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 18 November 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.

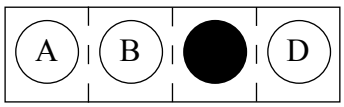
Foundation tier candidates: answer questions 1 – 24.
Higher tier candidates: answer questions 17 – 40.
All candidates are to answer questions 17 – 24.

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.

$$\text{average velocity} = \frac{\text{displacement}}{\text{time}} \qquad v = \frac{s}{t}$$

$$\text{acceleration} = \frac{\text{change in velocity}}{\text{time}} \qquad a = \frac{(v-u)}{t}$$

$$\text{force} = \text{mass} \times \text{acceleration} \qquad F = m \times a$$

$$\text{momentum} = \text{mass} \times \text{velocity} \qquad p = m \times v$$

$$\text{change in potential energy} = \text{mass} \times \text{gravitational field strength} \times \text{change in height} \qquad PE = m \times g \times h$$

$$\text{kinetic energy} = \tfrac{1}{2} \times \text{mass} \times (\text{velocity})^2 \qquad KE = \tfrac{1}{2} \times m \times v^2$$

$$\text{electrical energy} = \text{voltage} \times \text{current} \times \text{time} \qquad E = V \times I \times t$$

$$\text{power} = \frac{\text{work done}}{\text{time taken}} \qquad P = \frac{W}{t}$$

$$\text{work done} = \text{force} \times \text{distance moved in the direction of the force} \qquad W = F \times s$$

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

Properties and uses of radiation

1. The nucleus of an atom can contain

A electrons only
B neutrons only
C protons and neutrons only
D protons and electrons only

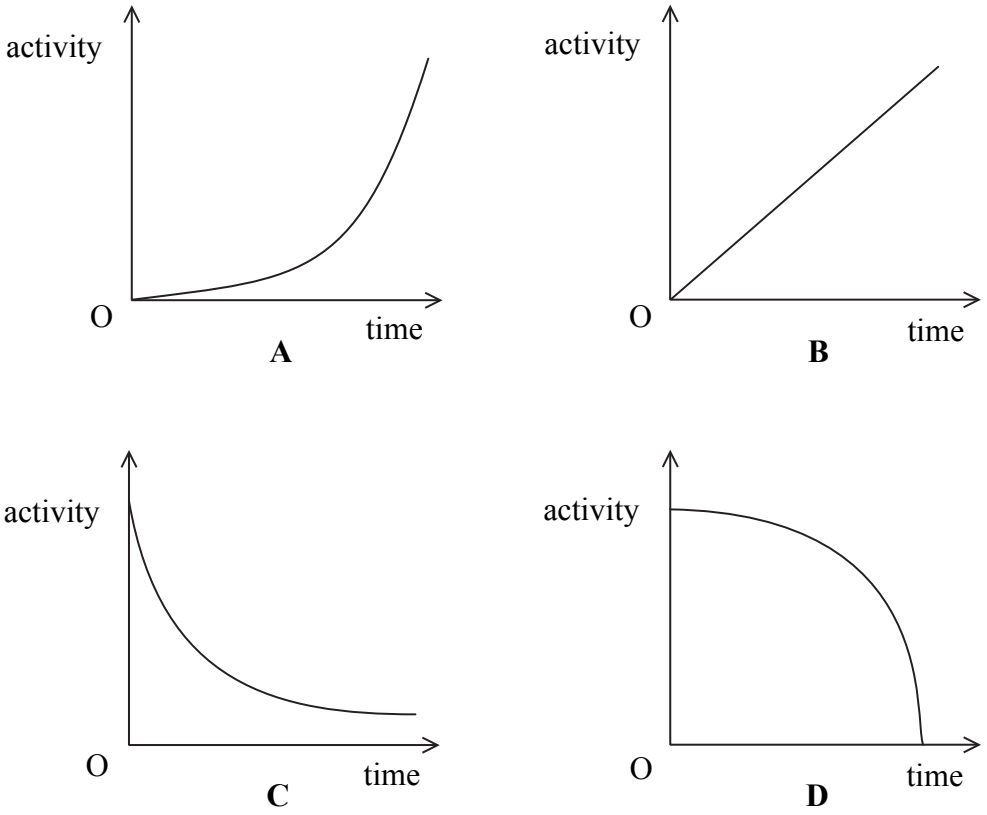
2. The radiation used to sterilise hospital equipment is

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

3. Alpha particles are used in smoke detectors because

A they emit beta particles
B they are strongly ionising
C they have no charge
D they are too small to see

