Write your name here

Surname		Other names

Centre Number | Candidate Number

Pearson Edexcel
Level 1/Level 2 GCSE (9-1)

Combined Science
Paper 2: Biology 2

Foundation Tier

Sample Assessment Materials for first teaching September 2016
Time: 1 hour 10 minutes

Paper Reference
1SC0/2BF

You must have:
Calculator, ruler

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- Calculators may be used.
- Any diagrams may NOT be accurately drawn, unless otherwise indicated.
- You must **show all your working out** with **your answer clearly identified** at the **end of your solution**.

Information

- The total mark for this paper is 60.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*
- In questions marked with an asterisk (*), marks will be awarded for your ability to structure your answer logically showing how the points that you make are related or follow on from each other where appropriate.

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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Answer ALL questions. Write your answers in the spaces provided.

**Some questions must be answered with a cross in a box ☒.
If you change your mind about an answer, put a line through the box ☒ and then
mark your new answer with a cross ☒.**

1   Plants need light for photosynthesis.

Part of the photosynthesis equation is shown below.

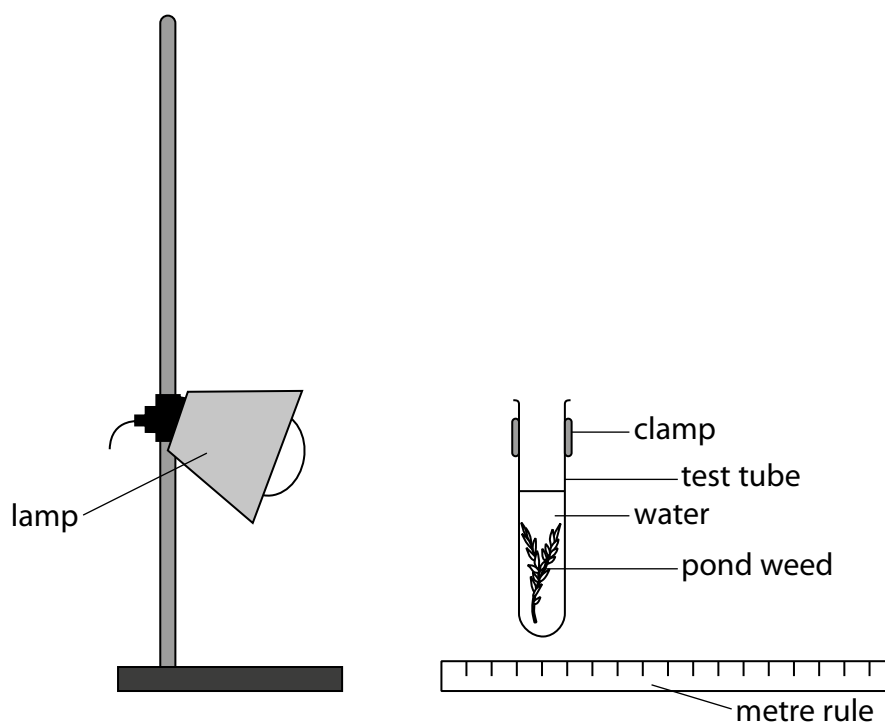...   +   carbon dioxide   →   glucose   + ...

(a) Which of the following would complete the photosynthesis equation?

(1)

	reactant	product
☒ **A**	water	chlorophyll
☒ **B**	chlorophyll	oxygen
☒ **C**	water	oxygen
☒ **D**	oxygen	water

A scientist investigates the effect of light intensity on photosynthesis.

He sets up the equipment shown in Figure 1.

Figure 1

He positions the lamp 10 cm from the test tube and records the number of bubbles produced in five minutes.

He repeats the procedure with the lamp at a distance of 20 cm and 30 cm away from the test tube.

The scientist wants to repeat his investigation at each distance.

(b) (i)   State **three** variables that should be kept constant to improve the results.

(3)

1 temperature of water (1)

2 Start each experiment with the same amount of carbon dioxide (1)

3 Start each experiment with the same amount of water (1)

The scientist noticed that the temperature of water near the light increased.

(ii) Give **one** improvement the scientist could make to reduce the effect of this increase in temperature.

(1)

Use a heat shield (1)
Use a water bath (1)

(c) Figure 2 shows the results of the investigation.

distance (cm)	number of bubbles counted			
	test 1	test 2	test 3	mean
10	42	37	44	41
20	23	24	22	
30	10	11	12	11

Figure 2

(i) Calculate the mean result for a distance of 20 cm.

