



13 + Entrance Examination

Paper 1

Biology - Level 2

Total marks: 60

Time allowed: 40 minutes

Calculators may be used

Full name

1. Circle the correct answer for each of the following questions

a. What is happening when the sperm and egg fuse together?

conception

fertilisation

ejaculation

reproduction

b. What is produced from photosynthesis?

oxygen & water

carbon dioxide & water

oxygen & glucose

glucose & carbon dioxide

c. What is the name of the main airway that branches of into the bronchi?

trachea

alveoli

diaphragm

bronchioles

d. Which enzyme is not found in humans to aid digestion?

lipase

protease

amylase

cellulase

e. In a food chain, approximately how much of the energy and raw materials at each level passes on to the next level?

10%

40%

70%

100%

f. Which is an example of continuous variation?

height

gender

blood group

eye colour

g. How are plant cells different to animal cells?

they have no cell wall

they are generally smaller

they can contain chloroplasts

they have no vacuole

h. Which life process does egestion a part of?

excretion

reproduction

respiration

movement

- i. If an organism with a backbone was found to have dry scaly skin, what would it be classed as?

mammal	fish
amphibian	reptile

- j. Which mineral do plants require for healthy growth?

magnesium	nitrates
phosphates	potassium

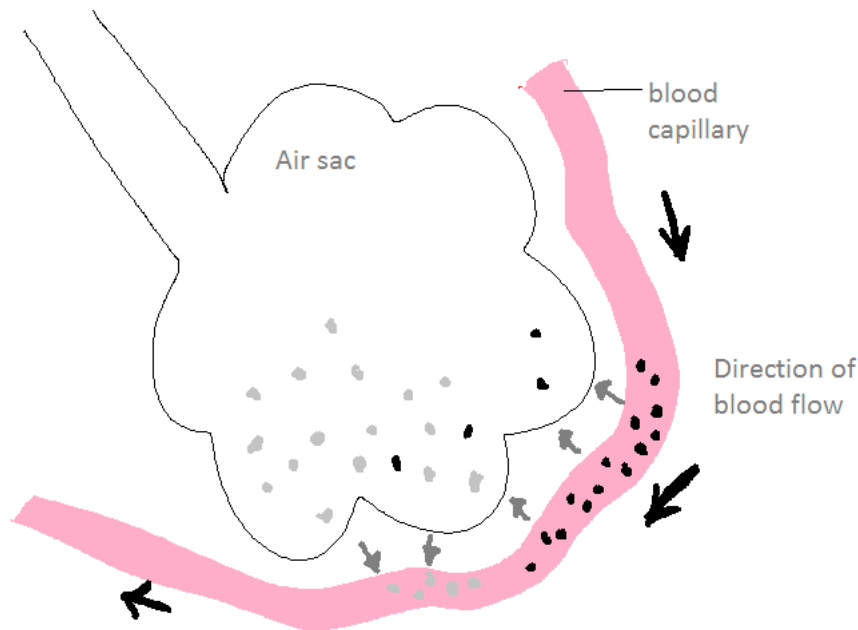
(10 marks)

2. Match the part of a cell (on the left) with its function (on the right).

cell membrane	contain the green pigment needed to absorb light for photosynthesis
nucleus	structures that carry out the release of energy by respiration
mitochondria	controls the entry and exit of dissolved substances
chloroplast	contains the DNA which controls the activities and characteristics of the cell

(4 marks)

3. Look at the diagram of an air sac below.



a. What is the name of the gas going into the air sac?

(1 mark)

b. What is the name of the gas going into the blood capillary?

(1 mark)

c. What is the name of the process which allows these gases to exchange?

(1 mark)

d. Give two features of the alveoli that allow for easy and efficient gas exchange.

(2 marks)

- e. Explain how gas exchange is fundamental for respiration in humans. In your explanation include where the two gases end up going and why.

(3 marks)

- f. Write the word equation for respiration:

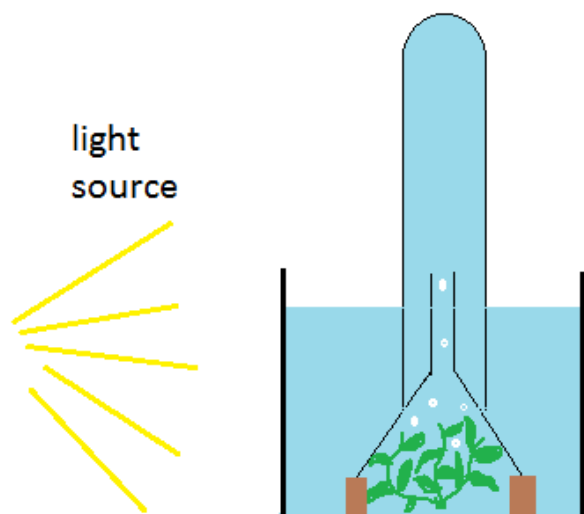
_____ + _____  _____ + _____

(2 marks)

- g. Smoking leads to many potential problems. Specifically concerning the lungs and circulation, it can affect how easily oxygen circulates around the body. Smoking can also affect how much oxygen gets into the blood in the first place. Explain clearly what smoking is doing to the body that leads to either of these problems.