4. Which of these graphs shows how the activity of a radioactive isotope changes with time?

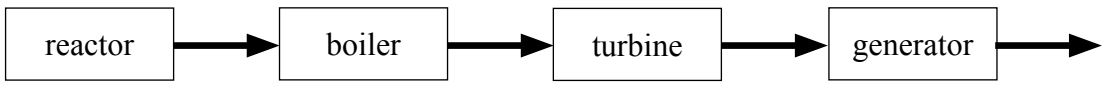


Nuclear power stations

5. In a nuclear reactor, energy is released by

A spontaneous combustion
B nuclear explosions
C nuclear fission
D uranium emission

6. The diagram shows places where energy is transferred in a nuclear power station.

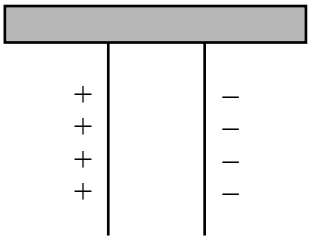


Electrical energy comes out of

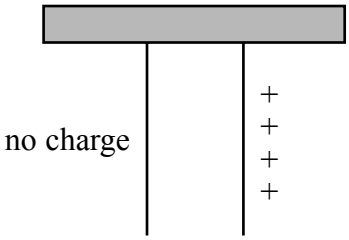
A the reactor
B the boiler
C the turbine
D the generator

Static electricity

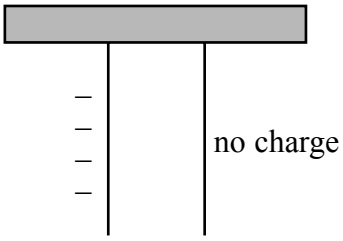
7. Some thin plastic strips are held close to each other.
Which pair of strips will repel each other?



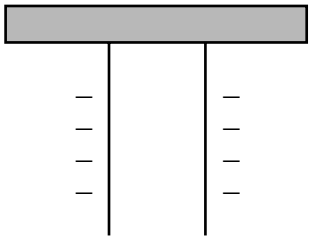
A



B



C



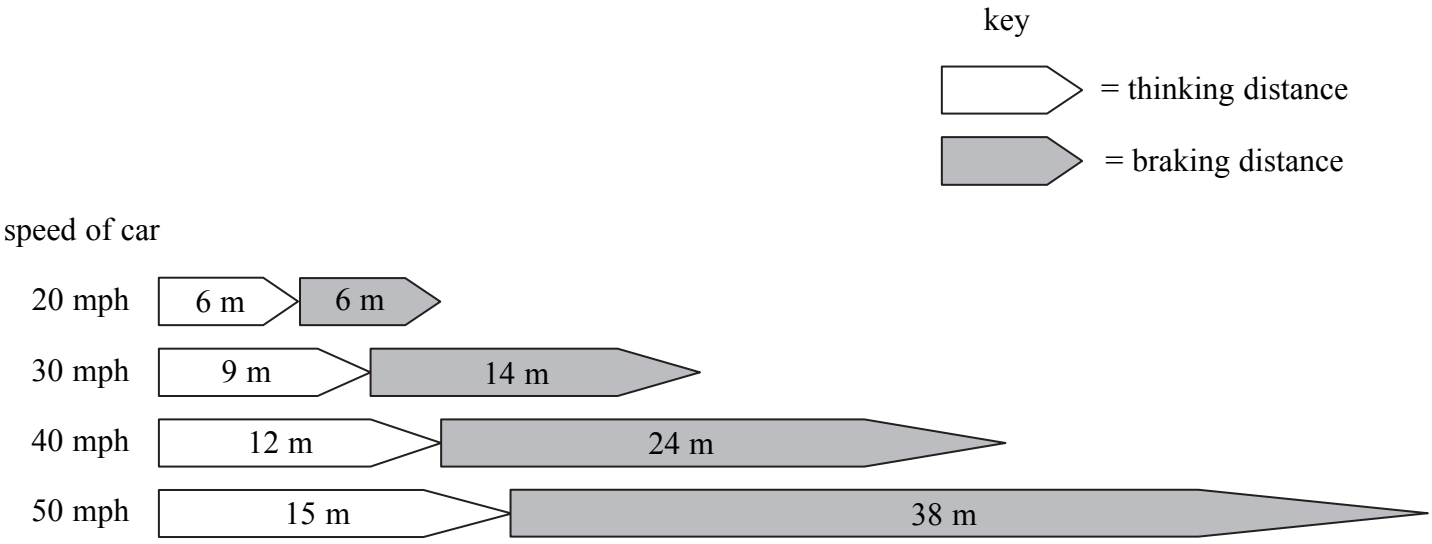
D

8. An aircraft becomes electrically charged during refuelling.
This charging is caused by

A friction
B heating
C radiation
D sunlight

Highway code

James is studying the highway code before his driving lesson.
The chart below shows how a driver's thinking and braking distances change with speed.



