Surname	Initial(s)
Signature	

Paper Reference(s)

5019 5047

Edexcel GCSE

Additional Science (5019)

Physics (5047)

P2 – Topics 9 to 12

Foundation and Higher Tier

Wednesday 4 March 2009 – Morning

Time: 20 minutes

Materials required for examination
Multiple Choice Answer Sheet
HB pencil, eraser and calculator

Items included with question papers
Nil

Instructions to Candidates

Use an HB pencil. Do not open this booklet until you are told to do so.
Mark your answers on the separate answer sheet.

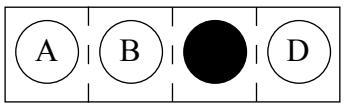
Foundation tier candidates: answer questions 1 – 24.
Higher tier candidates: answer questions 17 – 40.
All candidates are to answer questions 17 – 24.

Before the test begins:

Check that the answer sheet is for the correct test and that it contains your candidate details.

How to answer the test:

For each question, choose the right answer, A, B, C or D and mark it in HB pencil on the answer sheet.
For example, the answer C would be marked as shown.



Mark only **one** answer for each question. If you change your mind about an answer, rub out the first mark **thoroughly**, then mark your new answer.

Do any necessary calculations and rough work in this booklet. You may use a calculator if you wish.

You must not take this booklet or the answer sheet out of the examination room.

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FORMULAE

You may find the following formulae useful.

$\text{average velocity} = \dfrac{\text{displacement}}{\text{time}}$	$v = \dfrac{s}{t}$
$\text{acceleration} = \dfrac{\text{change in velocity}}{\text{time}}$	$a = \dfrac{(v-u)}{t}$
force = mass × acceleration	$F = m \times a$
momentum = mass × velocity	$p = m \times v$
change in potential energy = mass × gravitational field strength × change in height	$PE = m \times g \times h$
kinetic energy = ½ × mass × (velocity)^2	$KE = ½ \times m \times v^2$
electrical energy = voltage × current × time	$E = V \times I \times t$
$\text{power} = \dfrac{\text{work done}}{\text{time taken}}$	$P = \dfrac{W}{t}$
work done = force × distance moved in the direction of the force	$W = F \times s$

Questions 1 to 16 must be answered by Foundation tier candidates only.
Higher tier candidates start at question 17.

Radioactivity

Some students are investigating radioactivity.

1. Gamma radiation is used to treat strawberries.
This makes the strawberries

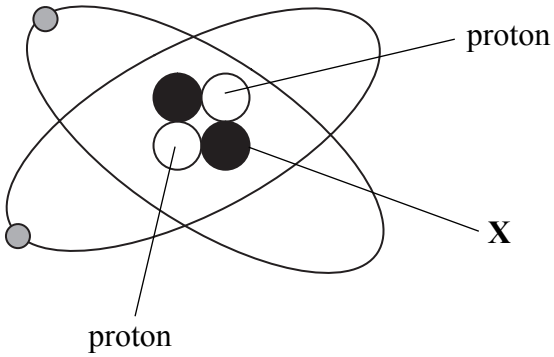
A shinier
B warmer
C softer
D last longer

2. One type of radiation that can travel through many centimetres of lead is

A gamma radiation
B beta radiation
C alpha radiation
D microwave radiation

3. The diagram represents an atom of helium.

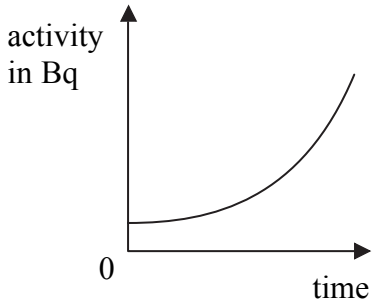
not to scale



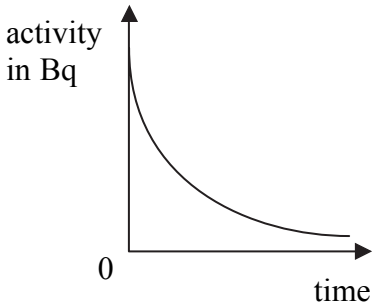
Particle **X** is

A a neutron
B an alpha particle
C an electron
D a beta particle

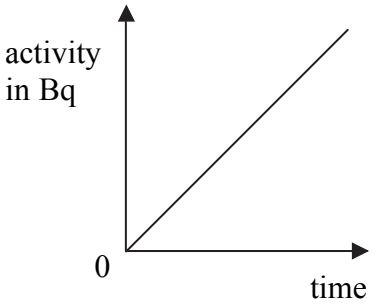
4. Which of these shows how the activity of a radioactive source changes over a period of time?



