

Name:



OUNDLÉ

School

2018 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 75 marks; 25 for Biology, 24 for Chemistry, and 26 for Physics*

You will need:

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

Biology mark /25	
Chemistry mark / 24	
Physics mark /26	
Total mark /75	
Percentage	

Biology Section

1. Two gardeners compared their tomato crops.

Both grew 10 plants of the same variety in a greenhouse. One gardener altered the environmental conditions in his greenhouse to increase the rate of photosynthesis. His plants yielded 720 tomatoes. The other gardener only produced 480 tomatoes.

- a. What was the percentage increase in the yield of tomatoes when the rate of photosynthesis was increased?

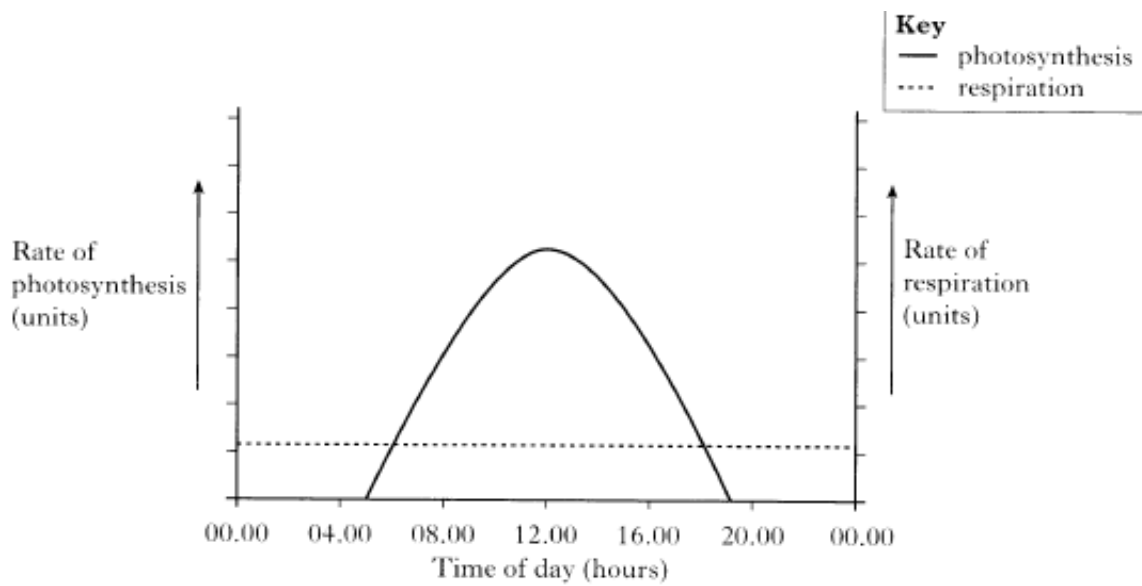
_____ [2]

- b. State two changes to the environmental conditions in the greenhouse which could have increased the rate of photosynthesis.

1. _____

2. _____ [2]

c. The gardeners measured the rates of photosynthesis and respiration in their tomato plants over a period of 24 hours. The results are shown in the graph below:

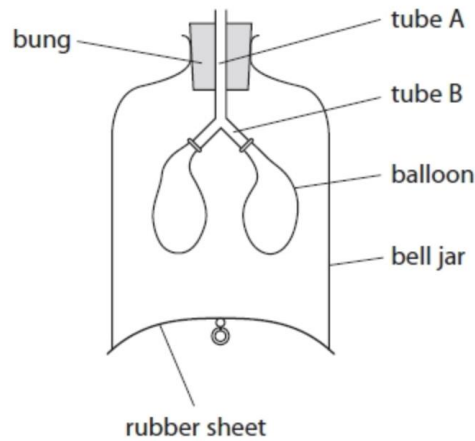


Between what two times was the plant producing more oxygen than it was using?

