Q1.(a) On islands in the Caribbean, there are almost 150 species of lizards belonging to the genus *Anolis*. Scientists believe that these species evolved from two species found on mainland USA. Explain how the Caribbean species could have evolved.

(6)

(b) *Anolis sagrei* is a species of lizard that is found on some of the smallest Caribbean islands. Describe how you could use the mark-release-recapture method to estimate the number of *Anolis sagrei* on one of these islands.

(4)

(c) Large areas of tropical forest are still found on some Caribbean islands. The concentration of carbon dioxide in the air of these forests changes over a period of 24 hours and at different heights above ground.

Use your knowledge of photosynthesis and respiration to describe and explain how the concentration of carbon dioxide in the air changes:

- over a period of 24 hours
- at different heights above ground.

(5)
(Total 15 marks)

Q2.(a) Describe how acetylcoenzyme A is formed in the link reaction.

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(2)

(b) In the Krebs cycle, acetylcoenzyme A combines with four-carbon oxaloacetate to form six-carbon citrate. This reaction is catalysed by the enzyme citrate synthase.

(i) Oxaloacetate is the first substrate to bind with the enzyme citrate synthase.

This induces a change in the enzyme, which enables the acetylcoenzyme A to bind.

Explain how oxaloacetate enables the acetylcoenzyme A to then bind to the enzyme.

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(2)

(ii) Another substance in the Krebs cycle is called succinyl coenzyme A. This substance has a very similar shape to acetylcoenzyme A.

Suggest how production of succinyl coenzyme A could control the rate of the reaction catalysed by citrate synthase.

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(2)

(c) In muscles, pyruvate is converted to lactate during anaerobic respiration.

(i) Explain why converting pyruvate to lactate allows the continued production of ATP during anaerobic respiration.

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(2)

(ii) In muscles, some of the lactate is converted back to pyruvate when they are well supplied with oxygen. Suggest **one** advantage of this.

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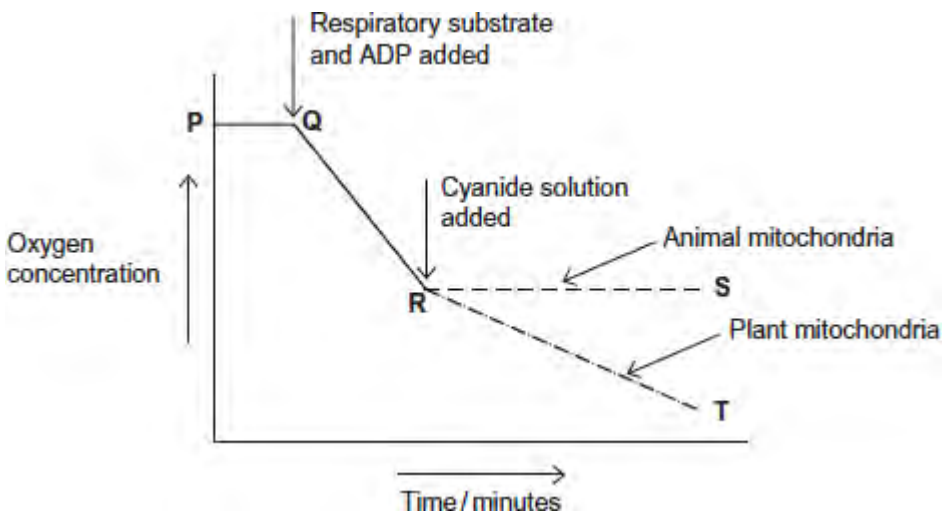
(1)

(Total 9 marks)

Q3. Researchers investigated the effect of cyanide on oxygen uptake by mitochondria. They prepared a suspension of mitochondria from animal cells and a suspension of mitochondria from plant cells. They placed the suspensions in separate flasks containing isotonic solution, started the timer and began recording the concentration of oxygen in each flask.

- After 5 minutes, they added a respiratory substrate and ADP to each flask.
- After 13 minutes, they added cyanide solution to each flask.

The graph below shows their results. From **P** to **R** the curves for animal and plant mitochondria overlap.



(a) Explain the line between **P** and **Q**.

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(2)

(b) (i) Explain the line between **Q** and **R**.

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(2)

(ii) The respiratory substrate and ADP added after 5 minutes (**Q**) were part of a buffered isotonic solution.

What other substance would the buffer or solution have to contain?

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(1)

(c) Describe and explain the difference between line **R** to **S** (animal mitochondria) and line **R** to **T** (plant mitochondria).

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[Extra space] .....