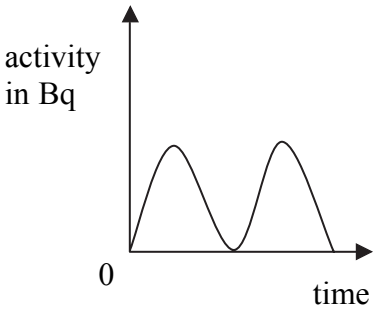
A



B



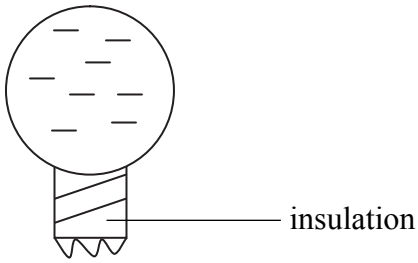
C



D

Electrostatics

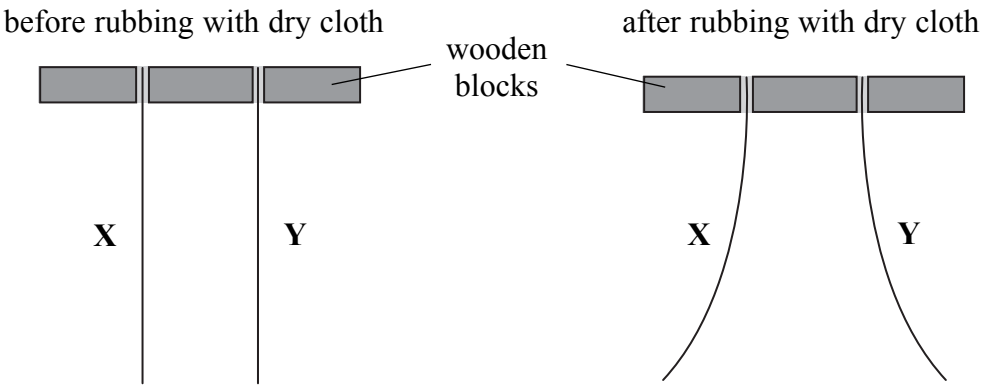
An insulated metal ball is given a negative electric charge.



5. The ball is charged by the transfer of

A protons
B neutrons
C alpha particles
D electrons

6. Two thin strips of plastic **X** and **Y** are held so that they hang down.
The diagrams show the strips before and after rubbing with a dry cloth.



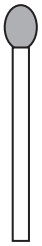
After rubbing, strip **X** has a negative charge.
The charge on strip **Y**

A must be positive
B must be negative
C may be either positive or negative
D may be zero

Nuclear reactions

7. Burning matches can be used to show ideas about the chain reaction.

An unburnt match looks like this

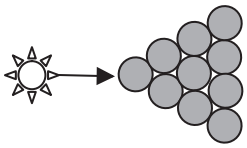


Seen from above, it looks like this  .

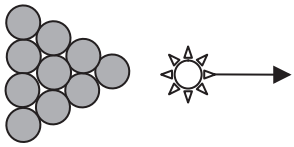
Seen from above, a burning match looks like this  .

The arrows on the diagrams below show the direction in which the burning match is moved.

Which diagram best represents an uncontrolled chain reaction?



A



B

C

D

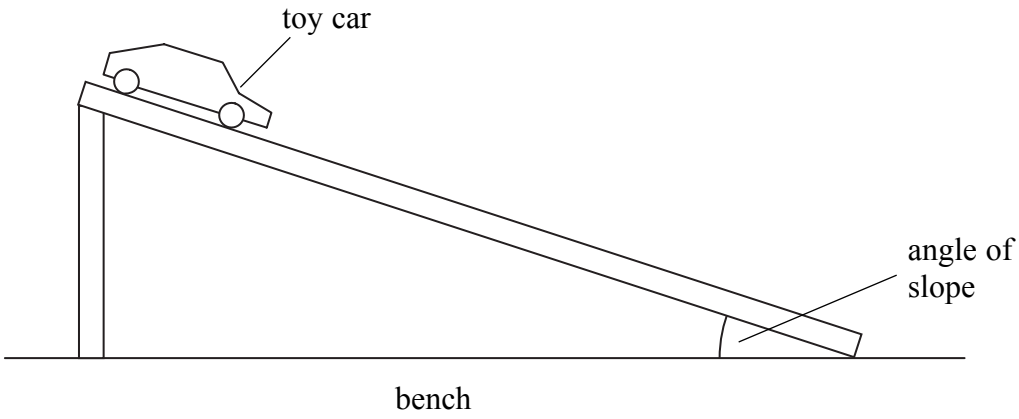
8. The waste products from a nuclear reactor are dangerous because they

A have a high voltage
B explode suddenly
C stay radioactive for years
D melt any solid container

