

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 9 June 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.

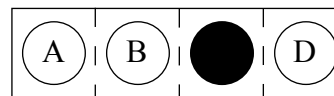
Before the test begins:

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.

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

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

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

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

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

$$F = m \times a$$

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

$$p = m \times v$$

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

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

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

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

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

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

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

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

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

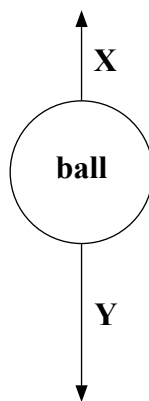
$$W = F \times s$$

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

Forces and motion

Use this information to answer questions 1 and 2.

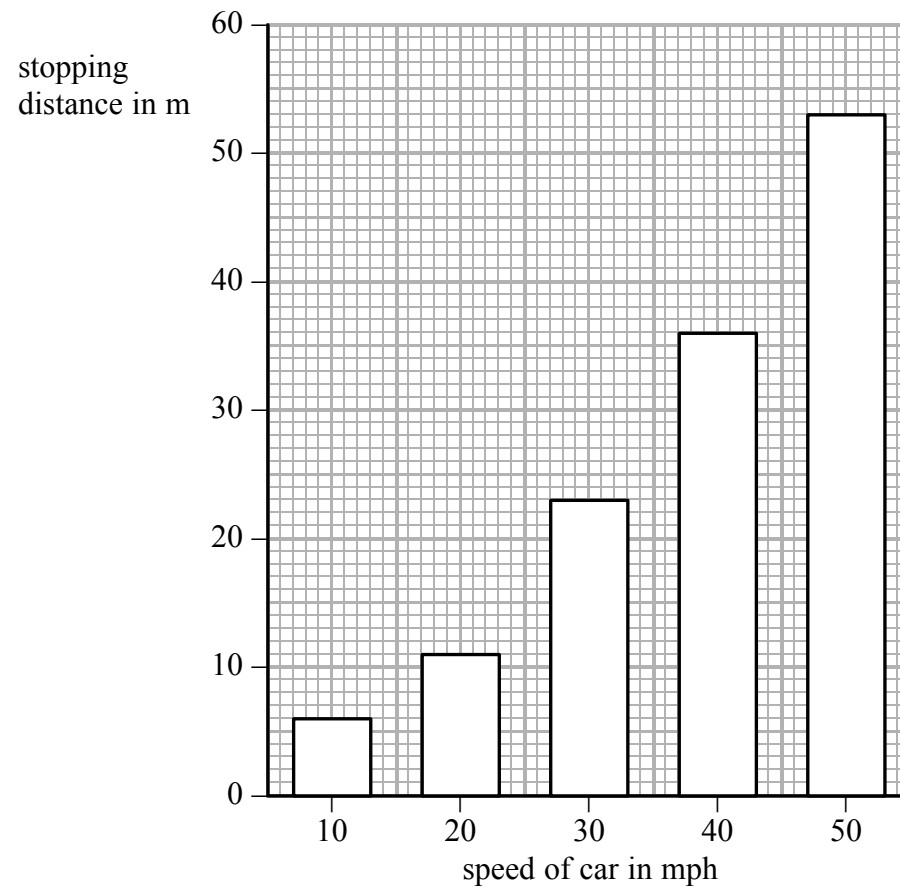
The diagram shows the forces acting on a ball falling through the air.



1. The upward force **X** is
 - A gravity
 - B weight
 - C air resistance
 - D mass

2. When force **Y** is larger than force **X**, the ball will
 - A speed up
 - B slow down
 - C move at a steady speed
 - D stop moving

3. The chart shows how the stopping distance of a car changes with its speed.



What is the stopping distance for a car travelling at 20 mph?