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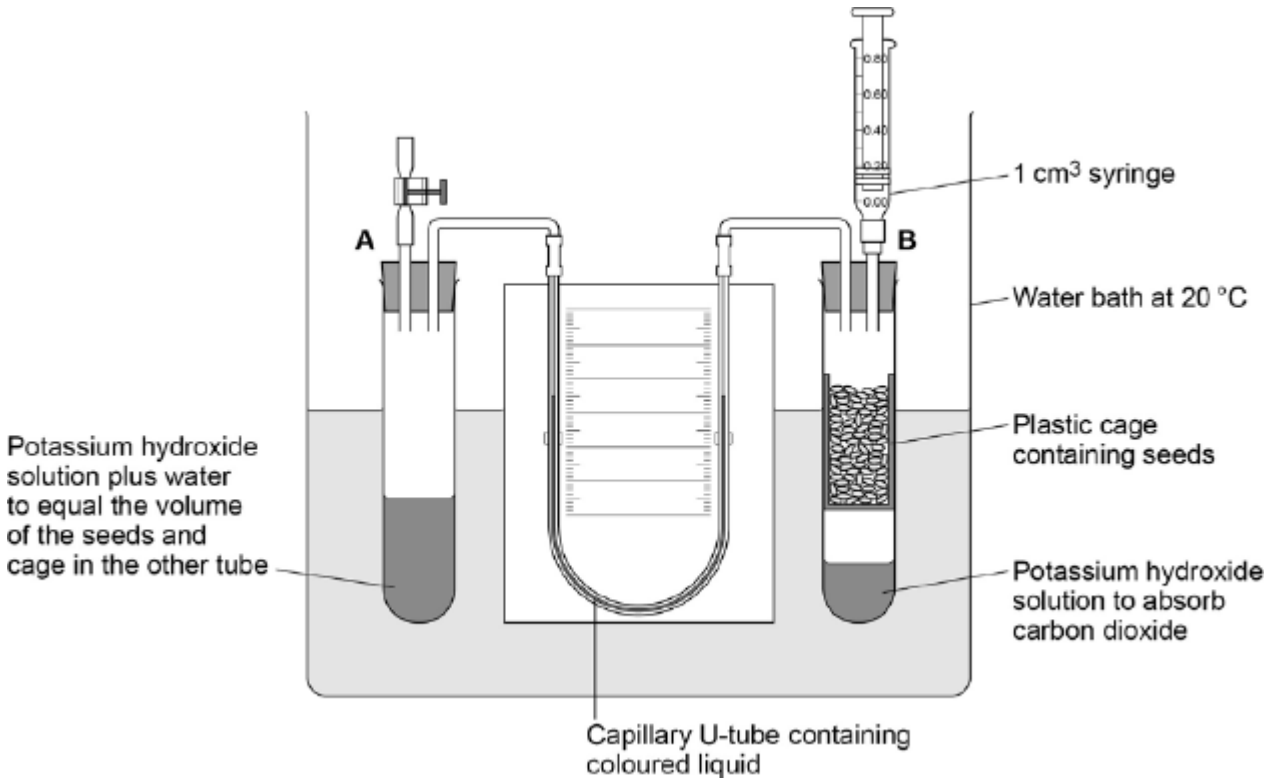
(4)
(Total 9 marks)

Q4. The figure below shows the apparatus used for measuring the rate of oxygen consumption in aerobic respiration by seeds.



(a) For the first 10 minutes, the tap attached to tube **A** was left open and the syringe from tube **B** was removed.

Suggest **three** reasons why the apparatus was left for 10 minutes.

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2 .....

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3 .....

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(3)

(b) Suggest and explain why the chosen temperature was 20 °C for this experiment.

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(2)

After 10 minutes, the tap attached to tube **A** was closed and the syringe was attached to tube **B**. Every minute, the syringe plunger was moved until the levels in the U-tube were the same. The reading on the syringe volume scale was then recorded.

The results are shown in the table below.

Time / minutes	**Reading on syringe volume scale / cm^3**
0	0.84
1	0.81
2	0.79
3	0.76
4	0.73
5	0.70
6	0.68
7	0.66
8	0.63
9	0.62
10	0.58

(c) During the experiment, the coloured liquid in the tubing moved towards tube **B**.

Explain what caused this.

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(Extra space) .....

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(3)

(d) The mass of the seeds was 1.6 g. Use the information in the table above to calculate the rate of oxygen consumption in $cm^3\ g^{-1}\ hour^{-1}$ by the seeds.

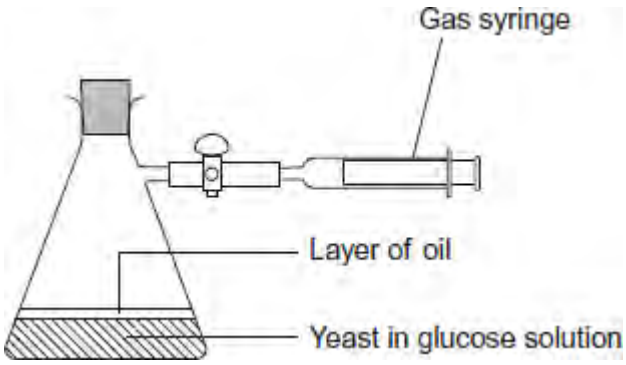
Show your working.

Rate = ... $cm^3\ g^{-1}\ hour^{-1}$

(2)

(Total 10 marks)

Q5. A student investigated the rate of anaerobic respiration in yeast. She put 5 g of yeast into a glucose solution and placed this mixture in the apparatus shown in the figure below. She then recorded the total volume of gas collected every 10 minutes for 1 hour.



(a) Explain why a layer of oil is required in this investigation.

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(1)

(b) The student's results are shown in the following table.

Time / minutes	**Total volume of gas collected / cm^3**
10	0.3
20	0.9
30	1.9
40	3.1
50	5.0
60	5.2

(i) Calculate the rate of gas production in $cm^3\ g^{-1}\ min^{-1}$ during the first 40 minutes of this investigation. Show your working.

Answer = ... $cm^3\ g^{-1}\ min^{-1}$

(2)

(ii) Suggest why the rate of gas production decreased between 50 and 60 minutes.

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(1)

(iii) Yeast can also respire aerobically. The student repeated the investigation with a fresh sample of yeast in glucose solution, but without the oil. All other conditions remained the same.
Explain what would happen to the volume of gas in the syringe if the yeast were only respiring aerobically.

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(2)

(c) Respiration produces more ATP per molecule of glucose in the presence of oxygen than it does when oxygen is absent. Explain why.

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(2)
(Total 8 marks)