[1]

Total: 5 marks

2. The diagram shows a model that can be used to demonstrate how the lungs inflate.



a. Suggest which part of the human thorax is represented by

i. the balloons

_____ [1]

ii. the rubber sheet

_____ [1]

iii. tube A

_____ [1]

iv. tube B

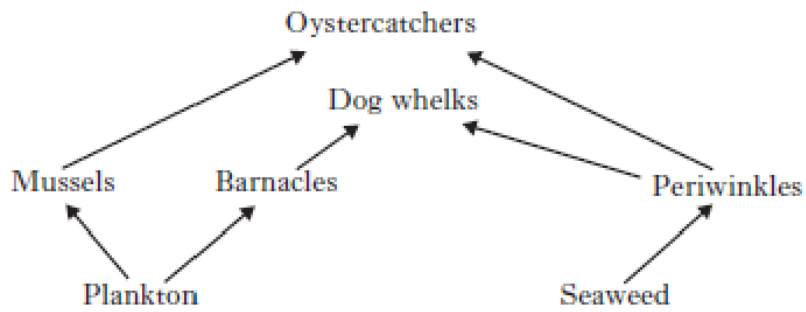
_____ [1]

b. Explain why the model does not fully show the mechanism of breathing in the human thorax.

_____ [2]

Total: 6 marks

3. Part of a food web is shown below.



The number of mussels and periwinkles may be affected if the barnacles are removed from the food web.

a. Describe and explain what would happen to the mussel population if barnacles were removed.

[2]

b. Which organism can be described as a producer?

[1]

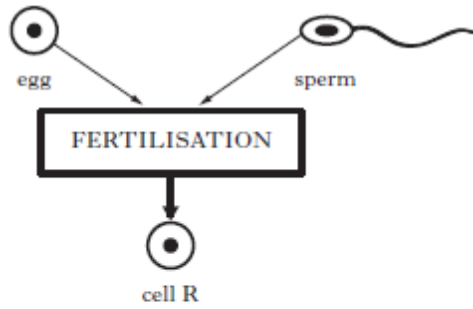
c. What do the arrows represent in a food chain or web?

[1]

Total: 4 marks

4.

a. The diagram below shows the process of fertilisation.



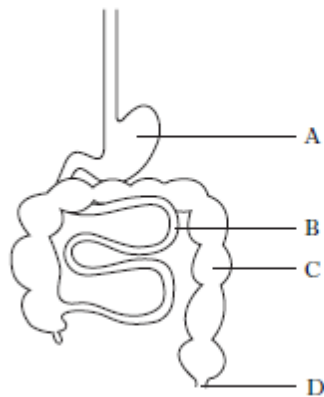
What type of cell is cell R?

- A a zygote
- B a gamete
- C an ovule
- D an embryo

Answer _____ [1]

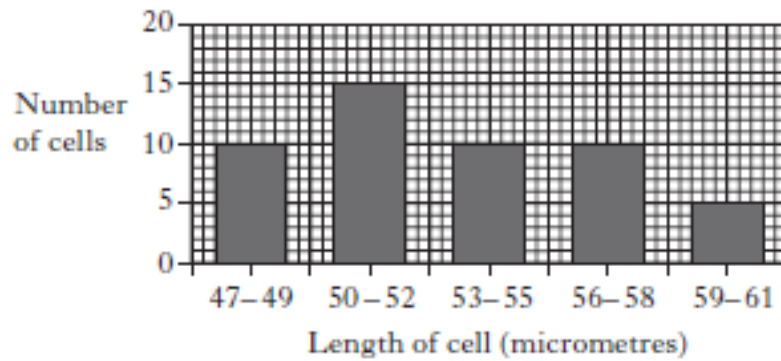
b. The diagram below shows the human alimentary canal.

Which structure contains villi?



Answer _____ [1]

- c. The bar chart below shows the number of cells of different lengths in a sample of onion epidermis.



What percentage of cells have a length greater than 55 micrometers?

- A 10%
- B 15%
- C 20%
- D 30%

Answer _____ [1]

- d. Which substance enters plant cells by diffusion and is used to produce energy in respiration:

- A carbon dioxide
- B water
- C oxygen
- D starch

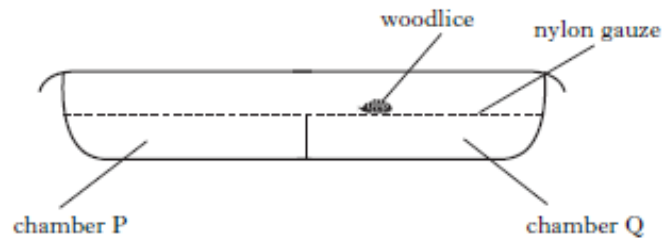
Answer _____ [1]

- e. What is "the total variety of all living things on Earth" describing?