- A 6 m
 - B 11 m
 - C 12 m
 - D 23 m
4. A driver uses a mobile phone while he is moving.
This will probably make his stopping distance
- A increase
 - B decrease
 - C stay the same
 - D zero

Relativity and roller coasters

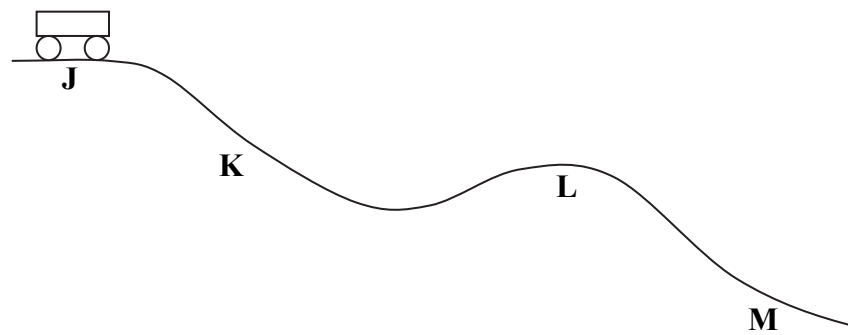
5. Einstein developed his theory of relativity by doing
- A dangerous experiments
 - B practical experiments
 - C experiments in outer space
 - D thought experiments

Use this information to answer questions 6 to 8.

Tom and his friends are in a car on a roller coaster ride.



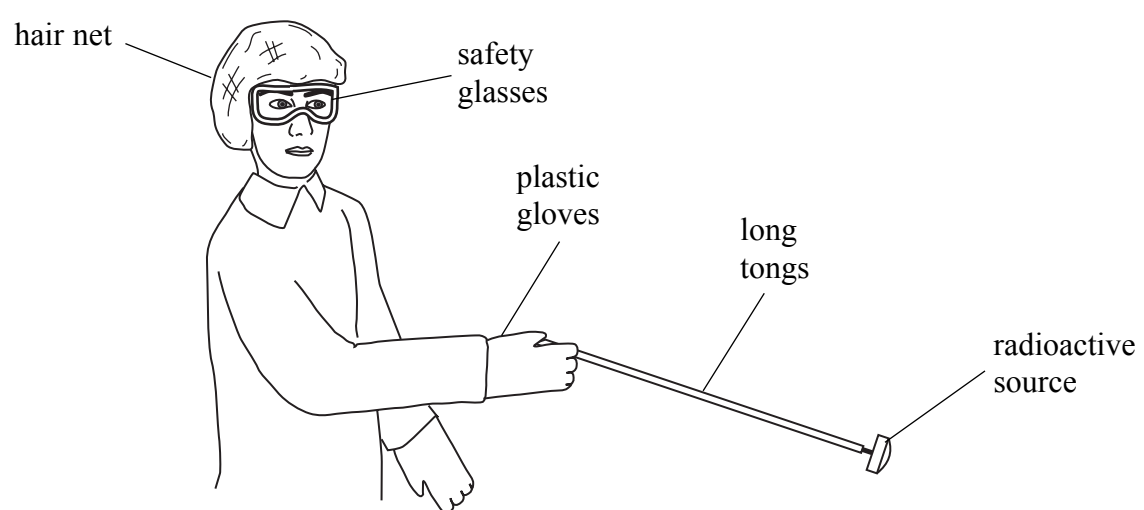
The diagram below shows points J, K, L and M on the roller coaster ride.



6. The car rolls down the track because of the force of
- A friction
 - B electricity
 - C movement
 - D gravity
7. The car has most gravitational potential energy at
- A J
 - B K
 - C L
 - D M
8. When the car passes K, the main energy transfer is from gravitational potential energy to
- A electrical
 - B sound
 - C kinetic
 - D friction