9. What is the thinking distance when a car is travelling at 40 mph?

A 6 m
B 9 m
C 12 m
D 24 m

10.

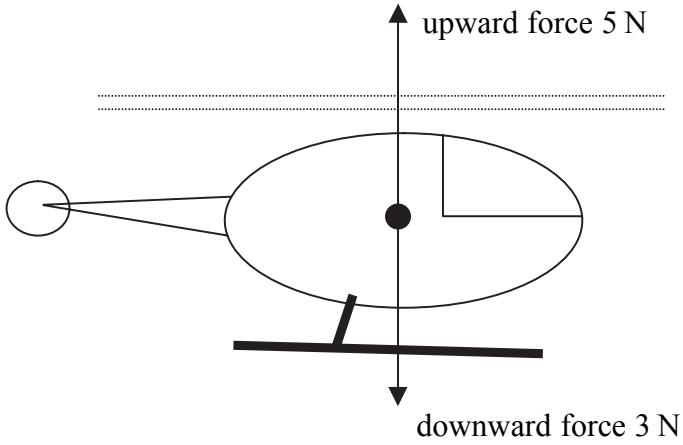
stopping distance = thinking distance + braking distance

The **stopping** distance for a car travelling at 50 mph is

A 15 m
B 35 m
C 38 m
D 53 m

Forces and motion

The diagram shows the forces acting on a model helicopter.



11. The resultant force on the helicopter is

A 2 N up
B 3 N down
C 5 N up
D 8 N down

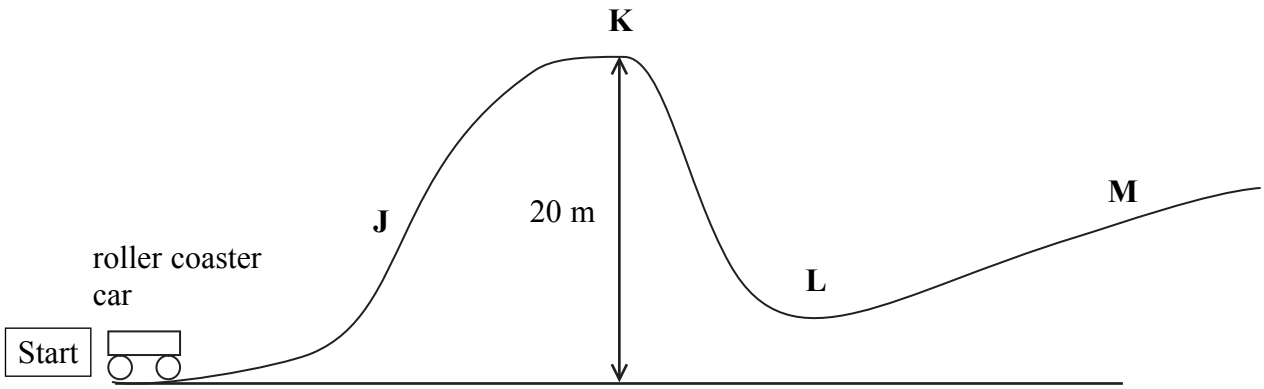
12. The helicopter now hovers.
Which row of the table shows the forces when the helicopter is hovering?

	upward force (N)	**downward force (N)**
A	0	0
B	0	3
C	3	3
D	4	3

Physics of Fun

Remi and his friends are riding on a roller coaster ride.

The diagram shows part of the roller coaster track.



An electric motor pulls the roller coaster car slowly up the hill from the start.
The car passes point **J** and stops briefly at point **K**.
Then the car rolls down past point **L** and up to point **M**.

13. When the car stops at point **K**, the energy transferred in the electric motor has become

A gravitational potential energy only
B thermal energy only
C kinetic energy and thermal energy
D gravitational potential energy and thermal energy

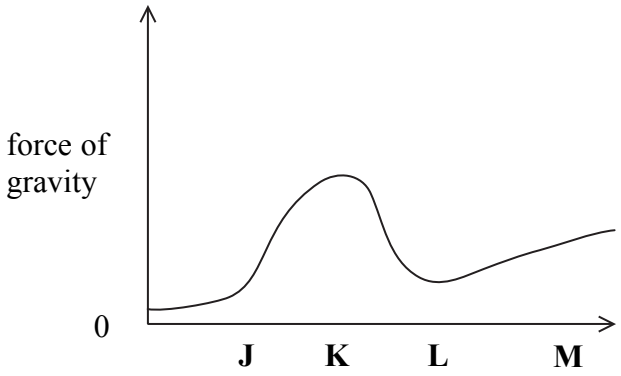
14. At which of these points is the speed of the roller coaster car highest?