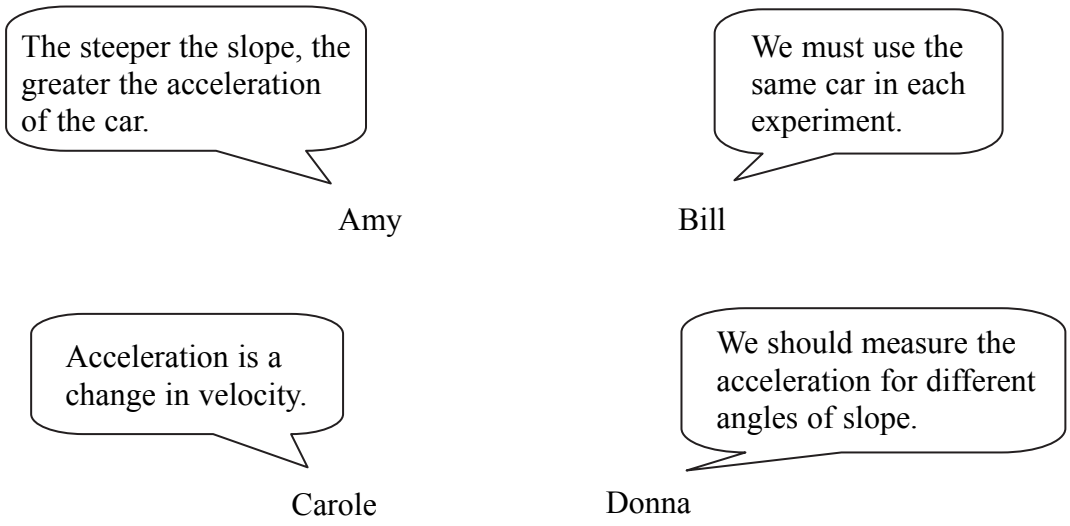
Forces and motion

Some students investigate how toy cars roll down a slope.
They plan

- to use a data-logger
- to measure the velocity of a car at two different places on the slope
- to repeat the experiment with the slope at different angles



9. The students discuss the investigation.



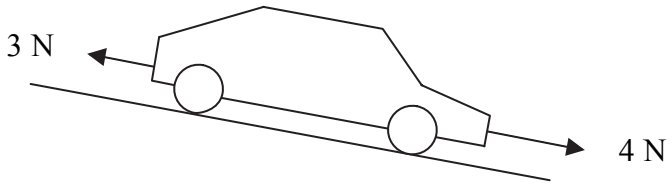
Who has made a prediction for the investigation?

A Amy
B Bill
C Carole
D Donna

10. In this investigation the same car is used each time.
Choosing the same car each time makes it

A a dependent variable
B an independent variable
C a controlled variable
D an uncontrolled variable

11. The diagram shows some of the forces acting on a toy car as it rolls down a slope.



The resultant of the two forces shown is

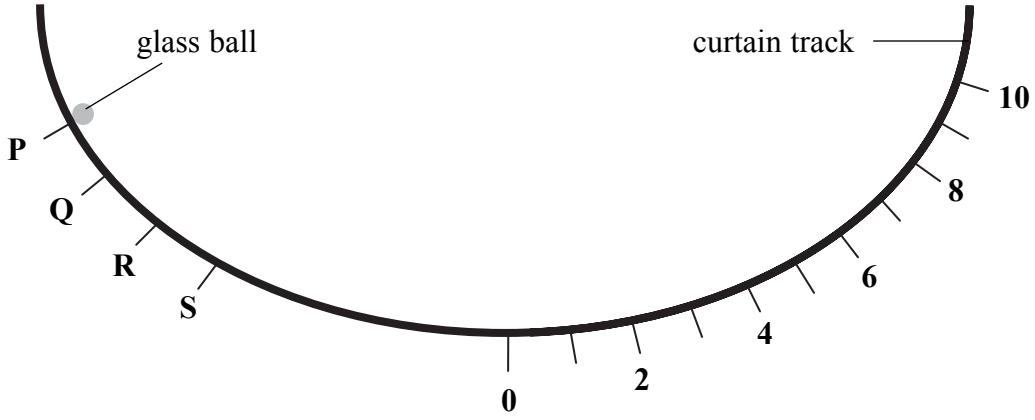
A 1 N down the slope
B 1 N up the slope
C 7 N down the slope
D 7 N up the slope

12. Another car is rolling down the slope.
If the resultant force on this car is zero it will

A come to a stop
B continue at a steady acceleration
C continue at a steady speed
D start to slow down

Effects of gravity

John uses a small glass ball and a piece of curtain track to investigate movement.
He supports the curtain track like this.



He releases the ball so that it rolls down the track.
He notes the highest mark the ball reaches on the other side.