Radiation and its uses

9. A teacher uses a radioactive source in an experiment.

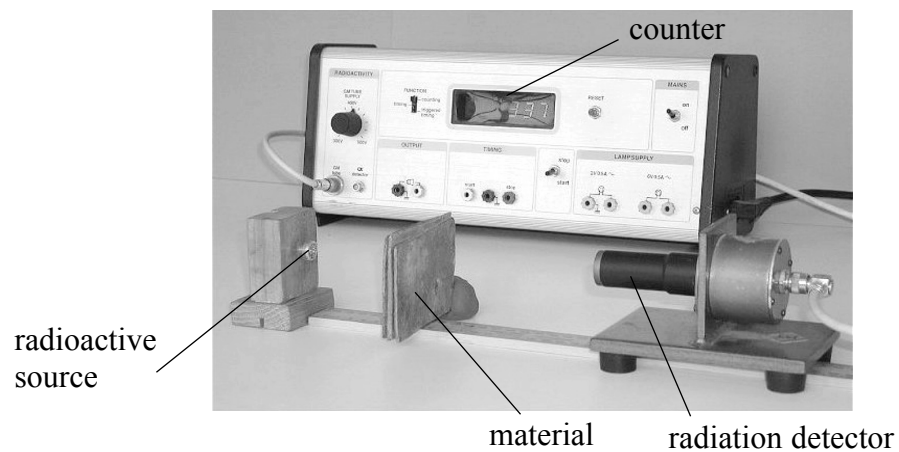


Which of these most reduces the risk to him from ionising radiation?

- A hair net
- B safety glasses
- C plastic gloves
- D long tongs

Use this information to answer questions 10 and 11.

A radioactive source emits only one type of radiation.
 The teacher places the source near a radiation detector.
 The teacher places different materials between the source and the detector.



Here are his results.

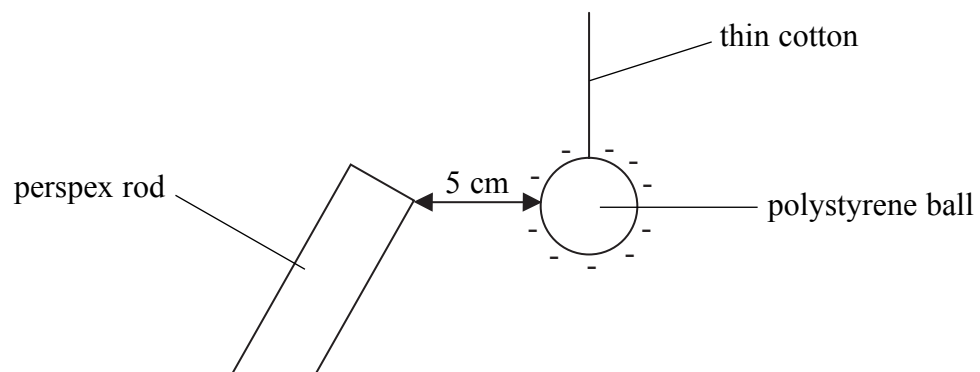
material between source and detector	what happens to the radiation
piece of paper	it passes through
a few cm of aluminium	it is completely stopped

10. The radiation emitted by the source is
- A alpha
 - B beta
 - C gamma
 - D X-rays
11. Suppose the teacher repeats the experiment.
 For which of these would the test **not** be a fair one?
- A using a different day for the test
 - B using a different source
 - C using the same distance between the source and detector
 - D using the same detector
12. Which type of radiation is used for sterilising hospital equipment?
- A alpha
 - B beta
 - C gamma
 - D microwave

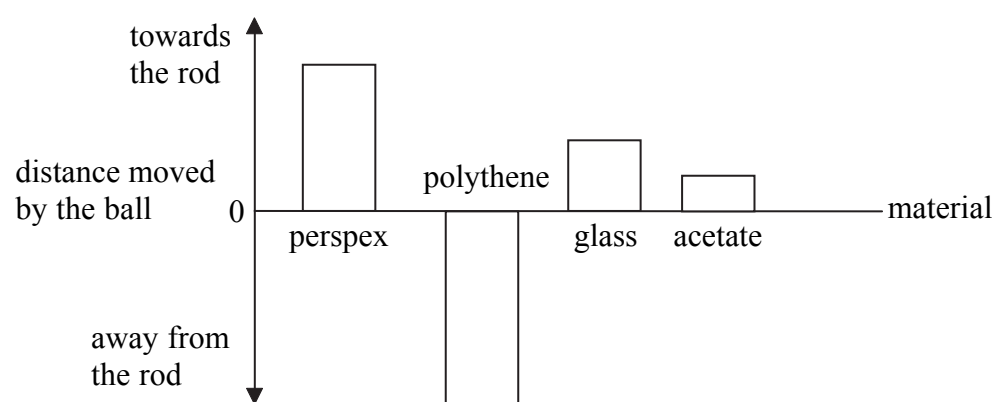
Electrostatics

Use this information to answer questions 13 to 16.

