

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 11 November 2010 – Afternoon

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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Turn over

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FORMULAE

You may find the following formulae useful.

$$\text{average velocity} = \frac{\text{displacement}}{\text{time}}$$

$$v = \frac{s}{t}$$

$$\text{acceleration} = \frac{\text{change in velocity}}{\text{time}}$$

$$a = \frac{(v-u)}{t}$$

$$\text{force} = \text{mass} \times \text{acceleration}$$

$$F = m \times a$$

$$\text{momentum} = \text{mass} \times \text{velocity}$$

$$p = m \times v$$

$$\text{change in potential energy} = \text{mass} \times \text{gravitational field strength} \times \text{change in height}$$

$$PE = m \times g \times h$$

$$\text{kinetic energy} = \frac{1}{2} \times \text{mass} \times (\text{velocity})^2$$

$$KE = \frac{1}{2} \times m \times v^2$$

$$\text{electrical energy} = \text{voltage} \times \text{current} \times \text{time}$$

$$E = V \times I \times t$$

$$\text{power} = \frac{\text{work done}}{\text{time taken}}$$

$$P = \frac{W}{t}$$

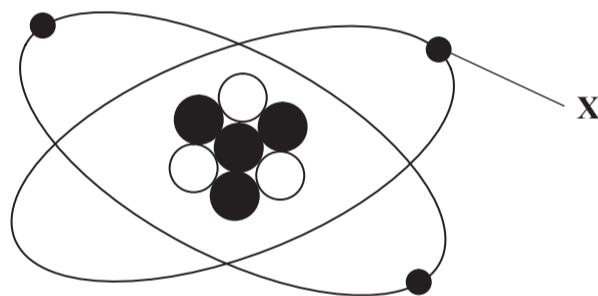
$$\text{work done} = \text{force} \times \text{distance moved in the direction of the force}$$

$$W = F \times s$$

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

Radioactivity

- The type of radiation used to sterilise hospital equipment is
A beta particles
B gamma rays
C sound waves
D alpha particles
- Which of these can pass through a few centimetres of lead?
A alpha particles
B beta particles
C gamma rays
D ultraviolet light
- The diagram represents a lithium atom.



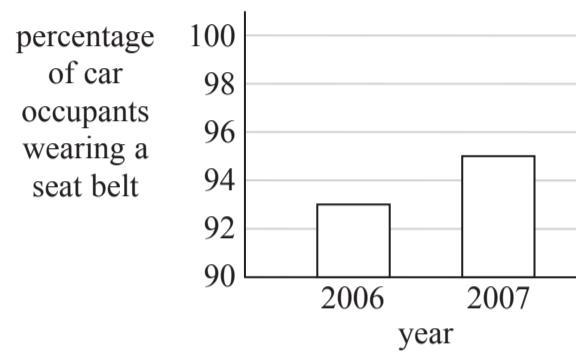
not to scale

Particle X is

- Particle X is
A an electron
B a proton
C a neutron
D a nucleus
- Which of these radiations is **least** likely to pass through skin cells?
A alpha particles
B beta particles
C gamma rays
D X-rays

Car safety

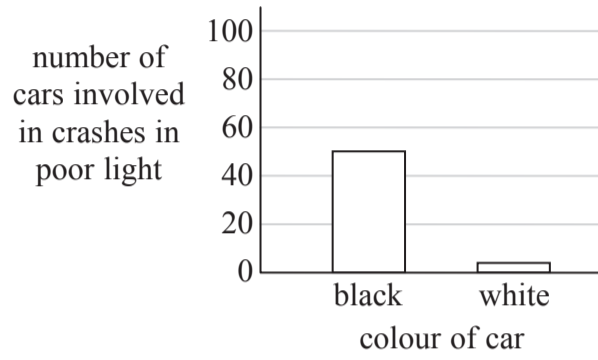
5. This data is from a government survey on wearing seat belts.



