Each candidate should be provided with the following:-

REAGENT

Solution **Z**   -   100% potassium permanganate solution

PLANT SPECIMENS

Specimen **K** :   Large sized Irish potato

Specimen **M** :   Mature yellow oxalic plant

Specimen **N** :   Mature fern plant

ANIMAL SPECIMENS

Specimen **X** :   Mature cockroach

Each candidate should have:

- *Hand lens*
- *Boiling tubes(2)*
- *Filter paper*
- *Razor blade*
- *Stop clock*

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1. You are provided with specimen **K** which is a plant organ and solution **Z** which is a common laboratory reagent. Use them to carry out the experiment below and answer the questions that follow:

- Peel specimen **K** and cut it to obtain two cubes K_1 and K_2.
- Using a razor blade, trim two(2) cubes.
- Trim cube K_1 in the dimension of 5mm x 5mm x 5mm.
- Trim cube K_2 in the dimensions of 10mm x 10mm x 10mm.
- Measure 20cm^3 of solution **Z** and pour it into the boiling tubes(1) and (2) respectively.
- Drop both cubes K_1 and K_2 simultaneously into each of the boiling tubes and wait for 15 minutes. **MEANWHILE CONTINUE WITH OTHER WORK**
- After 15 minutes, remove both cubes K_1 and K_2 from the solution **Z** and dry them with the filter paper.
- Then cut each cube vertically into two(2) equal halves using a razor blade.
- Measure the distance penetrated by solution **Z** into each cube K_1 and K_2 as shown below:

— Stained part
— Unstained part
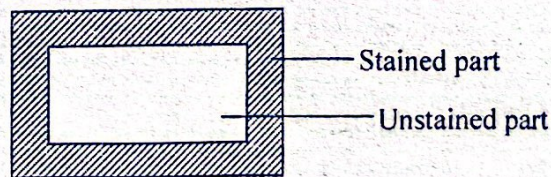
From the experiments above, calculate the volume, surface area, surface area to volume ratio and the average distance moved by solution **Z** into cube K_1 and K_2 and fill the results in the table below: (10 marks)

(a)

Cubes	Volume (mm^3)	Surface area (mm^2)	Surface area to volume ratio	Average distance moved by solution
K_1				
K_2				

(b) From your results in the table above, explain the differences in the distance moved by the solution Z into each of the cubes K_1 and K_2. (04 marks)

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(c). Explain how the large cube would overcome its disadvantage. (02 marks)

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(d) Identify the biological process investigated in the experiment. (01 mark)

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(e) Suggest any other three(3) factors that may affect the process investigated above. (03 marks)

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2. You are provided with specimens **M** and **N** which are plant organs.
Examine them carefully and use them to answer the questions that follow:

(a). Identify the plant divisions to which each specimen belongs. (02 marks)

Specimen **M** : ....

Specimen **N** : ....

3

(b) Using observable features, state any **four(4)** differences between specimens **M** and specimens **N**.   (04 marks)

	Specimen M	Specimen N
i)		
ii)		
iii)		
iv)		

(c) Using observable features, explain the advantages of specimen **N** over specimen **M**.   (04 marks)

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(d) Explain the adaptations of specimen **M** for survival in its habitat.   (04 marks)

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(e) Cut off the roots from specimen **M** and make a well labeled drawing of the remaining part and indicate your magnification. (06 marks)

3. You are provide with a freshly killed animal specimen **X**. Examine it carefully and use it to answer the questions that follow;

(a) (i) Using observable features, suggest the phylum for the specimen stating three reasons to support your answer.   (04 marks)

Phylum

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Reasons

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(ii) Identify the habitat for the organism.   (01 mark)

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(b) Explain how the features listed below make the organism become adapted for survival in its colony.

i) Body shape.   (01 mark)

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ii) Antennae   (02 marks)

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iii) Outer wings   (02 marks)

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iv) Hind legs. (02 marks)

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(c) (i) Suggest the mode of feeding for the organism **X**. (01 mark)

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(ii) Explain how the organism **X** is adapted for the mode of feeding stated in (c) (i) above. (01 mark)

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(d) In the space provided, make a well labeled drawing of the ventral view of specimen **X** without the abdomen and indicate you magnification. (06 marks)

END