Name and School:

OUNDLE

School

2021 Academic Scholarship

Preliminary Examination

Science

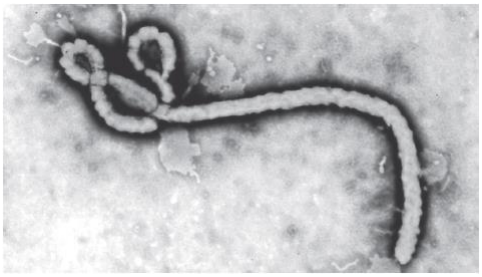
Time Allowed : 60 minutes

- Write your name on the question paper
- Write all your answers on the question paper
- Calculators are allowed

Biology Section [27 marks]

1. The image shows an Ebola virus.

The Ebola virus causes a disease called haemorrhagic fever which is very infectious.



(i) Complete the sentence by putting a cross (☒) in the box next to your answer.

The Ebola virus is also a

(1)

- ☐ **A** autotroph
- ☐ **B** heterotroph
- ☐ **C** pathogen
- ☐ **D** protozoan

(ii) Explain why scientists do not classify viruses into any of the five kingdoms.

(2)

.....

.....

.....

.....

(iii) The Ebola virus is transferred from person to person through blood and other body fluids.

Name one other common disease transferred by body fluids.

(1)

.....

2. The photograph shows a locust.

(i) One square metre of maize plants has a biomass of 8800 g.

When the maize plant is eaten, 8% of this biomass is passed on to the locusts.
Calculate how much of the maize plant biomass is passed on to the locusts.

(2)

..... g

(ii) State one reason why only 8% of the biomass from the maize plants is passed on to the locusts.

(1)

.....

.....

3. The photograph shows the mushroom, *Russula silvicola*.

Russula silvicola is a multicellular organism that does not have chlorophyll.

(a) (i) Complete the sentence by putting a cross (⊠) in the box next to your answer.

Russula silvicola belongs to the kingdom

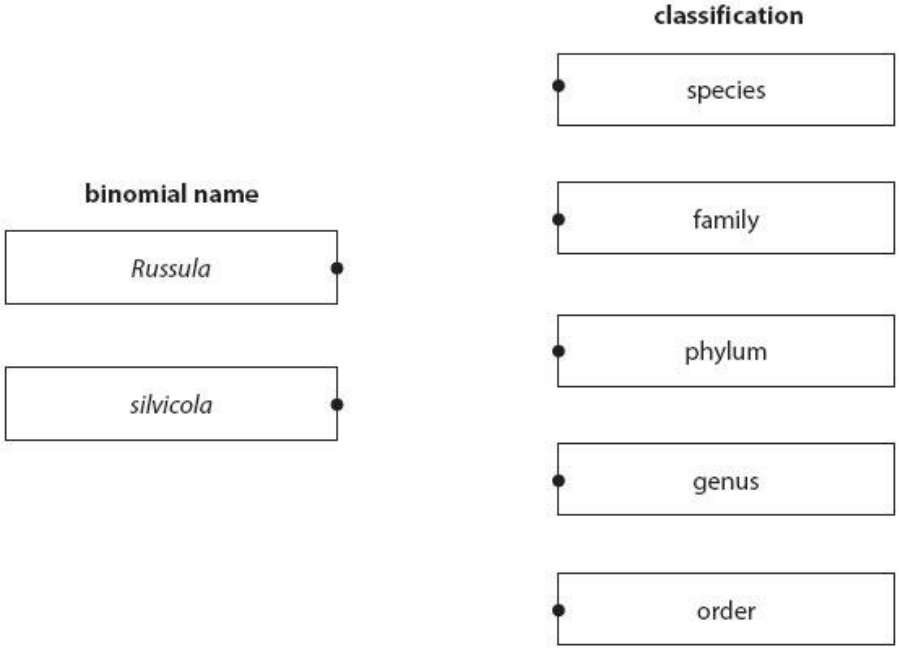
(1)

- ☐ **A** Animalia
- ☐ **B** Fungi
- ☐ **C** Prokaryotes
- ☐ **D** Protoctista

(ii) *Russula silvicola* is the binomial name of this mushroom.

