EDEXCEL GCSE SCIENCE (360SCIENCE)

SCIENCE



EXAM QUESTION PACK

UNIT P1b MULTIPLE CHOICE 5010 PAPERS

STEMUP

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Surname	Initial(s)
Signature	

Paper Reference(s)

5010 5046

Edexcel GCSE

Science (5010)

Physics (5046)

P1b – Topics 11 and 12

Foundation and Higher Tier

Tuesday 15 November 2011 – Morning

Time: 20 minutes

Materials required for examination
Multiple Choice Answer Sheet
HB pencil, eraser and calculator

Items included with question papers
Nil

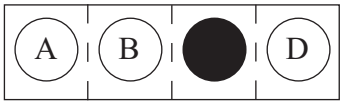
Instructions to Candidates

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

Space

1. The Solar System is part of

A the Earth
B the Sun
C a galaxy
D a planet

2. Which of these is most likely to collide with the Earth?

A a supernova
B a black hole
C a comet
D a moon

3. Stars are formed when clouds of dust and gas are pulled together by

A electrostatic forces
B the force of gravity
C the force of friction
D magnetic forces

4. The Milky Way consists of

A a few stars
B billions of stars
C a few galaxies
D billions of galaxies

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Use this information to answer questions 5 and 6.

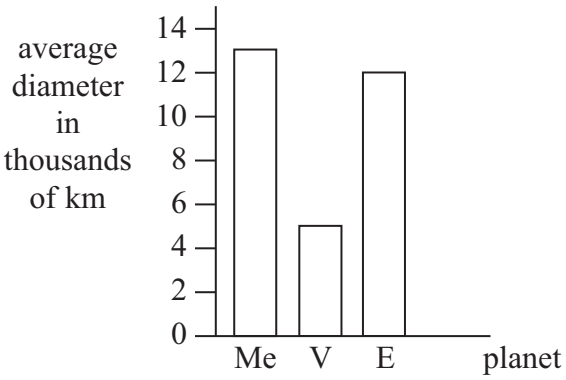
The table gives information about three planets.

	Mercury	Venus	Earth
average distance from the Sun (millions of km)	58	108	150
average diameter (thousands of km)	4.9	12.1	12.8

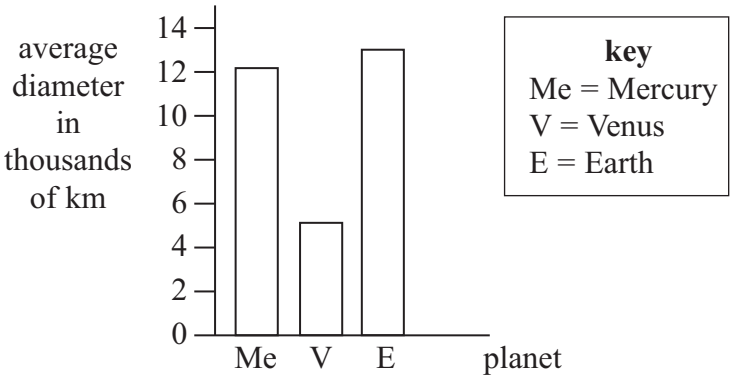
5. The average distance from the Sun to Earth is

A 150 km
B 150 thousand km
C 150 million km
D 150 thousand million km

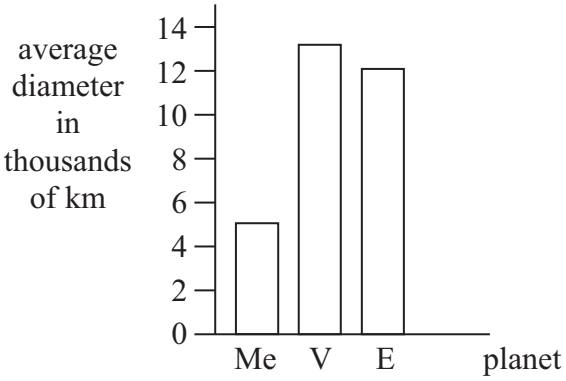
6. Which bar chart correctly shows the average diameter of the planets?



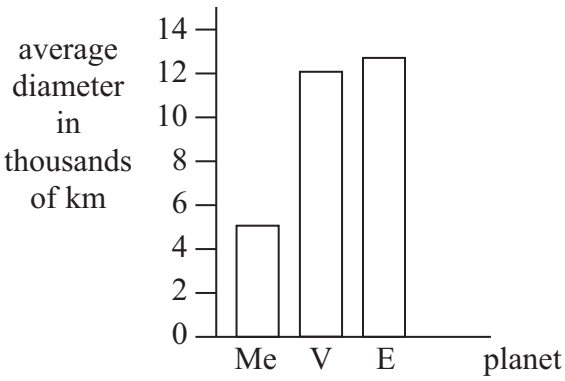
A



B



C



D

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Uses of waves

7. One use of microwaves is to monitor

A rain storms
B bone fractures
C skin burns
D unborn babies

8. Fishing boats use sonar to locate shoals of fish.
Sonar is scanning by

A reflection
B transmission
C absorption
D refraction

9. Which of these uses fluorescence to check whether bank notes are genuine?

A gamma-rays
B X-rays
C ultraviolet
D ultrasound

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Use this information to answer questions 10 and 11.

An article about the use of wi-fi networks in schools stated that

- exposure to radiation from wi-fi is about a million times smaller than the agreed safe level
- a student using a mobile phone receives about half the agreed safe level
- sitting for a whole year in a classroom with a wi-fi network is as dangerous as using a mobile phone for 20 minutes
- the strength of FM radio and TV signals are the same as a classroom wi-fi network
- if wi-fi is banned for safety reasons, FM radio and TV should also be banned.

10. According to the article, a student sitting in a classroom with a wi-fi network for a year

A has a 0 per cent chance of being affected by radiation
B has the same exposure to radiation as using a mobile phone for a year
C has a 50 per cent chance of being affected by radiation
D has the same exposure to radiation as using a mobile phone for 20 minutes

11. According to the article, which of these has the same strength signal as a wi-fi network in a classroom?

A a signal 20 million times the agreed safe level
B a signal half the agreed safe level
C FM radio and TV signals
D a mobile phone signal

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Electromagnetic spectrum

Use this information to answer questions 12 to 14.

The chart represents the electromagnetic spectrum.
Some parts have been named.

radio waves	**J**	infrared	light waves	**K**	**L**	**M**

12. The part of the electromagnetic spectrum labelled **M** is

A microwaves
B ultrasound waves
C gamma rays
D ultraviolet rays

13. Radio waves, infrared waves and light waves are used for communications.
Which other part of the electromagnetic spectrum is used for communications?

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

14. All parts of the electromagnetic spectrum

A have the same wavelength
B have the same frequency
C are longitudinal waves
D are transverse waves

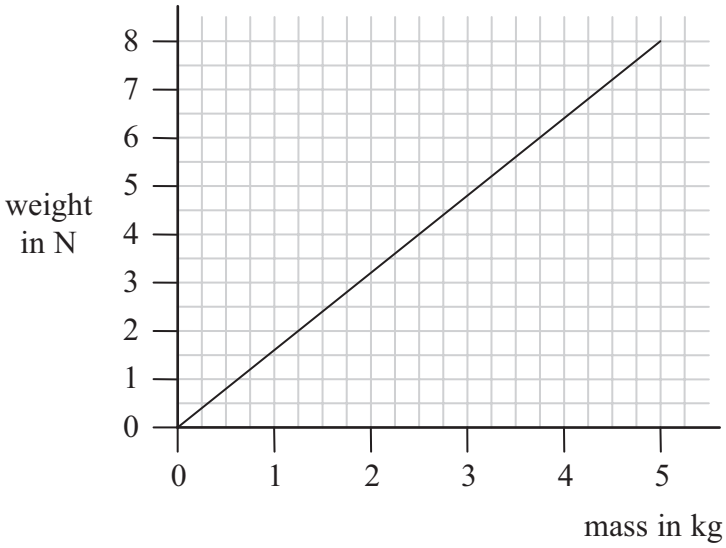
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The Moon

15. An astronaut on the Moon holds a hammer.
He lets go of the hammer.
The hammer will

A float upwards into space
B float at the same height above the surface
C fall with constant speed to the Moon's surface
D fall with increasing speed to the Moon's surface

16. The graph shows how the mass and weight of objects on the Moon are related.



Which of these is correct?

