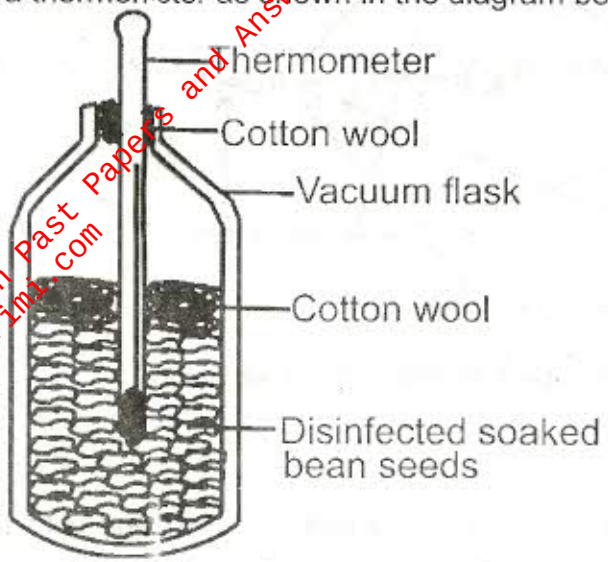
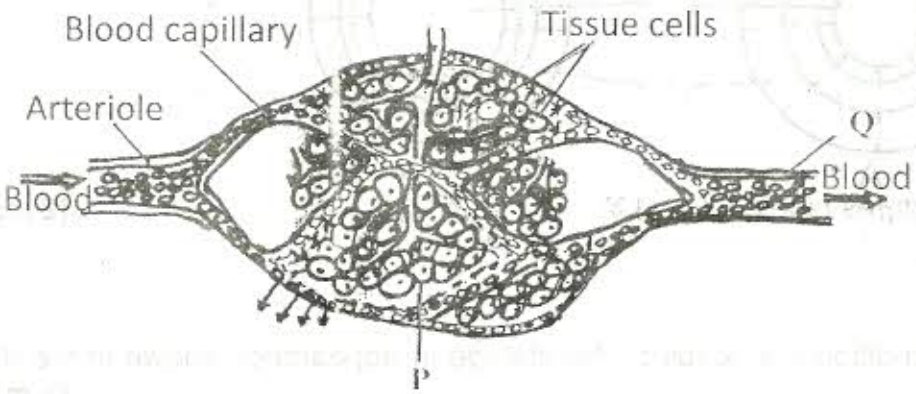
1. In an experiment, disinfected soaked bean seeds were put in a vacuum flask which was then fitted with a thermometer as shown in the diagram below.



The temperature readings were taken every morning for three consecutive days.

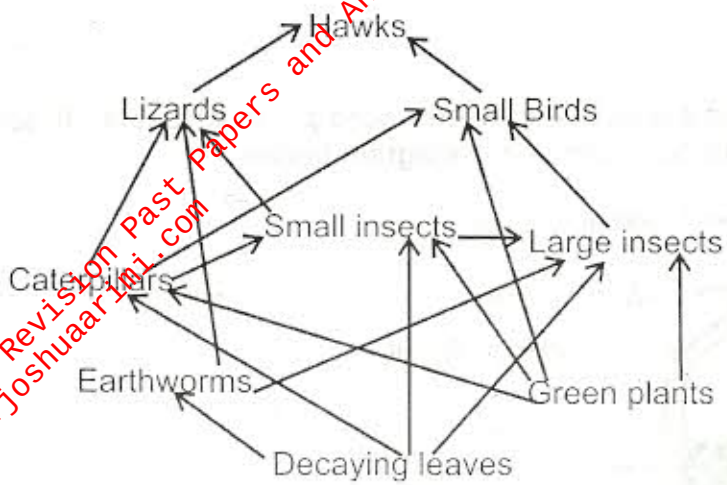
(a) Which process was being investigated? **(1 mark)**
(b) (i) What were the expected results? **(1 mark)**
(ii) Account for the answer in (b) (i) above. **(2 marks)**
(c) Why were the seeds disinfected? **(2 marks)**
(d) Why was a vacuum flask used in the set-up? **(1 mark)**
(e) How would a control for this experiment be set? **(1 mark)**