A **J**
B **K**
C **L**
D **M**

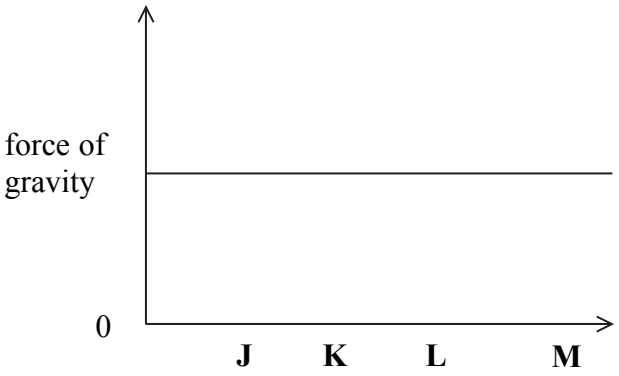
15. The weight of one car is 8 000 N.
What is the work done when this car is lifted up by 20 m?
[Ignore the friction forces]

A 400 J
B 8 000 J
C 16 000 J
D 160 000 J

16. Which of these shows the force of gravity on the roller coaster car as it moves along the ride?



A



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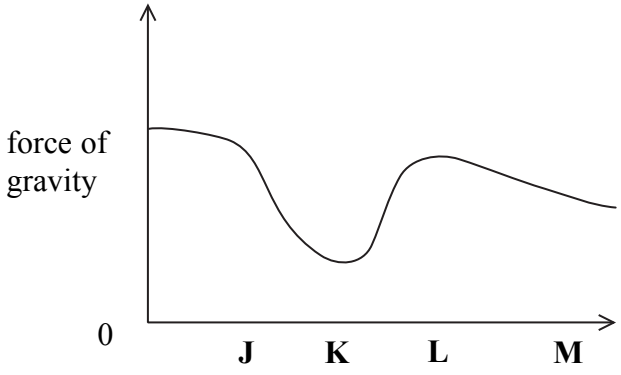
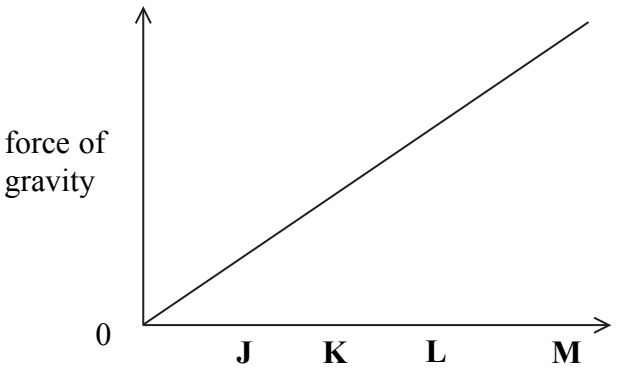


C

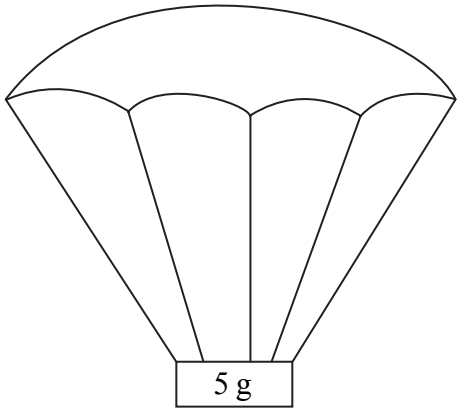


D

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.

Parachute investigation

Rob is investigating a parachute.
He attaches a 5 g block to the parachute.



Rob drops the parachute and measures the time taken for it to fall 4 m.
He plans to repeat the experiment with some different masses.

17. The dependent variable in his investigation is

A the time taken to fall 4 m
B the area of the parachute
C the mass attached to the parachute
D the height the parachute is dropped from

18. Rob's measurements for one mass are shown below.

5.3 s 1.3 s 2.4 s 3.8 s

Which row of the table is correct for these measurements?

	the measurements are	**Rob should now**
A	reliable	repeat the measurements
B	unreliable	repeat the measurements
C	reliable	work out an average
D	unreliable	work out an average

19. Rob raises the parachute 4 m.
It has a mass of 0.015 kg.
Gravitational field strength is 10 N/kg.

How much gravitational potential energy is gained by the parachute?

