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 15 June 2011 – 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.

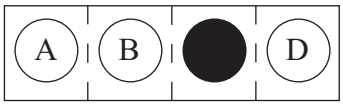
Foundation tier candidates: answer questions 1 – 24.
Higher tier candidates: answer questions 17 – 40.
All candidates are to answer questions 17 – 24.

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.

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

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

force = mass × acceleration $\qquad F = m \times a$

momentum = mass × velocity $\qquad p = m \times v$

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

kinetic energy = ½ × mass × (velocity)^2 $\qquad KE = ½ \times m \times v^2$

electrical energy = voltage × current × time $\qquad E = V \times I \times t$

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

work done = force × 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.

Nuclear power

1. The fission of U-235 releases two or three

A protons
B neutrons
C electrons
D alpha particles

2. Control rods are put in a nuclear reactor to

A speed up alpha particles
B slow down protons
C reflect electrons
D absorb neutrons

3. A nuclear chain reaction produces particles which can

A cause fission of a daughter nucleus
B cause fission of another uranium nucleus
C make a daughter nucleus stable
D make another uranium nucleus stable

4. Nuclear fusion releases

A protons
B uranium
C energy
D electrons

Radioactivity and its uses

5. Which of these is used to help preserve some foods?

A gamma rays
B radio waves
C alpha particles
D ultrasound waves

6. A teacher demonstrates radioactivity to a class.
Which of these safety precautions helps most to protect the students during this demonstration?

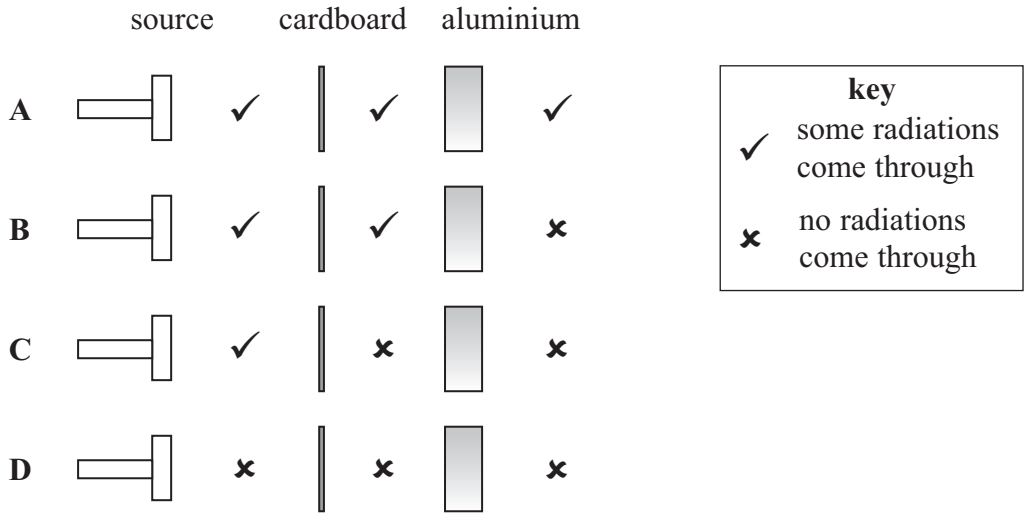
A tying long hair back
B students washing hands afterwards
C the teacher controlling the direction of the source
D closing the blinds

7. The emission of a beta-particle is a result of

A radioactive decay
B a chain reaction
C fusion
D fission

8. The radiation from four radioactive sources is aimed at a sheet of cardboard and a 5 cm thick block of aluminium.
John's teacher uses a detector to discover if any radiation has passed through the materials.

Which source emits beta-particles only?



Forces and acceleration

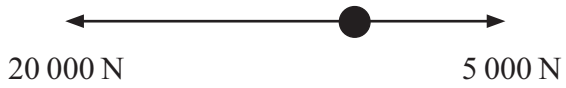
9. An object will accelerate when

A the forces acting on it are balanced
B the forces acting on it are unbalanced
C air resistance is equal to the object's weight
D its weight is equal to the reaction from the ground

Use this information to answer questions 10 to 12.

The photograph shows a car taking part in drag racing.

