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

Thursday 22 November 2007 – Morning

Time: 20 minutes

Materials required for examination	**Items included with question papers**
Multiple Choice Answer Sheet HB pencil, eraser and calculator	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.

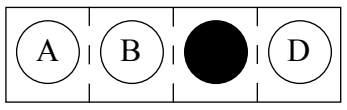
Foundation tier candidates: answer questions 1 – 24.
Higher tier candidates: answer questions 17 – 40.
All candidates are to answer questions 17 – 24.

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.

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Turn over

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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	$p = m \times v$
gravitational potential energy transferred = mass × acceleration of free-fall × 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.

The hospital job

Alison is studying in a hospital.
She finds out about the types of radiation used in hospitals.

1. To detect broken bones, doctors use

A gamma rays
B X-rays
C beta particles
D alpha particles

2. Gamma radiation is produced when

A fast moving electrons hit a metal target
B an unstable nucleus breaks down
C a metal is heated in a vacuum
D there is an electric spark

3. Alison learns that radiation is used to sterilise equipment for operations.
The type of radiation used is

A alpha particles
B beta particles
C gamma rays
D X-rays

4. Gamma rays are

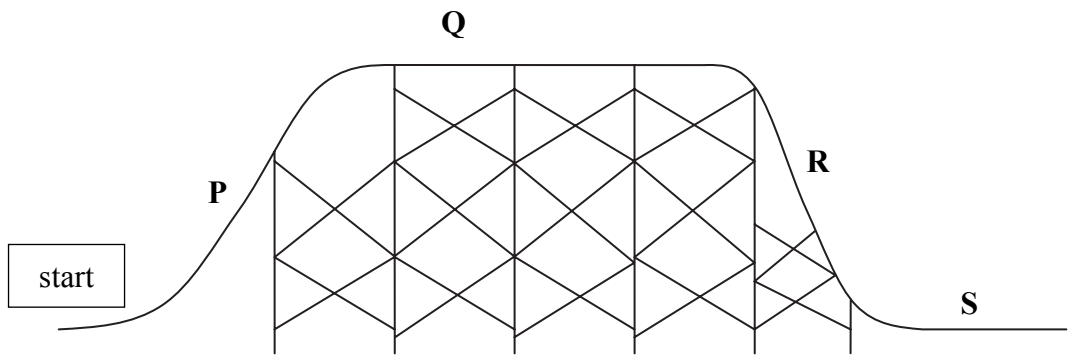
A neutrons
B protons
C both protons and neutrons
D electromagnetic waves

The roller coaster ride

Iain and his friends are riding in a car on a roller coaster.

Use this information to answer questions 5 to 8.

The diagram below shows part of the track divided into four sections **P**, **Q**, **R** and **S**.



5. The roller coaster has greatest acceleration in section

A **P**
B **Q**
C **R**
D **S**

6. Most work is done on the car by the motor in section

A **P**
B **Q**
C **R**
D **S**

7. The roller coaster car has most gravitational potential energy in section

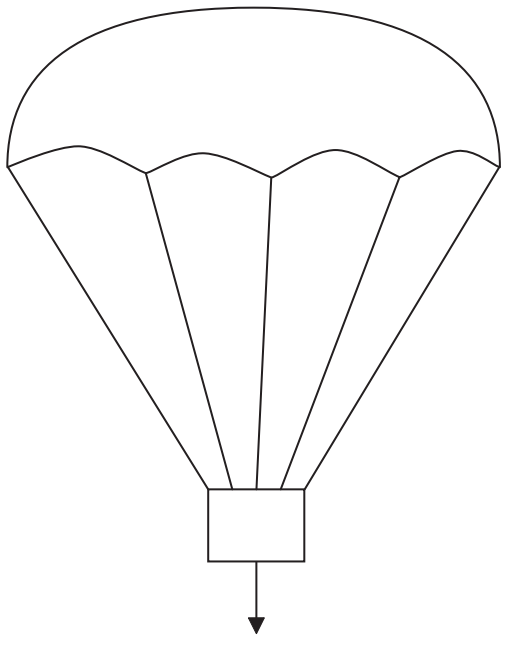
A **P**
B **Q**
C **R**
D **S**

8. In section **R**, the main energy transfer for the roller coaster car is

A kinetic energy → chemical energy
B kinetic energy → gravitational potential energy
C gravitational potential energy → chemical energy
D gravitational potential energy → kinetic energy

Model parachutes

Ashley and Peter are investigating model parachutes.