A student investigates electrostatic forces.
She hangs a negatively charged polystyrene ball from thin cotton.
She uses a cloth to rub a perspex rod.
Then she holds the rod 5 cm from the ball.



She measures how far the ball moves.
She repeats the experiment using some other rods.
Here are her results.



13. The material that produced the greatest force on the ball is
- A perspex
 - B polythene
 - C glass
 - D acetate
14. Which of these would increase the force between the perspex rod and the ball?
- A increase the amount of charge on the perspex rod
 - B change the sign of the charge on the ball
 - C move the perspex rod away from the ball
 - D decrease the amount of charge on the ball

15. The charge on the perspex rod is positive and it attracts the polystyrene ball. Which row of the table is correct for the polythene rod shown in her results?

	charge on the polythene rod	effect on the polystyrene ball
A	positive	repels
B	positive	attracts
C	negative	repels
D	negative	attracts

16. The perspex rod is given a positive charge when it

- A** gains protons
- B** loses protons
- C** gains electrons
- D** loses electrons

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.

Motion and work

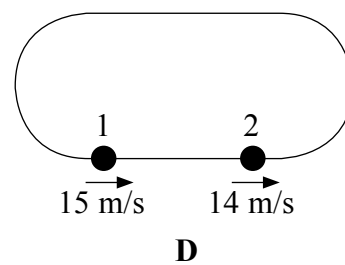
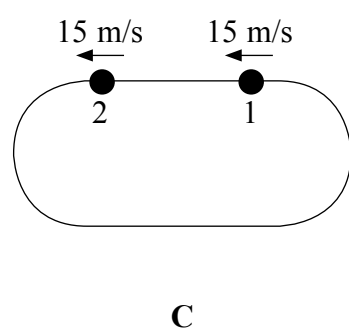
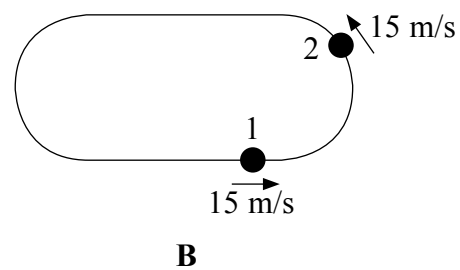
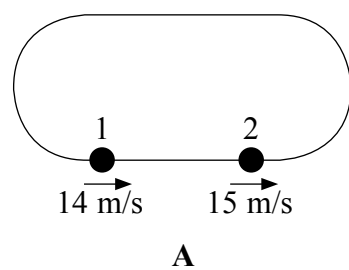
A cyclist is riding around a level track.



17. Which of these could be a **velocity** of the cyclist?

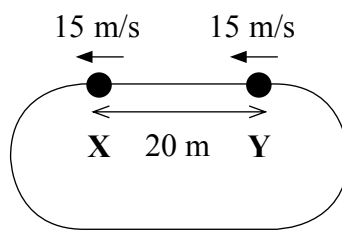
- A 20 m/s
- B 20 m/s per second
- C 20 mph
- D 20 m/s northwards

18. Each diagram shows the cyclist's velocity at two different places (1 and 2) on the track.
 Which diagram does **not** show any acceleration (positive or negative)?



Use this information to answer questions 19 and 20.

The cyclist does work while pedalling the bike between points X and Y on the track.



19. The amount of work done on the bike by the cyclist between X and Y is

- A the increase in kinetic energy of the cyclist and bike
- B the energy transferred to the bike and the surroundings
- C the force needed to overcome air resistance
- D the increase in gravitational potential energy

20. The average force produced by the cyclist between X and Y is 200 N.
The work done by the cyclist between X and Y is

- A 4000 J
- B 4000 W
- C 10 J
- D 10 W

Radioactivity and its uses

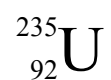
21. Electrical energy is produced in a nuclear power station.
Which row of the table is correct for the reaction in the nuclear reactor?

	energy is released during nuclear	the reaction is
A	fission	uncontrolled
B	fusion	uncontrolled
C	fission	controlled
D	fusion	controlled