2. The diagram below shows blood circulation in a mammalian tissue.



(a) Name the parts labeled P and Q.
P _____ **(1 mark)**
Q _____ **(1 mark)**
(b) Name the substances that are:
(i) Required for respiration that move out of capillaries. **(1 mark)**
(ii) Removed from tissue cells as a result of respiration. **(1 mark)**
(c) Explain how substances move from blood capillaries into the tissue cells. **(3 marks)**
(d) Name **one** component of the blood that is not found in the part labeled P. **(1 mark)**

3. The diagram below represents a food web in a certain ecosystem.

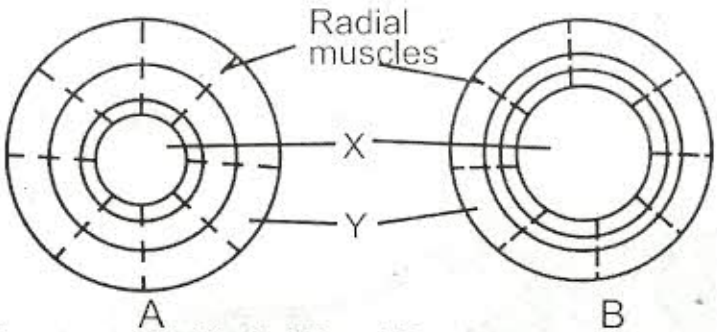


(a) Name the trophic level occupied by each of the following:
(i) Caterpillars **(1 mark)**
(ii) Small insects **(1 mark)**

(b) From the food web, construct two food chains which end with lizards as a tertiary consumer. **(2 marks)**

(c) (i) Which organisms have the least biomass in this ecosystem? **(1 mark)**
(ii) Explain the answer in (c) (i) above. **(3 mark)**

4. The diagram below shows how the iris and pupil of a human eye appear under different conditions.



(a) Name the structures labeled **X** and **Y**. **(2 marks)**
X _____
Y _____

(b) (i) State the condition that leads to the change in appearance shown in the diagram labeled B. **(1 mark)**
(ii) Describe the changes that lead to the appearance of the iris and pupil as shown in the diagram labeled B. **(4 marks)**
(iii) What is the significance of the changes described in (b) (ii) above. **(1 mark)**

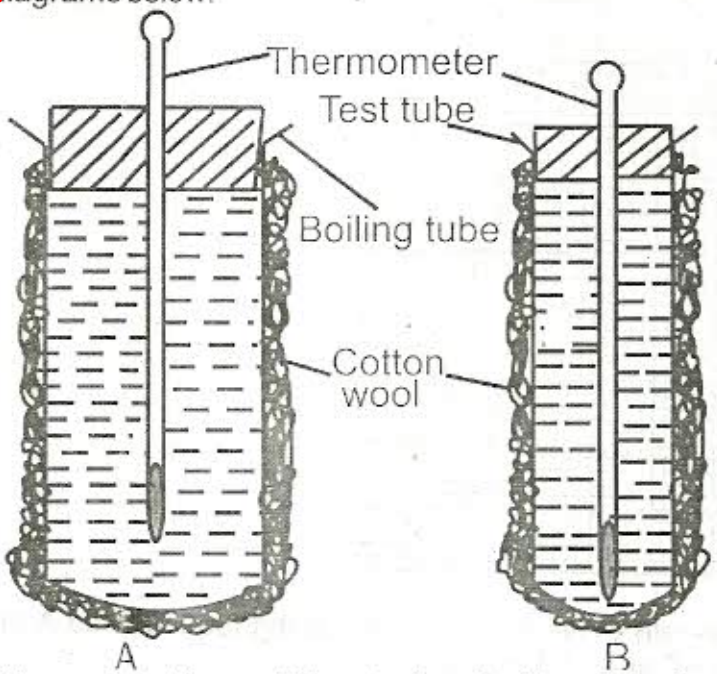
5. When pure breeding black guinea pigs were crossed with pure breeding white guinea pigs, the offspring had a coat with black and white parthces.
(a) Using letter G to represent the gene for black coat colour and letter H for white coat colour, work out the genotypic ratio of F_2. **(5 marks)**