Draw **one** straight line from each part of the binomial name to its classification.

(2)



(b) State **two** characteristics of the kingdom Plantae. **(2)**

.....

.....

.....

.....

(c) (i) Vertebrates belong to the kingdom Animalia.

Use words from the box to complete the following sentence.

(2)

Chordata	chromosome	backbone
Prokaryote	Protoctista	cell

Vertebrates are members of the phylum …….. …….. and most have a

…….. …….. running the length of the body.

(ii) State the structures that vertebrate organisms use to absorb oxygen from their surroundings.

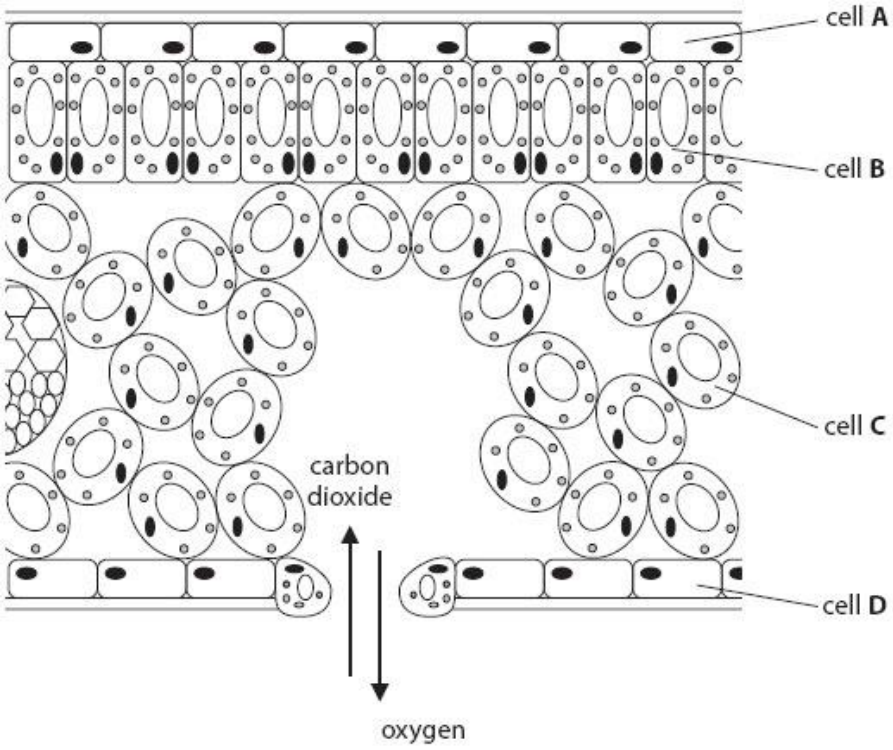
(3)

.....

.....

.....

4. The diagram shows a section through a leaf.



(i) Complete the sentence by putting a cross (☒) in the box next to your answer.
The cell that will make the **most** glucose is

(1)

- ☐ **A**
- ☐ **B**
- ☐ **C**
- ☐ **D**

(ii) Describe how carbon dioxide enters the leaf.

(2)

.....

.....

.....

.....

.....

(iii) Describe the process that takes place in the leaf to produce oxygen.

(3)

.....

.....

.....

.....

.....

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.....

5. (i) Complete the word equation for aerobic respiration.

(1)

oxygen + glucose ⟶ ..... + ...

(ii) Explain why oxygen uptake increases as an athlete runs at faster speeds.

(2)

.....

.....

.....

.....

.....

.....

(ii) When athletes train hard they can respire anaerobically.
Which of the following statements about anaerobic respiration are true?

1. Lactic acid and carbon dioxide are produced.
2. Lactic acid can build up causing cramp.

Put a cross (☒) in the box next to your answer.

(1)

- ☐ **A** statement 1 only
- ☐ **B** statement 2 only
- ☐ **C** both statement 1 and 2
- ☐ **D** neither statement 1 nor 2.