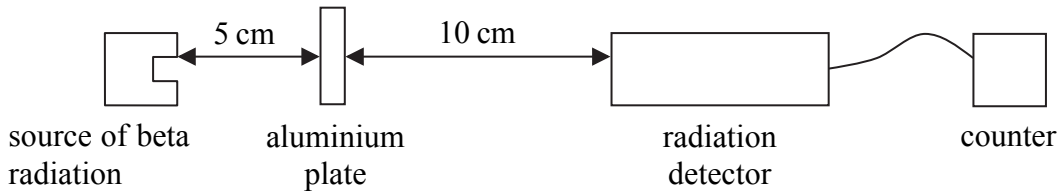
A 0.006 J
B 0.06 J
C 0.6 J
D 6 J

20. Rob lets go of the parachute.
Which row of the table is correct for the parachute as it starts to fall?

	forces on parachute	**motion of parachute**
A	balanced	steady speed
B	unbalanced	steady speed
C	balanced	accelerating
D	unbalanced	accelerating

Particles

A teacher investigates the penetrating ability of beta particles.
She measures the activity of radiation that penetrates the aluminium plate as shown.



She repeats the experiment using a different thickness of aluminium plate each time.
The teacher keeps the distances labelled 5 cm and 10 cm constant.

21. Which of these is **not** a controlled variable in this investigation?

A type of radiation
B thickness of the aluminium plate
C distance from the source to the aluminium plate
D distance from the aluminium plate to the detector

22. Which row of the table is correct for a beta particle?

	a beta particle is an	**a beta particle can penetrate**
A	electron	a few mm of aluminium
B	electromagnetic wave	a few mm of aluminium
C	electron	a few m of aluminium
D	electromagnetic wave	a few m of aluminium

23. Which row of the table is correct for the fission of U-235?

	number of daughter nuclei produced	**number of neutrons produced**
A	2	2
B	4	2
C	2	235
D	4	235

24. A plastic sheet is rubbed with a dry cloth.
The sheet becomes negatively charged.
The sheet is charged because it

A gains alpha particles
B gains electrons
C loses alpha particles
D loses electrons

TOTAL FOR FOUNDATION TIER PAPER: 24 MARKS

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.

25. Which row of the table is correct for the production of X-rays?

	particle accelerated	accelerated by
A	proton	high pressure
B	electron	high pressure
C	proton	high voltage
D	electron	high voltage

Radioactivity

A form of an isotope called technetium-99 is used as a radioactive tracer to diagnose heart disease.

26. A technetium-99 nucleus can be described as

$$^{99}_{43}\mathrm{Tc}$$

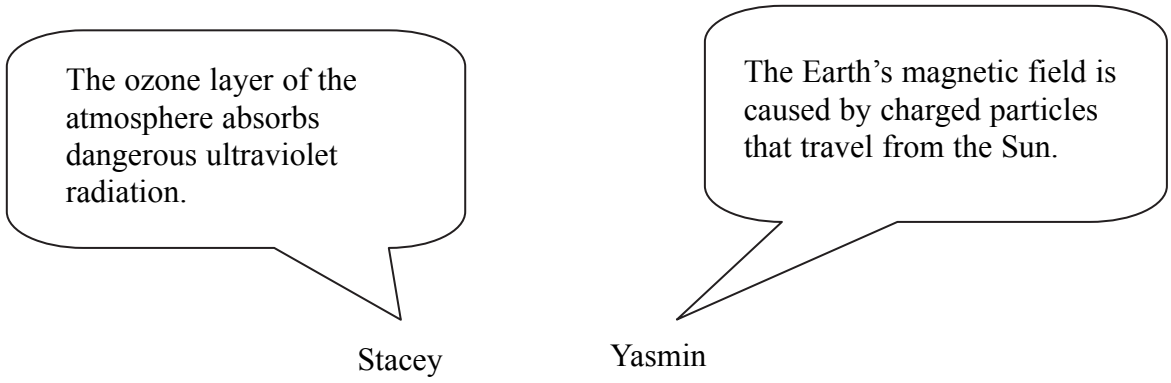
How many electrons are there in a neutral technetium-99 atom?

A 43
B 56
C 99
D 142

27. The radioisotope technetium-99 has a half-life of 6 hours.
A sample contains 10 mg of technetium-99.
After 12 hours, how much technetium-99 would be left from the sample?