(b) State the phenotypic ratio of F_2. **(1 mark)**
(c) (i) Name the term used when two alleles in heterozygous state are fully expressed phenotypuically in an organism. **(1 mark)**

(ii) Give an example of a trait in human beings where the condition whose term is named in (c) (i) above expresses itself. **(1 mark)**

SECTION B (40 MARKS)

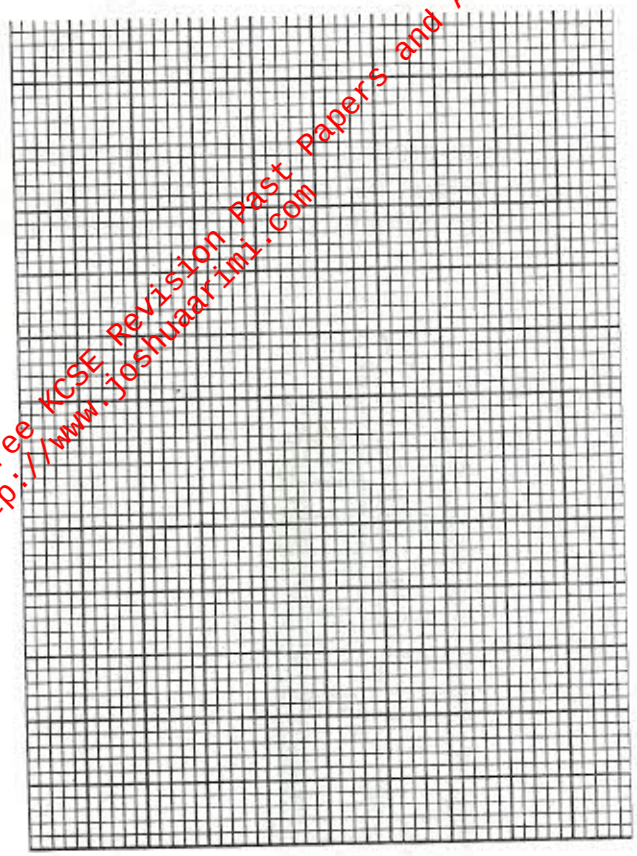
6. In an experiment to investigate a certain physiological process, a boiling tube labeled A and a test tube labelec B were covered with cotton wool. The two tubes were simultaneously filled with hot water and fitted with thermometers. The experimental set-up was as in the diagrams below.



Temperature readings were taken at the start and after every two minutes for twenty minutes. The results were as shown in the table below.

Time (Minutes)	Temperature (°c)	
	Boiling tube A	Test tube B
0	60	60
2	59	54
4	57	50
6	55	46
8	53	43
10	52	40
12	51	37
14	49	35
16	48	33
18	47	32
20	46	30

(a) Using the same axes, draw graphs of temperature against time. **(6 marks)**



(b) (i) Work out the rate of heat6 loss in the boiling tube labeled A and test-tube labeled B between the 5th and 15th minutes. **(2 marks)**

A _____ **(2 marks)**

B _____

(ii) Account for the answers in (b) (i) above. **(2 marks)**

(iii) How does the explanation in (b) (ii) above apply to an elephant and a rat? **(2 marks)**

(c) (i) State the role of the cotton wool in this experiment. **(1 mark)**

(ii)Name **two** structures in mammals that play the role stated in (c) (i) above. **(2 marks)**

(d) State three advantages of having constant body temperature in mammals. **(3 marks)**

7. Describe the process of fertilization in flowering plants. **(20 marks)**

8. Describe how a finned fish such as Tilapia moves in water. **(20 marks)**