- A an ecosystem
- B biodiversity
- C a community
- D speciation

Answer _____ [1]

f. A choice chamber was used to investigate the effect of **humidity** (concentration of water vapour in the air) on the behaviour of woodlice, as shown below.



Which line in the table below describes the most appropriate set up for this investigation?

	Number of woodlice	Contents of chamber P	Contents of chamber Q	Modifications to choice chamber
A	2	Drying agent	Wet cotton wool	Half covered in black paper
B	2	Wet cotton wool	Drying agent	No black paper
C	10	Drying agent	Wet cotton wool	Half covered in black paper
D	10	Wet cotton wool	Drying agent	No black paper

Answer _____ [1]

g. Which of the following terms describes the arrangement of muscles in pairs?

- A antagonistic
- B complementary
- C paired
- D dual

Answer _____ [1]

h. Which of the following is a deficiency disease associated with a lack of vitamin C in the diet?

- A scurvy
- B obesity
- C diabetes
- D Kwashiorkor

Answer _____ [1]

i. A number of scientists were involved in discovering the structure of DNA. Choose the correct combination

- I. Watson
- II. Attenborough
- III. Dawkins
- IV. Franklin

- A I only
- B I and IV
- C II and III
- D I and III

Answer _____ [1]

j. Where is bile produced?

- A liver
- B pancreas
- C gall bladder
- D stomach

Answer _____ [1]

Total: 10 marks

Chemistry Section

5. The table below shows some chemical reactions that take place when a substance is heated.

	Mass before (g)	Mass after (g)	Percentage change
Reaction A	3.46	3.12	- 9.8
Reaction B	2.76	2.76	0.0
Reaction C	4.12	5.13	?
Reaction D	3.14	3.26	+ 0.38

- a. The percentage change can be worked out by this formula:

$$\frac{\text{difference in mass}}{\text{mass before}} \times 100$$

What is the percentage change of reaction C?

_____ [3]

- b. These are two chemical reactions that happen when a substance is heated.

Reaction 1: Zinc carbonate \rightarrow zinc oxide + carbon dioxide

Reaction 2: Copper \rightarrow copper oxide

Which of the reactions in the table (A, B, or D) is

- i. Reaction 1?

_____ [1]

- ii. Reaction 2?

_____ [1]

c. Which of the reactions in the table (A, B, or D) is a physical change, *eg* ice melting?

[1]

Total: 6 marks

6.

a. Balance the following combustion equations:



[1]



[1]

b.

i. Give the symbols of all the elements in the following list.

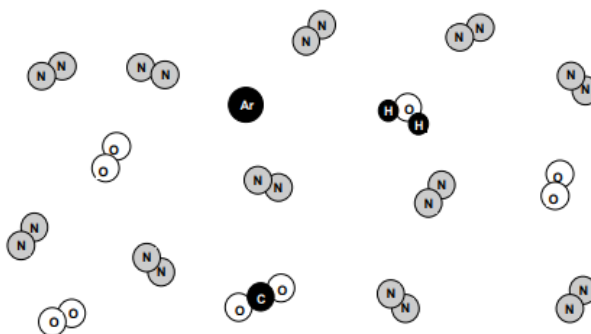
H_2 Br_2 Co HF H_2S S_8 $\text{C}_6\text{H}_{12}\text{O}_6$ CO

_____ [1]

ii. Define the term element.

_____ [1]

c. The diagram below represents the particles in air.



i. Is air an element, a mixture or a compound?

_____ [1]

ii. What percentage by volume of the air is nitrogen?

_____ [1]

iii. Give the formula of each of the substances shown in the diagram that are compounds.

_____ [1]

iv. Define the term compound

_____ [1]

Total: 8 marks

7.

a. Substance X is a strong alkali. What colour would red litmus paper be if dipped into Substance X?

- A red
- B green
- C blue
- D yellow

Answer _____ [1]

b. Substance Y is a strong acid. What could be the pH of Substance Y?

- A 2
- B 7
- C 10
- D 14

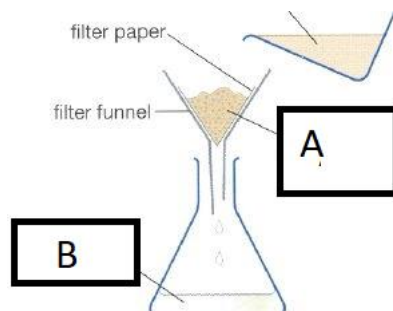
Answer _____ [1]

c. What is the common name given to Group 7 in the periodic table?