10. At one time the forces acting on the car are as shown below.



What is the size of the resultant force on the car?

A 5 000 N
B 15 000 N
C 20 000 N
D 25 000 N

11. The car accelerates.

Which of these is a unit of acceleration?

A $m\ s^2$
B m^2/s
C m/s^2
D m^2/s^2

12. John estimates that the chance of an accident in a drag car race is 0.1%.
This is the same as

A one in a thousand
B one in a hundred
C one in ten
D a hundred to one

Height does matter?

13. The photograph shows a seagull and a boy at opposite ends of a sculpture.

The boy has more gravitational potential energy than the seagull **because**

A he has a bigger gravitational field strength
B he is taking a higher risk
C he has much more mass
D he is much lower

14. The gravitational potential energy gained by the boy as he climbed up is equal to

A the work done against gravity
B the energy created by gravity
C the energy destroyed by friction
D the power he develops in his muscles

15. On which of these fairground rides does the gravitational potential energy of the rider change **least**?

A

B

C

D

16. For one ride, John has to climb a height of 15 m.
His mass is 60 kg.
The gravitational field strength is 10 N/kg.
How much gravitational potential energy does John gain?

A 40 J
B 90 J
C 900 J
D 9000 J

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

X-rays, radioactivity and fission

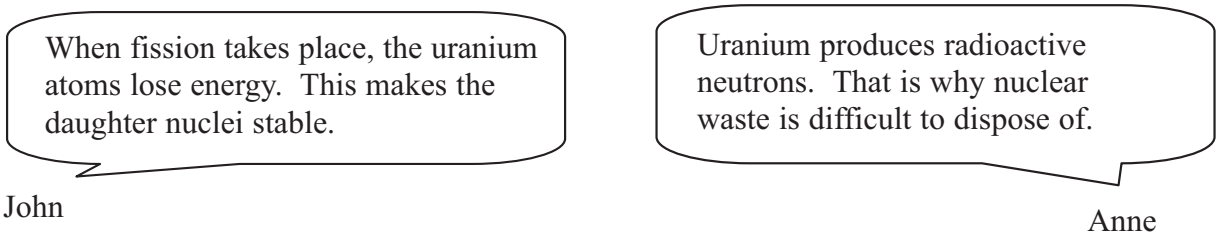
17. Which row of the table correctly compares X-rays and gamma rays?

	X-rays	gamma rays
A	are produced in the nucleus	have higher frequency
B	have lower frequency	are produced in the nucleus
C	are produced in the nucleus	are produced in the nucleus
D	have higher frequency	have lower frequency

18. Radioactivity was discovered in 1896.
This happened because

A doctors learned how to treat radiation burns
B the scientist who obtained an unexpected result did not ignore it
C powerful microscopes were used to see the particles
D powerful machines were made to produce radioactivity

19. John and Anne discuss the products of fission.



Who is correct?

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

20. A uranium nucleus will repel

A an alpha particle
B a beta particle
C a gamma ray
D a neutron

Drugs and driving

Tests have been done to find out how taking drugs affects reaction times.
The tests were done under carefully controlled conditions away from public roads.
The tests were done with the same drivers when they had taken

- alcohol
- cannabis
- no drugs.