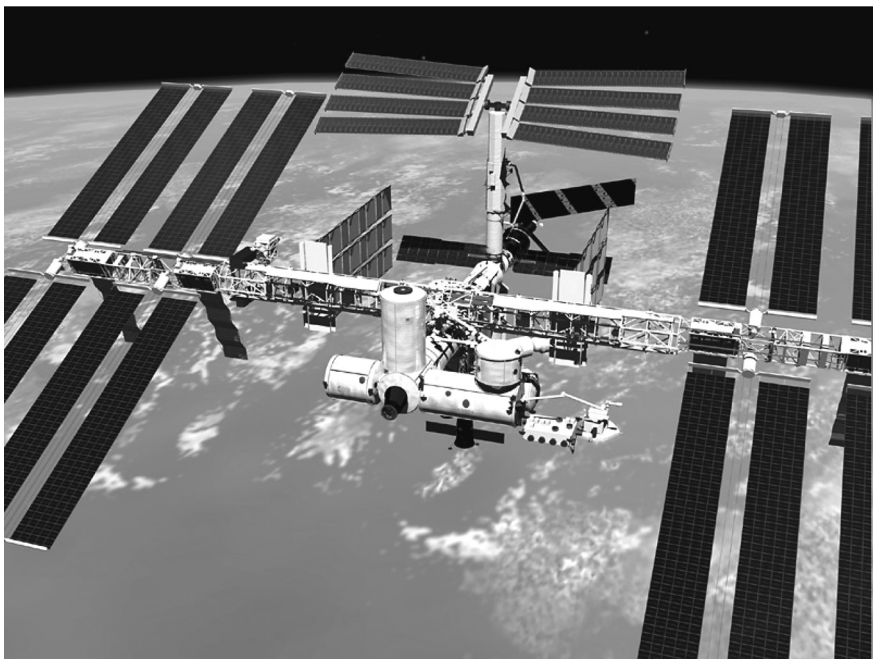
A a 5 kg mass weighs 8 N on the Moon
B a 5 kg mass weighs 5 N on the Moon
C a 5 N mass weighs 8 kg on the Moon
D a 5 N mass weighs 5 kg on the Moon

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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.

Space tourists

The photograph shows the International Space Station.



17. Which row of the table is correct for the conditions in space near to this station?

	temperature	**gravitational field strength**
A	lower than on Earth	lower than on Earth
B	higher than on Earth	lower than on Earth
C	higher than on Earth	higher than on Earth
D	lower than on Earth	higher than on Earth

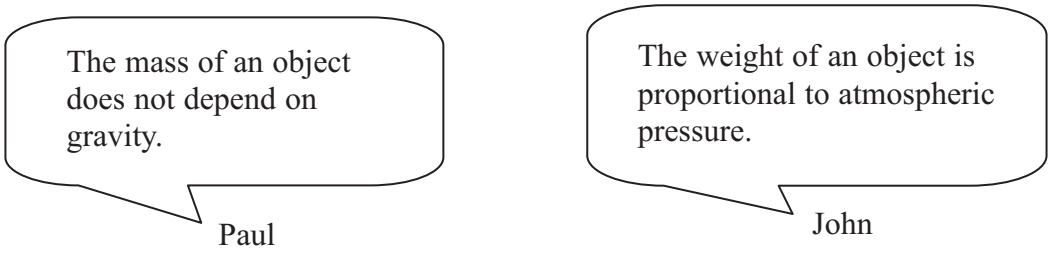
18. One of the problems of long space flights is muscle wastage.
Astronauts reduce muscle wastage by

A breathing pure oxygen
B using an exercise machine
C sleeping for at least 10 hours each day
D keeping their feet pointed towards the Earth

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Mass and weight

19. Two students discuss mass and weight.



Who is correct?

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

20.

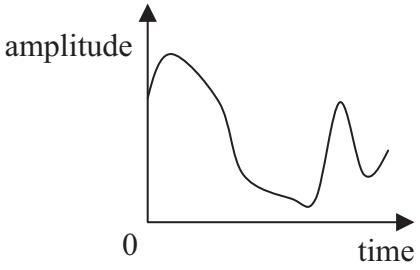
weight = mass × gravitational field strength $W = mg$

The gravitational field strength on Mars is 3.7 N/kg.
A rock has a mass of 2 kg.
The weight of the rock on Mars is

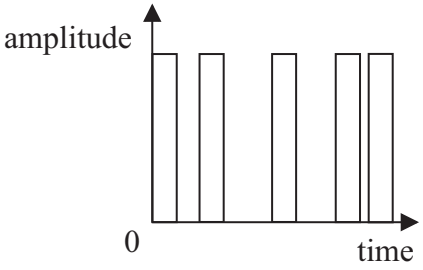
A zero
B 1.85 N
C 3.7 N
D 7.4 N

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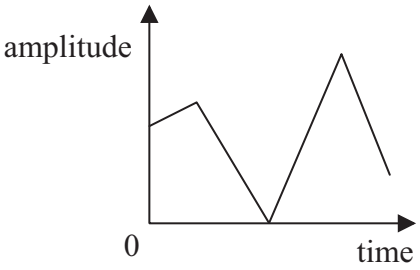
21. Which of these shows a digital signal?



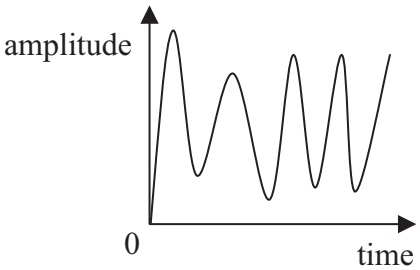
A



B

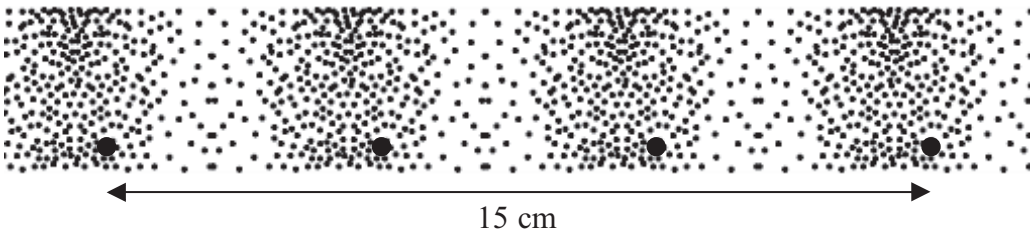


C



D

22. The diagram represents a longitudinal wave.



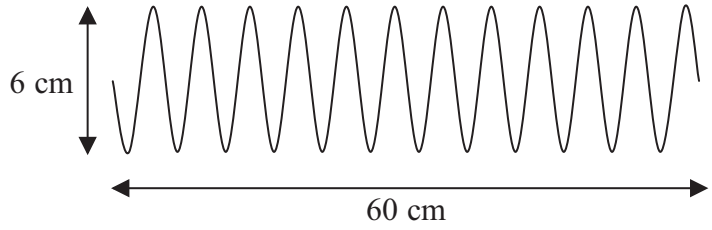
The wavelength of the wave is about

A 45 cm
B 18 cm
C 5 cm
D 4 cm

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Use this information to answer questions 23 and 24.

The diagram shows the waves sent out by a source in a time of 3 seconds.



23.

speed = distance ÷ time

The speed of the waves is

A 180 cm/s
B 20 cm/s
C 18 cm/s
D 2 cm/s

24. The frequency of the waves is

A 4 Hz
B 5 Hz
C 12 Hz
D 720 Hz

TOTAL FOR FOUNDATION TIER PAPER: 24 MARKS

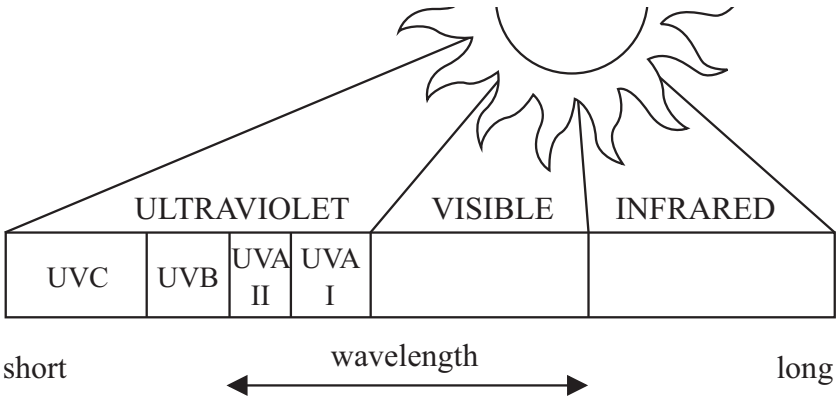
Foundation tier candidates do not answer any more questions after question 24.

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Questions 25 to 40 must be answered by Higher tier candidates only.
Foundation tier candidates do not answer questions 25 to 40.