(2 marks)

4. A test was set up to see how levels of light affected the rate of photosynthesis in pond weed. The light was moved further and further away from the plant in the beaker.



- a. What is the independent variable in this test?

(1 mark)

- b. What gas is the pondweed giving off?

(1 mark)

- c. Clearly explain how the 'rate of photosynthesis' could be effectively measured in this test?

(2 marks)

5. The picture below shows a whelk (the snail like organism), barnacles (the abundant, smaller shelled creatures) and seaweed.



Scientists have monitored the numbers of whelks on a specific stretch of rocky shore every ten years since 1974.

Year	Approximate number of whelks
1974	4200
1984	1900
1994	1500
2004	1450
2014	2000

- a. Barnacles and whelks are both consumers. What does this mean?

(1 mark)

- b. Barnacles and whelks both belong to the animal kingdom. What kingdom does the seaweed belong to?

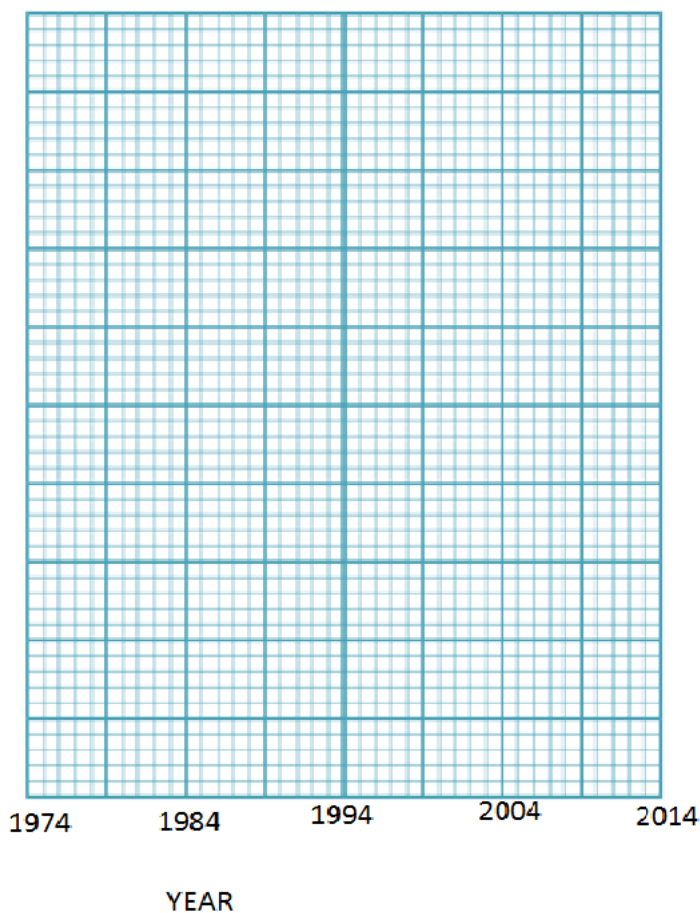
(1 mark)

- c. Barnacles and whelks are both animals that lack a backbone and are classed as invertebrates. Give an example of a vertebrate that lives in or around the rocky shore.

(1 mark)

- d. Label the y axis and add a suitable scale then plot this data on the graph and join the points with a smooth curve.

(4 marks)



- e. Use your graph to estimate the approximate number of whelks on the rocky shore in 1979.

(1 mark)

- f. Describe what has happened to the population of whelks since 1974

(2 marks)

- g. It was found that a chemical called TBT was responsible for the change in population. It was a treatment used on the underside of boats but it would end up getting into the seawater and would then eventually enter the food chain. In the whelks it caused the females of the population to undergo imposex which meant that they were unable to reproduce and if severe enough would die. This chemical was extensively used prior to 1970 and was banned in the 1980s. It can, however, remain in the ecosystem for up to 30 years. Using this information explain the changes in the whelk population since 1974.

(2 marks)

- h. Whelks feed on barnacles. Describe and explain what might have happened to the barnacle population since 1974?

(2 marks)

- i. Seaweed are producers in the rocky shore habitat. Draw out a food chain to represent these three species.

(2 marks)

- j. To estimate numbers of whelk on the rocky shore habitat, scientists used a quadrat. Explain how a quadrat should be used in order to get as clear an approximation as possible.