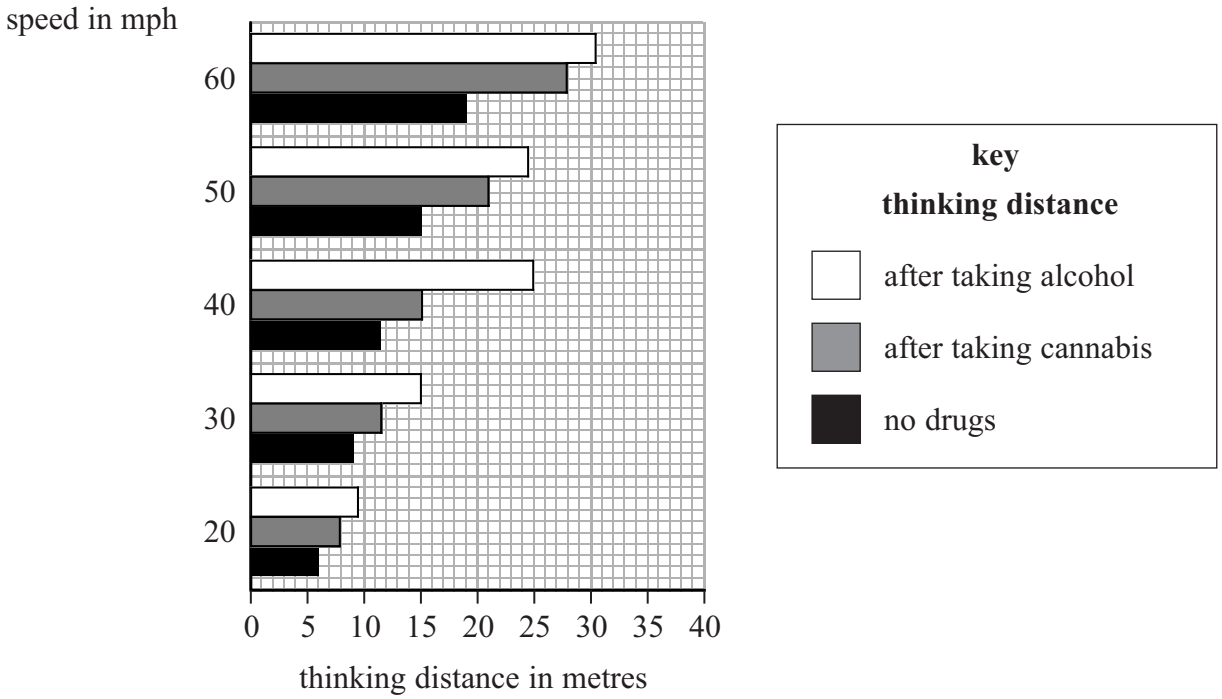
21. A driver's **reaction time** is **least** likely to depend on

A the speed of the car
B the amount of alcohol taken
C when the cannabis was taken
D if the person had taken both cannabis and alcohol

22. A driver will have the **most** kinetic energy when he

A uses cannabis
B uses alcohol
C drives very fast
D becomes very high

Use this information about thinking distances to answer questions 23 and 24.



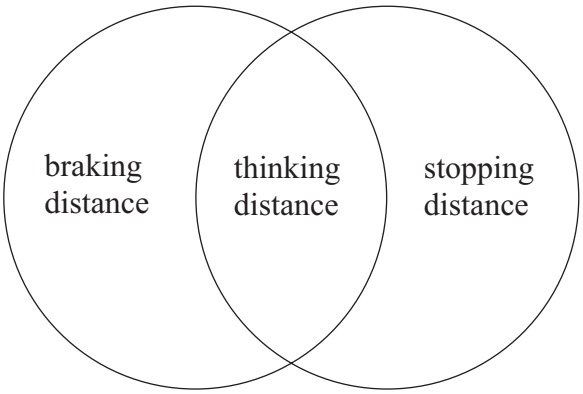
23. Which of these seems to produce an anomalous result?

A driving at 20 mph after taking alcohol
B driving at 30 mph after taking cannabis
C driving at 40 mph after taking alcohol
D driving at 60 mph after taking cannabis

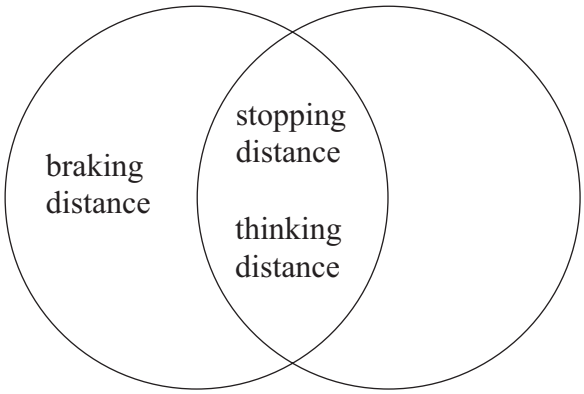
24.

stopping distance = thinking distance + braking distance

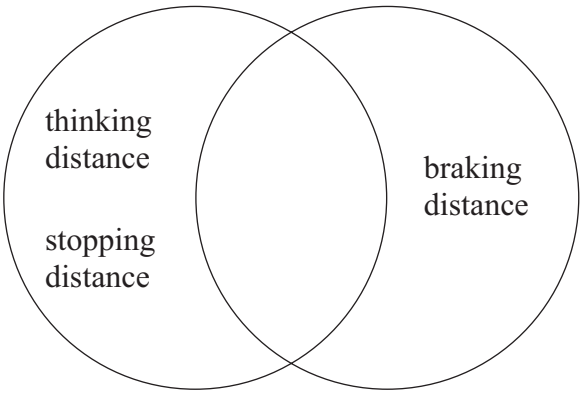
Which of these diagrams is correct?