(1)

$$\frac{23 + 24 + 22}{3}$$

69/ 3 = 23

The number of bubbles counted for test 2 at 10 cm was anomalous.

(ii) State how the scientist could deal with this anomaly.

(1)

Repeat the reading to get concordant results/calculate the mean without the anomalous result

(iii) Give a conclusion about the effect of light intensity on photosynthesis.

(1)

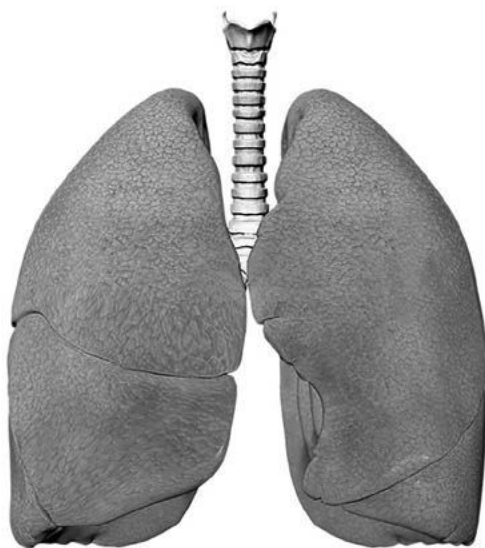{as light intensity decreases/distance from the lamp increases} the rate of photosynthesis decreases

(Total for Question 1 = 8 marks)

2 Figure 3 shows a pair of human lungs.

Figure 3

(a) (i) Where does gas exchange take place in the lungs?

(1)

☒ **A** alveolus

☐ **B** bronchus

☐ **C** bronchiole

☐ **D** trachea

A person had emphysema. This reduces the number of alveoli in the lungs.

(ii) Explain how emphysema would affect the amount of oxygen carried in the bloodstream.

(2)

understanding (1 mark):
emphysema will reduce the amount of oxygen carried into the bloodstream (1)
because there is reduced alveoli, which are the gas
exchange surface between the lungs and blood capillaries (1)

(b) Figure 4 is a table that shows the surface area (SA) to volume (V) ratio in three different sized cubes.

cube size (cm)	surface area / SA (cm²)	volume / V (cm³)	SA:V ratio
2	24	8	
4	96	64	1.5:1
6	216	216	1:1

Figure 4

(i) Calculate the SA:V ratio for the 2 cm cube.

(2)

24 / 8

3 : 1

(ii) Give **one** reason why it is important that human lungs have a high surface area to volume ratio.

(1)

Maximise gas exchange/maximise oxygen uptake

Oxygen is involved with aerobic respiration in cells.

(iii) Which is the correct equation for aerobic respiration?

(1)

☒ **A** oxygen + carbon dioxide → glucose + lactic acid

☒ **B** carbon dioxide + water → oxygen + lactic acid

☒ **C** glucose + oxygen → carbon dioxide + water

☒ **D** glucose + water → carbon dioxide + oxygen

(Total for Question 2 = 7 marks)

3 Scientists can measure how much water is lost by the leaves of a plant.

(a) (i) What is the movement of water molecules from an area with a low solute concentration to an area with a high solute concentration called?

(1)

☒ **A** active transport

☒ **B** diffusion

☒ **C** osmosis

☒ **D** transpiration

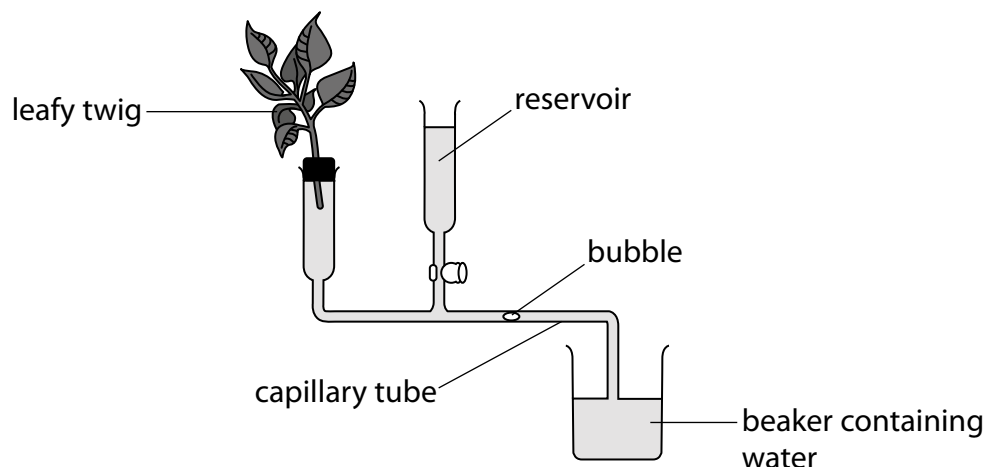(ii) What structure transports water through the stem of the plant?