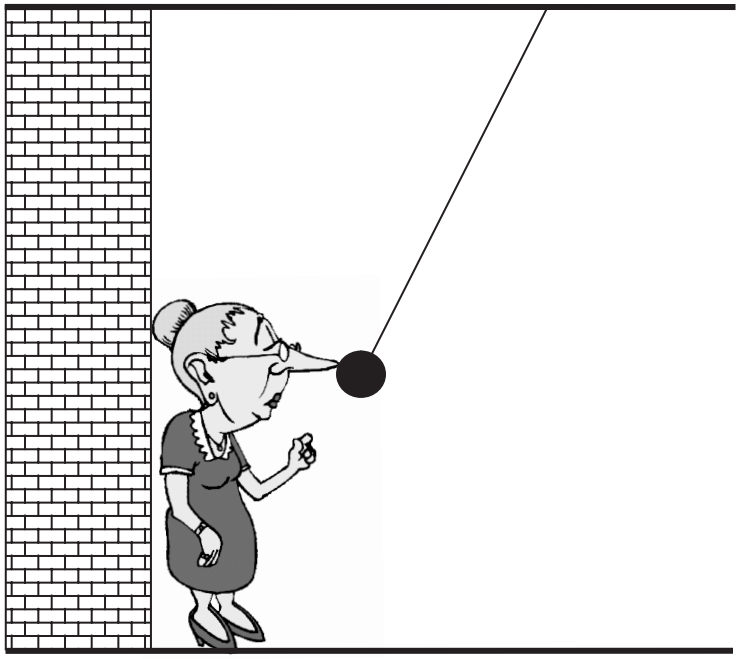
13. John releases the ball from points **P**, **Q**, **R** and **S** in turn.
Which row of the table shows an anomalous reading?

	released from point	**mark reached**
A	**P**	**9**
B	**Q**	**6**
C	**R**	**5**
D	**S**	**3**

14. John wanted to make his results more reliable.
He took three readings for each point.
He did this so that he could

A find the biggest reading
B find the smallest reading
C add the three readings and divide by two
D add the three readings and divide by three

15. Sue hangs a ball from a string attached to the ceiling.



She stands with her head touching a wall.
She pulls the ball so that it just touches her nose as shown.
She releases the ball.
The ball will **not** hit her when it swings back because

A the ball is smooth
B the ball is too heavy
C some of the ball's energy will be transferred into gravitational potential energy
D some of the ball's energy will be transferred into thermal (heat) energy

16. Aristotle, a man who lived in Greece thousands of years ago, said that heavier objects fall faster than lighter objects.
Scientists no longer believe Aristotle's statement because

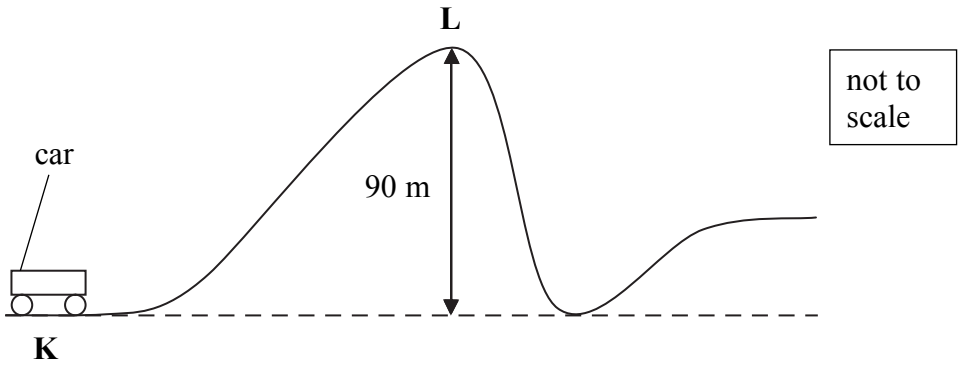
A he is dead
B he lived in Greece
C they have done experiments with falling objects
D gravitational field strength has changed

Higher tier candidates start at Question 17 and answer Questions 17 to 40.
Questions 17 to 24 must be answered by all candidates: Foundation tier and Higher tier.

Looking at roller coasters

Carlos and his friends look at a car on a roller coaster.

The diagram shows a side view of part of the roller coaster.



The empty car weighs 800 N.
The car is raised from **K** to **L** by an electric motor.

17. The work done raising the empty car from **K** to **L** is

A 720 J
B 7 200 J
C 72 000 J
D 720 000 J

18. A car carrying passengers is raised from **K** to **L**.
The current in the motor is 200 A and the voltage across it is 250 V.
The ride takes 20 seconds to move from **K** to **L**.
The electrical energy supplied to the motor is

A 4 000 J
B 5 000 J
C 50 000 J
D 1 000 000 J

Radiation

19. Which of these is correct for gamma rays but **not** for X-rays?

A low ionising ability
B travel through muscle
C can expose photographic plates
D produced in the nucleus of an atom

20. A teacher measured the half-life of a radioactive element.
Her results were

54 s	57 s	55 s	116 s	58 s

The value she should use for half-life is

A 54 s
B 56 s
C 68 s
D 116 s

Investigating parachutes

Alison is investigating how the area of a parachute affects the time it takes to fall to the ground.
She cuts different sized pieces from plastic bags to make the parachutes.