(3 marks)

- k. Imposex means that the females start developing a sperm duct and a penis. What is the role of the penis in human reproduction?

(2 marks)

- l. Getting TBT banned was a vital move for the conservation of the whelk population. Write about another species you know about that is endangered and include at least two steps that can be taken (or have been taken) to help conserve them and increase their numbers in the wild.

(3 marks)

END OF TEST

Mark Scheme 13+ Biology Paper 1

1. (10 marks)

- a. fertilisation
- b. oxygen & glucose
- c. trachea
- d. cellulase
- e. 10%
- f. Height
- g. they have no vacuole
- h. excretion
- i. reptile
- j. nitrates

2. (4 marks)

cell membrane: controls entry and exit of dissolved substances

nucleus: contains the DNA which controls the activities and characteristics of the cell

mitochondria: structures that carry out the release of energy by respiration

chloroplast: contain the green pigment needed to absorb light for photosynthesis

3.

- a. carbon dioxide **(1 mark)**
- b. oxygen **(1 mark)**
- c. diffusion **(1 mark)**
- d. two of the following: **(2 marks)**
 - Thin walls
 - Large surface area
 - Rich blood supply
 - Moist walls
- e. Gas exchange allows the oxygen needed for respiration to enter the blood from the lungs and so get transported to the cells of the body. Likewise it allows carbon dioxide, a product of respiration from the cells, to exit the body via the lungs. **(up to 3 marks)**
- f. $\text{Glucose} + \text{oxygen} \rightarrow \text{carbon dioxide} + \text{water}$ **(2 marks)**
- g. Smoking takes carbon monoxide into the lungs where it passes into the blood. Here it binds to the red blood cells meaning there's less space for oxygen to bind to and hence less oxygen will circulate. Smoking causes the large surface area of the alveoli to reduce meaning there's less surface for the oxygen to diffuse across through. **(up to 2 marks)**

4.

- a. The distance of the light source **(1 mark)**
- b. Oxygen **(1 mark)**
- c. Count how many bubbles are produced in a set period of time, i.e. a minute. The more bubbles, the greater the rate of photosynthesis. **(2 marks)**
- d. chlorophyll **(1 mark)**
- e. Take leaf sample and dip into boiling water. Remove the leaf and next place in boiling ethanol. To get ethanol to boil you MUST NOT use a bunsen burner as it is extremely flammable. Instead either use an electric water bath or place the test tube containing ethanol into the beaker with the boiling water ensuring the bunsen is turned off. Next remove the leaf. It can be placed back into boiling water to soften it. Finally apply iodine solution on to the leaf. If this turns a blue/black colour that indicates there is starch present. **(up to 4 marks - for full marks, health & safety precaution must be included)**
- f. Any of the following: **(1 mark)**
Amount of water
Amount of carbon dioxide
Temperature

5.

- a. consumers feed on other organisms **(1 mark)**
- b. plant **(1 mark)**
- c. fish, seagull...any sensible answer **(1 mark)**
- d. **(up to 4 marks)**
Correct scale on y axis - every 10 small squares on y axis to represent a 1000 approximate number of whelks.
Accurate plotting of all points (if one or two are incorrect only award one mark)
Drawing a smooth curve
- e. Between 2700-2900 - look for evidence on graph **(1 mark)**
- f. The whelk population fell quickly between 1974 and 1985. It continued to fall up until 2004, but at a much slower rate. After 2004, the numbers began to increase. **(2 marks)**
- g. Before the 1980s there was a lot of TBT getting into the ecosystem which caused the steep drop in numbers up until around 1985. Even after it had been banned around this time, it still remained in the ecosystem - for up to 30 years - and so continued to cause the population numbers to decrease further (but at a lesser rate). By 2005 there was likely to be no trace of TBT left (or a very minimal one) and so numbers started to increase. **(2 marks)**
- h. With fewer predators about, the barnacle numbers would have initially risen, but only to a certain point. As the numbers of whelks began to increase again, this would have caused a drop in the barnacles population. **(2 marks)**

- i. Seaweed → barnacles → whelks **(2 marks: arrows must point in the correct direction)**
- j. Place the quadrat randomly within the habitat and count how many whelks there are within the quadrat. Repeat - the more samples taken, the more accurate the estimate. Find the mean average from the samples of whelks in a typical square meter. Work out the area of the whole habitat and multiply the average number of whelks in one square metre by the number of square meters in the whole habitat. **(3 marks)**
- k. to deliver sperm to the female reproductive system / vagina **(2 marks)**
- l. any valid example which has been well explained. For example, captive breeding to increase numbers before releasing back into the wild **or** protecting habitats in law meaning they can't be destroyed / chopped down **or** banning hunting / obvious pollutants causing damage **(up to 3 marks)**

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