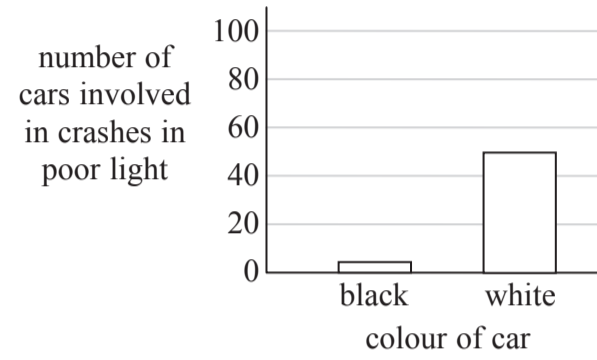
In this survey, between 2006 and 2007, the percentage of car occupants wearing a seat belt has

- A decreased by 2%
 - B increased by 2%
 - C increased by 93%
 - D increased by 95%
6. Which of these would increase the stopping distance of a car?
- A decrease the grip between the tyres and the road
 - B decrease the speed of the car
 - C decrease the driver's reaction time
 - D increase the force from the brakes
7. A car driver brakes suddenly.
She exerts a force of 500 N on her seat belt.
What is the force exerted on the driver by the seat belt?
- A zero
 - B less than 500 N
 - C 500 N
 - D more than 500 N

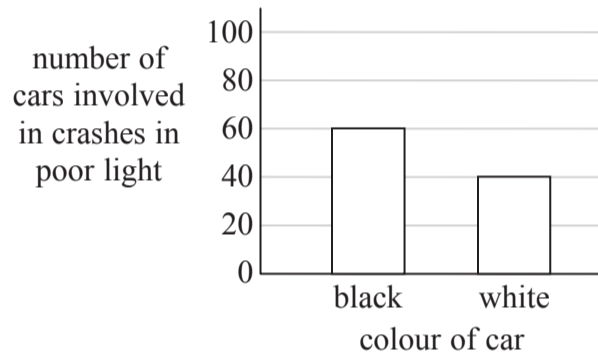
8. Researchers compared the colours of cars which were involved in crashes in poor light. They found that black cars were 1.5 times more likely than white cars to crash. Which graph best shows this data?



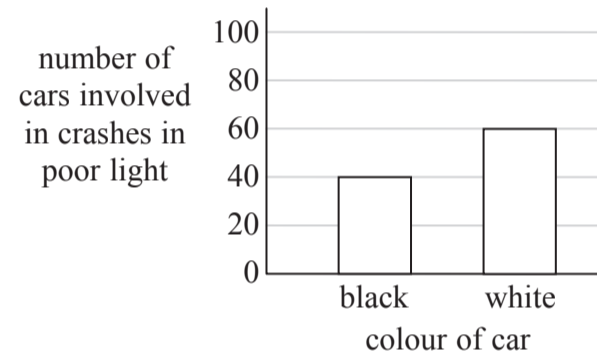
A



B



C



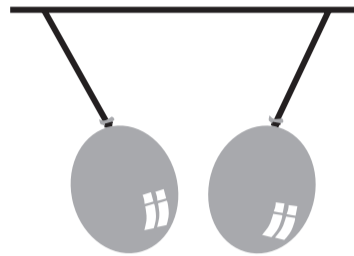
D

Static electricity

9. An object is charged by friction. The object is charged due to the transfer of

- A** atoms
- B** neutrons
- C** protons
- D** electrons

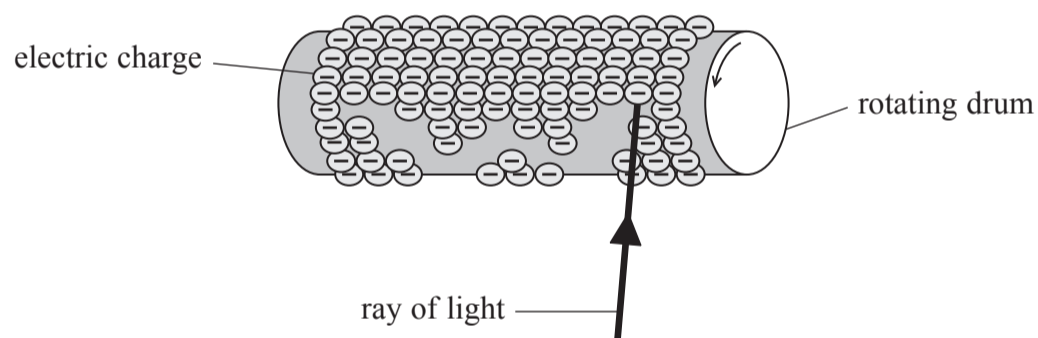
10. The diagram shows two charged balloons hanging from strings.