A 40 mg
B 2.5 mg
C 1.25 mg
D none

28. Two students discuss radiation from space.

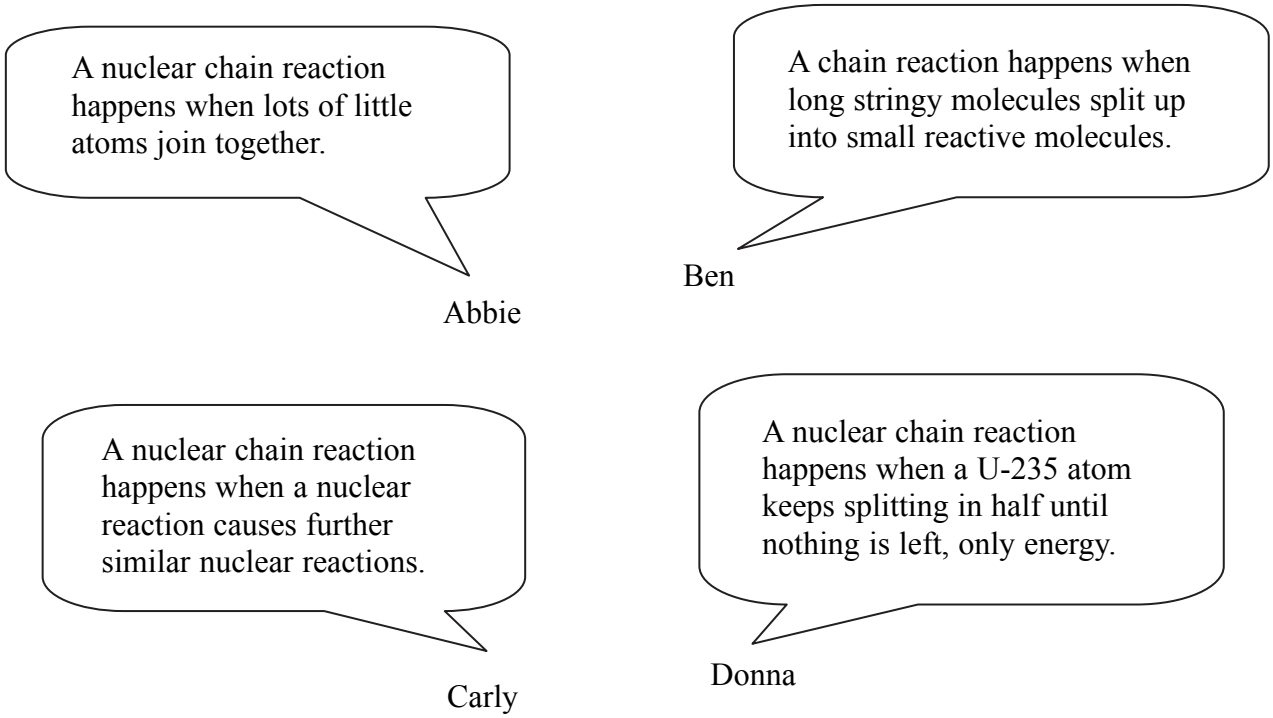


Who is correct?

A Stacey only
B Yasmin only
C both Stacey and Yasmin
D neither

Power of the atom

29. Some students discuss nuclear chain reactions.



Who has correctly described a nuclear chain reaction?

A Abbie
B Ben
C Carly
D Donna

30. In a nuclear reactor, the chain reaction is controlled by using a material such as boron. The boron absorbs

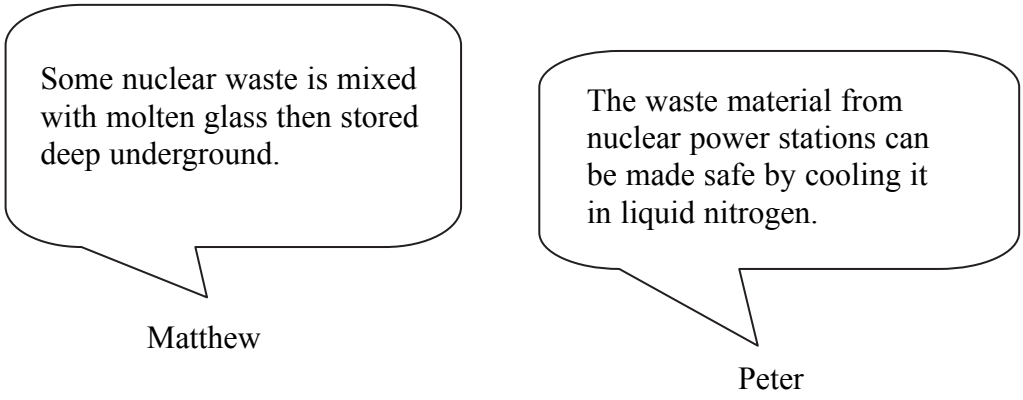
A electrons
B protons
C daughter nuclei
D neutrons

31. Scientists are testing methods of producing electricity from nuclear fusion. Early attempts have shown it is difficult to design an efficient fusion reactor.

