solution cloudy. See Fig. 3.1.

Take care when handling hot liquids

(a) Mark a large cross in the centre of a piece of paper. The flask will be placed on this paper. You will look down at the cross through the solution. When the cross disappears, the reaction has finished.

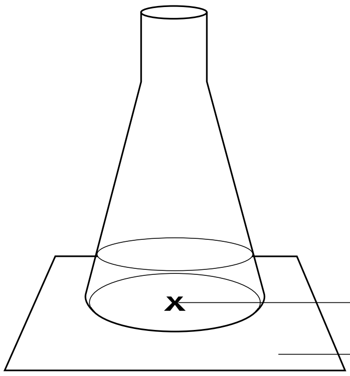

Fig. 3.1

(b)
- Using the larger measuring cylinder, measure 50 cm^3 of the solution labelled **H** and pour it into the flask.
- Warm the contents of the flask to 35 °C (this will only take a few seconds). Place the flask over the cross on the paper.
- Using the smaller measuring cylinder, measure 5 cm^3 of the solution labelled **J** and add it to the flask containing solution **H**. Start the clock and swirl the flask to mix the contents.
- When you can no longer see the cross on the paper, stop the clock.
- Record the starting temperature and time in seconds, in the table Fig. 3.2.

starting temperature / °C	time for cross to disappear/s

[5]

Fig. 3.2

(c)
- Wash out the flask with water.
- Repeat the above procedure but heat solution **H** to 40 °C.
- Record the starting temperature and time in the table.
- Repeat three more times using an increased starting temperature each time. Do **not** exceed a starting temperature of 70 °C

For Examiner's Use

(d) Plot a graph on the grid provided of time (vertical axis) against temperature. La temperature axis from 0 °C to 100 °C.
Draw a smooth curve through your points.

[4]

(e) Use your graph to answer the following questions:

(i) Find the time for the reaction at 10 °C.

time = ...s

(ii) Find the temperature required to produce a reaction time of 50 seconds.

temperature = ...°C [2]

(f) Describe the relationship between the temperature and the time taken for the reaction to occur.

....

....

....[1]

(g) The graph you have plotted does not show the relationship between **rate of reaction** and temperature. Briefly explain what you would do with your results to show such a relationship.

....

....

....[1]

(h) Briefly describe how you would carry out an experiment at 0 °C to find the reaction time.

....

....

....

....[2]

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CHEMISTRY PRACTICAL NOTES

Test for anions

anion	*test*	*test result*
carbonate (CO_3^{2-})	add dilute acid	effervescence, carbon dioxide produced
chloride (Cl^-) [in solution]	acidify with dilute nitric acid, then add aqueous silver nitrate	white ppt.
nitrate (NO_3^-) [in solution]	add aqueous sodium hydroxide, then aluminium foil; warm carefully	ammonia produced
sulphate (SO_4^{2-}) [in solution]	acidify, then add aqueous barium chloride *or* aqueous barium nitrate	white ppt.

Test for aqueous cations

cation	*effect of aqueous sodium hydroxide*	*effect of aqueous ammonia*
ammonium (NH_4^+)	ammonia produced on warming	–
copper(II) (Cu^{2+})	light blue ppt., insoluble in excess	light blue ppt., soluble in excess, giving a dark blue solution
iron(II) (Fe^{2+})	green ppt., insoluble in excess	green ppt., insoluble in excess
iron(III) (Fe^{3+})	red-brown ppt., insoluble in excess	red-brown ppt., insoluble in excess
zinc (Zn^{2+})	white ppt., soluble in excess, giving a colourless solution	white ppt., soluble in excess, giving a colourless solution

Test for gases

gas	*test and test result*
ammonia (NH_3)	turns damp litmus paper blue
carbon dioxide (CO_2)	turns lime water milky
chlorine (Cl_2)	bleaches damp litmus paper
hydrogen (H_2)	‘pops’ with a lighted splint
oxygen (O_2)	relights a glowing splint