Ultraviolet radiation

25. Four types of ultraviolet radiation (UV) are shown in the chart.

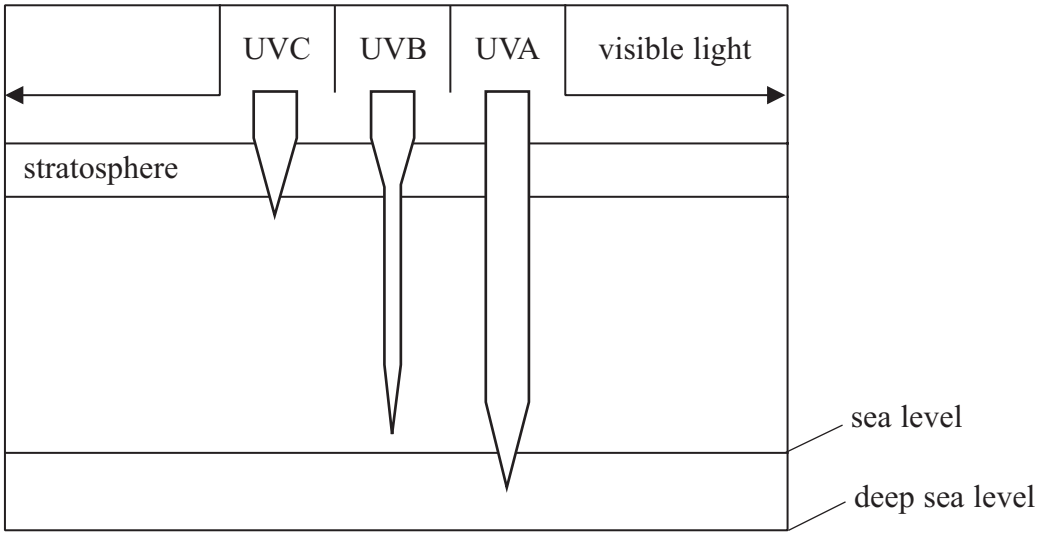


Which row of the table is correct for UVA I compared to other types of ultraviolet radiation?

	wavelength	**frequency**
A	shortest	lowest
B	shortest	highest
C	longest	highest
D	longest	lowest

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26. In the diagram below, the width of each arrow represents how much UV radiation penetrates the Earth's atmosphere and oceans.



Some students discuss the diagram.
One of them makes an incorrect statement.

UVC does not reach the Earth's surface.

Aisha

Some UVB is absorbed in the stratosphere, but it still penetrates deep into the atmosphere.

Ben

You cannot get overexposed to UVA if you are covered in water.

Carl

The higher you are, the greater the danger from UV radiation.

Dean

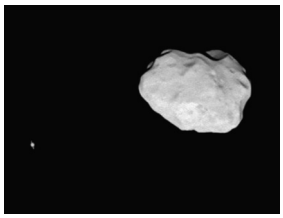
Who has **not** made a correct statement?

A Aisha
B Ben
C Carl
D Dean

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Space exploration

This photograph was taken by the Rosetta spacecraft as it flew past an asteroid.

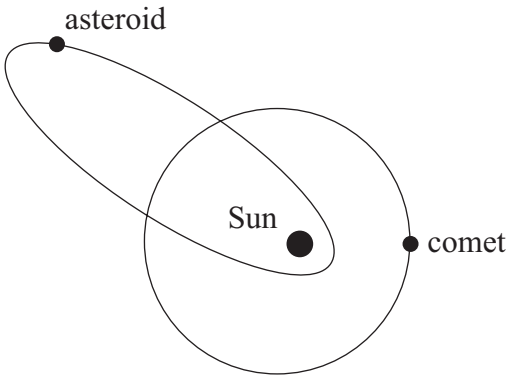


The Rosetta spacecraft is designed to land on a comet and collect data about how the Solar System was formed.

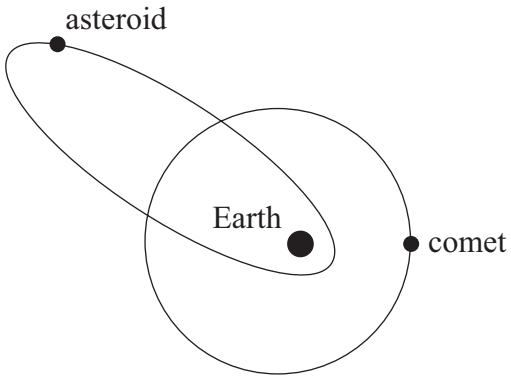
27. Which of these statements is correct?

A data from the comet will prove how the Solar System was formed
B scientists have already proved how the Solar System was formed
C scientists will soon prove how the Solar System was formed
D scientists are not sure how the Solar System was formed

28. Which of these correctly shows the orbit of an asteroid and a comet?

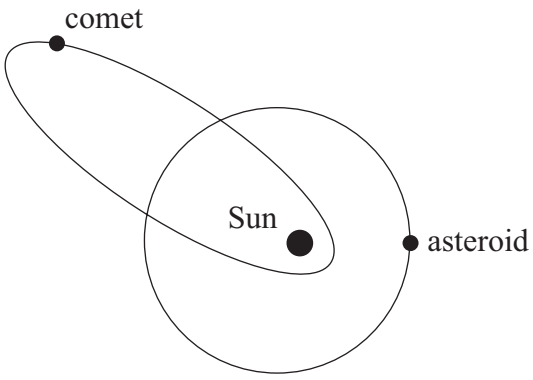


A

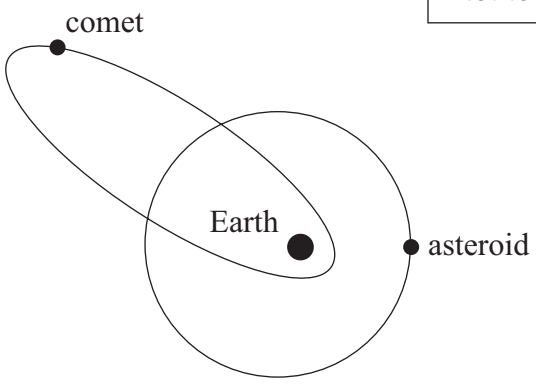


B

Not to scale



C

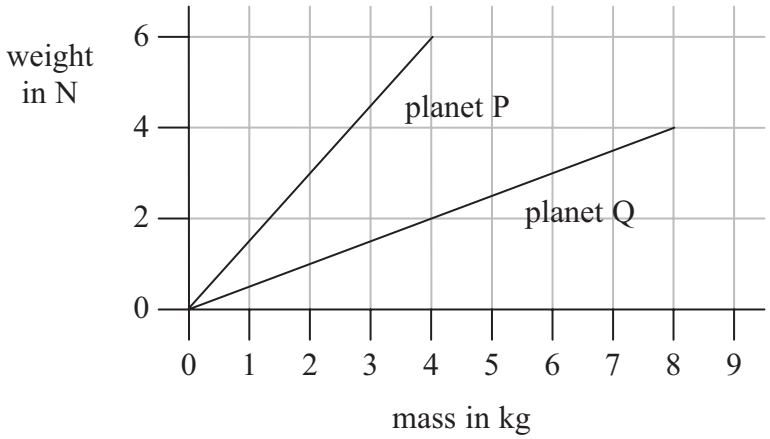


D

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Gravitational field strength

The graph shows the relationship between weight and mass on two planets, **P** and **Q**.



29. An object has a weight of 3 N on planet **P**.
What is the weight of the object on planet **Q**?

A 1 N
B 2 N
C 4 N
D 6 N

30.

weight = mass × gravitational field strength	$W = mg$

The gravitational field strength for planet **Q** is

A 32 N/kg
B 2 N/kg
C 1.5 N/kg
D 0.5 N/kg

Space and rockets

31. Which row of the table is correct for a black hole?

	gravitational field strength	**amount of light escaping from a black hole**
A	very high	very high
B	zero	very high
C	zero	zero
D	very high	zero

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32. Which of these gives the correct order for stages in the life cycle of a star like our Sun?

A main sequence → protostar → black dwarf → red giant → white dwarf
B protostar → red giant → main sequence → white dwarf → black dwarf
C protostar → main sequence → red giant → white dwarf → black dwarf
D protostar → main sequence → red giant → black dwarf → white dwarf

Use this information to answer questions 33 and 34.

A spacecraft is between the Earth and the Moon.
Its rocket engine starts up.

33. Which row of the table will give the biggest reaction force on the rocket engine?

	energy per second from burning fuel	**speed of hot gases leaving the rocket engine**
A	high	high
B	high	low
C	low	high
D	low	low

34.

force = mass × acceleration

The resultant force on the spacecraft is 1000 N.
The mass of the spacecraft is 2000 kg.

What is the acceleration of the spacecraft?

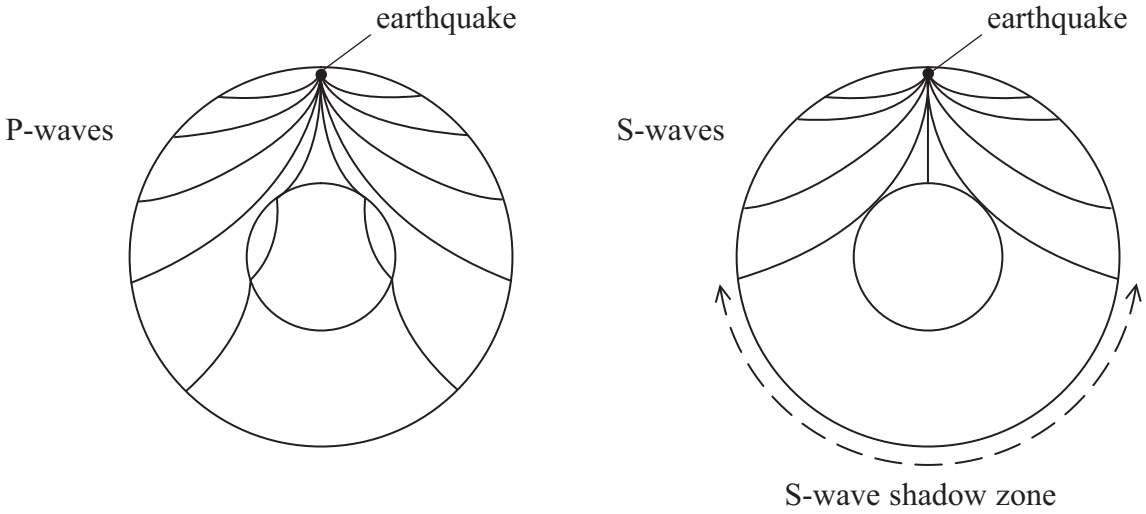
A 0.5 m/s^2
B 2 m/s^2
C 5 m/s^2
D 2 000 000 m/s^2

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Earthquakes and seismic waves

Use this information to answer Questions 35 and 36.

