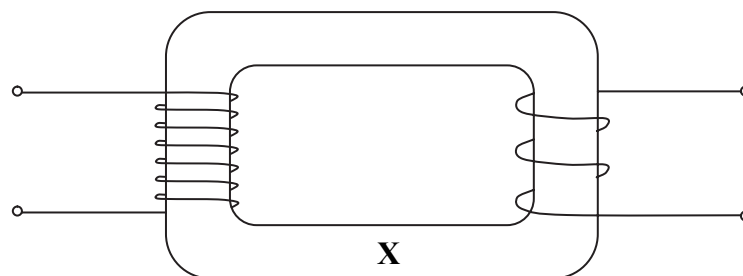


Answer ALL the questions. Write your answers in the spaces provided.

1. (a) The diagram shows a simple transformer.



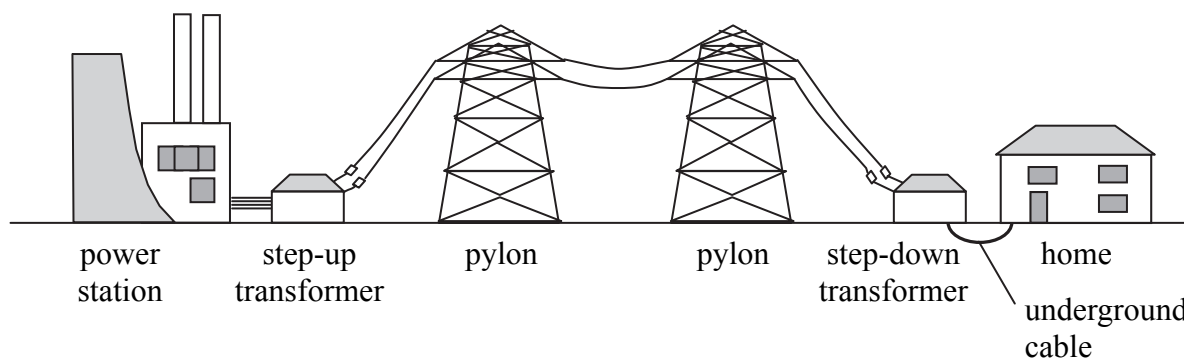
(i) Name part X.

..... (1)

(ii) Suggest a suitable material for part X.

..... (1)

(b) The diagram shows two transformers in part of the National Grid.



(i) What is meant by a step-up transformer?

..... (1)

(ii) Explain why step-up transformers are used in the National Grid.



..... (3)



Leave blank

- (c) High voltage power lines cause electrical and magnetic fields. Many people think that these electrical and magnetic fields are dangerous. Scientists studied the health of people who live near power lines. They concluded that there was no increase in cancer rates.

Suggest why people may not want to live near overhead power lines, even though they have been told it is safe.

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

(2)

Q1

(Total 8 marks)

2. Adam is competing in a strong-man competition.



Source: www.ontariostrongman.ca

He pulls the truck at a steady speed with a force of 1200 N.

- (a) What is the size and direction of the frictional force on the truck?

..... (1)

- (b) Calculate the work done by Adam when he pulls the truck 12 m. State the units in your answer.

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

(4)