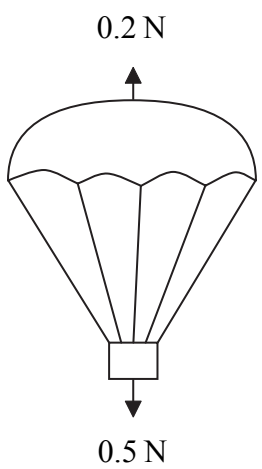
X

9. Force **X** on the parachute is

A weight
B air resistance
C friction
D upthrust

Use this information to answer questions 10 and 11.

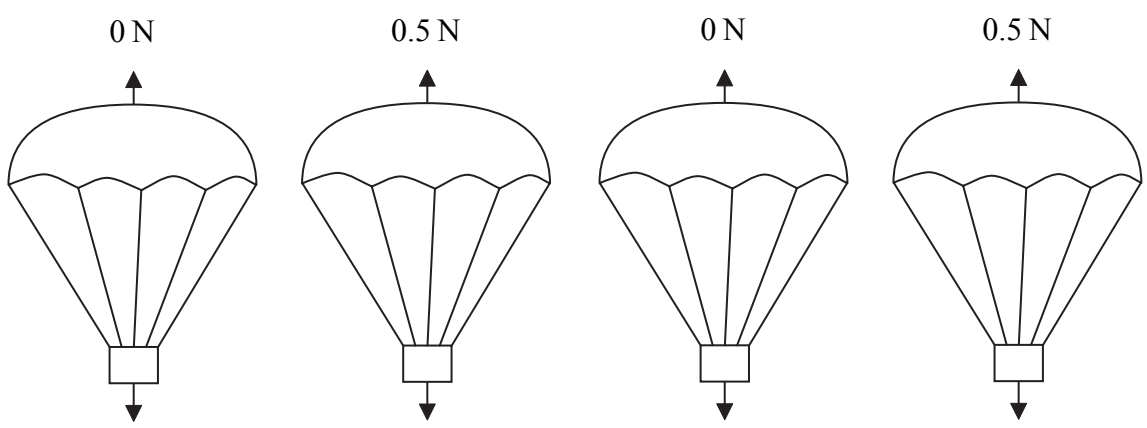
The diagram shows the vertical forces on the parachute shortly after release.



10. The resultant vertical force on the parachute is

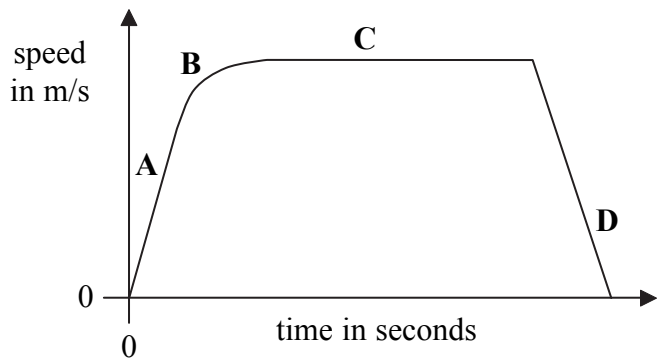
A 0.7 N ↑
B 0.7 N ↓
C 0.3 N ↑
D 0.3 N ↓

11. When it is falling at a constant speed, the forces on the parachute will be



A **B** **C** **D**

12. The speed-time graph for the parachute's journey is shown below.



In which section is the parachute falling at a constant speed?

Nuclear power

Callum and Sangita are researching nuclear power to find the advantages and disadvantages of building nuclear power stations.

