

Name:



OUNDLE

School

2017 Non Common Entrance Examination
For Third and Fourth Form Entry

Science

Time Allowed : 60 minutes

- *Please write your name in the box above*
- *Answer as many questions as you can in the time available*
- *The paper is out of 60 marks; 20 for Biology, 19 for Chemistry, and 21 for Physics*

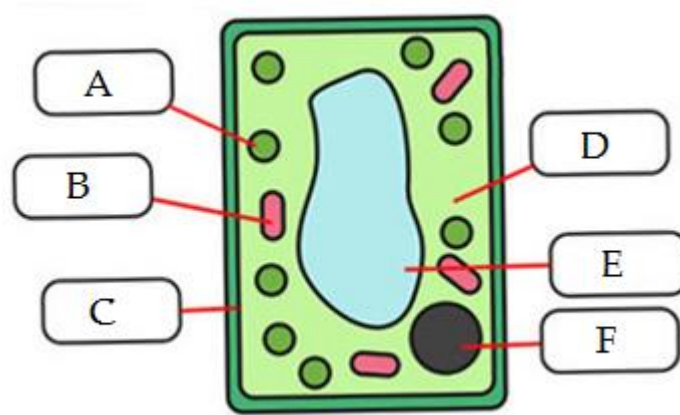
You will need:

- *A pen*
- *A pencil*
- *A ruler*
- *A calculator*

Biology mark /20	
Chemistry mark / 19	
Physics /21	
Total mark /60	
Percentage	

Biology Section

1. Below is a diagram of a plant cell.



a. Complete the table by writing either a letter or the name of a structure.

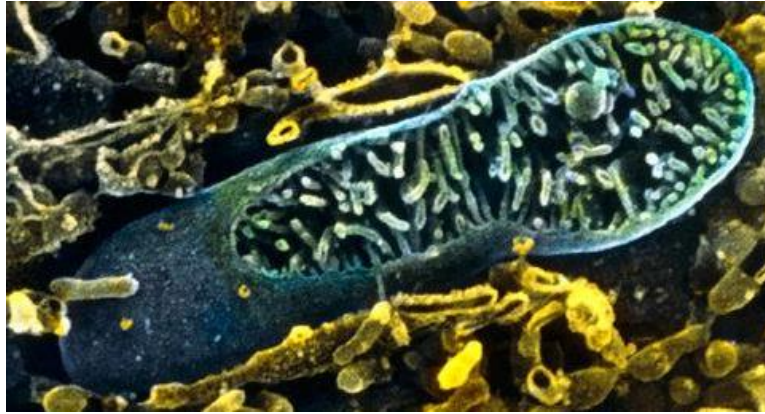
Letter	Structure
A	Chloroplast
	Vacuole
F	

(2)

b. Name one structure on the diagram above that would not be found in an animal cell.

.....
(1)

c. This is a more magnified image of structure B. State its name and function.



Name:

Function:

.....
.....

(2)

d. This is a passage about reproduction in plants and animals. Fill in the spaces with the most appropriate word.

In plants and humans, sex cells are known as The male sex cell in plants is called and is produced in the The fusing of a male and female sex cell, a process known as, takes place in the in humans and in the in plants.

(6)

e. This question is about nutrition and digestion.

i. Name one component of a balanced diet and its importance.

Component:

Importance:

.....
.....

(2)

ii. Describe the digestion of carbohydrates in the mouth.

.....
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.....
.....

(3)

f. Compare the processes of aerobic and anaerobic respiration in plants and animals. *NB no credit will be given for writing the word equations.*

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(4)

[Biology Section = 20 marks]

Chemistry Section

1. Railway tracks are made from steel.

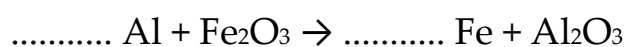
Steel is an alloy. A mixture of iron and carbon.



Molten iron is used to weld (join) the railway tracks.

The reaction of aluminium with iron oxide is used to produce molten iron.

a. Balance the chemical equation for the reaction.



(1)

b. Why does aluminium react with iron oxide?

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(2)

c. This reaction releases heat. Name the reaction that releases heat.