(1)

☒ **A** guard cell

☒ **B** phloem

☒ **C** stomata

☒ **D** xylem

(b) A scientist measured the rate of water loss from a plant shoot using a potometer.

Figure 5 shows the equipment used in the experiment.

Figure 5

The volume of water lost from the plant can be calculated by measuring the distance a bubble moves along the capillary tubing.

(i) Calculate the rate of water loss from the plant in mm³/s if the volume of water lost was 12 mm³ in 10 minutes.

(3)

10 min = 600 s

12 / 600

0.02

rate of water loss = ... mm³/s

(ii) Explain how the water loss would change if the plant only had one leaf.

(2)

transpiration would be reduced (1)

as less evaporation from the surface of the leaf (1)

The scientist wants to extend the investigation by considering other factors that affect transpiration rate.

(iii) State **two** variables, other than temperature, that she could investigate.

(2)

1 humidity (1)

2 air speed (1)

(c) Explain the effect of increasing air temperature on the rate of transpiration in a plant.

(2)

transpiration rate is increased (1)

because water molecules have more energy/move faster (1)

(Total for Question 3 = 11 marks)

4 (a) A scientist wanted to estimate the number of earthworms in a field using a quadrat.

The scientist placed the quadrats at random on the surface of the area being sampled and then watered the area with a very dilute solution of mustard.

This causes the earthworms to come to the surface to be counted.

(i) Give a reason why the quadrats were placed at random.

(1)

To obtain a representative sample of the field (1)

....

....

The skin of the earthworm acts as a gas exchange surface.

(ii) Describe the gases that are exchanged across the skin of the earthworm as a result of the earthworm respiring.

(2)

Oxygen moves from the air across the skin in the worm/bloodstream (1)

....

Carbon dioxide move from inside the worm/bloodstream to the air (1)

....

(iii) What is the method in which gases are exchanged across the skin of the earthworm?

(1)

☒ **A** active transport

☒ **B** diffusion

☒ **C** osmosis

☒ **D** transpiration

(b) A student wants to estimate the number of daisy plants in a 500 m² field.

She uses a 1 m² quadrat to sample the field.

Figure 6 shows the results for the number of daisy plants counted in six areas sampled with the quadrat.

sample number	number of daisy plants	mean diameter of daisy plants / cm
1	5	7
2	2	2
3	6	9
4	3	3
5	4	5
6	4	6

Figure 6

(i) Calculate the mean number of daisy plants for the six samples.

(1)

$$\frac{5+2+6+3+4+4}{6}$$

mean number of daisy plants = ...4....

(ii) Describe how the student could use this calculated mean to estimate the total number of daisy plants in this field.

(2)

Oxygen moves from the air across the skin in the worm/bloodstream (1)

Carbon dioxide move from inside the worm/bloodstream to the air (1)

Sample 2 was taken in an area where there were many overhanging trees.

(iii) Explain how these trees may have affected the distribution of daisy plants growing in this area.

(2)

less daisy plants are likely to be growing in this area (1) because the trees would cause lower light levels for

photosynthesis/lower mineral levels for growth/less water

available for photosynthesis (1)

(iv) Give **two** abiotic factors that could affect the distribution and size of daisies growing in this field.

(2)

Temperature (1)

pH (1)