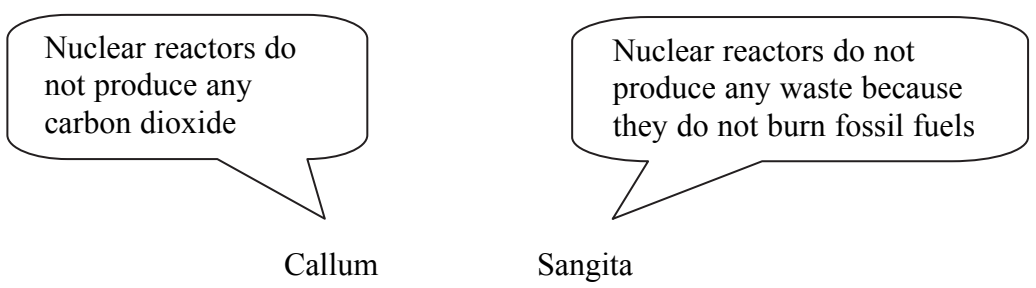
13. Callum discovers that the reaction producing the energy in the reactor is

A nuclear fission
B nuclear fusion
C chemical combustion
D chemical fusion

14. Which of these is most likely to be used as a fuel in a nuclear power station.

A H-3
B U-27
C U-235
D C-14

15. Callum and Sangita discuss the environmental impact of nuclear power stations.



Who is correct?

A Callum only
B Sangita only
C both Callum and Sangita
D neither

16. Sangita draws some flow charts to show where energy is transferred when a nuclear power station is working.
The correct sequence is

A reactor → turbine → boiler → generator

B reactor → boiler → generator → turbine

C reactor → turbine → generator → boiler

D reactor → boiler → turbine → generator

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.

Safety first

Jo is researching road safety.

17. She reads a web page about a driver who had an accident as he was driving to start a new job.
Which of these is most likely to have increased the risk of an accident?

A The car had air bags
B The car had crumple zones
C The driver did not know the road
D The road was dry

18. Jo looks at ways to reduce the stopping distance for a car.
Which of these could help to reduce stopping distance?

A reducing the braking force
B increasing the car's speed
C increasing friction between the tyres and the road
D increasing the driver's reaction time

Smoke detectors

Use this information to answer questions 19 and 20.

A smoke detector is fitted to the ceiling in a room.
Alpha particles in the smoke detector come from an isotope of the element americium.

19. The radiation from the smoke detector is usually **not** harmful.
This is because

A alpha particles are electromagnetic waves
B alpha particles only travel a few centimetres in air
C alpha particles cause very little ionisation
D alpha particles are too large to enter human cells

20. A nucleus of the isotope of americium (Am) used in the smoke detector can be described as

$$^{241}_{95}\mathrm{Am}$$

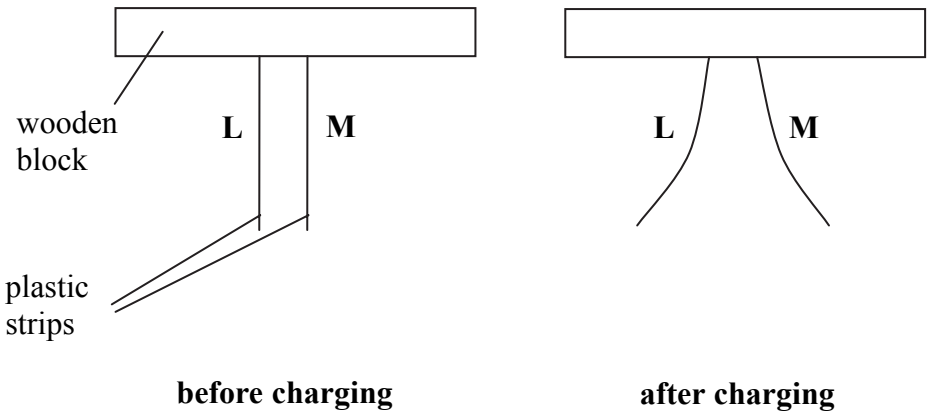
The number of protons in an americium nucleus is

A 95
B 146
C 241
D 336

Electrostatics

Kim, Aiesha, Julie and Ruth are investigating static electricity.