22. A student compares a nuclear power station to an oil-fired power station.
Which row of the table is correct?

	a benefit of using nuclear power	a drawback of using nuclear power
A	no carbon dioxide produced	disposal of radioactive waste is difficult
B	no carbon dioxide produced	the station must be near a uranium mine
C	no waste heat produced	disposal of radioactive waste is difficult
D	no waste heat produced	the station must be near a uranium mine

23. The fuel used in nuclear reactors is uranium.
A nucleus of the isotope used can be described as



The number of protons in this nucleus is

- A 327
B 235
C 143
D 92
24. The half-life of uranium-235 is about 700 million years.
A sample contains 16 g of uranium-235.
How long will it be until only 4 g of the original uranium-235 remain?
- A about 2800 million years
B about 1400 million years
C about 1050 million years
D about 175 million years

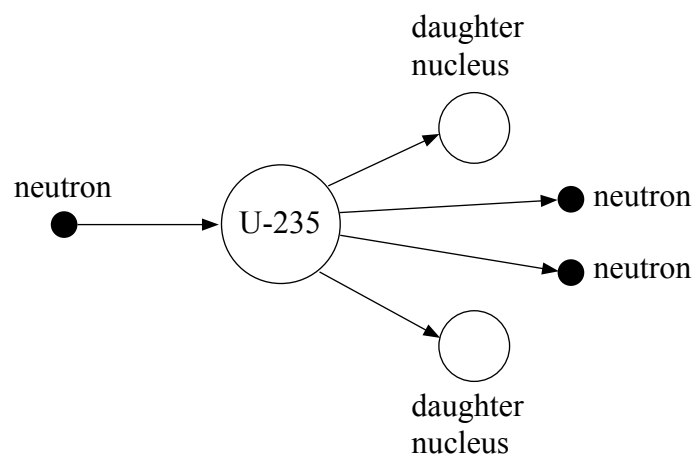
TOTAL FOR FOUNDATION TIER PAPER: 24 MARKS

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.

Nuclear power

25. The diagram shows what can happen when the nucleus of a uranium-235 atom absorbs a neutron.

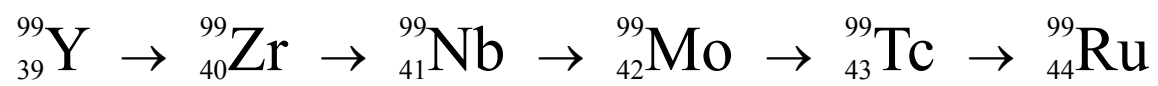


This process is called

- A nuclear combustion
 - B nuclear fusion
 - C a nuclear chain reaction
 - D nuclear fission
26. One of the daughter nuclei formed in a nuclear reactor is yttrium-99.



Yttrium-99 forms this decay series.



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

	number of neutrons	number of protons
A	increases by one	stays the same
B	decreases by one	stays the same
C	increases by one	increases by one
D	decreases by one	increases by one

27. Two students discuss scientific theories.

New theories should not be accepted until other scientists have provided evidence to support them.

Kyle

If you can make a prediction from a theory, then the theory must be correct.

Peter

Who is correct?

- A Kyle only
- B Peter only
- C both Kyle and Peter
- D neither

28. In the Sun, hydrogen nuclei fuse to produce helium nuclei.
Which row of the table shows the conditions needed for fusion?

	temperature of hydrogen	particle density
A	very low	high
B	very low	low
C	very high	high
D	very high	low

Radioactivity

29. Some students are discussing radiation.
One of the students has made an incorrect statement.

<div style="border: 1px solid black; border-radius: 15px; padding: 5px; width: fit-content; margin: 0 auto;">Alpha and beta particles are ionising radiations.</div> <p>Alan</p>	<div style="border: 1px solid black; border-radius: 15px; padding: 5px; width: fit-content; margin: 0 auto;">Alpha particles are emitted from unstable nuclei.</div> <p>Brian</p>
<div style="border: 1px solid black; border-radius: 15px; padding: 5px; width: fit-content; margin: 0 auto;">Alpha particles cannot cause damage to living tissue.</div> <p>Chris</p>	<div style="border: 1px solid black; border-radius: 15px; padding: 5px; width: fit-content; margin: 0 auto;">You cannot predict when an alpha particle will be emitted.</div> <p>Dave</p>

Who made the **incorrect** statement?

