

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

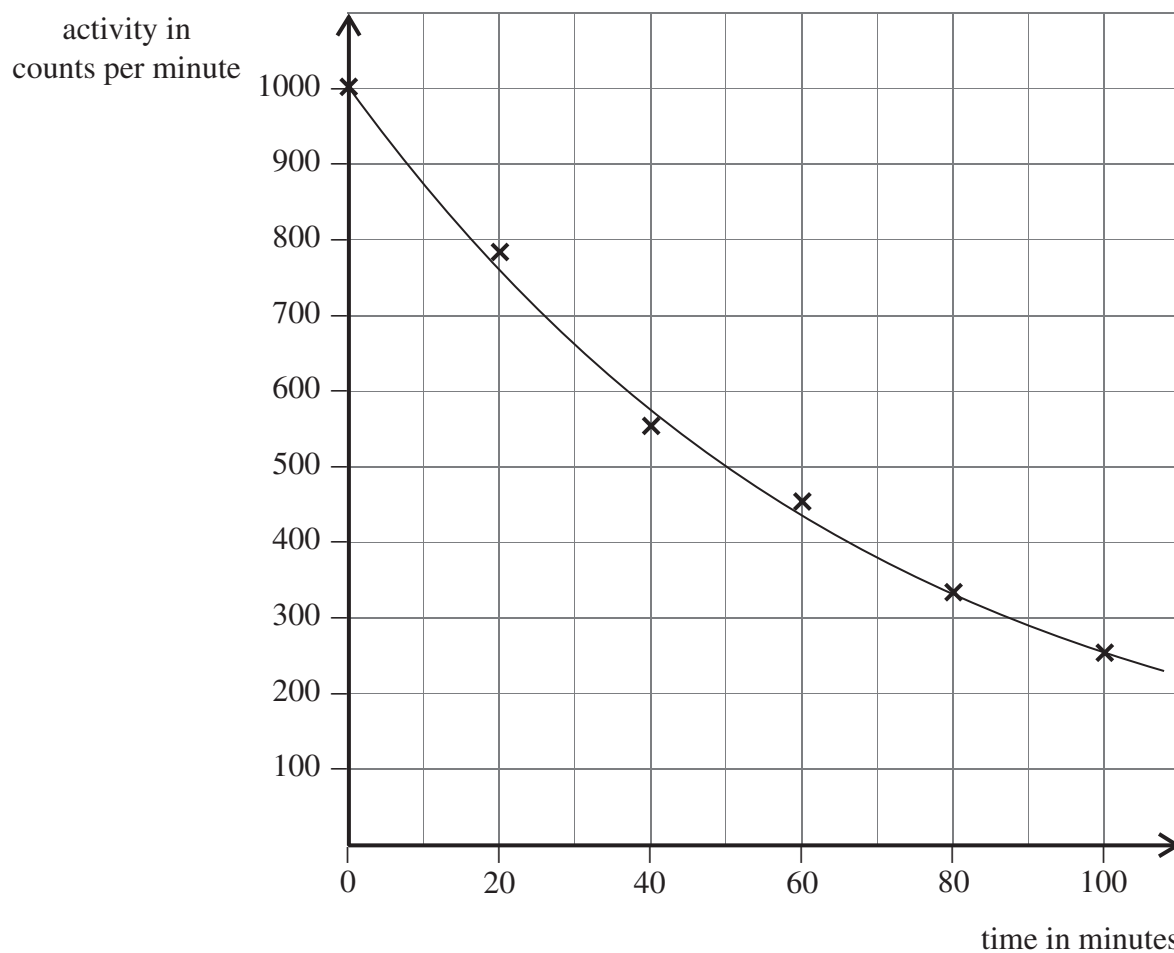
1. (a) What is meant by the term **radioactive half-life**?

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(1)

(b) A teacher did an experiment to find the half-life of a radioactive isotope. She measured the activity of the isotope with a Geiger-Müller tube and a counter.

The graph shows her results.



Use the graph to find the half-life of the isotope.

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(2)



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(c) A nuclear power station has been dismantled.