21. They charge two plastic strips, **L** and **M**.
The diagrams show the strips before and after charging.

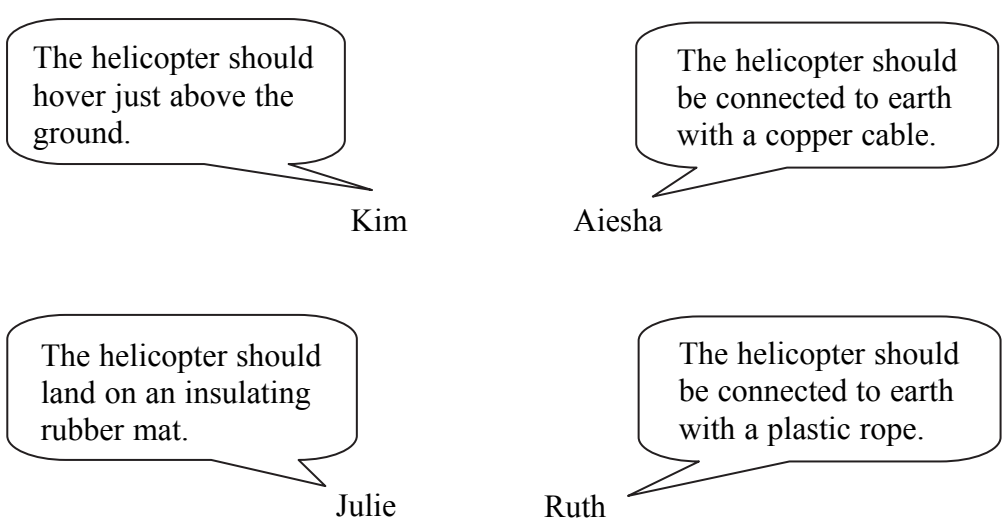


before charging **after charging**

Which row of the table could be correct for the charges on **L** and **M**?

	charge on L	**charge on M**
A	none	positive
B	negative	positive
C	negative	none
D	positive	positive

22. During refuelling, charge can build up on a helicopter.
Kim, Aiesha, Julie and Ruth discuss how to prevent this.



The correct statement is

A Kim
B Aiesha
C Julie
D Ruth

Catapult investigation

Use this information to answer questions 23 and 24.

Jamie shoots a stone from a catapult.

23. The catapult exerts an average force of 30 N whilst the stone moves a distance of 0.3 m.
The work done by the catapult is

A 9 W
B 9 J
C 900 W
D 900 J

24. The work done by the catapult is equal to

A the energy transferred to the stone
B the increase in power of the stone
C the speed transferred to the stone
D the increase in acceleration of the stone

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.

Physics of fun

Andy and Hannah visited a theme park. They were studying some of the rides for a science project.

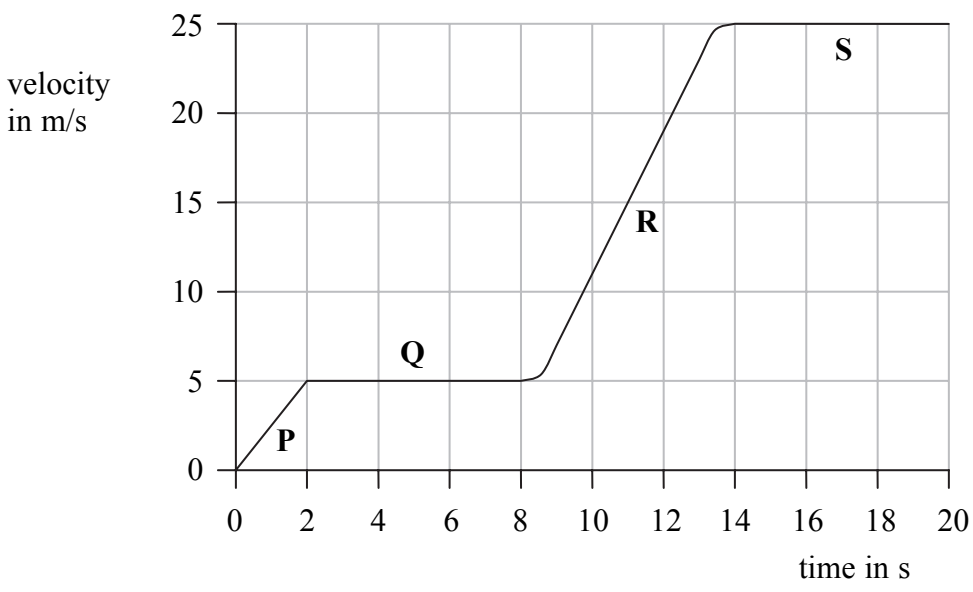
25. Andy and Hannah found that the roller coaster car took a time of 2 s to travel 40 m.