- A Alan
 B Brian
 C Chris
 D Dave
30. A nucleus of element X can be described as



Which of these could represent an isotope of element X?

${}_{26}^{54}\text{X}$	${}_{54}^{112}\text{X}$	${}_{56}^{26}\text{X}$	${}_{24}^{56}\text{X}$
A	B	C	D

31. A student compares X-rays and gamma rays.
Which row of the table is correct?

	is normally produced in a machine	is normally produced in the nucleus of an atom
A	gamma rays	X-rays
B	gamma rays	gamma rays
C	X-rays	X-rays
D	X-rays	gamma rays

32. Two students discuss background radiation.

Background radiation is radiation that cannot be detected during radioactivity experiments.

Jill

Background radiation is mainly caused by radon gas from nuclear power stations.

Lucy

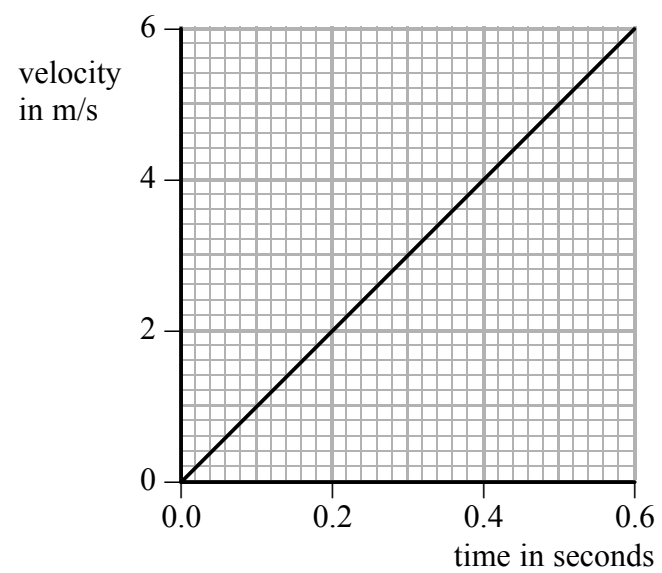
Who is correct?

- A Jill only
- B Lucy only
- C both Jill and Lucy
- D neither

Rockets and satellites

Some students are investigating the motion of rockets.

33. They find the velocity-time graph for the motion of a rocket.



What is the acceleration of the rocket?

- A 10.0 m/s^2
- B 6.0 m/s^2
- C 3.6 m/s^2
- D 1.0 m/s^2

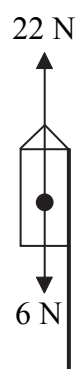
Use this information to answer questions 34, 35 and 36.

The photograph shows a firework rocket.



The rocket is fired vertically upwards.

34. The diagram shows the forces acting on the rocket.
The rocket has a mass of 0.4 kg.



The acceleration of the rocket is

- A 8.8 m/s^2
 - B 40.0 m/s^2
 - C 55.0 m/s^2
 - D 70.0 m/s^2
35. The rocket fuel stops burning.
The acceleration of the rocket is now
- A upwards and increasing
 - B upwards and decreasing
 - C downwards
 - D zero