21. In her investigation the independent variable is

A the gravitational field strength
B the height the parachute is dropped from
C the time taken to fall to the ground
D the area of the parachute

22. The parachute falls through 2 m in a time of 0.5 s.
What is the average velocity of the parachute?

A 0.5 m/s downwards
B 4.0 m/s downwards
C 0.5 m/s upwards
D 4.0 m/s upwards

23. Alison rubs the plastic sheet of a parachute with a cloth.
She finds that the parachute has become positively charged.
The parachute has become charged by

A gaining electrons
B gaining protons
C losing electrons
D losing protons

24. The charged parachute falls to the floor and gets dusty.
Which row of the table explains why the dust sticks to the parachute?

	force between dust and parachute is	**charges on dust and parachute could be**
A	a repulsion	the same
B	a repulsion	opposite
C	an attraction	the same
D	an attraction	opposite

TOTAL FOR FOUNDATION TIER PAPER: 24 MARKS

Foundation tier candidates do not answer any more questions after question 24.

Foundation tier candidates do not answer any more questions after question 24.

Questions 25 to 40 must be answered by Higher-tier candidates only.
Foundation-tier candidates do not answer Questions 25 to 40.

Collisions

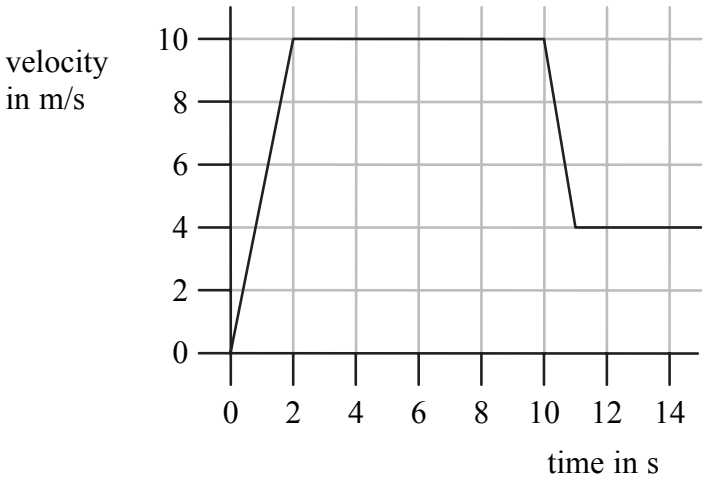
Nafis and her friends are investigating what happens when cars collide.
They use a number of model cars on a frictionless track.

25. One of the model cars has a mass of 0.2 kg.
The car is given an acceleration of 4 m/s^2.
The force needed to produce this acceleration is

A 0.05 N
B 0.8 N
C 2.0 N
D 8.0 N

Use this information to answer questions 26 and 27.

The velocity-time graph shows the motion of a different model car during one experiment.



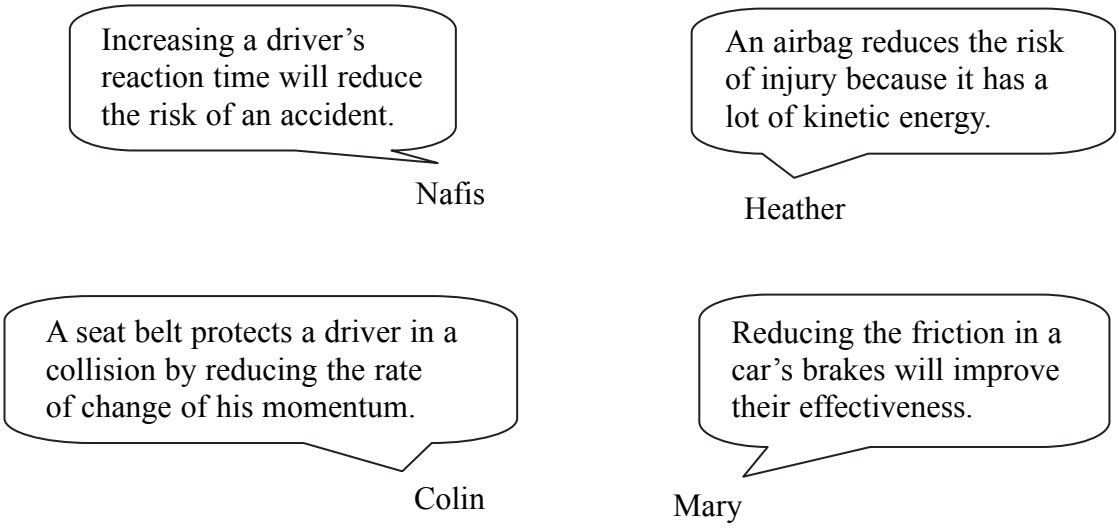
26. The acceleration of this car during the first 2 seconds is

A 0.2 m/s^2
B 5 m/s^2
C 10 m/s^2
D 20 m/s^2

27. After 5 seconds the momentum of the car is 4 kg m/s
What is the mass of the car?

A 0.4 kg
B 0.8 kg
C 20 kg
D 40 kg

28. Nafis and her friends discuss safety and collisions.

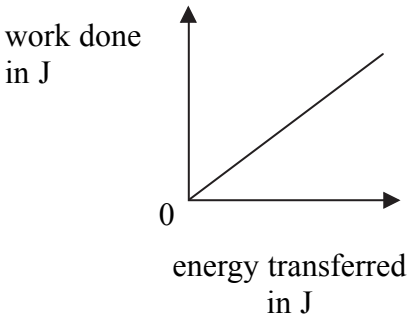


Who is correct?