- A alkali metals
- B transition metals
- C halogens
- D Noble gases

Answer _____ [1]

d.



Choose the correct name for the substance labelled A in the diagram above.

- A filtrate
- B Residue
- C distillate
- D condensation

Answer _____ [1]

e. How many electrons are found in an atom of neon?

- A 10
- B 8
- C 12
- D 2

Answer _____ [1]

f. When heated from its solid form, Substance Z changes directly from a solid to a gas. What is Substance Z?

- A copper sulphate
- B carbon dioxide
- C mercury
- D water ice

Answer _____ [1]

g. Choose the **least** reactive of the following metals

- A potassium
- B aluminium
- C copper
- D gold

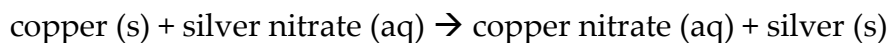
Answer _____ [1]

h. Substance Z is a fuel used in oil lamps. Which of the following is NOT a possible product formed when Substance Z is burned?

- A hydrogen
- B carbon monoxide
- C water
- D carbon dioxide

Answer _____ [1]

i. When copper wire is added to a solution of silver nitrate, the following reaction occurs:



What is the name given to this kind of reaction?

- A replacement
- B decomposition
- C combustion
- D displacement

Answer _____ [1]

j. Choose the element which is a liquid at room temperature:

- A hydrogen
- B chlorine
- C bromine
- D zinc

Answer _____ [1]

Total: 10 marks

Physics Section

8. Three students walk together from school to a bridge. The students stand together on the bridge for three minutes and then return separately to school.

The distance-time graphs for student A, student B and student C are shown in Fig. 1.1.