Which row of the table correctly shows two of the problems?

	it is difficult to make high plasma density because	**power output from a fusion reactor is**
A	the hydrogen ions are very small	more than the power input
B	the ions repel each other	less than the power input
C	the ions repel each other	more than the power input
D	the hydrogen ions are very small	less than the power input

32. Two students discuss the long term storage of radioactive materials.

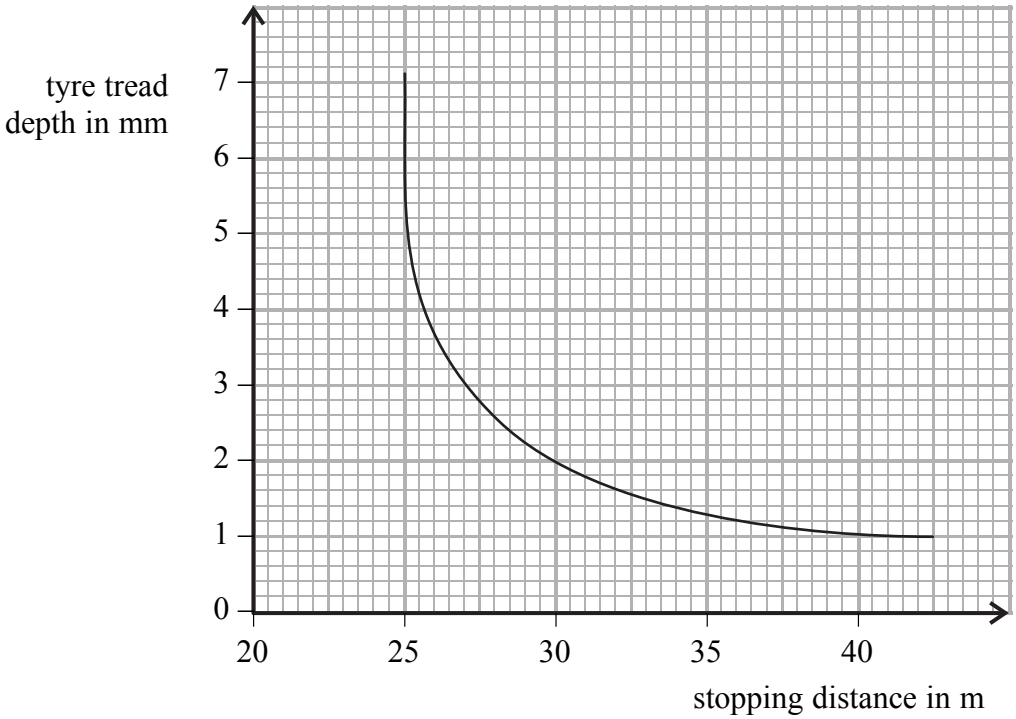


Who is correct?

A Matthew only
B Peter only
C both Matthew and Peter
D neither

Forces and motion

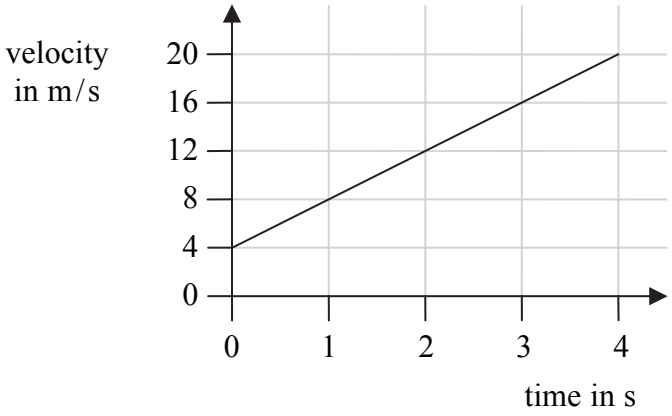
33. The graph shows how the tyre tread depth affects the stopping distance of a car.



If the tyre tread depth decreases from 6.5 mm to the legal limit of 1.6 mm, then the stopping distance increases by about

A 34 m
B 32 m
C 9 m
D 7 m

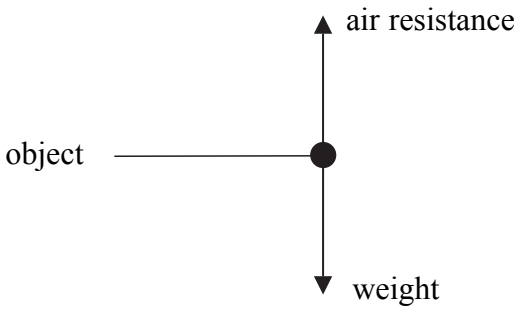
34. Here is a velocity-time graph for the motion of a car.



What is the acceleration of the car?

A 8 m/s^2
B 6 m/s^2
C 5 m/s^2
D 4 m/s^2

35. The diagram shows the forces acting on an object which has been dropped.



Some pupils discuss the falling object.

As the object falls, air resistance makes the object slow down.