The diagram shows the paths through the Earth of P-waves and S-waves after an earthquake.



35. Many of the paths are curved.
This is because

A the density of the Earth changes
B seismic waves are transverse
C tectonic plates are moving
D the Earth's core is liquid

36. On the opposite side of the Earth to the earthquake

- P-waves from the earthquake can be detected
- S-waves from the earthquake can **not** be detected

The accepted explanation for these observations is that

A the centre of the Earth is filled with water
B the centre of the Earth is metallic
C there is a layer of gas deep in the Earth
D there is a layer of liquid deep in the Earth

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37.

speed = distance ÷ time

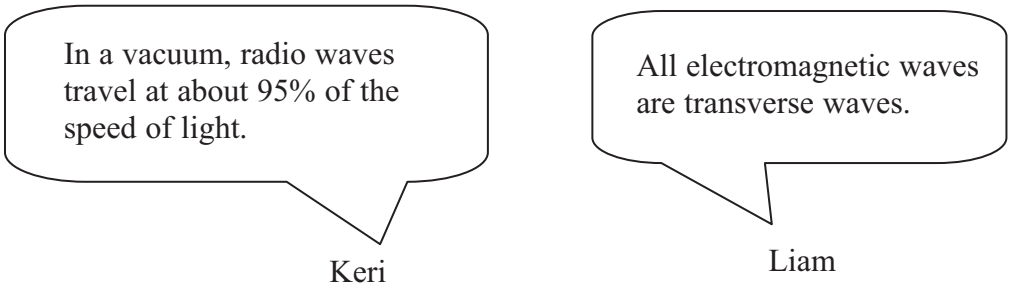
An explosion on the Earth's surface produces seismic waves.
One of these waves has an average speed of 8 km/s.
The wave is reflected from a depth of 8000 m.

The time between the explosion and when the reflected wave first reaches the surface is

A 2000 s
B 1000 s
C 2 s
D 1 s

Electromagnetic waves

38. Two students discuss electromagnetic waves.



Who is correct?

A Keri only
B Liam only
C both Keri and Liam
D neither

39. Some samples of living cells are exposed to four different X-rays for the same length of time.
For which row of the table will the X-rays cause most damage to living cells?

	wavelength of X-rays	energy of X-rays
A	shortest	2 mJ
B	longest	2 mJ
C	shortest	2 J
D	longest	2 J

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40.

speed = frequency × wavelength

An X-ray has a speed of 3×10^8 m/s.
The frequency of the X-ray is 6×10^{16} Hz.
What is the wavelength of the X-ray?

A 5×10^{-33} m
B 5×10^{-9} m
C 2×10^{8} m
D 2×10^{24} m

TOTAL FOR HIGHER TIER PAPER: 24 MARKS

END

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Mark Scheme (Results)

November 2011

360Science

GCSE Science
Multiple Choice Paper P1b (5010)

GCSE Physics
Multiple Choice Paper P1b (5046)

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5010 & 5046 (P1b) Mark Scheme
November 2011

Unit P1b – 5010/5046	
Topics 1 & 2	
1	C
2	C
3	B
4	B
5	C
6	D
7	A
8	A
9	C
10	D
11	C
12	C
13	A
14	D
15	D
16	A

Unit P1b – 5010/5046	
Topics 1 & 2	
17	A
18	B
19	A
20	D
21	B
22	C
23	B
24	A

Unit P1b – 5010/5046	
Topics 1 & 2	
25	D
26	C
27	D
28	C
29	A
30	D
31	D
32	C
33	A
34	A
35	A
36	D
37	C
38	B
39	C
40	B

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Science (5010)

Physics (5046)

P1b – Topics 11 and 12

Foundation and Higher Tier

Friday 17 June 2011 – Afternoon

Time: 20 minutes

Materials required for examination
Multiple Choice Answer Sheet
HB pencil, eraser and calculator

Items included with question papers
Nil

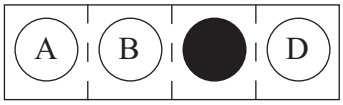
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For example, the answer C would be marked as shown.



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

Waves in hospitals

1. A doctor does an ultrasound scan of a patient's eye.
Ultrasound waves are

A seismic
B transverse
C longitudinal
D electromagnetic

Use this information to answer questions 2 and 3.

Scientists have designed a machine to detect people who have a higher temperature than normal. The machine scans people as they walk past.

2. The waves used to scan for a high temperature are

A microwaves
B infrared waves
C ultrasound waves
D ultraviolet waves

3. The machine scans by

A refraction
B absorption
C reflection
D emission

4. A type of wave used for treating cancer is

A infrared waves
B ultraviolet waves
C gamma waves
D microwaves

5. X-rays are used to scan for broken bones.
This is scanning by

A absorption
B refraction
C emission
D reflection

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6. Ultrasound waves are better than X-rays for scanning a fetus because X-rays

A can damage cells
B travel more slowly
C have lower frequency
D have a longer wavelength

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The Solar System

7. Which row of the table describes the orbits of an asteroid and a comet?

	an asteroid	a comet
A	orbits the Earth	orbits the Earth
B	orbits the Sun	orbits the Earth
C	orbits the Earth	orbits the Sun
D	orbits the Sun	orbits the Sun

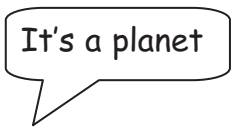
8. There is an object in space between Earth and Mars.
Which of these is the same for the object there as it is on Earth?

A atmospheric pressure
B temperature
C weight
D mass

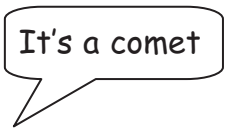
9. Our Sun is evolving.
It will next become

A a white giant
B a red giant
C a blue dwarf
D a black dwarf

10. John and Anne look at the same object in the sky.



John



Anne

Which row of the table is **not** possible?

	John	Anne
A	correct	correct
B	incorrect	correct
C	correct	incorrect
D	incorrect	incorrect

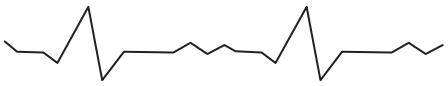
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In and out: on and off

11. A dog has been given genes which make it glow.
This is called fluorescence.
Which row of the table is correct for fluorescence?

	radiation taken in	radiation given out
A	ultraviolet	visible
B	ultraviolet	infrared
C	infrared	visible
D	visible	infrared

12. Which of these is a digital signal?



A



B



C



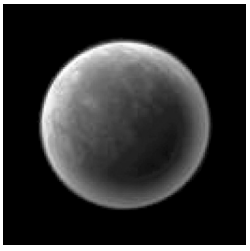
D

Galaxies

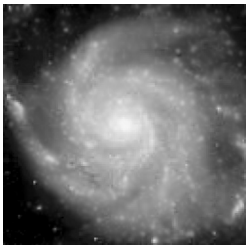
13. Our galaxy is called

A the Solar System
B the Milky Way
C the Universe
D the asteroid belt

14. Which of these shows a galaxy?



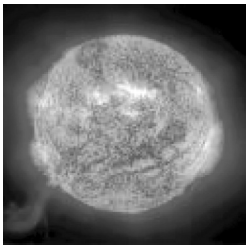
A



B



C



D

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Use this information to help you answer questions 15 and 16.

Some astronomers ask non-astronomers to help them classify galaxies.
For each galaxy in turn, the astronomers

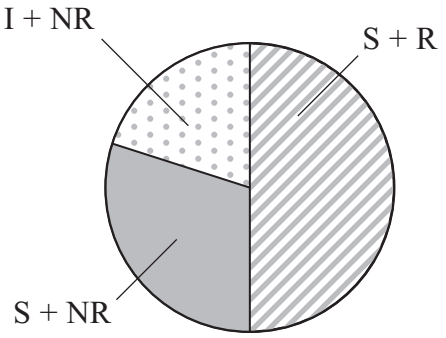
- show many people a photograph of it
- ask many people some questions about it
- analyse all the answers

15. Here are the results for one galaxy

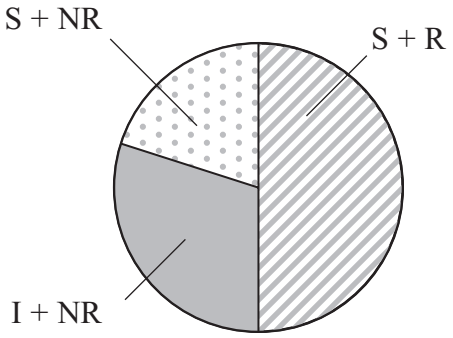
- 50% thought it was smooth and rounded
- 30% thought it was irregular and not rounded
- 20% thought it was smooth and not rounded

Which of these pie charts correctly shows these data?