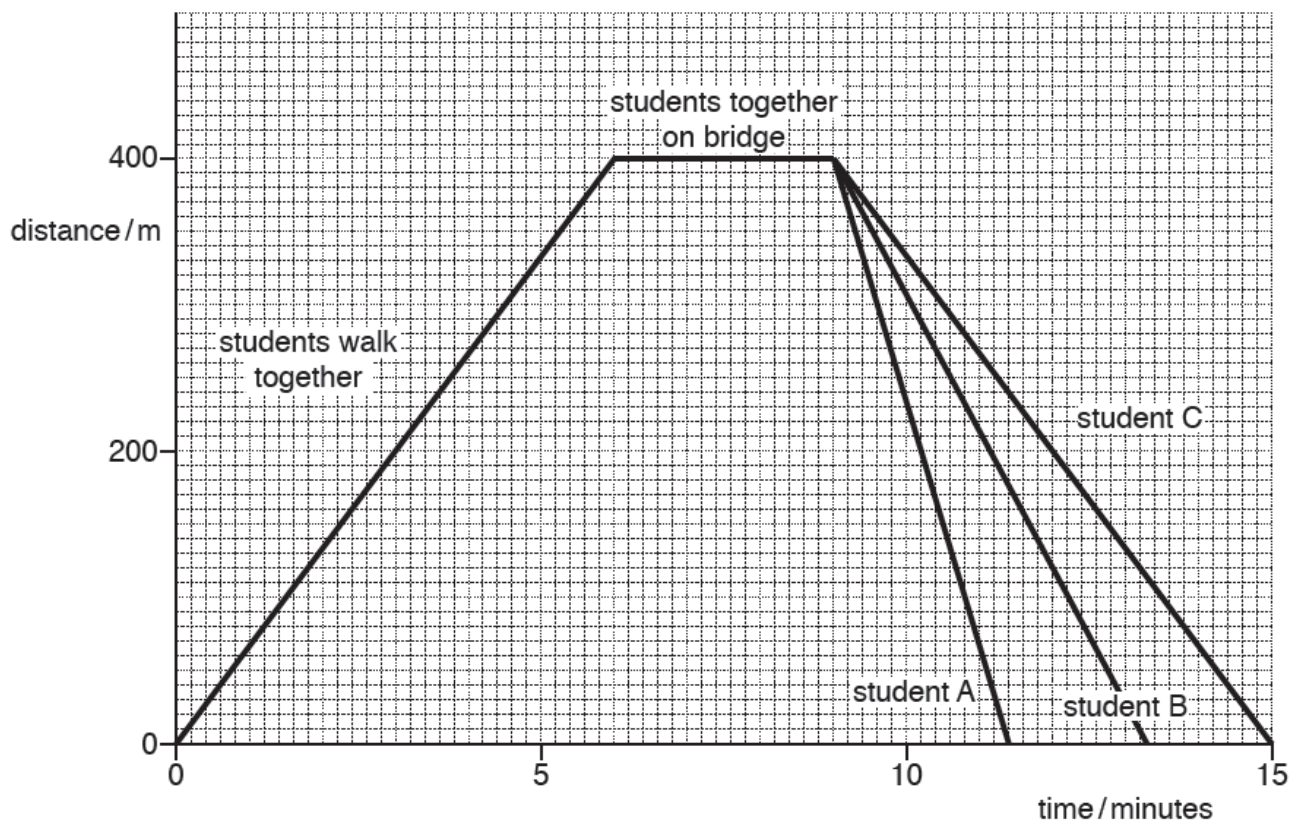


Figure 1.1

a.

- i. Determine the distance from the school to the bridge.

distance = _____ m [1]

- ii. Calculate the average speed of the students when they are walking to the bridge. Give your answer in m / s.

average speed = _____ m/s [4]

- b. The students return to school at different speeds. One student walks slowly, one student walks quickly and the other student runs.

State which student runs. Explain how this is shown by the graph.

Circuit:

Explanation:

[2]

Total: 7 marks

9. Fig. 2.1 shows a spring before and after a load is added.

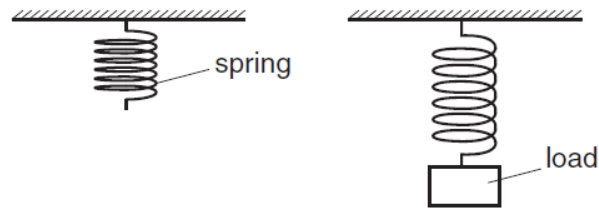


Figure 2.1

a. What is meant by the *extension* of the spring?

[1]

b. When the graph of extension against load is drawn for the spring, the result is the line shown in Fig. 2.2.

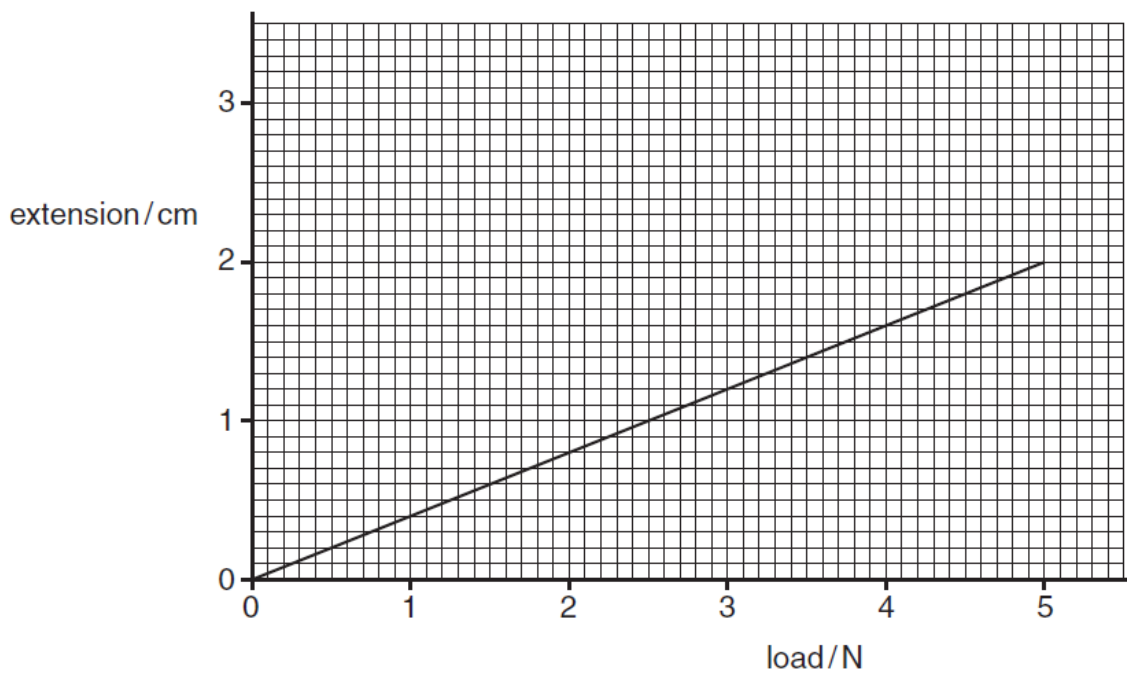


Figure 2.2

i. The unstretched length of the spring is 9.0 cm.
Calculate the total length of the spring when a 5.0 N load is hanging from the spring.