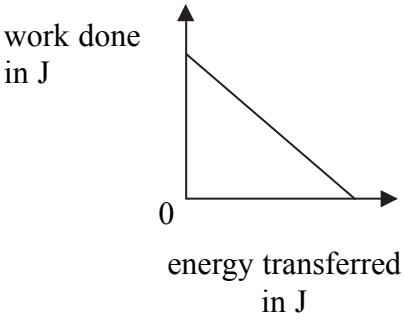
A Nafis
B Heather
C Colin
D Mary

Funfair rides

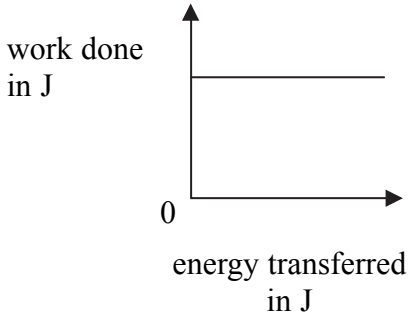
29. Which of these graphs shows the relationship between work done on a ride and energy transferred to the ride?



A



B



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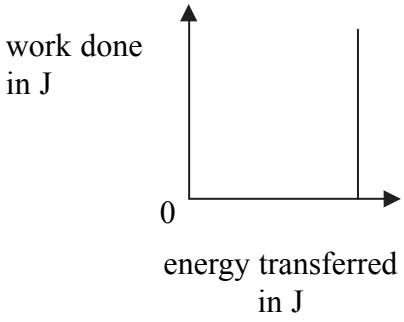
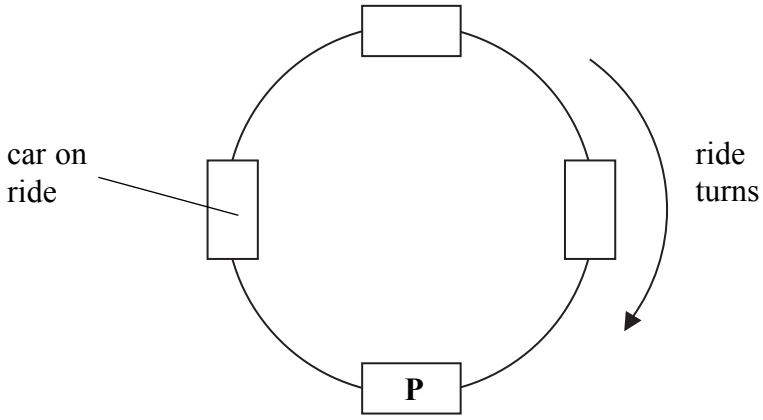


D

Use this information to answer questions 30 and 31.

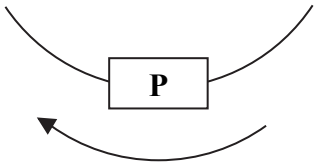
The diagram below shows a simplified overhead view of this fairground ride.



30. The ride turns at a steady speed.
Which of these describes the motion of one of the cars?

	velocity of car	**acceleration of car**
A	changing	constant size
B	steady	zero
C	steady	constant size
D	changing	zero

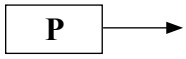
31. Part of the diagram, showing car **P**, is repeated below.



ride turns at a steady speed

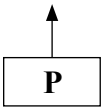
Which of these shows the direction of the resultant force that keeps car **P** moving in a circle?

A



B

C



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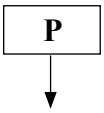
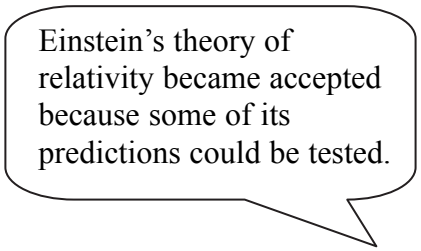
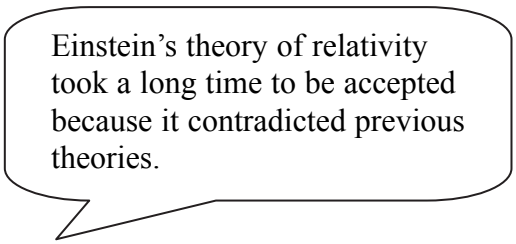


Scientific theories

32. Donna and Kerry discuss Einstein's theory of relativity.



Donna



Kerry

Who is correct?