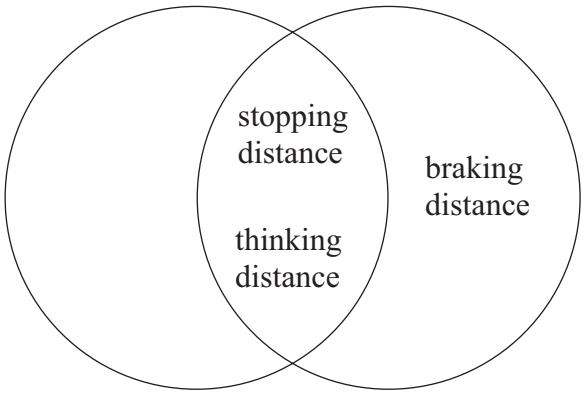
A



B



C



D

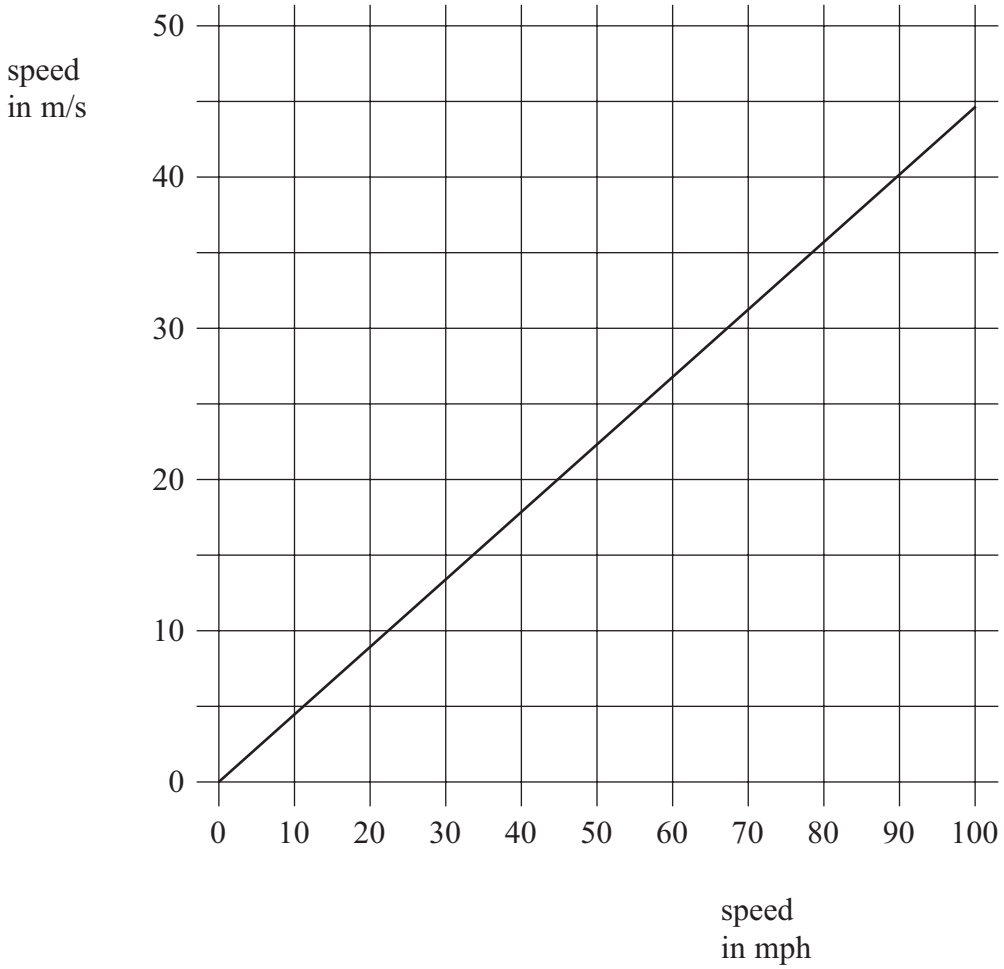
TOTAL FOR FOUNDATION TIER PAPER: 24 MARKS

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.