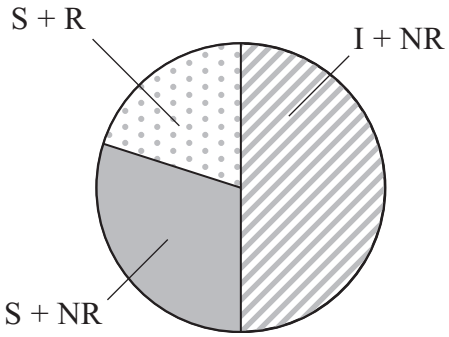
key
S + R = smooth and rounded
I + NR = irregular and not rounded
S + NR = smooth and not rounded



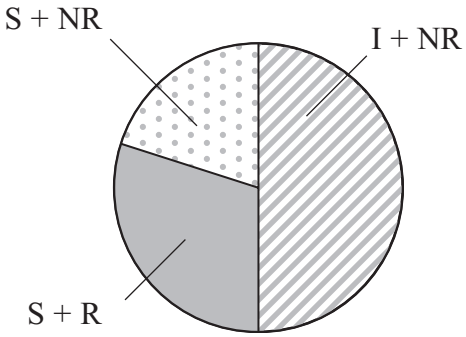
A



B



C



D

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16. Here are descriptions of some types of galaxies.



rounded



oval-shaped

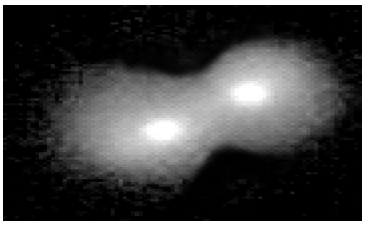


smooth

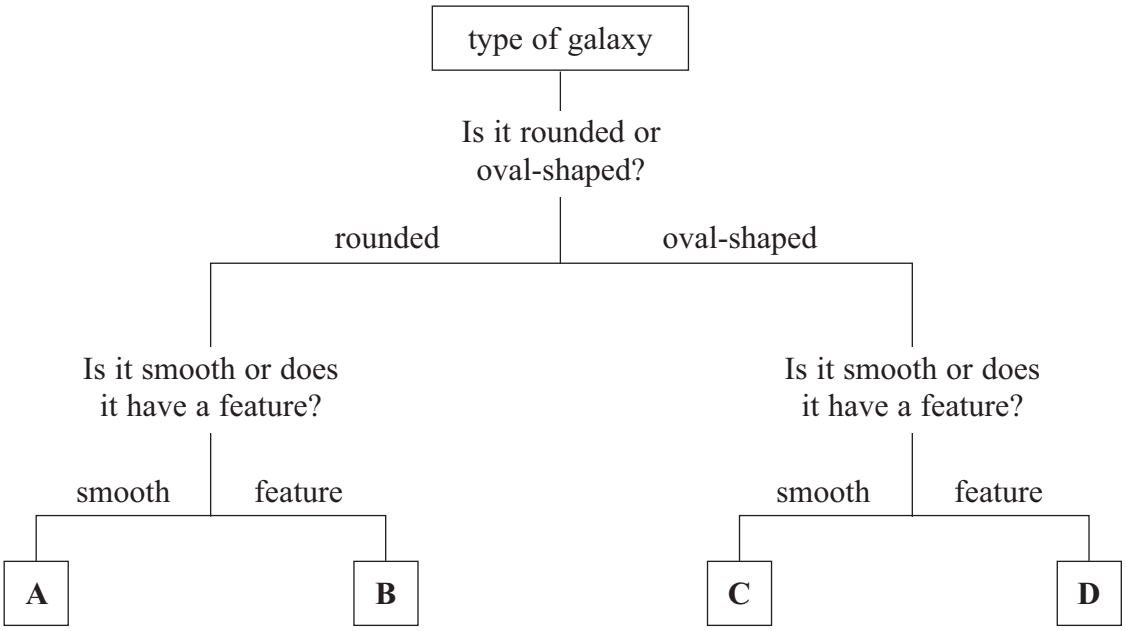


has a feature

John saw the photograph below of a single galaxy.



Identify this galaxy using the above descriptions and the key below.
Which type of galaxy is it?



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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

Waves in action

17. One result of typing the slogan **'5 a day'** into an Internet search engine is

$$5 \text{ a day} = 5.78703704 \times 10^{-5} \text{ hertz}$$

This treats the slogan as

A a wavelength
B an amplitude
C a frequency
D a speed

18. Which of these is **not** used to collect data from stars?

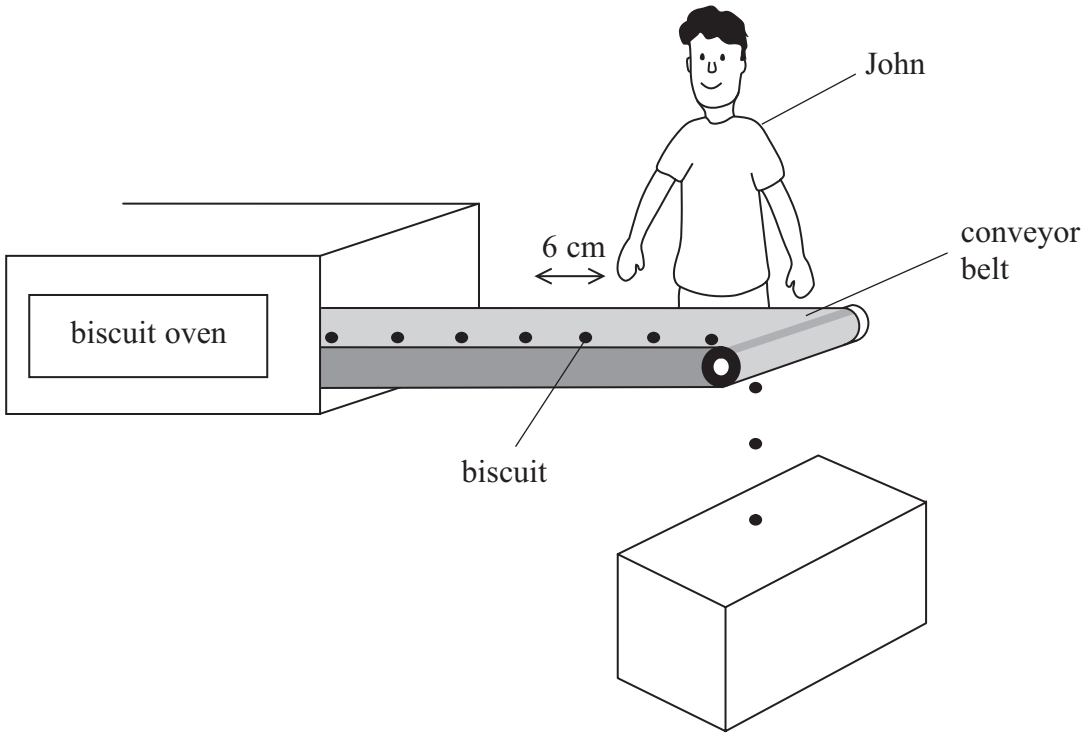
A visible light waves
B infrared waves
C ultraviolet waves
D ultrasound waves

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19.

speed = frequency × wavelength

The diagram shows biscuits coming out of an oven on a conveyor belt.
The biscuits are 6 cm apart.



John finds that five biscuits pass him every 10 seconds.
The speed at which the biscuits are moving is

A $\frac{5\times6}{10}$ cm/s

B $\frac{6\times10}{5}$ cm/s

C $\frac{10}{5\times6}$ cm/s

D $5 \times 6 \times 10$ cm/s

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Orion

Use this information to help you answer questions 20 to 22.

The table shows some data about stars found in the constellation Orion.

star	diameter (number of times bigger than Sun)	colour	distance from Earth (light years)	brightness (number of times brighter than the Sun)
Alnilam	26	blue	1300	375 000
Bellatrix	5.7	blue	240	4 000
Betelgeuse	936	red	640	135 000
Rigel	78	blue	773	40 000

20. Astrologers think these stars are in a close group.
Which of the following indicates that the stars do **not** form a close group?