- Scientists find that the ground contains radioactive waste.
- They discover that the half-life of the radioactive isotope in the ground is 30 years.
- A sample of the waste has an activity of 8 Bq.
- Builders hope that the ground will be completely safe after 60 years.

(i) What activity would the sample have after 60 years?

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(1)

(ii) Explain why people may not want to live in houses built where the nuclear power station used to be, even after 60 years.

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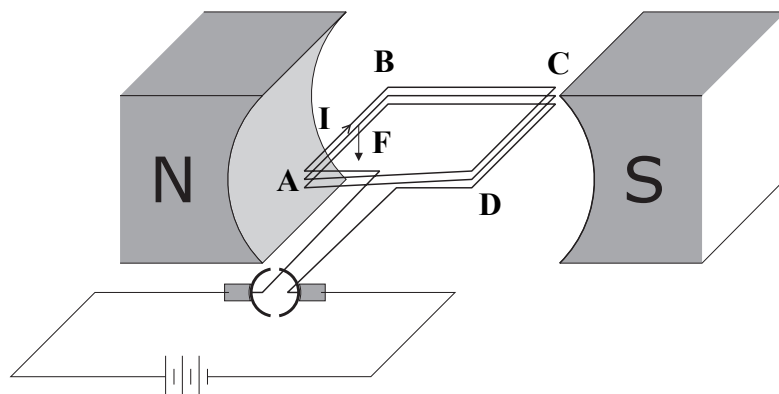
(2)

Q1

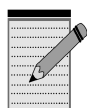
(Total 6 marks)



2. The diagram shows part of an electric motor connected to a battery.
The current **I** is marked along side **AB**.
The force **F** is also marked on side **AB**.



- (a) On the diagram add:
- (i) an arrow showing the direction of the current on side **CD** of the coil – label this current **X**,
 - (ii) an arrow showing the direction of the force on side **CD** of the coil – label this force **Y**.
- (2)**
- (b) Describe changes that could be made to the equipment that would make the motor spin in the opposite direction.



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(3)

- (c) The motor is connected to a 6 V battery.
The current carried by the wire is 0.5 A.
Calculate the electrical power supplied to the motor.
State the unit.

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(3)

Q2

(Total 8 marks)



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3. Some gas is stored in a container.

(a) Explain how the gas exerts a pressure on the container.

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(3)

(b) One gram of gas was stored in a container.
The volume was 200 cm^3 and the pressure was $5.0 \times 10^5 \text{ Pa}$.
The same mass of the gas was also placed in a second container.
The volume was 960 cm^3 .
Both gases were at the same temperature.

$$P_1 \times V_1 = P_2 \times V_2$$

Calculate the pressure of the gas in the second container.

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(3)

Q3

(Total 6 marks)

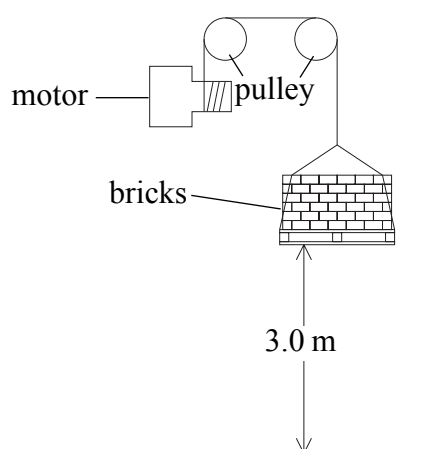


4. (a) Explain the difference between **kinetic** energy and **gravitational potential** energy.

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(2)

(b) An electric motor is used to lift 500 kg of bricks 3.0 m vertically as shown.



(i) Calculate the increase in the gravitational potential energy of the bricks. The gravitational field strength is 10 N/kg.

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J
(3)

(ii) The energy supplied to the motor was 24 000 J.
Explain why this is not the same as your answer to part (i).

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(2)

(Total 7 marks)

Q4



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5. Sound waves can be diffracted.

(a) How is the frequency of a wave calculated from its wavelength and speed?

frequency =

(1)

(b) Explain why the open door of a music room diffracts lower frequency sounds more than higher frequency sounds.
(You may choose to draw a diagram to help your explanation.)

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(2)

Q5

(Total 3 marks)

TOTAL FOR PAPER: 30 MARKS

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