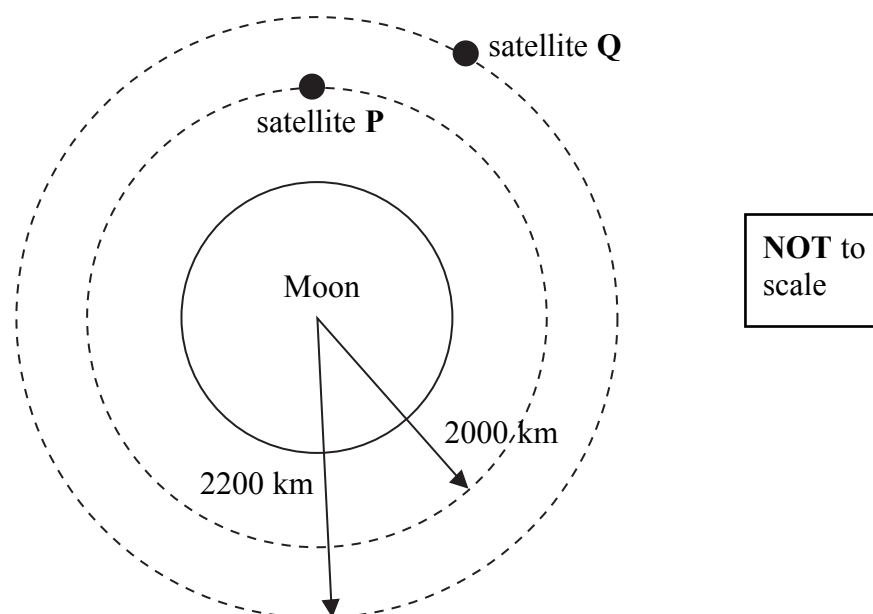
36. A rocket with a mass of 0.2 kg falls back to the ground.
The momentum of the rocket just before it lands is 2 kg m/s.

What is the speed of the rocket?

- A 100.0 m/s
- B 10.0 m/s
- C 0.4 m/s
- D 0.1 m/s

Use this information to answer questions 37 to 40.

Two satellites orbit the Moon.
Each satellite is in a circular orbit.

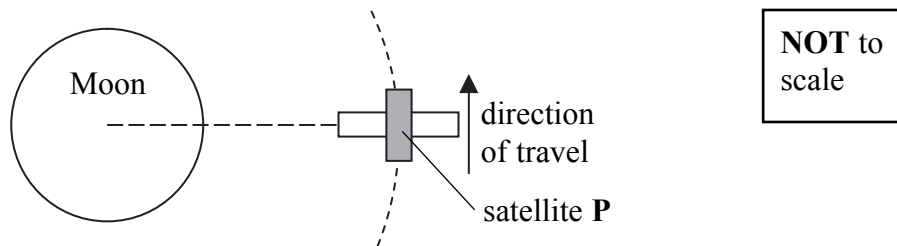


37. Satellite P moves from its current orbit to the same orbit as satellite Q.
The mass of satellite P is 200 kg.
The average gravitational field strength between the orbits P and Q is 1.1 N/kg.

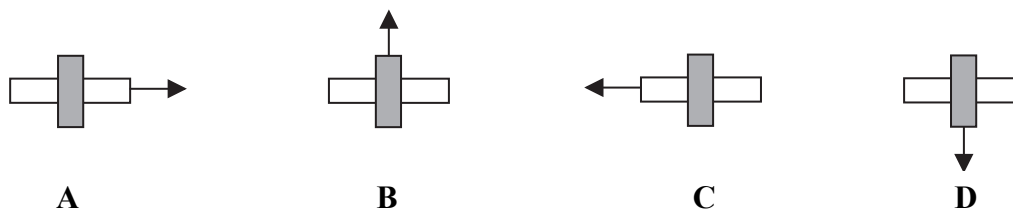
What is the increase in gravitational potential energy of satellite P?

- A 40 000 000 J
- B 44 000 000 J
- C 440 000 000 J
- D 484 000 000 J

38. The diagram shows part of the orbit of satellite **P**.
Satellite **P** is travelling at a steady speed.



Which of these shows the direction of the resultant force that keeps satellite **P** moving in a circle when the satellite is in the position shown?



39. Satellite **Q** has a mass of 200 kg.
Its kinetic energy is 2.25×10^8 J.

What is the speed of satellite **Q**?

- A 2.25×10^6 m/s
B 1500 m/s
C 1060 m/s
D 750 m/s

40. Two students discuss satellite **Q**.
Q orbits at a steady speed.

Satellite **Q** is accelerating whilst orbiting at a steady speed.

Rob

Satellite **Q** has a constant velocity around the Moon.

Steve

Who is correct?

- A Rob only
B Steve only
C both Rob and Steve
D neither

TOTAL FOR HIGHER TIER PAPER: 24 MARKS

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