The average speed of the roller coaster was

A 0.05 m/s
B 20 m/s
C 42 m/s
D 80 m/s

Use this information to answer questions 26, 27 and 28.

Andy and Hannah produced a velocity-time graph for the start of the roller coaster ride.



26. What is the acceleration of the roller coaster car during the first two seconds?

A 0.4 m/s^2
B 2.5 m/s^2
C 5 m/s^2
D 10 m/s^2

27. Which sections of the graph show times when the resultant force on the roller coaster car is zero?

A all four sections
B **P** and **R**
C **Q** and **S**
D none of them

28. The momentum of the roller coaster car after 6 seconds is 9000 kg m/s.
The momentum of the car after 18 seconds is

A 3 000 kg m/s
B 27 000 kg m/s
C 45 000 kg m/s
D 162 000 kg m/s

Radiation all around us

Phil and Irma were investigating radiation.

29. They measured the level of background radiation in their school science laboratory.
They made five different measurements at the same place using the same equipment.
Here are their results.

time of measurement	average reading of background radiation (counts/minute)
9:00 – 9:15	31
10:00 – 10:15	28
11:00 – 11:15	26
12:00 – 12:15	32
14:00 – 14:15	29

The reason for the variation in the results is

A background radiation is due to random processes
B background radiation is gradually decreasing
C background radiation varies from place to place
D scientists do not fully understand radioactivity

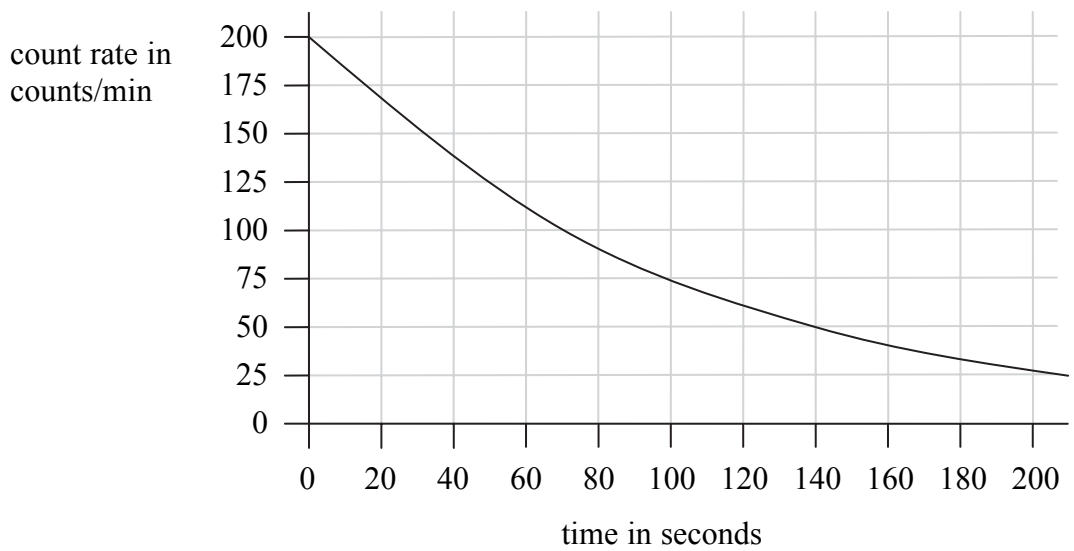
30. Phil and Irma saw an old advertisement that said:

- Radioactive radium salts are good for you
- Many illnesses can be cured by having a bath in radium salts
- Radioactivity helps to carry electricity deep into the body

The advertisement was from the year 1910.
Now, scientists would not recommend using radioactive radium salts.
This is because

A the dangers of radioactivity are better understood now than they were in 1910
B the dangers of radioactivity are worse now than they were in 1910
C radioactivity has all decayed since 1910
D people are now immune to radioactivity