Which row of the table is correct for the balloons?

	the balloons	the charges on the balloons are
A	repel	the same
B	repel	opposite
C	attract	the same
D	attract	opposite

11. The diagram shows part of a machine.



The ray of light removes electric charges from parts of the rotating drum.
The machine is

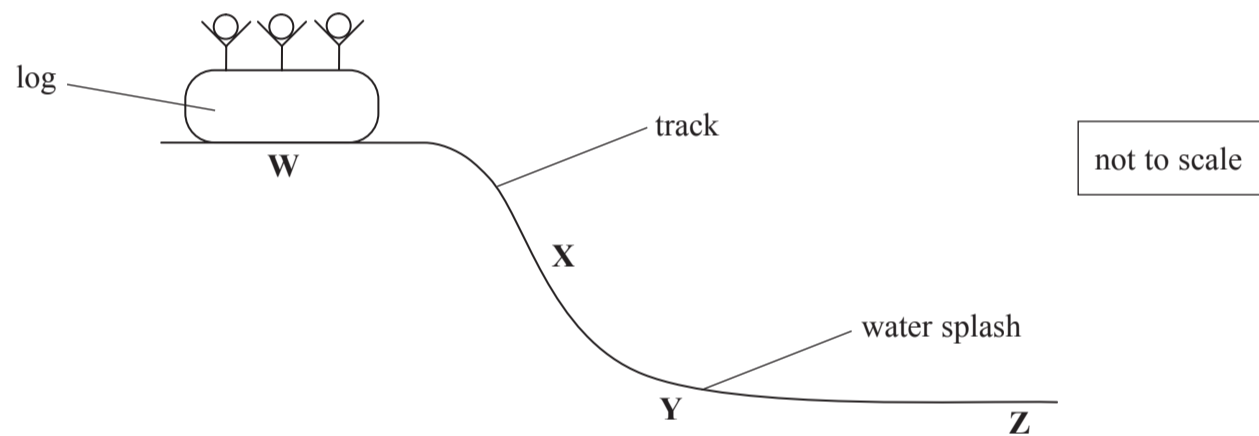
- A** an inkjet printer
 - B** a digital camera
 - C** a laser printer
 - D** a television
12. A petrol tanker becomes positively charged as it moves.
When it stops, the driver connects the tanker to Earth with a conducting strip.
This removes the built-up charge by conducting
- A** positive charge from the tanker to the Earth
 - B** positive charge from the Earth to the tanker
 - C** negative charge from the tanker to the Earth
 - D** negative charge from the Earth to the tanker

Use this information to answer questions 13 to 15.

Alan and his friends visit a theme park.
They try a log flume ride.



The diagram below shows part of the ride.



13. The log has most gravitational potential energy at

- A W
- B X
- C Y
- D Z

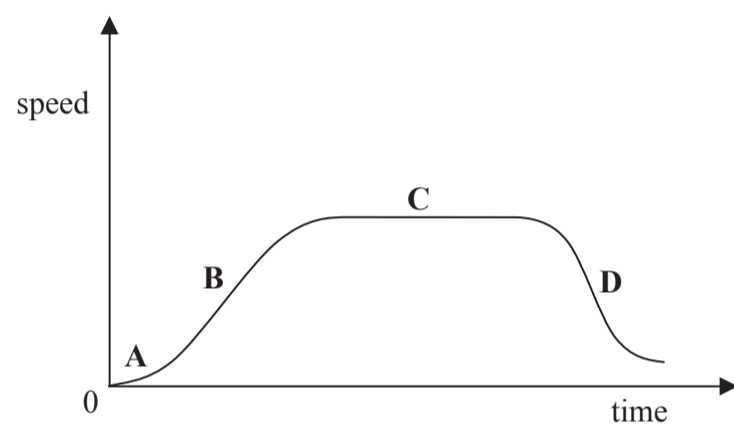
14. Which row is correct for the log as it enters the water splash at Y?