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(1)

d. Iron oxide is classed as a compound. Give the definition of a compound

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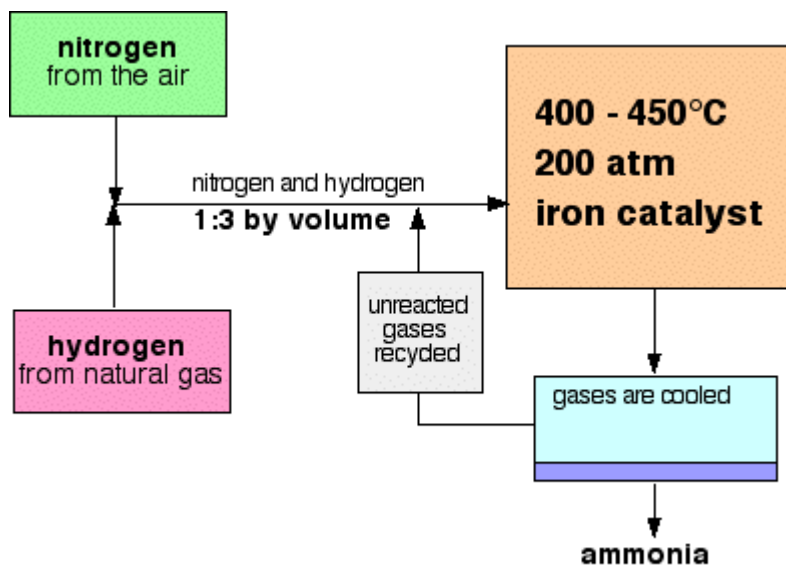
(2)

e. State two properties of steel that make it suitable for the use in railway tracks

1.
.....
2.
.....

(2)

2. In the production of ammonia, NH_3 , nitrogen and hydrogen are reacted at 450°C and under 200 atmospheres of pressure.



a. As stated in the diagram, nitrogen comes from the air. What proportion of the air is nitrogen?

.....
(1)

b. The table below shows the boiling points of ammonia, nitrogen and hydrogen.
i. In what order will the gases condense?

Gas	Boiling Point ($^\circ\text{C}$)	Melting Point ($^\circ\text{C}$)
Ammonia	-33	-78
Hydrogen	-253	-259
Nitrogen	-196	-210

Lowest Temperature:

.....

Highest Temperature:

(1)

ii. Complete the following sentence.

At -256°C , nitrogen will be a and hydrogen will be a

(2)

c. Ammonia, NH_3 , is an alkali and can be made to react with sulphuric acid, H_2SO_4 , to form ammonium sulphate, $(\text{NH}_4)_2\text{SO}_4$.

i. What type of reaction is this?

.....
(1)

ii. How many atoms of hydrogen are there in ammonium sulphate?

.....
(1)

iii. What pH would you expect sulphuric acid to have?

.....
(1)

iv. Sulphuric acid also reacts with magnesium. Name the two products that would be made in this reaction

.....
(1)

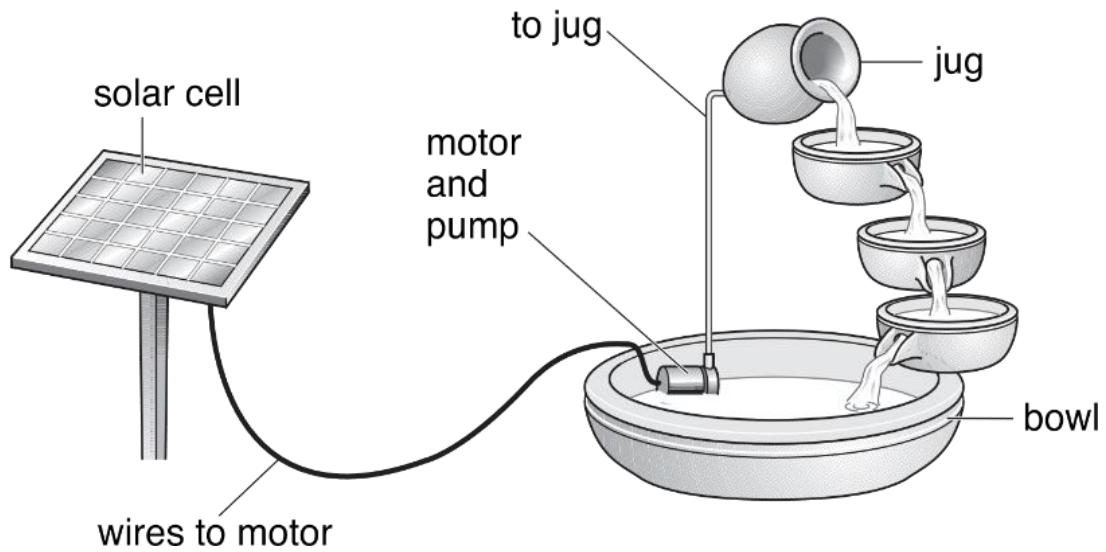
v. Ammonium sulphate is a fertiliser. Outline a simple experiment that could be used to prove that ammonium sulphate is a fertiliser