length = _____ cm [2]

ii. Find the extension that will be caused by a load of 2.0 N.

extension = _____ cm [1]

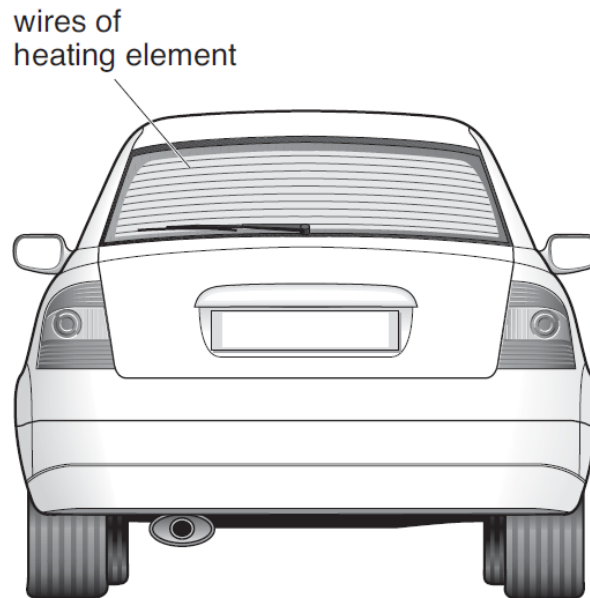
iii. Calculate the mass of a load of weight 2.0 N.

mass = _____ [2]

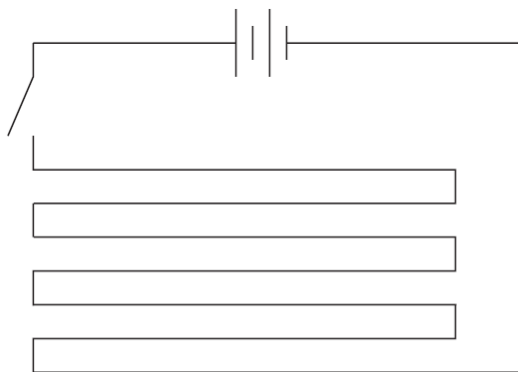
Total: 6 marks

10. The back window of this car contains a heating element.

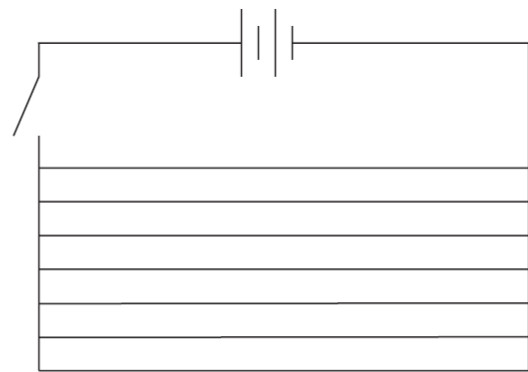
The heating element is part of an electrical circuit connected to the battery of the car.



The diagrams below show **two** ways of connecting the circuit of a heating element.



circuit A



circuit B

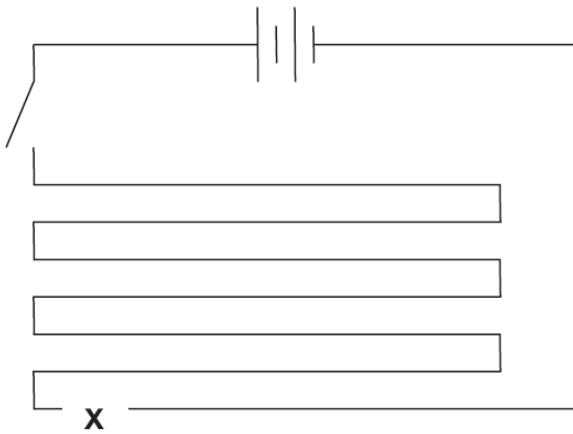
a. Give the name of each type of circuit:

circuit A = _____

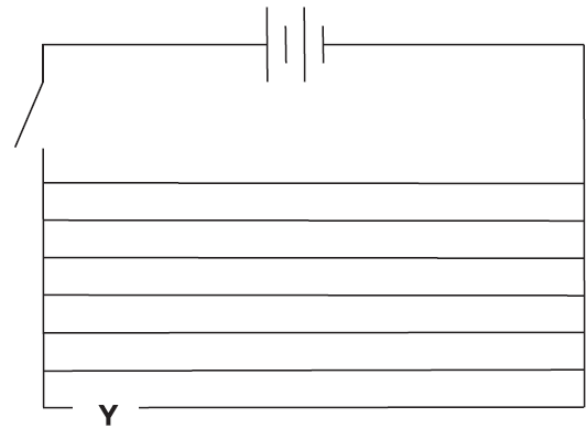
circuit B = _____

[2]

b. A wire gets broken at point X on circuit A and at point Y on circuit B.



circuit A



circuit B

When the switch is closed, how does the broken wire affect the heating element in:

i. circuit A?

[1]

ii. circuit B?

[1]

c. In very cold weather, ice may form on the back window of the car.
When the heating element is switched on, the ice will disappear and the surface of the window will become clear and dry.

i. Fill the gap below to show the energy transfer that takes place.

When the heater is switched on _____ energy
is transferred from the wires to the ice.

[1]

ii. As the window becomes clear and dry, physical changes take place in the ice.

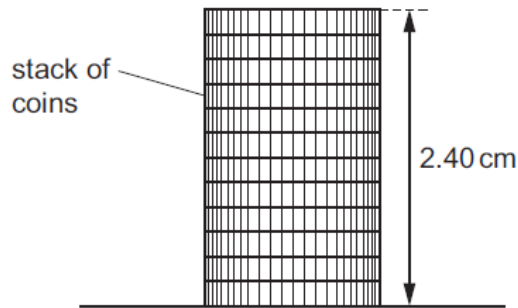
Fill the gaps below to show the physical changes which take place.

From _____ to _____ to _____ [1]

Total: 6 marks

11.

a. The diagram below shows the height of a stack of identical coins.



What is the thickness of one coin?

- A 0.20 mm B 2.0 mm C 0.24 cm D 2.0 cm

Answer _____ [1]

b. A girl stands at a distance from a large building. She claps her hands and a short time later hears an echo.

Why is an echo produced when the sound waves hit the building?

- A The sound waves are absorbed
B The sound waves are diffracted
C The sound waves are reflected
D The sound waves are refracted

Answer _____ [1]

c. The list contains three energy resources P, Q, and R

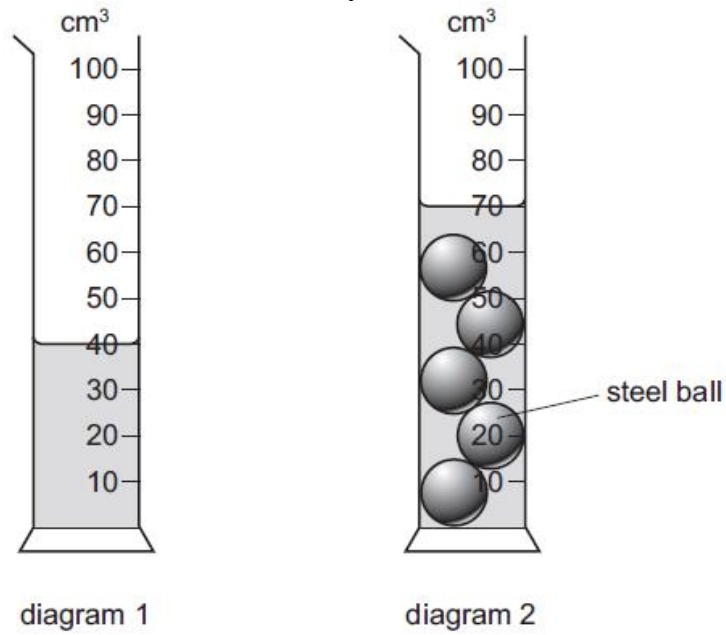
- P geothermal energy from hot rocks
Q nuclear fission in reactors
R Sunlight on solar panels

Which of these resources are renewable?