	the frictional forces on the log	the speed of the log
A	increase	increases
B	increase	decreases
C	decrease	increases
D	decrease	decreases

15. Work is done to raise the log to **W**.
All of the energy gained is eventually transferred to other forms.
This is an example of

- A** power efficiency
- B** energy conservation
- C** renewable energy
- D** energy accumulation

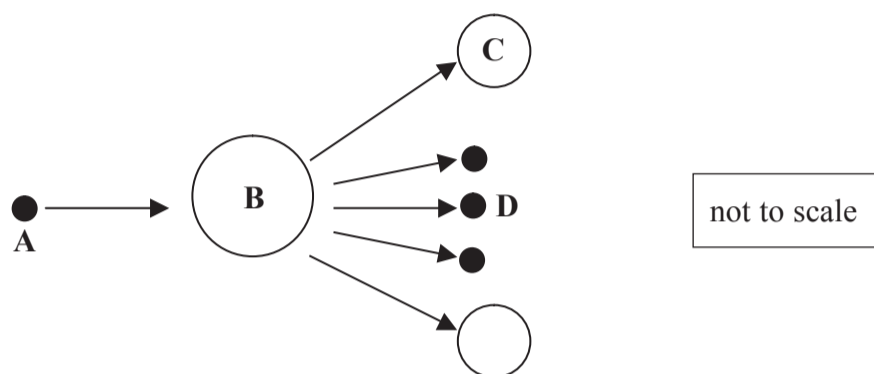
16. The graph shows how the speed of the log changes at another part of the ride.
At which point is the log travelling at a steady speed?



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

Nuclear power

17. The diagram represents nuclear fission
Which of the particles shown in the diagram is a daughter nucleus?



18. In a nuclear power station, the chain reaction is controlled by

- A absorbing neutrons
- B absorbing protons
- C producing neutrons
- D producing protons

19. In the past, some people thought that drinking water containing radioactive elements would cure many illnesses.



Nowadays, we have laws and rules about using radioactive elements.
This is because

- A radioactive elements have become more dangerous
- B there are not many radioactive elements left
- C radioactive elements are much more expensive now
- D the dangers of radioactive elements are better understood now

20. A radioactive isotope has a half-life of 20 minutes.
A sample contains 12 g of this isotope.
How much of this isotope remains after 60 minutes?