Chemistry Section [20 marks]

1a. Underline the word or phrase that completes each sentence correctly.

i) Metals are usually

magnetic. brittle. solids. electrical conductors. [1]

ii) Particles are most spread out in

solutions. liquids. solids. gases. [1]

iii) Atoms are the smallest unit of

compounds. mixtures. gases. elements. [1]

iv) Wasp stings are mildly alkaline. The best cure for a wasp sting would be [1]

limewater. vinegar. water. sodium hydroxide solution.

v) Metals are usually obtained from their ores by

oxidation. neutralisation. reduction. precipitation. [1]

vi) 'Acid rain' is formed by rain dissolving

carbon dioxide. sulphur dioxide. carbon monoxide. ozone. [1]

b) Some magnesium metal was warmed with dilute hydrochloric acid. Bubbles of gas were given off and tested to see if the gas were hydrogen.

A colourless solution remained.

i) How would you test a gas to see if it were hydrogen?

.....

..... [2]

ii) Name the other product formed in this reaction

..... [1]

iii) Write a balanced symbol equation for the reaction

..... [2]

A second sample of magnesium was dropped into some copper(II) sulphate solution. A dark, pinkish-brown coating appeared on the surface of the magnesium and the blue colour of the solution disappeared.

iv) Name the dark coating on the surface of the magnesium.

..... [1]

Write a word equation for the reaction.

.....

..... [2]

v) Explain how this experiment enables you to say whether copper is more or less reactive than magnesium.

.....

..... [1]

2. Universal indicator was used to measure the pH of different substances:

Substance A Indicator went blue-green

Substance B Indicator went orange

Substance C Indicator went red

Substance D Indicator went purple

(a) (i) Which substance is a weak acid?

..... [1]

(ii) Which substance is ammonia?

..... [1]

(iii) Substance C is naturally present in the body. Suggest what substance C might be?

..... [1]

(iv) Which substances could be used to increase the pH of acidic soil? [1]

..... [1]

(b) The soil in a garden has a pH of 4.9. What ionic compound could he add to the soil to make it neutral?

..... [1]

Physics Section [22 marks]

1. A student investigates the density of three different liquids.
The student pours liquid honey into a container, as shown in Fig. 1.1.

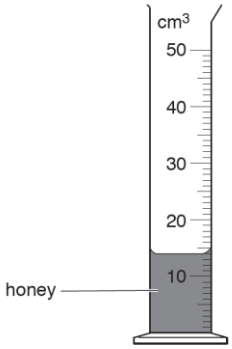


Fig. 1.1

(a) **(i)** Name the container shown in Fig. 1.1.

..... [1]

(ii) Name the other piece of apparatus necessary when determining the density of the honey.

..... [1]

(b) The student then carefully adds some water and then some kerosene. The liquids do not mix but form three separate layers as shown in Fig. 1.2.

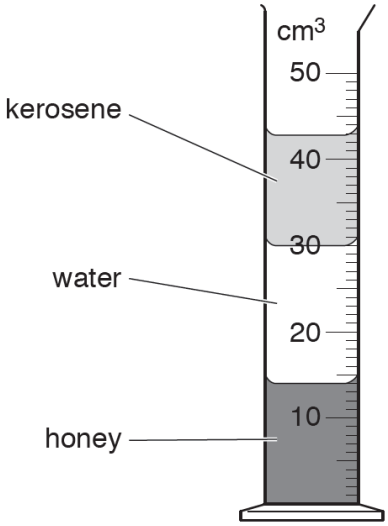


Fig. 1.2

Identify the correct statements about the densities of the liquids. Tick only **two** circles.

- o Honey has the smallest density.
- o Honey has a larger density than water.
- o Kerosene has the largest density.
- o Kerosene has a smaller density than water.
- o Water has a larger density than honey.
- o Water has a smaller density than kerosene.

[2]

(c) The mass of 13 cm^3 of the kerosene is 10.5 g.

Calculate the density of the kerosene, including an appropriate unit.

density = ... [4]

[Total: 8 marks]

2. Cameras are used to check average speeds on a long straight road. Each camera records the exact time that a car passes the camera.