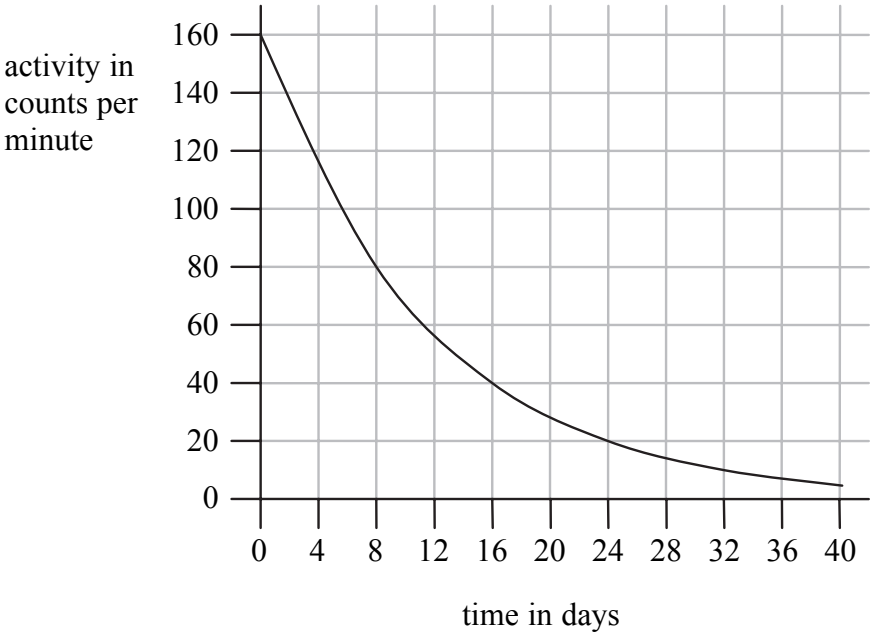
A Donna only
B Kerry only
C both Donna and Kerry
D neither

Radiation and its uses

33. Which row of the table correctly matches the types of radiation and their uses?

	treating brain cancer through the skull	**sterilising medical equipment**
A	gamma	gamma
B	alpha	gamma
C	gamma	alpha
D	alpha	alpha

34. The graph shows the decay of a radioactive isotope.
The graph has been corrected to remove the effect of background radiation.



The half-life of the isotope is about

A 8 days
B 20 days
C 40 days
D 80 days

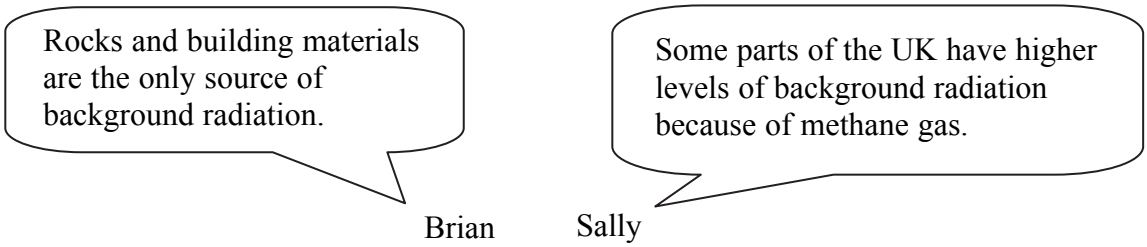
35. The nucleus of an isotope of the element iodine, I, can be described as