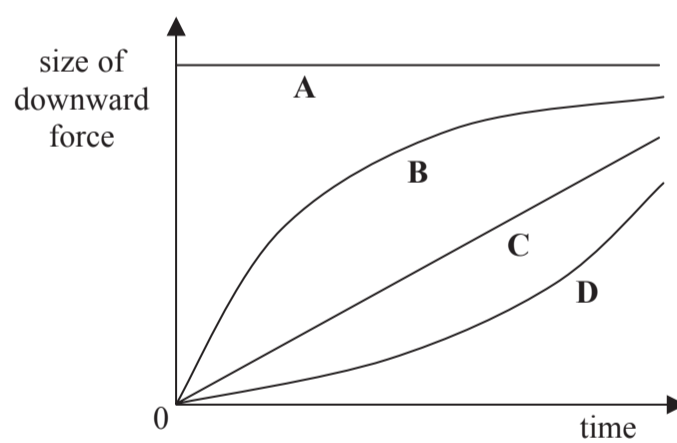
- A 0 g
- B 1.5 g
- C 3 g
- D 4 g

Movement and forces

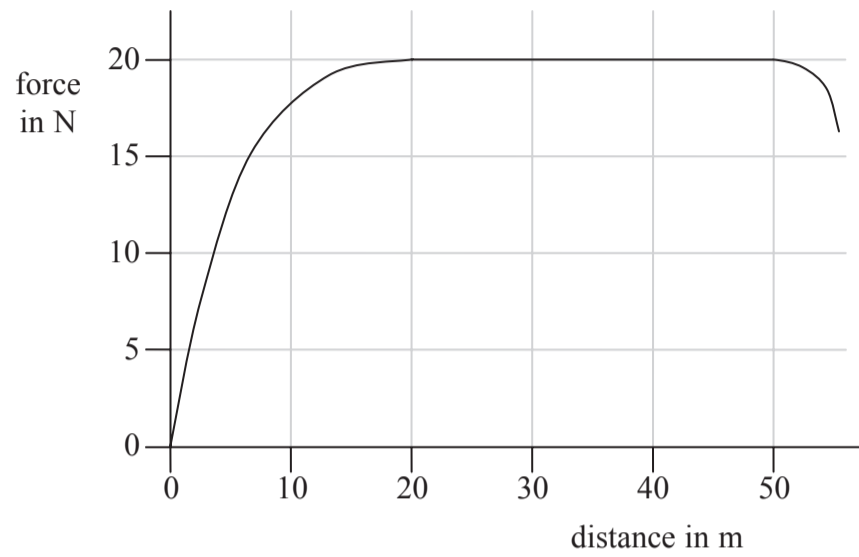
21. A car is accelerated by a force.
The mass of the car and the force are changed to increase the acceleration.
Which row of the table shows the changes that would give the biggest increase in acceleration?

	mass of the car is	force on the car is
A	doubled	halved
B	doubled	doubled
C	halved	halved
D	halved	doubled

22. A skydiver jumps out of an aeroplane.
Which graph shows the size of the downward force on the skydiver as she falls?

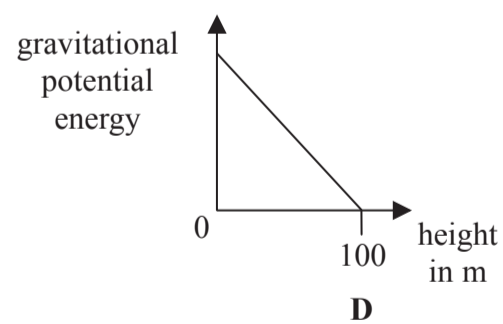
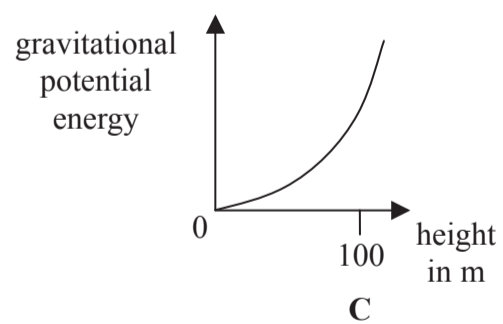
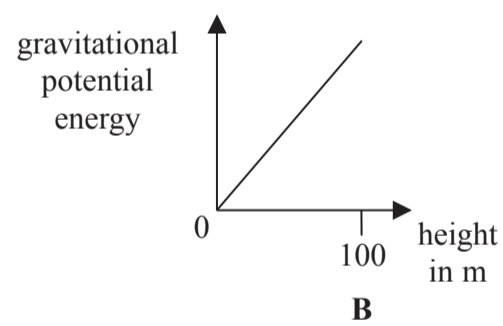
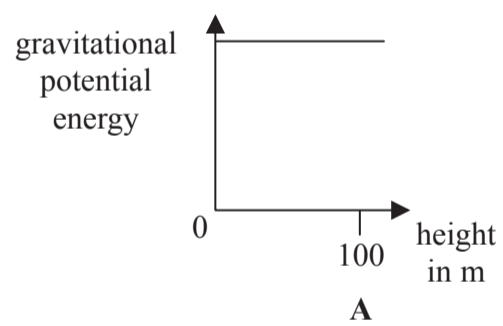


23. The graph shows how the force used to move an object varies with distance.



The work done to move the object from 20 m to 50 m is

- A 400 J
 - B 600 J
 - C 1000 J
 - D 1400 J
24. Which of these graphs shows how the gravitational potential energy of a bird varies with its height above the Earth's surface?