Racing cars

25. Jane compares the performance of some racing cars.
She finds this information on the internet.

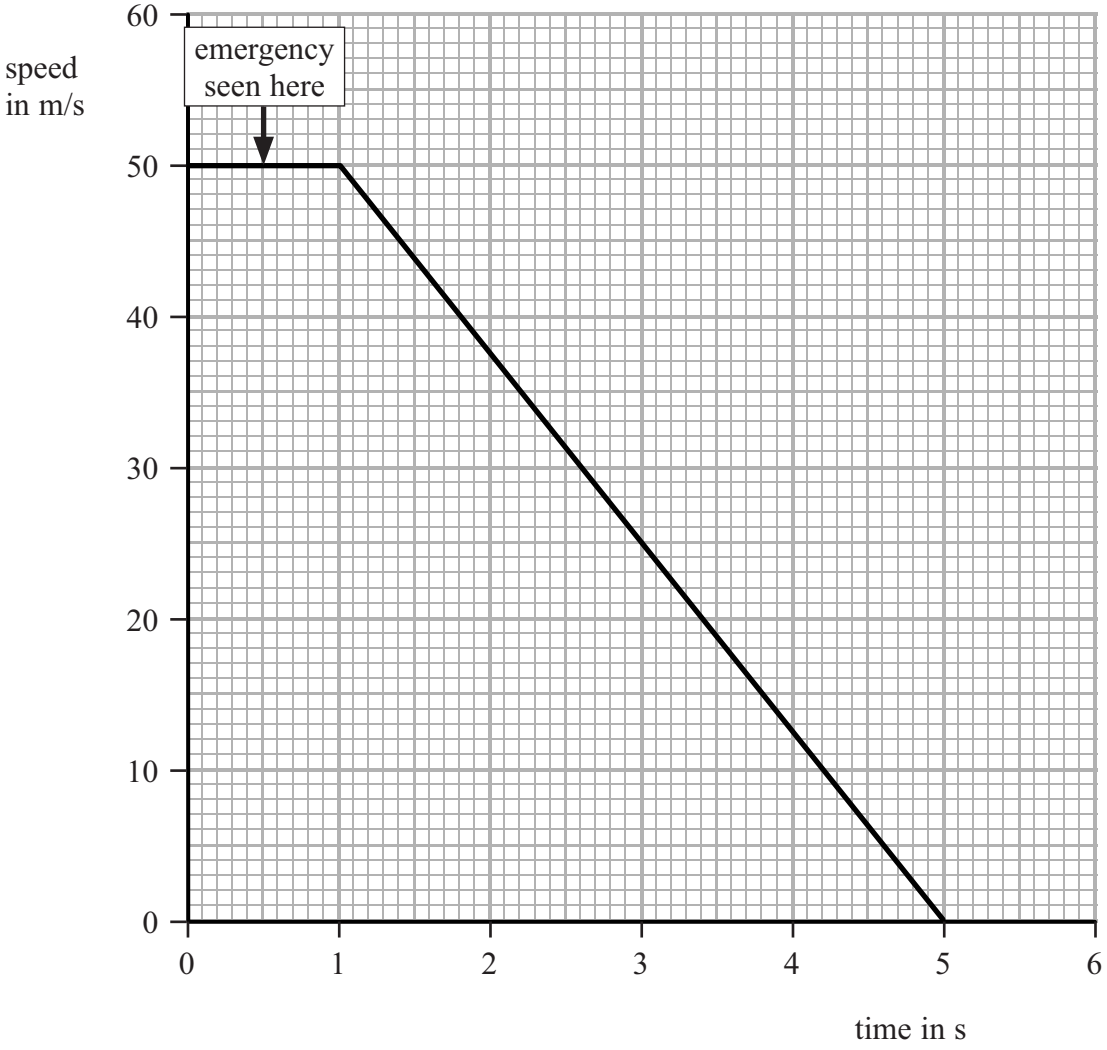


Jane discovers that a racing car accelerates from 0 to 30 mph in 1.2 s.
The speed of the car after 1.2 s from the start is about

A 13 m/s
B 16 m/s
C 36 m/s
D 67 m/s

Use this information to answer questions 26 to 28.