Amy

When weight is more than air resistance, the object slows down.

Bobby

Air resistance increases as the speed increases.

Carol

As air resistance increases, the object accelerates upwards.

Dan

Who is correct?

A Amy
B Bobby
C Carol
D Dan

36. The diagram shows the forces acting on a model car.

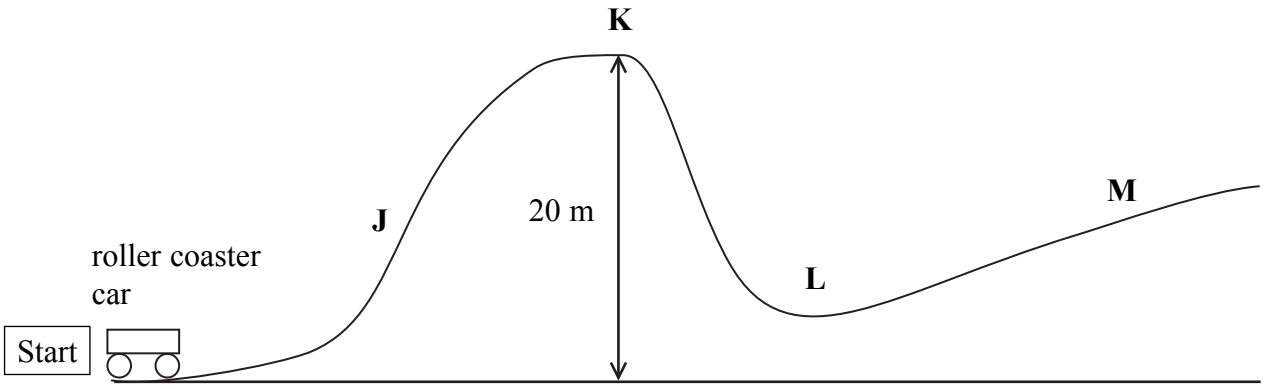
The mass of the car is 3 kg.
The acceleration of the car is 2 m/s^2.
X is

A 1.5
B 4.0
C 6.0
D 8.0

Roller coaster ride

Use this information to answer questions 37 and 38.

The diagram below shows part of a roller coaster ride.
An electric motor pulls the roller coaster car slowly up the hill from the start.
The car passes point **J** and stops briefly at point **K**.



37. A roller coaster car has a mass of 800 kg.
The gravitational field strength is 10 N/kg.
It takes 20 s for the car to reach **K** from the start.
What is the average power required to raise the car to **K** in this time?
[Ignore frictional forces]

A 20 W
B 800 W
C 8 000 W
D 80 000 W

38. The roller coaster car stops at point **K** and then accelerates between points **K** and **L**. Which of these causes this acceleration?

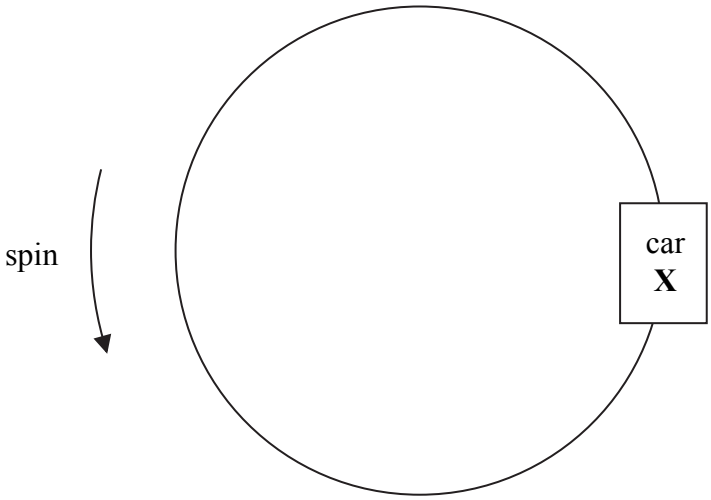
A the pull of gravity is stronger at **K** than **L**
B the car gains energy whilst it is stopped at point **K**
C the weight of the car is more than the resistive force
D the forces on the car are balanced between **K** and **L**

39. An illuminated display sign advertising the ride uses 2000 J of electrical energy in 10 s. The voltage of the display is 50 V.

What is the current in the cable for the display?

A 400 A
B 40 A
C 4 A
D 0.25 A

40. The diagram shows a ride seen from above.
The ride spins horizontally.



The ride is turning at a steady speed.
Which of the following is correct for car **X**?

	direction of acceleration of car X	**direction of resultant force on car X**
A	←	→
B	←	←
C	→	→
D	→	←

TOTAL FOR HIGHER TIER PAPER: 24 MARKS

END