A the diameters
B the colours
C the distances from Earth
D the brightnesses

21. Imagine that

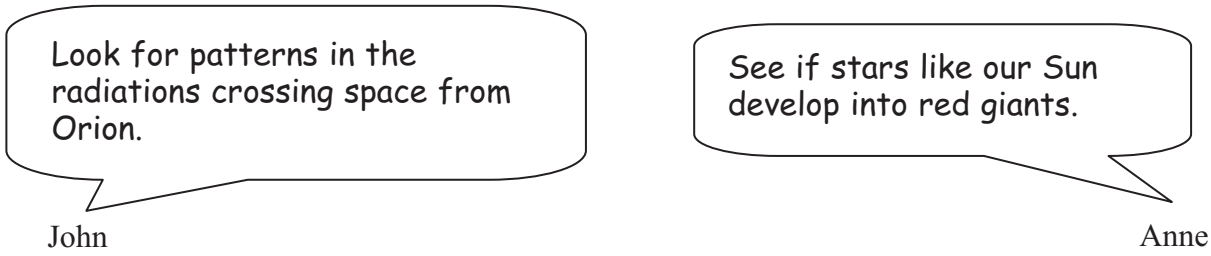
- Alnilam emits an X-ray signal
- Bellatrix emits a microwave signal
- Betelgeuse emits an infrared signal
- Rigel emits a visible signal

The signals are all emitted at the same time.
From which star will the signal arrive first at a space telescope near the Earth?

A Alnilam
B Bellatrix
C Betelgeuse
D Rigel

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22. John and Anne discuss ways of finding out if there is any intelligent life in the constellation Orion.



John Anne

Whose idea might be suitable?

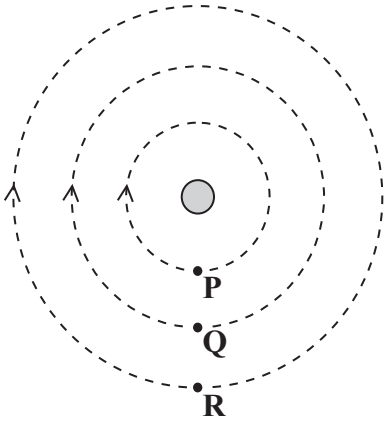
A John only
B Anne only
C both John and Anne
D neither

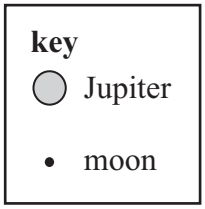
23. Imagine you are the same distance from some astronomical objects.
Which of these would have the biggest gravitational pull on you?

A a black dwarf
B a black hole
C a red giant
D a main sequence star

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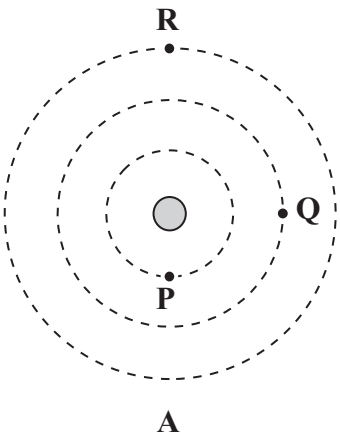
24. The diagram shows Jupiter and three of its moons.
The moons **P**, **Q** and **R** all orbit clockwise around the planet.



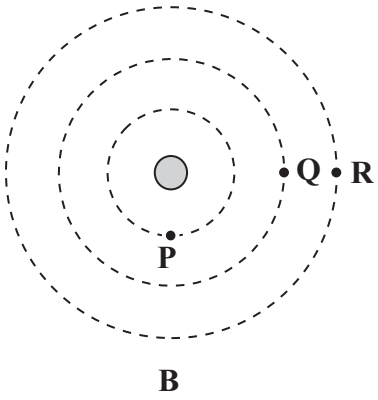


Not to Scale

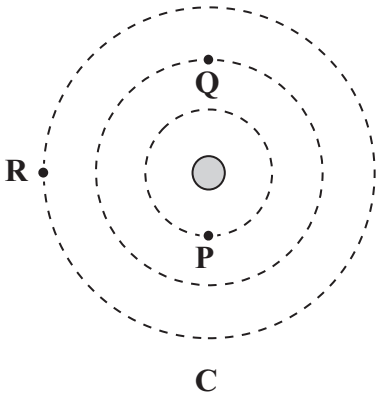
Q takes twice as long to complete an orbit as **P**.
R takes twice as long to complete an orbit as **Q**.
Which of these diagrams shows the positions of the moons after **P** has made three orbits?



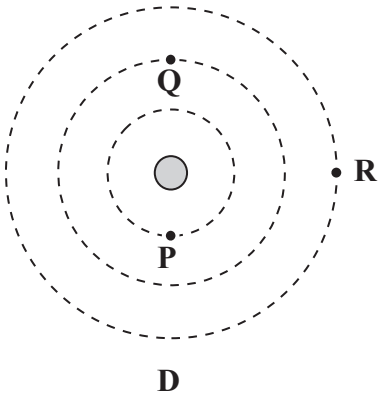
A



B



C



D

TOTAL FOR FOUNDATION TIER PAPER: 24 MARKS

Foundation tier candidates do not answer any more questions after question 24.

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Questions 25 to 40 must be answered by Higher tier candidates only.
Foundation tier candidates do not answer questions 25 to 40.

Gravity and rockets

25. The force of gravity on the surface of an asteroid is

A zero
B less than on the surface of Earth
C the same as on the surface of Earth
D more than on the surface of Earth

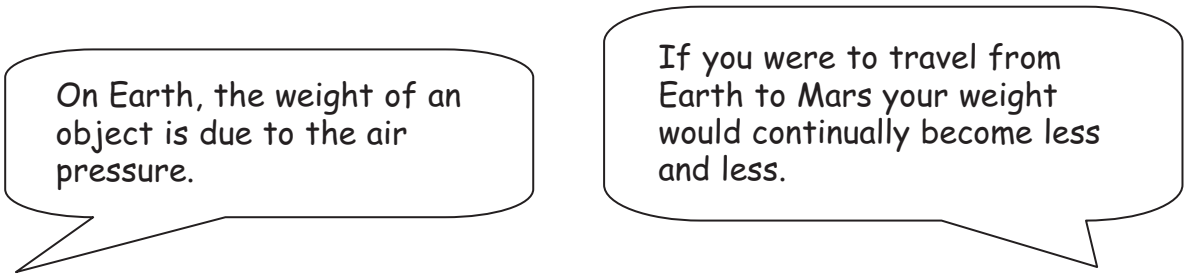
26.

weight = mass × gravitational field strength

On a moon, the gravitational field strength is 8 N/kg.
The weight of a 500 g mass on this moon is

A 0.016 N
B 4 N
C 62.5 N
D 4000 N

27. John and Anne discuss weight.



John Anne

Who is correct?

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

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28. John sets off a firework rocket.
As it rises in the air, it accelerates.
The acceleration is due to the reaction from

A sound energy
B light energy
C the Earth
D hot gases

29.

force = mass × acceleration

When the mass of the rocket is 0.05 kg, the force on it is 0.1 N.
What is its acceleration?

A 2000 m/s^2
B 2 m/s^2
C 0.005 m/s^2
D 0.002 m/s^2

Seismic events

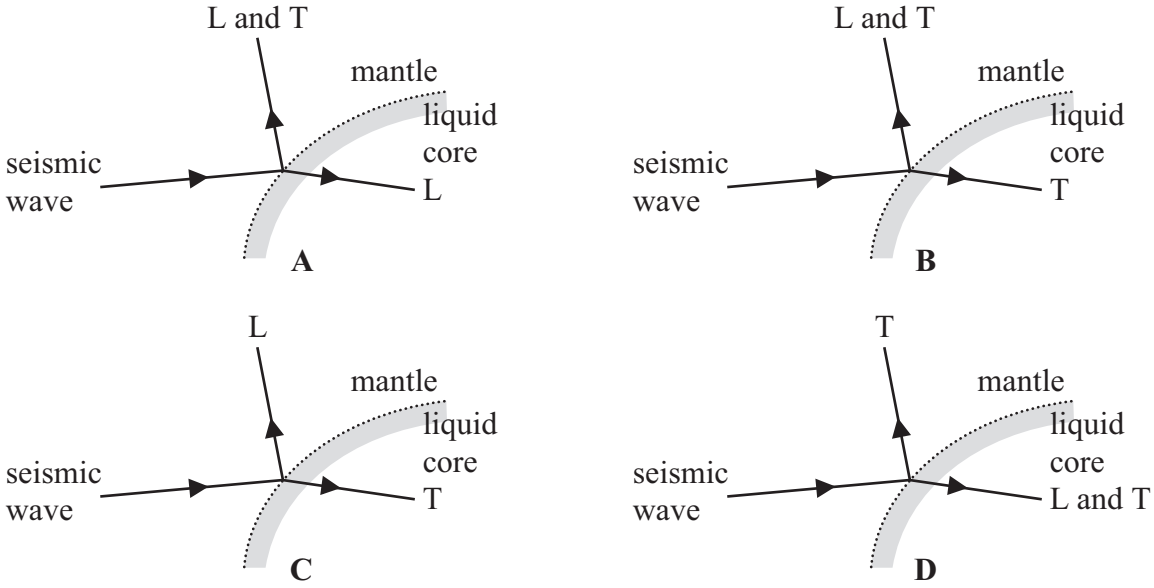
30. Seismic waves follow curved paths as they travel through the Earth because

A they are reflected at the different layers
B chunks of solid rock get in their way
C their speed changes with depth
D they are longitudinal