A car is moving in a straight line.
The graph shows the stopping of this car in an emergency.



26. The resultant force on the car during the first second is

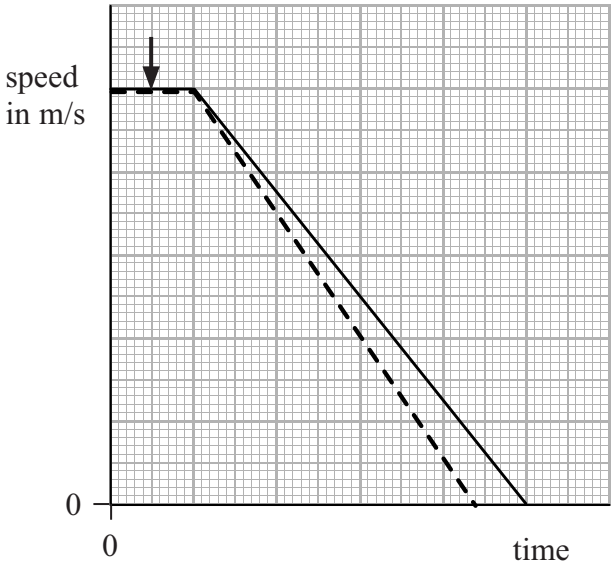
A 0 N
B 50 ÷ 2 N
C 50 ÷ 1.5 N
D 50 N

27. The acceleration of the car whilst braking is

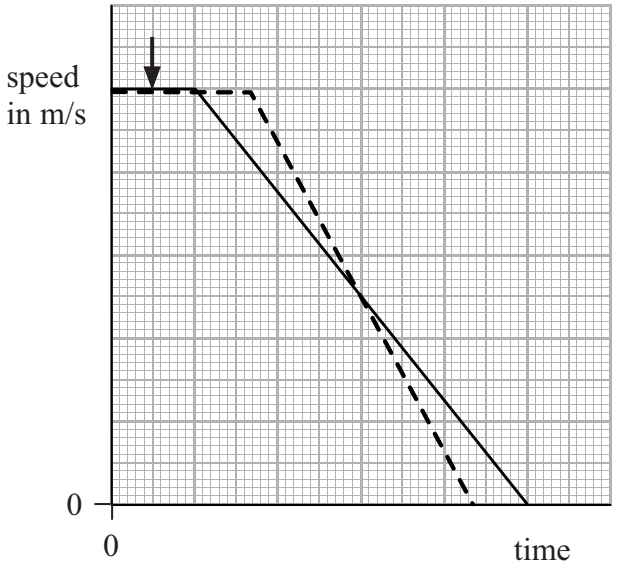
A $-0.1\ m/s^2$
B $-9\ m/s^2$
C $-10\ m/s^2$
D $-12.5\ m/s^2$

28. On these graphs, the solid line shows the graph on page 12.

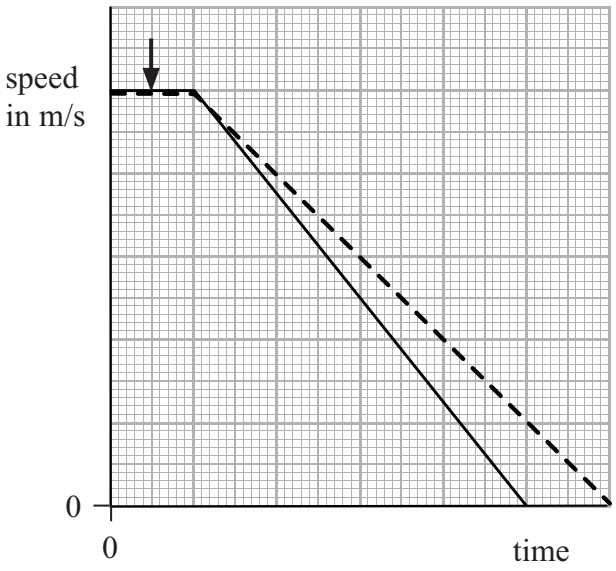
Which graph shows what would happen if the car suddenly hit a small patch of oil on the road, just as the driver started to brake.