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.

Radiation

25. Some students are discussing background radiation.

Cosmic rays are a source of background radiation.
Alan

Background radiation is constant throughout the UK.
Ben

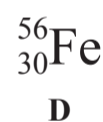
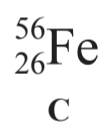
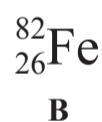
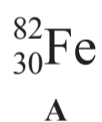
Some background radiation from space is absorbed by the atmosphere.
Carol

Background radiation from rocks has decreased since the Earth was formed.
Dave

Who has **not** made a correct statement?

- A Alan
- B Ben
- C Carol
- D Dave

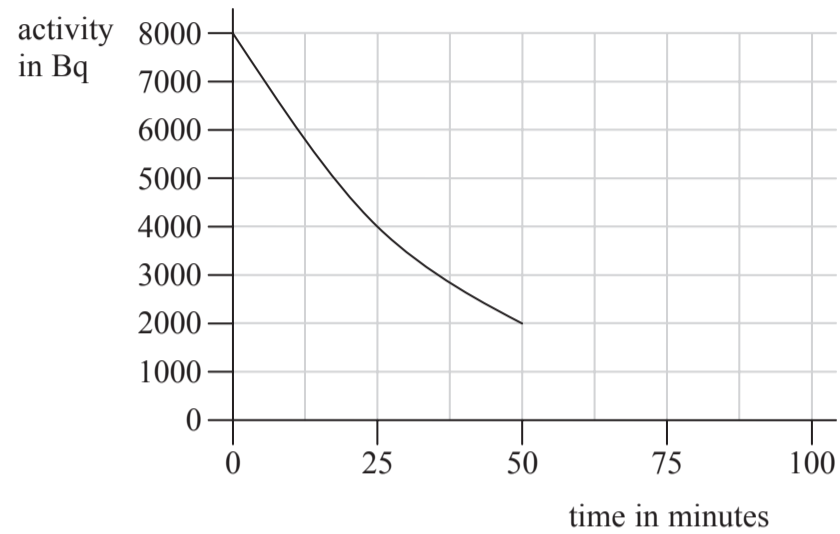
26. An atom of iron has 26 protons, 26 electrons and 30 neutrons. Which of these describes the nucleus of the iron atom?



27. Which row of the table is correct for the isotopes of uranium?

	atomic number	mass number
A	is the same	is different
B	is the same	is the same
C	is different	is the same
D	is different	is different

28. The graph shows the decay of radioactive iodine.



At a time of 100 minutes, the activity will be about

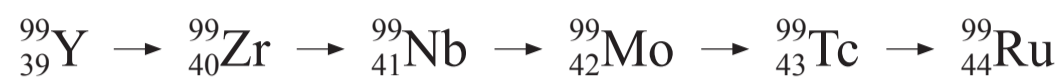
- A 0 Bq
- B 250 Bq
- C 500 Bq
- D 1000 Bq

Nuclear power

29. Which of these describes how energy is transferred in a nuclear power station?

- A nuclear energy → kinetic energy of daughter nuclei → kinetic energy of turbine → thermal energy of coolant → electrical energy from generator
- B chemical energy → kinetic energy of daughter nuclei → thermal energy of coolant → electrical energy from generator → kinetic energy of turbine
- C nuclear energy → kinetic energy of daughter nuclei → thermal energy of coolant → kinetic energy of turbine → electrical energy from generator
- D chemical energy → kinetic energy of daughter nuclei → thermal energy of coolant → kinetic energy of generator → electrical energy from turbine

30. Yttrium-99 (Y-99) forms this decay series.



Which row of the table is correct for each stage of the decay series?