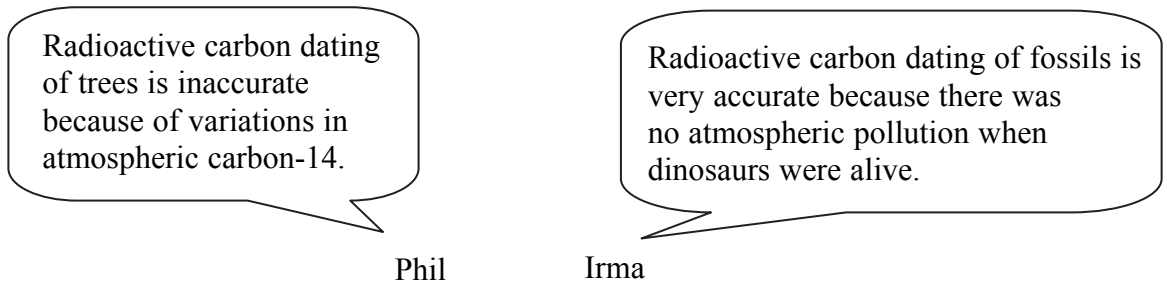
31. Phil and Irma drew this graph showing the decay of a radioactive isotope.
They have removed the effect of background radiation from the readings.



The half-life of the isotope is about

A 200 s
B 100 s
C 70 s
D 20 s

32. Phil and Irma were discussing radioactive carbon dating of plant and animal remains.



Who is correct?

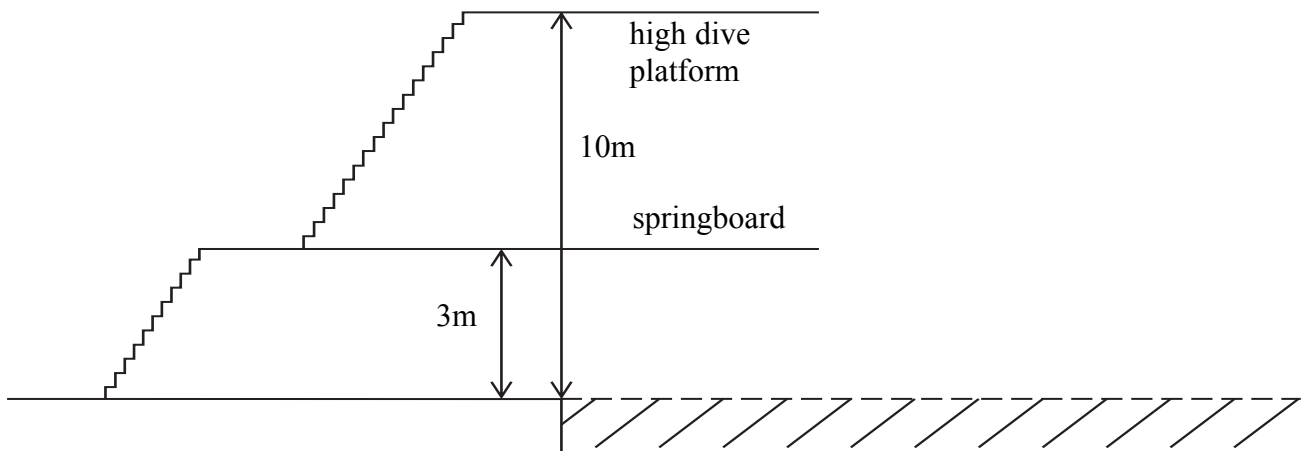
A Phil only
B Irma only
C both Phil and Irma
D neither

Sports Science

Adam and Sally are investigating sports science for a school project.

Use this information to answer questions 33 and 34.

First they looked at diving in the local swimming pool.