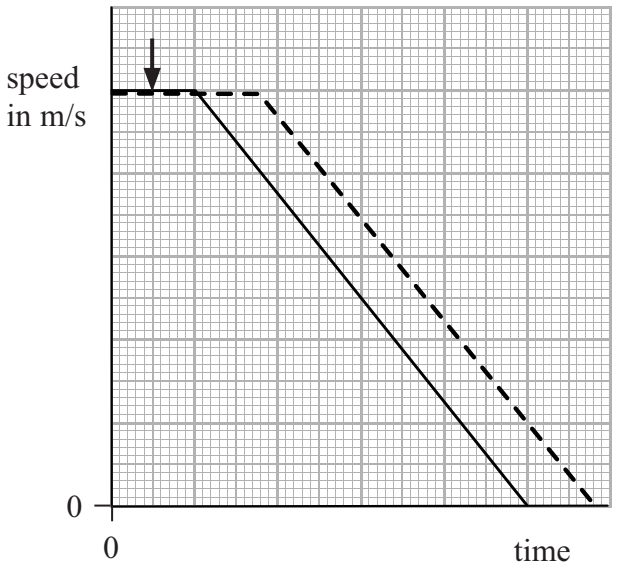
A



B



C

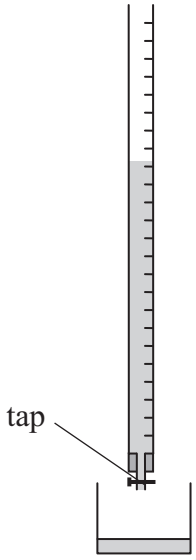


D

Radioactive decay

29. John's teacher showed him a model for half-life in radioactive decay.
She used a long tube with a small hole at the bottom.
She filled the tube to the 64 ml mark and then opened the tap.
John timed how long it took for the water surface to reach other marks.
Here are his results.

mark (ml)	time (s)	time interval (s)
64	0	-
32	10.1	10.1
16	20.0	9.9
8	30.2	10.2
4	40.7	10.5
2	51.3	10.6



John and Anne discuss whether this is a good model of what happens in radioactive decay.

If this is a good model, the time intervals should all be about the same.

John

If this is a good model, the time intervals should halve each time.

Anne

Who is correct?

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

30. Measurements of the radiation from a radioactive isotope are **uncertain** because

A the energy of the particles emitted changes with time
B the half-life of the isotope changes with time
C background radiation is random
D the energy of the particles must be taken into account

31. A sample of material contains 60 mg of a radioactive isotope.
6 days later there is only 15 mg of the isotope left.
What is the half-life of this isotope?

A 3 days
B 4 days
C 12 days
D 24 days

32. In 1988, the age of a piece of cloth was measured using radiocarbon dating.
The age was said to be 689 ± 16 years.
This means that the cloth was

A definitely not exactly 689 years old
B either exactly 673 or exactly 705 years old
C probably between 673 and 705 years old
D more than 705 or less than 673 years old

Going round and round in circles

33. On which of these rides does the rider always feel a nearly **constant horizontal** resultant force?

A

B

C

D

34. Study this equation for work done.

work done = force × distance moved in the direction of the force

When a satellite orbits the Earth, a gravitational force of magnitude F acts on it.
The orbit is of length L.
The amount of work done on the satellite in one circular orbit is

A zero
B less than $F \times L$
C equal to $F \times L$
D more than $F \times L$

35. These two statements are correct.

- Sometimes acceleration involves a change in speed.
- All fairground rides which move in circles involve acceleration.

Which of these follows from the two statements?

A all rides which move in circles involve a change in speed
B rides which move in straight lines do not involve acceleration
C all rides which involve a change in speed move in circles
D rides which involve a change in speed can move in circles

36. Frank is travelling in a circle, on a fairground ride, at constant speed.
Later he travels on the same ride at the same speed but in the opposite direction.
John and Anne discuss Frank's velocity and acceleration after the change in direction.