Fig. 2.1 shows three cameras and the times at which the car passes.

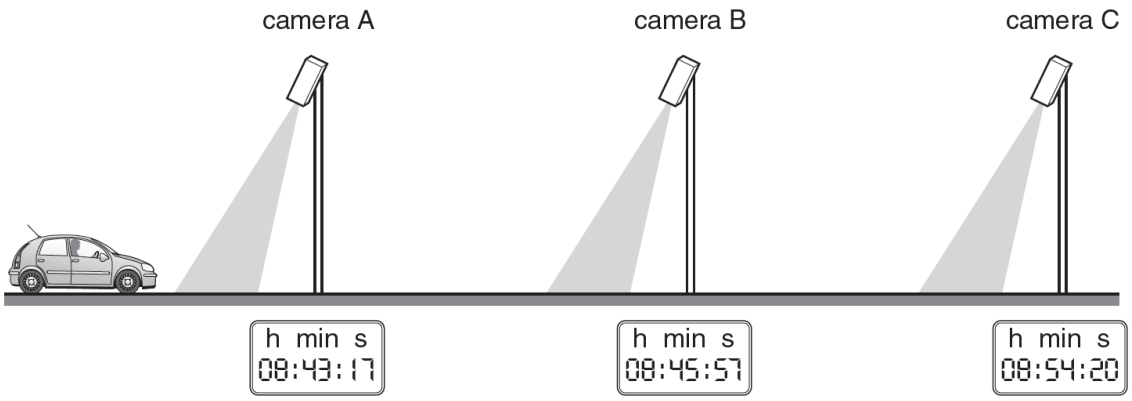


Fig. 2.1 (not to scale)

(a) **(i)** Calculate the time taken for the car to travel between camera A and camera B. State your answer in seconds.

time taken = ... s [2]

(ii) The cameras are placed 5000 m apart.

Calculate the average speed of the car between camera A and camera B.

average speed = ... m / s [3]

(iii) Using the information on the clocks, describe the average speed of the car between camera B and camera C. Tick **one** circle.

- o slightly slower than between A and B
- o much slower than between A and B
- o same as between A and B
- o slightly faster than between A and B
- o much faster than between A and B

[1]

(b) The speed limit for the road is 30 m / s.

Use your answers to **(a)(ii)** and **(a)(iii)** to estimate whether the car's average speed was greater or less than the speed limit when travelling between camera A and camera C. Explain how you decided on your answer.

estimate .....

explanation .....

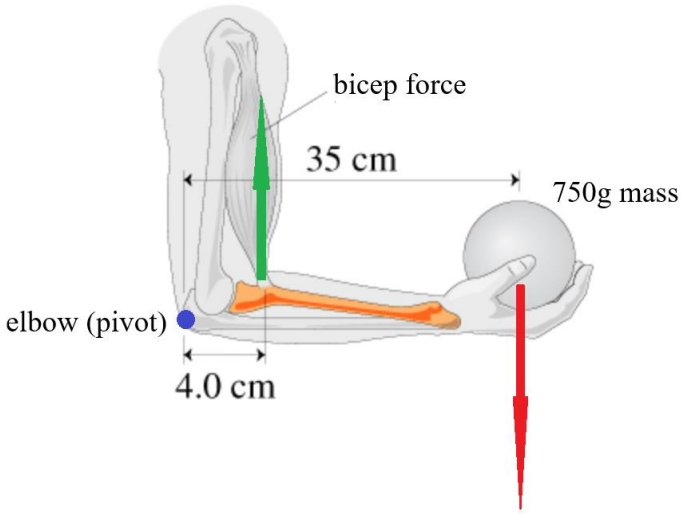
.....

.....

[3]

[Total: 9]

2. A forearm can be modelled as a 1.20kg, 35cm long "beam" that pivots at the elbow and is supported by the biceps, as shown in the diagram below.



By taking moments about the elbow (pivot), determine the magnitude of the force F provided by the bicep to hold a 750g ball with the forearm parallel to the floor?

Force provided by the bicep = ……

[Total: 5]