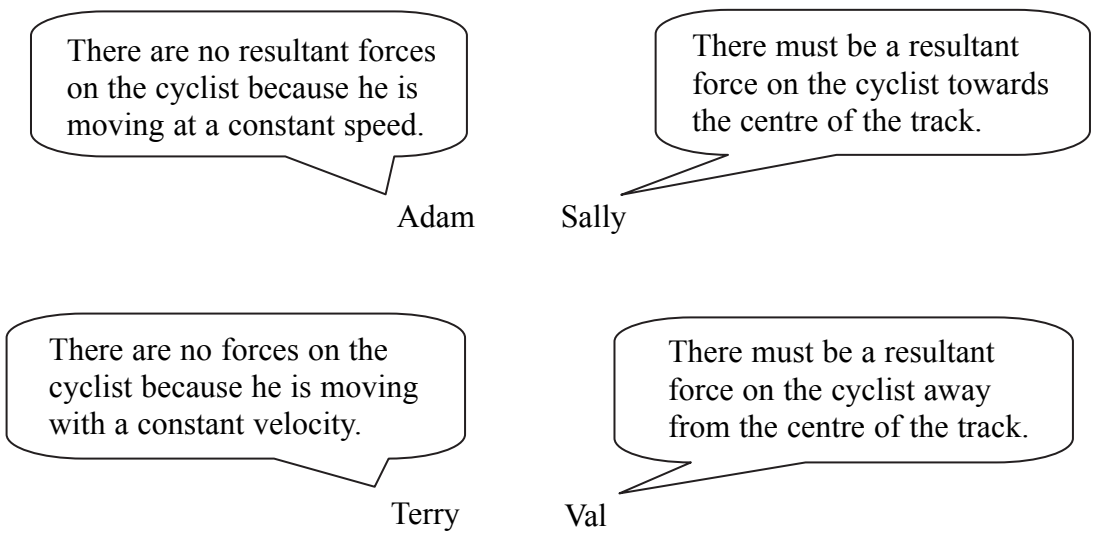
33. A diver is just entering the water, after diving off the high dive platform.
At this point the diver's gain in kinetic energy

A is almost zero
B cannot be worked out
C is almost equal to the gain in gravitational potential energy as he falls
D is almost equal to the loss in gravitational potential energy as he falls

34. A diver climbs from the springboard up to the high dive platform.
During this climb he gains 5600 J of gravitational potential energy.
The mass of the diver is about

A 43.1 kg
B 56.0 kg
C 80.0 kg
D 187 kg

35. Adam and Sally study a cyclist riding at a constant speed around a circular track.
They discuss the forces on the cyclist with some friends.



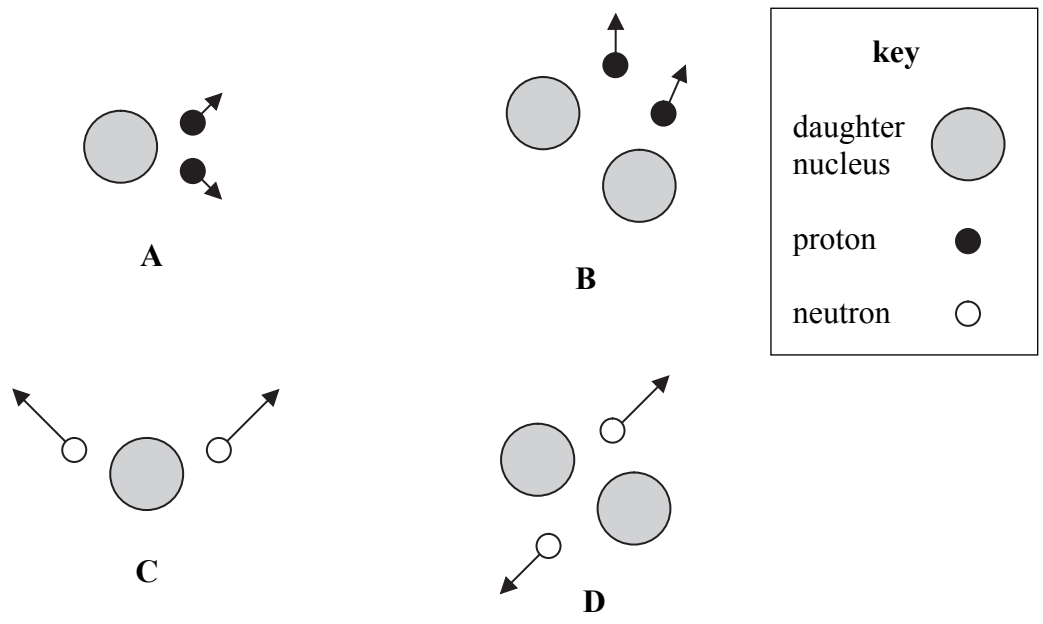
Who is correct?