Frank's velocity will be the same as before because the speed is the same.

John

Frank's acceleration will be the same size and in the same direction before and after the direction is reversed.

Anne

Who is correct?

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

The nucleus and charged particles

37. Which of these represents the first thing to happen when a neutron hits a uranium nucleus?

A $^{235}_{92}U \longrightarrow {}^{1}_{0}n + {}^{234}_{92}U$

B $^{235}_{92}U \longrightarrow {}^{1}_{0}n + {}^{236}_{92}U$

C $^{235}_{92}U + {}^{1}_{0}n \longrightarrow {}^{234}_{92}U$

D $^{235}_{92}U + {}^{1}_{0}n \longrightarrow {}^{236}_{92}U$

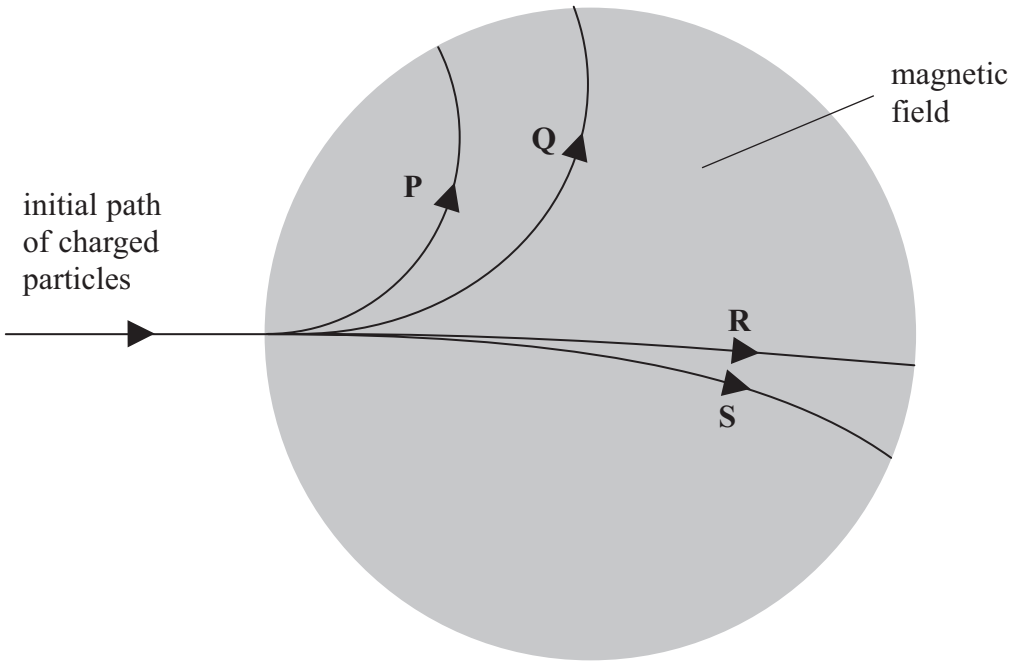
38. Fusion is difficult to control in the laboratory because the

A temperature is too low
B nuclei contain neutrons
C nuclei are positively charged
D nuclei of atoms are very dense

Use this information to answer questions 39 and 40.

- The direction of travel of charged particles may change when they move through a magnetic field.
- Particles with more mass are more difficult to deflect.
- Particles with more charge are easier to deflect.
- Particles with charges of the opposite sign are deflected in opposite directions.

The diagram shows the effect of a magnetic field on four charged particles.



39. All four particles have the same speed.

Which of these **might** be correct?

A **P** has least charge and most mass
B **Q** has most charge and least mass
C **R** has least charge and most mass
D **S** has most charge and least mass

40. **P** and **S** have the same speed and the same amount of charge.
Which row of the table correctly compares **P** and **S**?

	momentum	**sign of charge on particles**
A	**P** has more than **S**	same
B	**P** has less than **S**	opposite
C	**P** has more than **S**	opposite
D	**P** has less than **S**	same

TOTAL FOR HIGHER TIER PAPER: 24 MARKS

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