(Total for Question 4 = 11 marks)
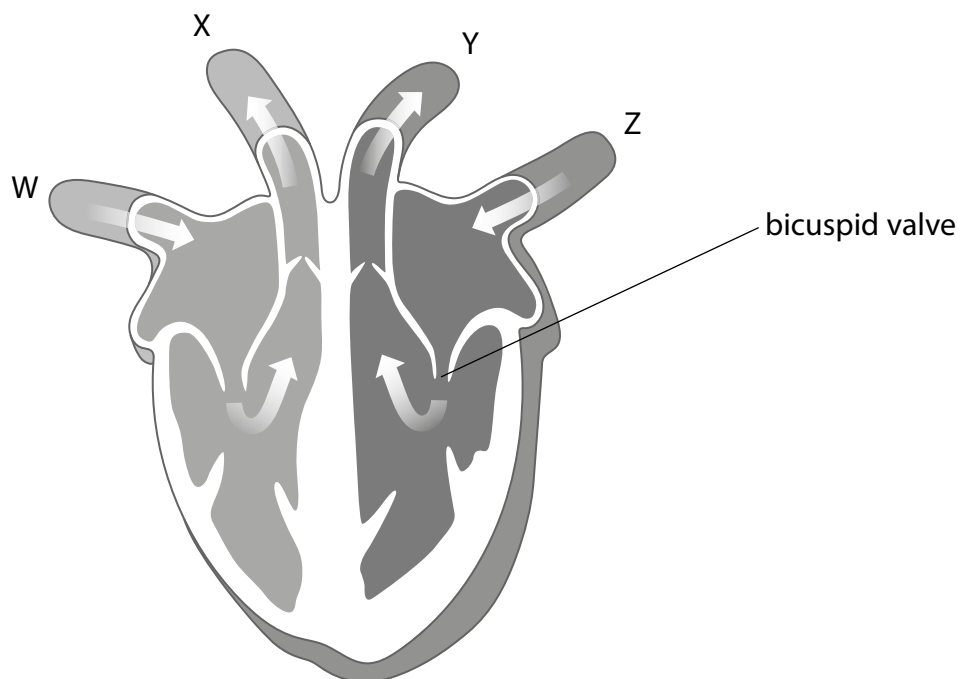
5 Figure 7 shows a diagram of the heart.

Figure 7

(a) (i) Vessel X takes

(1)

☒ **A** deoxygenated blood to the body

☒ **B** deoxygenated blood to the lungs

☒ **C** oxygenated blood to the body

☒ **D** oxygenated blood to the lungs

(ii) Give one reason why the wall of the left ventricle is thicker than the right.

(1)

To pump blood around the body under higher pressure

....

Valves in the human heart may become damaged and no longer function.

(iii) Describe what would happen to the flow of blood in the left side of the heart if the bicuspid valve did not function effectively.

(2)

blood would flow backwards from ventricle to atria/blood will leak through (1)

less (oxygenated) blood would be pumped to the body (1)

(b) Figure 8 shows a photomicrograph of a blood vessel.
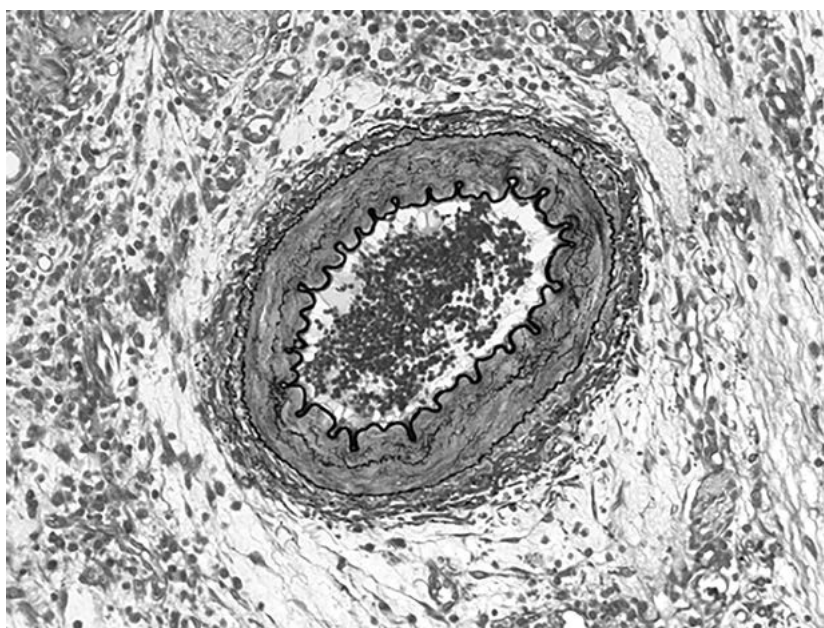
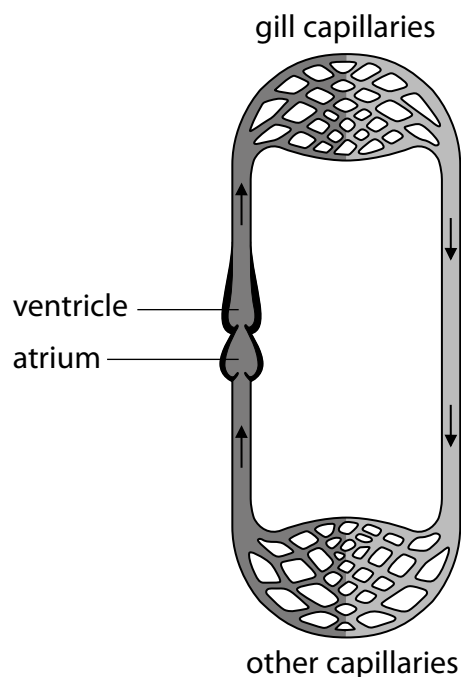(Source: Microscape/Science Photo Library)

Figure 8

Explain how the structure of this blood vessel is related to its function.