$$^{131}_{53}\mathrm{I}$$

The number of neutrons in the nucleus of one atom of this isotope is

A 53
B 78
C 131
D 184

36. Two students discuss background radiation.



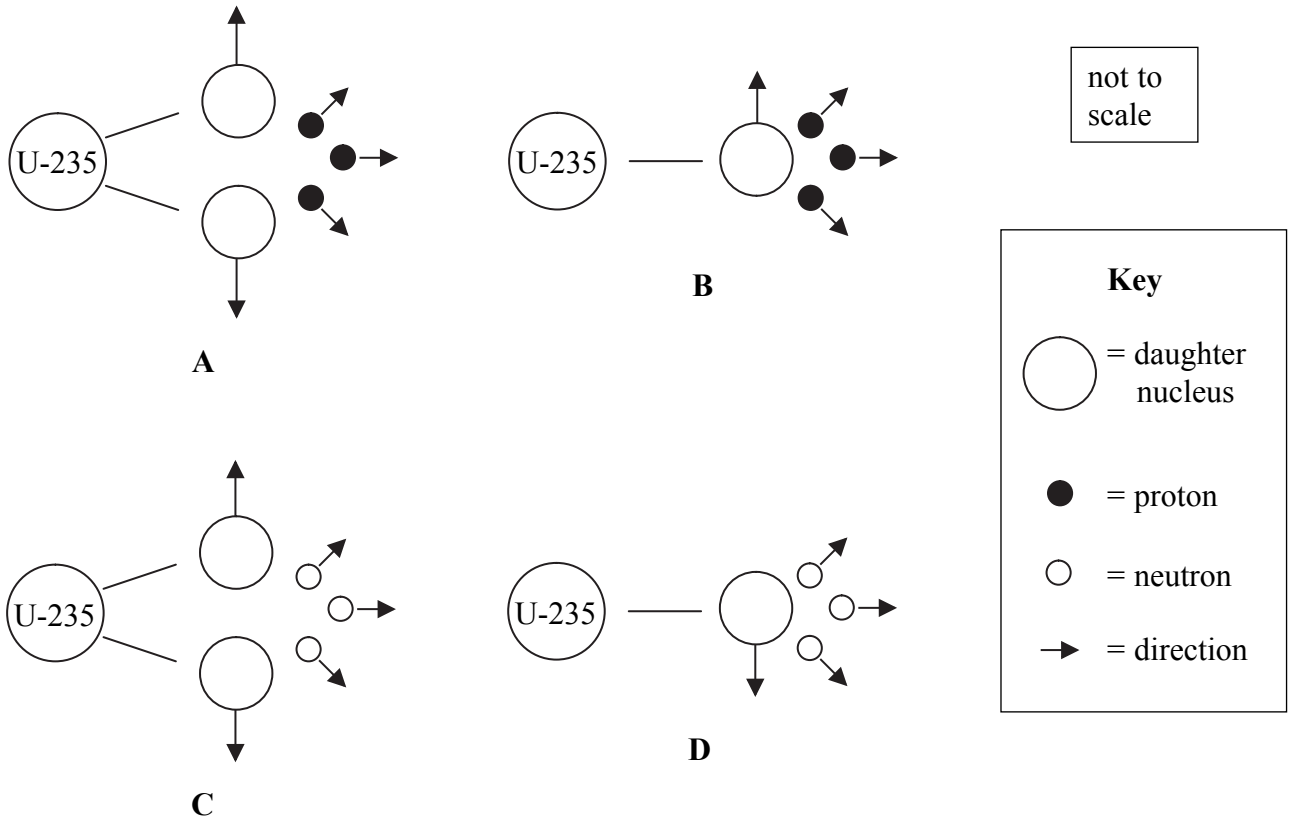
Who is correct?

A Brian only
B Sally only
C both Brian and Sally
D neither

Nuclear power

Alison and John visit a science museum to find out about energy from nuclear reactions.

37. Which of these best represents the fission of a U-235 nucleus?



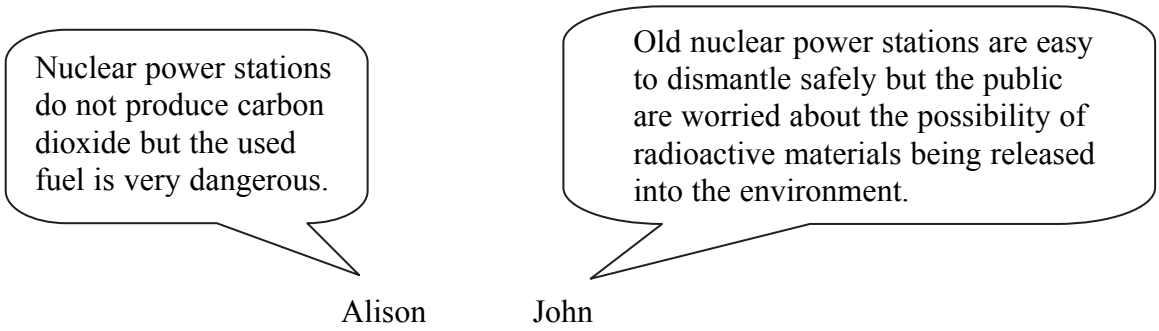
38. Alison learns that engineers are finding it difficult to control nuclear fusion reactions. Which row of the table is correct for nuclear fusion?

	temperature is	**density of plasma is**	**the ions in the plasma**
A	low	low	attract each other
B	high	low	repel each other
C	low	high	attract each other
D	high	high	repel each other

39. John finds out about the difference between nuclear fission and nuclear fusion.
Which row of the table is correct for nuclear **fusion**?

	type of nuclei used	**nuclear fusion takes place**
A	isotopes of uranium	in stars
B	isotopes of hydrogen	in stars
C	isotopes of hydrogen	in nuclear power stations
D	isotopes of uranium	in nuclear power stations

40. Alison and John discuss the advantages and disadvantages of generating electricity using nuclear power.



Who gives **both** a correct advantage **and** a disadvantage?

A Alison only
B John only
C both Alison and John
D neither

TOTAL FOR HIGHER TIER PAPER: 24 MARKS

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