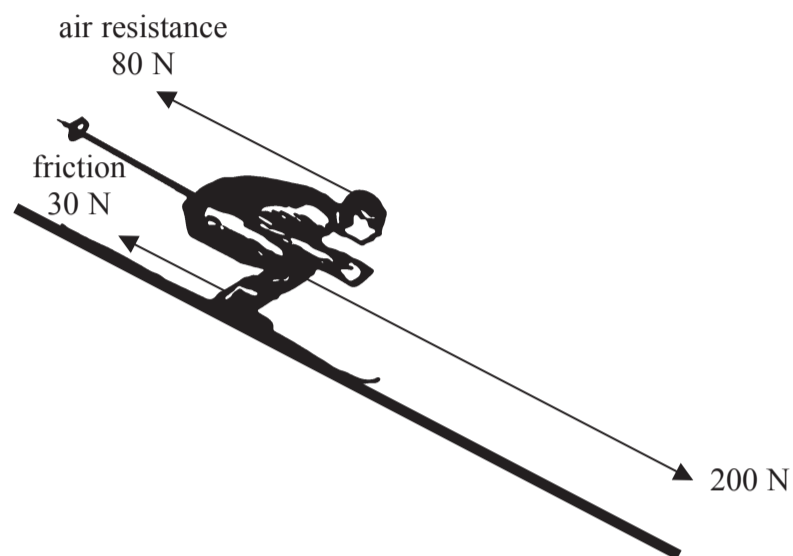
	atomic (proton) number	mass (nucleon) number
A	stays the same	stays the same
B	stays the same	increases by one
C	increases by one	stays the same
D	increases by one	increases by one

31. Which row of the table is correct for nuclear fusion?

	the temperature needed is	the density needed is	nuclear fusion is the source of energy for
A	very low	very low	stars
B	very low	very high	nuclear power stations
C	very high	very low	nuclear power stations
D	very high	very high	stars

Forces and motion

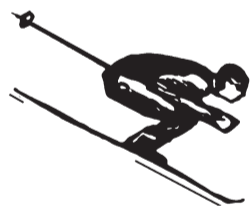
32. The diagram shows three of the forces acting on a downhill skier.



The resultant of these forces is

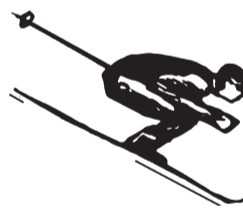
- A 90 N down the slope
B 90 N up the slope
C 310 N up the slope
D 310 N down the slope
33. The speed of the skier is measured at two points on the course.
The skier accelerates steadily between the two points.