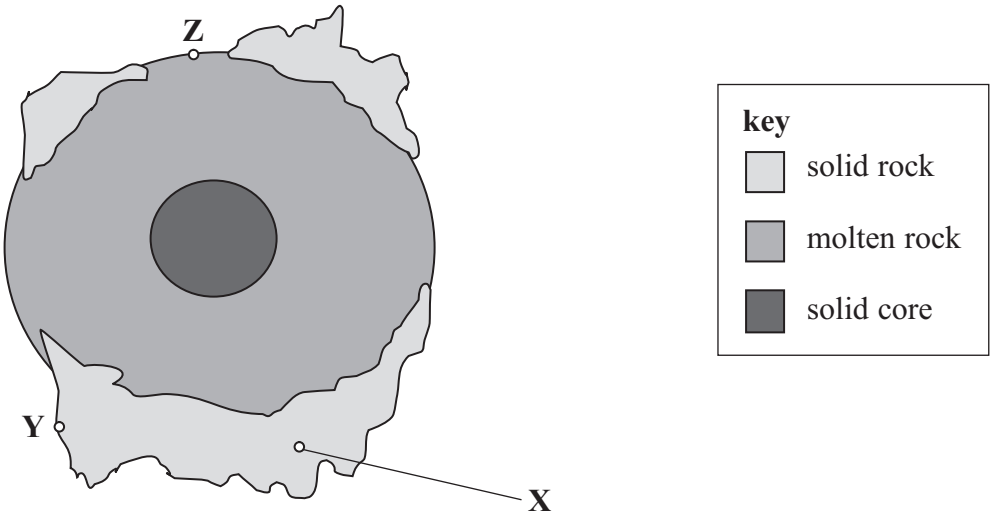
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31. Which of these diagrams correctly shows the seismic waves just before and just after striking the boundary between mantle and liquid core?

key
L – longitudinal waves
T – transverse waves



32. A science fiction book describes a planet where continents of solid rock float on molten rock.



Imagine that a seismic event (like an earthquake) occurs at point **X** on the planet.
Which row of the table is correct for the waves arriving at **Y** and at **Z**?

	waves arriving at Y are	waves arriving at Z are
A	longitudinal and transverse	longitudinal only
B	longitudinal and transverse	transverse only
C	transverse only	longitudinal only
D	longitudinal only	transverse only

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Using ultrasounds

Use this information to help you answer questions 33 and 34.

speed = frequency × wavelength

speed = distance / time

The speed of sound in air is 330 m/s.

John uses an ultrasonic device to find the length of a room.
The device contains an ultrasonic source and detector.
It is held touching one wall and is aimed at the other.
The signal travels from source to wall and back to detector in 0.036 s.
The device uses an ultrasound of frequency 30 kHz.

33. How long is the room?

A 2.97 m
B 5.94 m
C 11.88 m
D 23.76 m

34. What is the wavelength of the ultrasound the device uses?

A 0.011 m
B 0.99 m
C 11 m
D 99 m

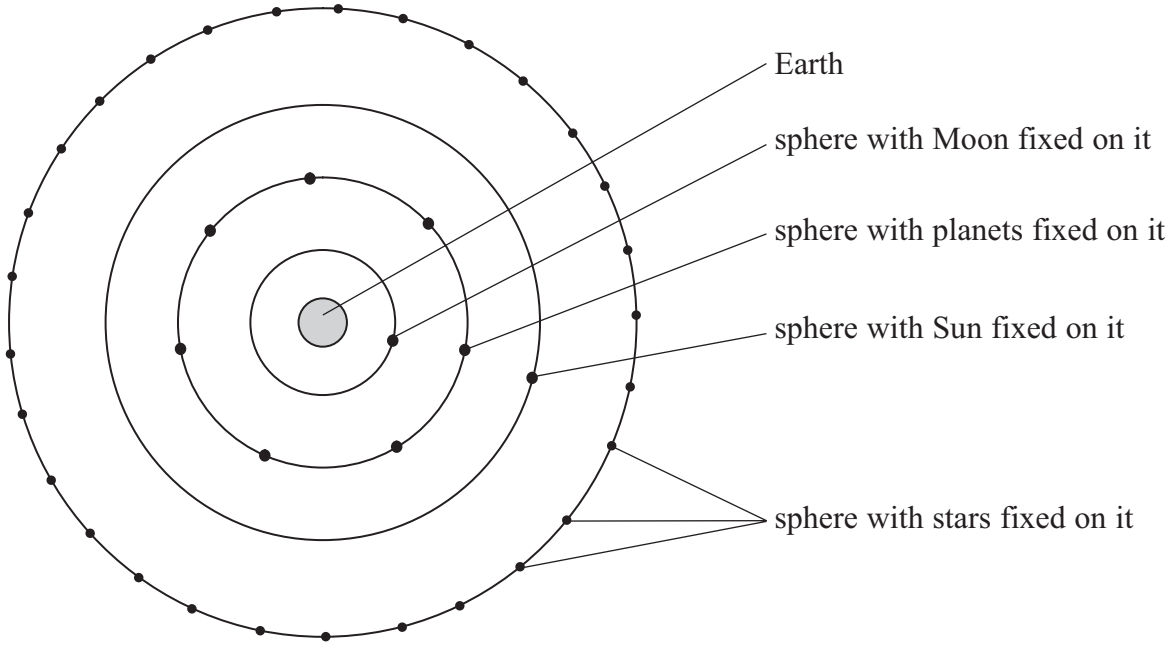
35. John hears a dog barking.
The sound waves from the dog are

A analogue only
B digital only
C both analogue and digital
D neither

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Modelling the Universe

Many years ago, a man called Aristotle thought of a model of the Universe.
The Earth was at the centre of several transparent spheres.



On this model,

- the Sun, Moon and planets are fixed on rotating spheres
- the stars are on a fixed sphere outside

36. The real planets move at different speeds to each other.
The model could be changed to allow for this by

A making the sphere with the planets rotate at different speeds
B letting the planets move around within an oval-shaped orbit
C moving the sphere with the planets to a greater distance from Earth
D giving each planet its own sphere at a different distance from Earth

37. Aristotle did **not** include neutron stars in his model because

A they are not charged
B he thought they were not proper stars
C they have only recently been identified
D they have a greater gravitational field than black holes

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38. Which of these provides experimental evidence to disprove Aristotle's model?

A eclipses
B black holes
C the Big Bang
D red shift

Electromagnetic waves in action

39. Which row of the table gives the conditions for greatest potential danger from electromagnetic waves?

	wavelength	**amplitude**
A	longest	largest
B	longest	smallest
C	shortest	largest
D	shortest	smallest

40. John looked at the display screen of his calculator through a pair of sunglasses.



He then turned his head.



He could not now see the numbers.
He read that a similar effect happened with ultraviolet and infrared but not with ultrasound radiations.
He correctly predicted that it happened with one type of wave only.

The type of wave is likely to be

A digital
B analogue
C longitudinal
D transverse

TOTAL FOR HIGHER TIER PAPER: 24 MARKS

END

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Mark Scheme (Results)

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360Science

GCSE Science
Multiple Choice Paper P1b (5010)

GCSE Physics
Multiple Choice Paper P1b (5046)

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5010 & 5048 (P1b) Mark Scheme
June 2011

Unit P1b - 5010	
Topics 11 & 12	
1	C
2	B
3	D
4	C
5	A
6	A
7	D
8	D
9	B
10	A
11	A
12	C
13	B
14	B
15	B
16	D

Unit P1b - 5010	
Topics 11 & 12	
17	C
18	D
19	A
20	C
21	B
22	A
23	B
24	D

Unit P1b - 5010	
Topics 11 & 12	
25	B
26	B
27	D
28	D
29	B
30	C
31	A
32	A
33	B
34	A
35	A
36	D
37	C
38	D
39	C
40	D

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Edexcel GCSE

Science (5010)

Physics (5046)

P1b – Topics 11 and 12

Foundation and Higher Tier

Friday 4 March 2011 – Morning

Time: 20 minutes

Materials required for examination
Multiple Choice Answer Sheet
HB pencil, eraser and calculator

Items included with question papers
Nil

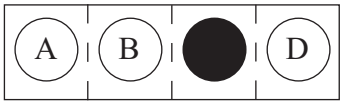
Instructions to Candidates

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

Stars, planets and moons

1. From the Earth, the Sun and the Moon look about the same size.
This is because the

A Sun is further away than the Moon
B Sun is nearer than the Moon
C Sun and the Moon are the same distance away
D Sun is hotter than the Moon

2. Which of these lists the objects in the correct order of size?

	smallest ⟶		**largest**
A	Sun	Moon	Earth
B	Sun	Earth	Moon
C	Moon	Earth	Sun
D	Moon	Sun	Earth

3. Stars are formed

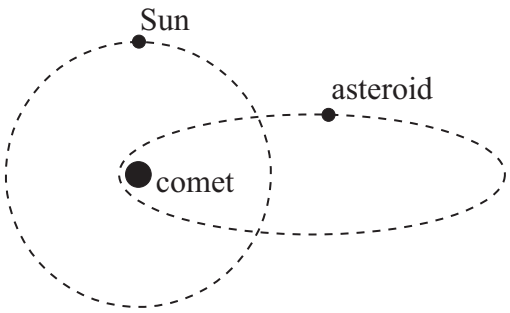
A when galaxies collapse
B from the tails of comets
C from clouds of gas and dust
D when solar systems collapse