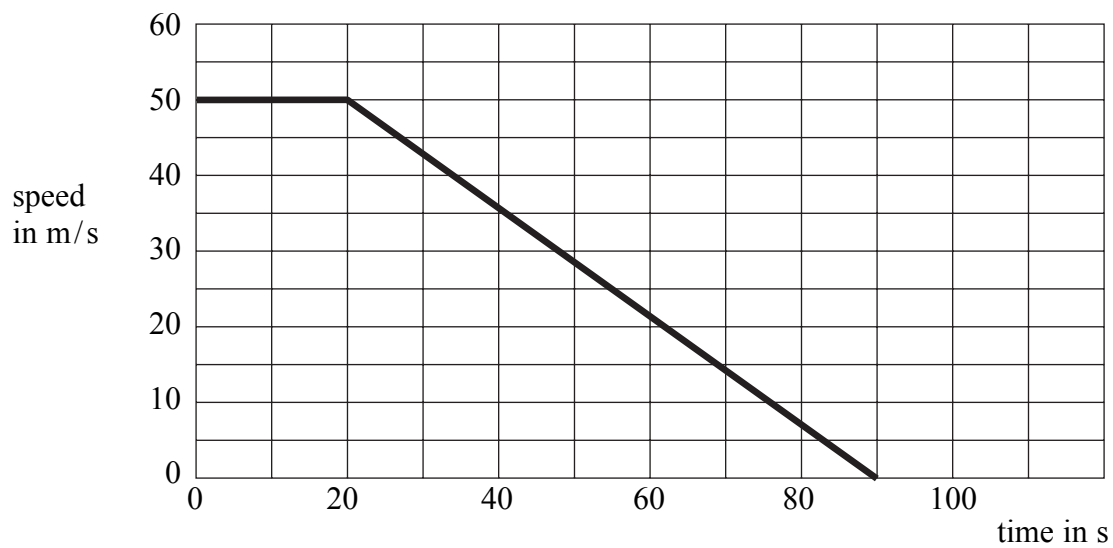
Q2

(Total 5 marks)



Leave blank

3. The graph shows the speed of a train at different times.



(a) Calculate the acceleration of the train while it is slowing down.

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

..... m/s²
(3)

(b) Calculate the distance travelled by the train in the 90 seconds shown on the graph.

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

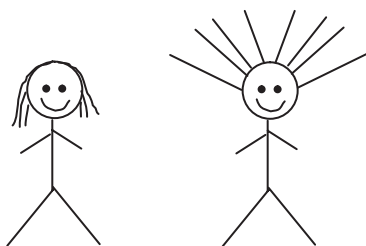
(3)

(Total 6 marks)

Q3



4. A girl uses a plastic comb to comb her hair.
This makes her hair stick out.



The comb has become positively charged.

- (a) Explain how the comb has become charged.

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

(2)

- (b) Explain why her hair no longer sticks out when she touches a metal water tap.

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

(1)

- (c) She holds the charged comb near a bowl of dry puffed rice.
Some of the puffed rice sticks to the comb.
Explain why the puffed rice sticks to her charged comb.

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

(1)

(Total 4 marks)

Q4



5. (a) (i) Iodine-131 has a half-life of 8 days.

What is meant by the term half-life?

.....

(1)

(ii) The activity of a sample of iodine-131 is 80 Bq.
 How long will it take for its activity to fall to 10 Bq?

.....

(1)

(b) Radioactive isotopes are used in medicine.
 Three important uses are

- to destroy tumours from the inside by putting a radioactive isotope into the tumour
- to destroy tumours from the outside by aiming radiation at the tumour
- to insert a radioactive isotope into the blood to test how well the blood flows

This table gives data about isotopes.

name	half-life	alpha emitter	beta emitter	gamma emitter
cobalt-60	5.27 years		✓	✓
technetium-99	6 hours			✓
palladium-103	17 days			✓
lutetium-177	6.7 days		✓	
bismuth-211	2.14 minutes	✓		
radium-226	1600 years	✓		

This table gives data about each type of radiation.

type of radiation	range in air (cm)	ionisation produced
alpha	10	very high
beta	100	medium/high
gamma	more than 1000	low



Use information from the tables to answer the following questions.

- (i) Doctors use cobalt-60 rather than radium-226 when trying to destroy a tumour from the outside.
Suggest two reasons for this.

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

(2)

- (ii) When doctors use a radioactive isotope inside a patient, they choose an isotope with a short half-life.
Suggest a reason for this.

.....
.....

(1)

- (iii) Choose the most suitable radioactive isotope to inject into the bloodstream to test how well the blood flows.
Explain your choice.

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

(2)

Q5

(Total 7 marks)

TOTAL FOR PAPER: 30 MARKS

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