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(3)

[Chemistry Section = 19 marks]

Physics Section

1. The drawing below shows a garden water feature. It is solar-powered.



The solar cell absorbs energy from the Sun.

The solar cell is connected to a motor in the bowl.

The motor drives a pump.

Water is pumped up to the jug and it flows back down to the bowl.

chemical	electrical	gravitational potential	kinetic
light	sound	thermal	

a. Choose words from the boxes above to help you complete the following sentences:

i. The useful energy change in the motor is from electrical energy to energy.

ii. As the water flows from the jug to the bowl energy is changed into energy.

b. Give one advantage and one disadvantage of using a solar cell to power the water feature.

i. Advantage:

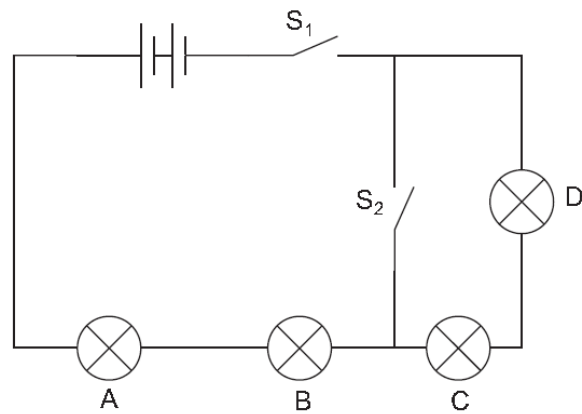
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ii. Disadvantage:

.....
.....

(2)

2. David built the circuit drawn below. All the bulbs are identical.

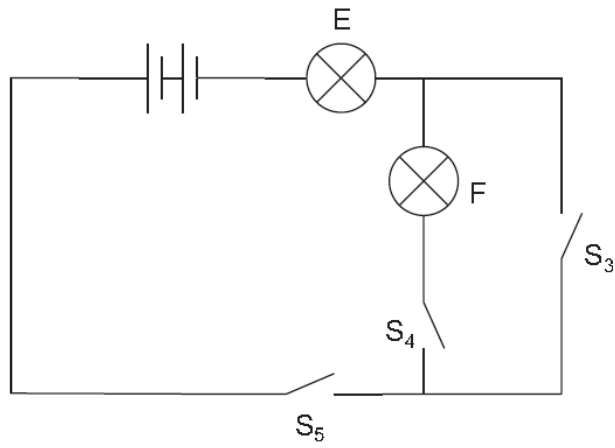


a. Complete the table below by writing **on** or **off** for each bulb. One has been done for you.

switch		bulb			
S_1	S_2	A	B	C	D
open	open	off	off	off	off
open	closed				
closed	open				
closed	closed				

(3)

b. David then built a different circuit as shown below.



How could Lorna get both bulbs to light at the same time in this circuit?