speed of skier = 8.0 m/s



time = 4.0 seconds

speed of skier = 14.0 m/s



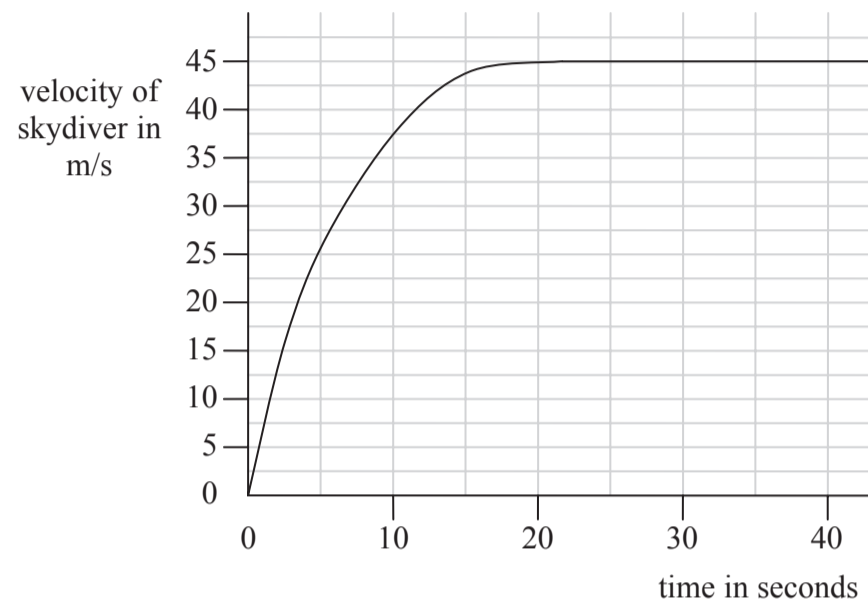
time = 10.0 seconds

The acceleration of the skier is

- A 0.6 m/s^2
B 1.0 m/s^2
C 1.4 m/s^2
D 2.3 m/s^2

Use this information to answer questions 34 and 35.

The graph shows how the velocity of a skydiver varies for the first part of his descent.



34. Some students discuss the motion of the skydiver.

His velocity increases at a steady rate until it reaches terminal velocity.

Amy

Acceleration due to gravity gradually decreases until he reaches terminal velocity.

Bob

Air resistance is constant and when it equals gravity he reaches his terminal velocity.

Carol

Air resistance increases with speed until it balances his weight and then he reaches his terminal velocity.

Dave

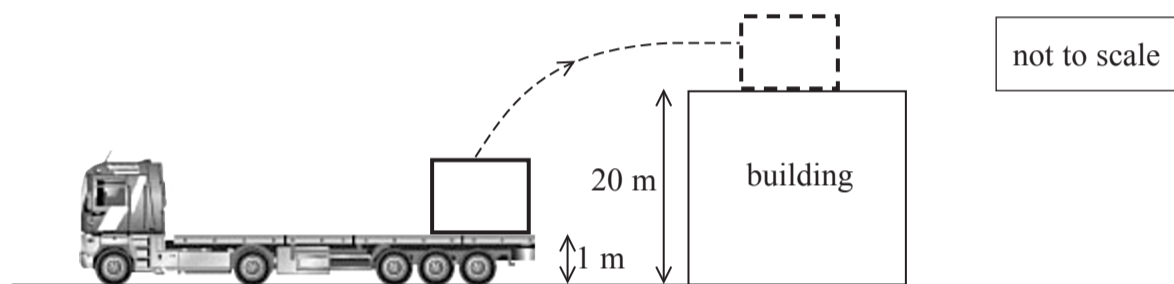
Which student gave a correct statement?

- A Amy
- B Bob
- C Carol
- D Dave

35. The mass of the skydiver is 100 kg.
What is the kinetic energy of the skydiver at terminal velocity?
- A 10 125 J
B 31 250 J
C 80 000 J
D 101 250 J

Work, energy and power

36. A crane lifts a box from a lorry on to a building.
The box has a mass of 500 kg.
Gravitational field strength, $g = 10 \text{ N/kg}$



- The increase in gravitational potential energy of the box is
- A 9 500 J
B 10 000 J
C 95 000 J
D 100 000 J
37. A model motor has an output power of 20 W.
The motor lifts a load of 20 N at a steady speed for a time of 5 seconds.
How many metres is the load lifted?
- A 1 m
B 5 m
C 20 m
D 500 m
38. Both the mass and the velocity of an object are doubled.
The kinetic energy of the object is now
- A twice as much
B three times as much
C four times as much
D eight times as much

39. A satellite orbits a planet.
The satellite travels at a steady speed in a circular orbit.
Two students discuss this circular motion.

The satellite orbits at a steady speed and it is accelerating.

Peter

As the satellite orbits the planet, a resultant force pushes the satellite away from the planet.

Stuart

Who is correct?

- A Peter only
B Stuart only
C both Peter and Stuart
D neither
40. Two students are discussing scientific theories.

New theories are not accepted until other scientists obtain the same results as the original experiment.

Kim

You can disprove a theory if the results of a reliable and valid experiment disagree with the predictions of the theory.

Toni

Who is correct?

- A Kim only
B Toni only
C both Kim and Toni
D neither

TOTAL FOR HIGHER TIER PAPER: 24 MARKS

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