A Adam
B Sally
C Terry
D Val

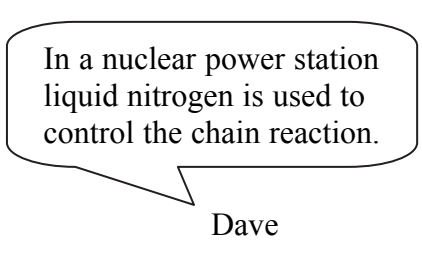
Nuclear reactions

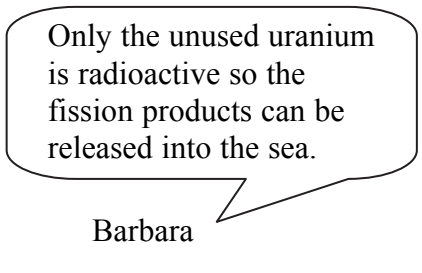
Dave and Barbara visit a local science museum to find out about nuclear reactions.

36. They saw a diagram showing the fission of a U-235 nucleus.
The correct products of the fission are



37. Dave and Barbara discuss nuclear power stations.





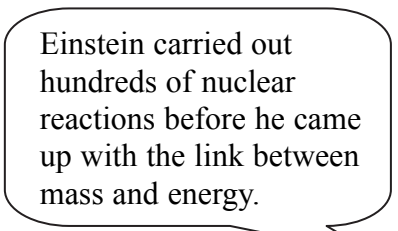
Who is correct?

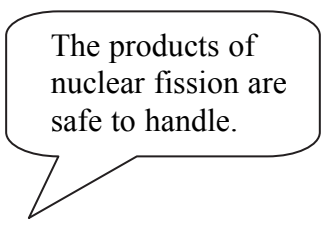
A Dave only
B Barbara only
C both Dave and Barbara
D neither

38. In another display Barbara found an explanation of nuclear fission and nuclear fusion.
Which row of the table gives a correct description of nuclear **fusion**?

	nuclear fusion happens	**nuclear fusion occurs**
A	when a nucleus is split	in nuclear power stations
B	when two nuclei join	in nuclear power stations
C	when two nuclei join	in stars
D	when a nucleus is split	in stars

39. Dave and Barbara discuss nuclear reactions.

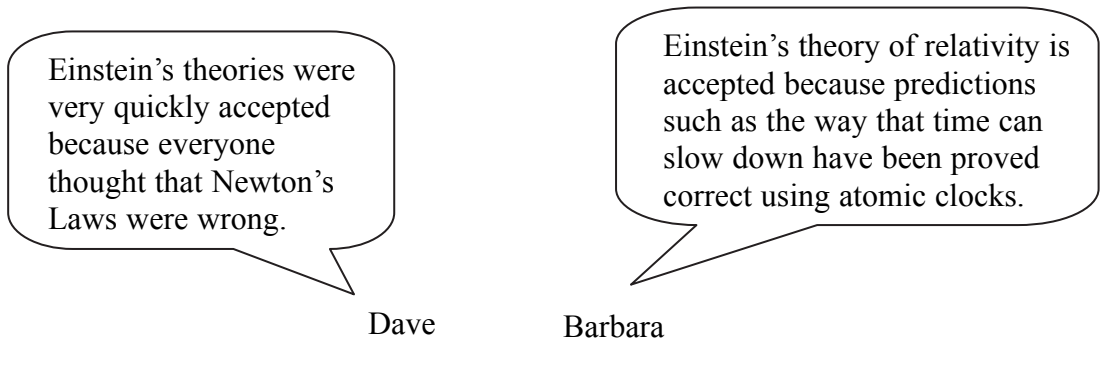




Who is correct?

A Dave only
B Barbara only
C both Dave and Barbara
D neither

40. Dave and Barbara discuss some of Einstein's work.



Who is correct?

A Dave only
B Barbara only
C both Dave and Barbara
D neither

TOTAL FOR HIGHER TIER PAPER: 24 MARKS

END