- A P and Q only
B P and R only
C Q and R only
D P, Q, and R

Answer _____ [1]

d. In the image below, diagram 1 shows a measuring cylinder containing water. Five identical steel balls are now lowered into the measuring cylinder. Diagram 2 shows the new water level in the cylinder.

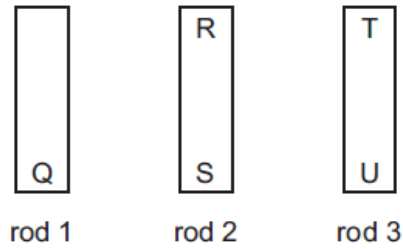


What is the volume of each steel ball?

- A 6 cm^3 B 14 cm^3 C 30 cm^3 D 70 cm^3

Answer _____ [1]

e. The ends of three metal rods are tested by holding end Q of rod 1 close to the others in turn



The results are as follows:

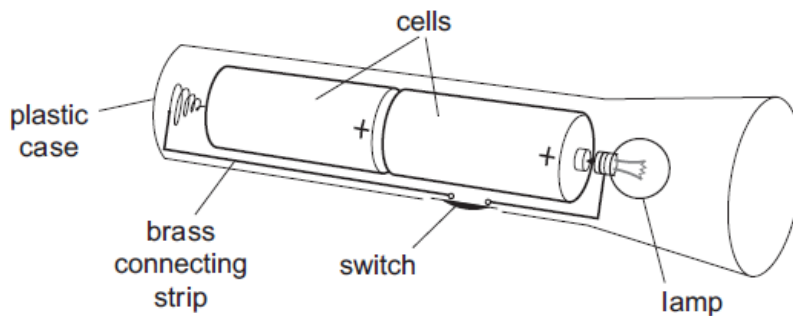
End Q attracts end R,
 attracts end S,
 attracts end T,
 Repels end U.

Which of the metal rods is a magnet?

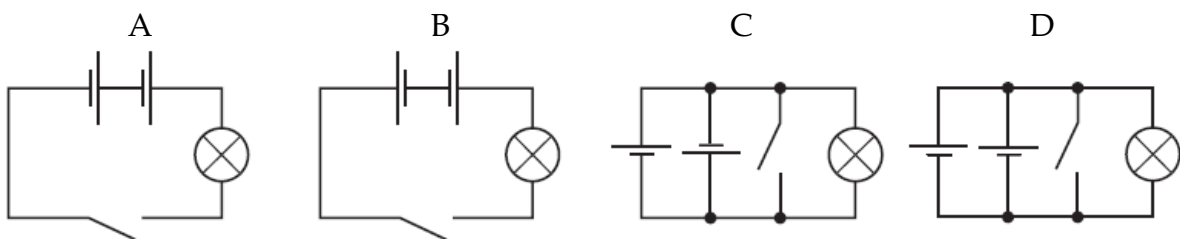
- A rod 1 only
- B rod 1 and rod 2
- C rod 1 and rod 3
- D rod 3 only

Answer _____ [1]

f. The diagram shows a torch containing two cells, a switch, and a lamp.

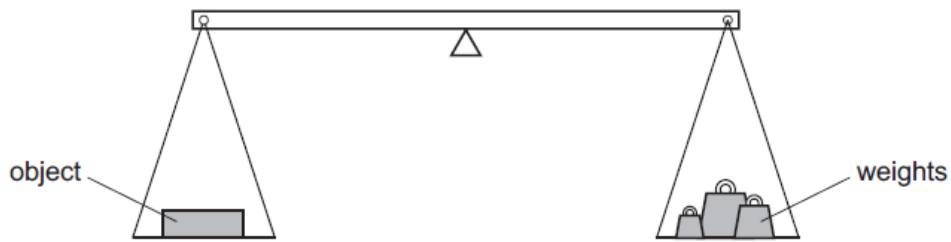


Which is the circuit for the torch?



Answer _____ [1]

g. The weight of an object is found using the balance shown in the diagram. The object is put in the left-hand pan and various weights are put on the right-hand pan.



These are the results.

weights in the right-hand pan	effect
0.1N, 0.1N, 0.05N, 0.02N	balance tips down slight on the left-hand side
0.2N, 0.1N, 0.01N	balance tips down slight on the right-hand side

What is the best estimate of the weight of the object?

A 0.27 N

B 0.29 N

C 0.31 N

D 0.58 N

Answer _____ [1]

Total: 7 marks