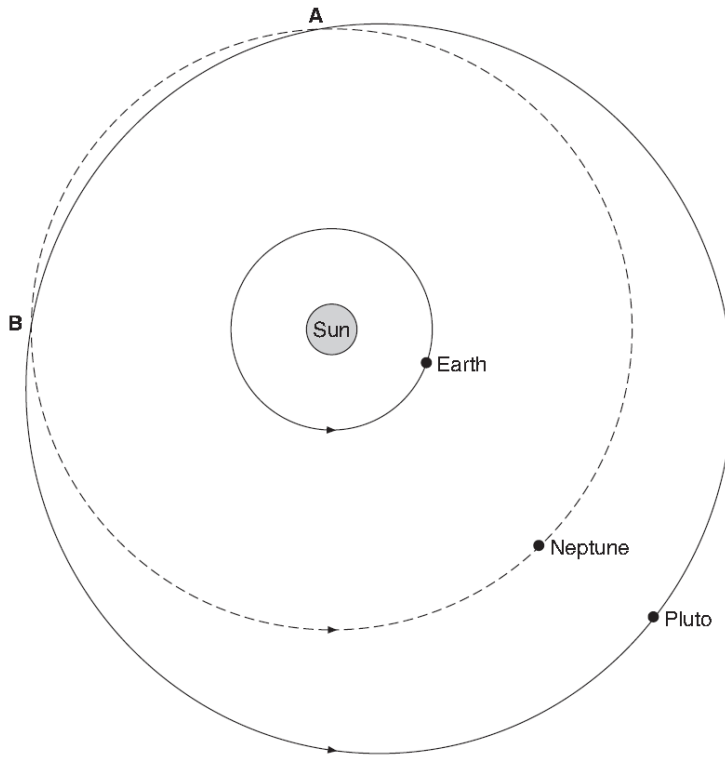
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(1)

3. The diagram below shows the orbits of Neptune, Pluto and the Earth. At two points, A and B, the orbits of Neptune and Pluto cross over each other.



not to scale

a. What force keeps planets in orbit around the Sun?

.....
(1)

b. Give **two** reasons why it takes Pluto more time than Neptune to orbit the Sun.

1.
.....
2.
.....
(2)

- c. Tom can see the Sun because it is a light source. It gives out its own light. Neptune and Pluto are **not** light sources but Tom can see them when he looks through his telescope.

Explain why Tom can see Neptune and Pluto even though they are not light sources.

.....

.....

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.....

(1)

- d. Between points A and B, Pluto is nearer than Neptune to the Earth. Tom noticed that Pluto is **not** as bright as Neptune, even when Pluto is closer than Neptune to the Earth.

Give one reason why Pluto is not as bright as Neptune.

.....

(1)

4. Some students investigate the speed of cars.
 They measure the time it takes each car to travel a distance of 80 m.
 a. State two measuring instruments the students should use.

1.

 2.

(2)

- b. The table shows some of their results.

colour of car	distance travelled / m	time / s
green	80	5.0
red	80	4.0
blue	80	5.5
black	80	4.3
white	80	5.6

- i. State the colour of the slowest car.

colour of the slowest car

(1)

- ii. Calculate the average speed of the black car.

speed of the black car = m/s

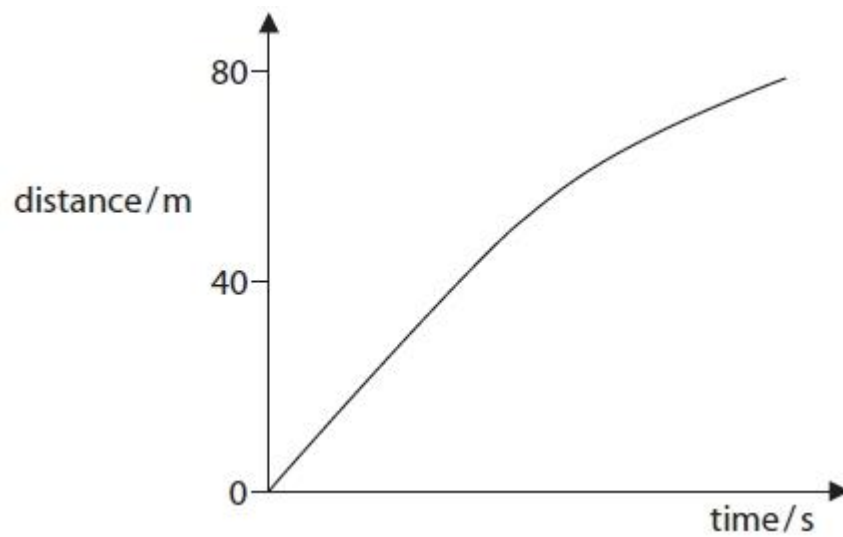
(1)

iii. 20 miles per hour is approximately 9 m/s.

Estimate the speed, in miles per hour, of the black car.

speed of the black car = miles per hour
(1)

c. A distance-time graph for a car is shown below.



Describe what the graph shows about the speed of the car as it travels the 80 m.

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(3)

[Physics Section = 21 marks]