(2)

the blood vessel has thick walls/small lumen (1)

to carry oxygenated blood/to carry blood under higher pressure (1)

(c) Figure 9 shows a diagram of the circulatory system of a fish.

gill capillaries

ventricle

atrium

other capillaries

Figure 9

Describe the differences between the structure of the circulatory system of a fish and the human circulatory system.

(4)

the fish heart has two chambers rather than four chambers (1)

the fish heart only has one ventricle and one atria rather than two ventricles and two atria (1)

only deoxygenated blood flows through the fish heart (1)

the fish heart shows a single circulatory system rather than a double circulatory system (1)

(Total for Question 5 = 10 marks)

6 (a) Blood tests can be used to check a person's blood glucose and hormone levels.

Figure 10 shows the results of two blood tests done on three people to check their blood glucose levels. Person 1 is healthy.

	blood glucose level (mmols/l)	
	after fasting for 12 hours	two hours after drinking 75 g glucose
person 1	5.4	6.4
person 2	5.6	9.0
person 3	7.8	12.1

Figure 10

(i) Compare the glucose levels of person 1 with the glucose levels of person 2 after fasting for 12 hours.

(1)

person 2 had a slightly higher blood glucose level than person 1 after fasting (by up to 0.2 mmols/l) (1)

(ii) Compare the glucose levels of person 2 with the glucose levels of person 1, two hours after drinking 75 g glucose.

(1)

person 2 had a much higher blood glucose than

person 1 two hours after taking the glucose by 2.6 moles

(iii) Person 3 cannot produce the hormone that controls blood glucose levels.

State the hormone that person 3 cannot produce.

(1)

Insulin (1)

(b) Figure 11 shows the level of progesterone for a female during five different stages of the menstrual cycle.

days in the menstrual cycle	progesterone level (nmol/l)
1–9	1.85
10–14	1.48
15–17	14.28
18–23	35.27
24–28	17.11

Figure 11

(i) Describe the changes in progesterone levels over the 28-day cycle.

(2)

levels remain low up until day 15 then rise (1)
they continue to rise to day 23 and drop at day 24 (1)

(ii) Explain why progesterone levels changed following day 14.

(2)

As ovulation occurs (1)

The levels of progesterone released from the corpus
luteum increases to maintain the lining of the uterus (1)

Figure 12 shows the effectiveness of different methods of contraception in the prevention of pregnancy during their first year of use.

It shows percentages for typical use (some mistakes when used) and perfect use (no mistakes when used).

contraceptive method	type of contraceptive	percentage of women with unintended pregnancies within the first year of use (%)	
		typical use	perfect use
diaphragm	barrier	16	6
female condom	barrier	21	5
male condom	barrier	15	2
intra uterine device	hormonal	8	0.3
combined pill	hormonal	8	0.2
mini pill	hormonal	8	0.3
combined patch	hormonal	8	0.2

Figure 12

*(c) Compare and contrast the data for different contraceptive methods and types, to advise a young adult as to the best method of contraception to avoid pregnancy.

(6)

During typical use the barrier methods are considerably less effective than hormonal methods
During perfect use the barrier methods are less effective than hormonal methods
Manipulation of data from the table to show these relationships
Perfect use of both barrier and hormonal methods are significantly more effective
Manipulation of data from the table to show this relationship
The use of the combined pill and combined patch are the most effective contraceptive method
With perfect use only 0.2% result in pregnancy pregnancies and with typical use 8% result in pregnancy
The least effective contraceptive method is the female condom
21% pregnancy with typical use and 16% pregnancy with perfect use
The most effective method of contraception is a hormonal method
The combined pill or combined patch are the most effective
Perfect use is more effective than typical use
It may be easier to use the combined patch rather than the combined pill as it is less effected by digestive problems

(Total for Question 6 = 13 marks)

TOTAL FOR PAPER = 60 MARKS

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