4. Which row of the table is correct for a 2 kg object?

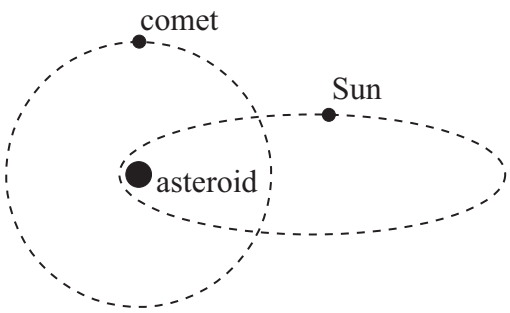
	mass of object on Moon (kg)	**mass of object on Mars (kg)**
A	2	2
B	2	0
C	0	2
D	0	0

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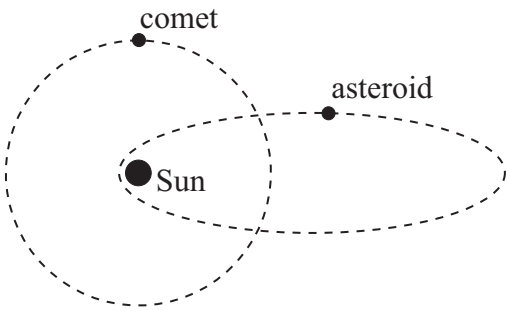
5. Which of these shows two correct orbits?



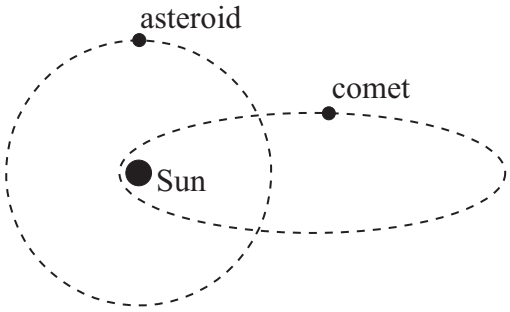
A



B



C



D

6. Our Sun is likely to end its life as

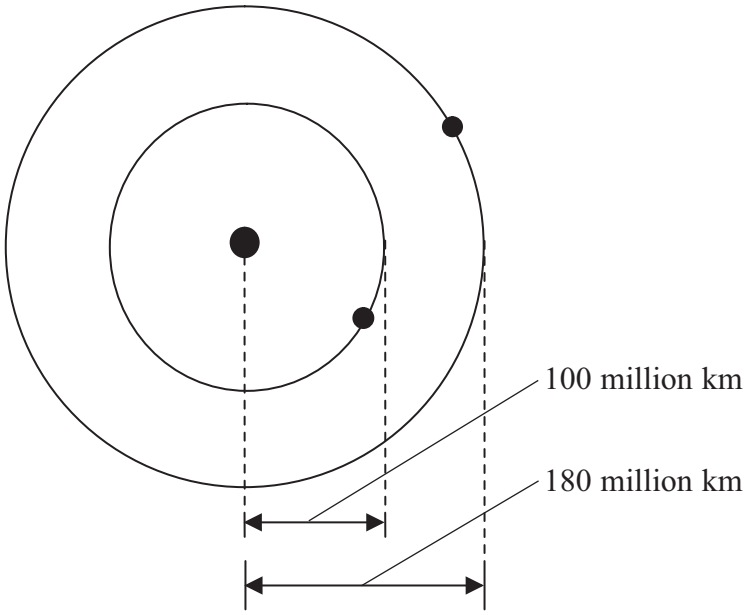
A a black hole
B a neutron star
C a black dwarf
D a nebula

7. Which of these questions has an answer that has been proved correct?

A Is there life on planets other than Earth?
B Can a plant grow on Mars?
C Can a person survive on the Moon?
D Are there red rocks on Jupiter?

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8. Two planets are in orbit around a star.
The radius of each orbit is marked on the diagram.



The smallest distance apart of the two planets as they orbit will be

A 80 million km
B 100 million km
C 180 million km
D 280 million km

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In the hospital

9. Which of these is used in hospitals to scan by absorption?

A seismic waves
B ultrasound waves
C X-rays
D radio waves

10. Some thermometers detect radiation coming from a patient's body. This process is

A scanning by reflection
B scanning by refraction
C scanning by absorption
D scanning by emission

11. Which of these can be used to measure the temperature of a patient?

A microwaves
B infrared waves
C ultraviolet waves
D X-rays

12. Which of these can cause mutation of cells **deep** in the body?

A radio waves
B gamma waves
C microwaves
D ultraviolet waves

13. In optical fibres, light is

A totally externally refracted
B totally internally refracted
C totally externally reflected
D totally internally reflected

14. When a fetus is scanned, the image is usually produced because body tissue

A reflects X-rays
B reflects ultrasound
C emits X-rays
D emits ultrasound

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15. Some devices in hospitals use digital signals.
Which of these represents a digital signal?



A



B



C



D

16. X-rays are produced in hospitals and X-rays also come from stars.
Hospital staff must be shielded from the X-rays produced in hospitals.
Nobody on Earth needs to be shielded from the X-rays that come from stars.

This is because, compared to X-rays from stars, X-rays of the same frequency produced in hospitals

A travel faster
B have longer wavelength
C have shorter wavelength
D are received in greater amounts

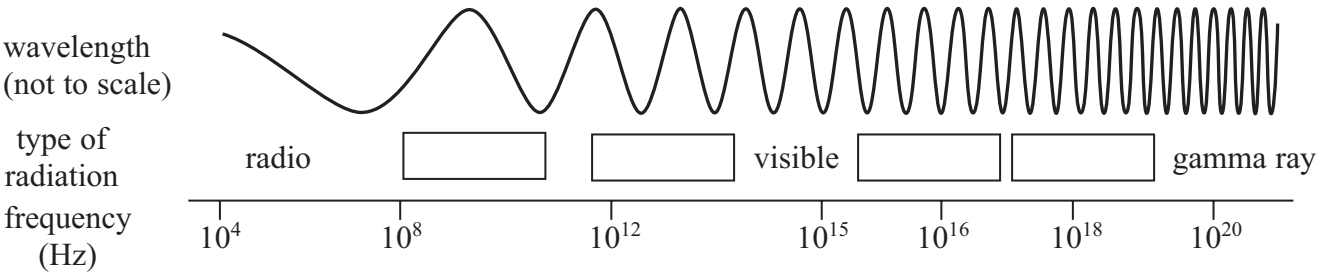
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Higher tier candidates start at question 17 and answer questions 17 to 40.
Questions 17 to 24 must be answered by all candidates: Foundation tier and Higher tier.

Infrared radiation

Use this information to answer questions 17 and 18.

The chart below gives information about seven parts of the electromagnetic spectrum.
Only three parts have been named.



17. Which of these is shown by the chart?

A as the wavelength becomes shorter, the frequency becomes higher
B as the wavelength becomes shorter, the frequency becomes lower
C as the frequency becomes higher, the wave speed becomes higher
D as the frequency becomes higher, the wave speed becomes lower

18. Which of these is a frequency for infrared radiation?

A 10^8 Hz
B 10^{12} Hz
C 10^{16} Hz
D 10^{18} Hz

19. Which of these is caused by too much infrared radiation?

A skin burns
B skin cancer
C mutation
D lung cancer

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The Herschel space telescope

Use this information to answer questions 20 to 24

The Herschel space telescope was sent into orbit in 2009.

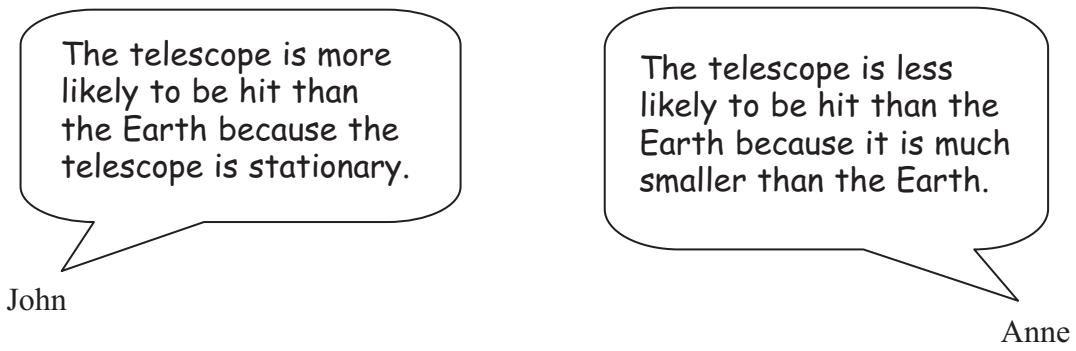


The telescope collects infrared light to investigate the Universe.

20. This telescope produces images of stars using

A scanning by emission
B scanning by reflection
C scanning by refraction
D scanning by transmission

21. John and Anne discuss the possibility of a comet hitting the telescope.



Who is correct?

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

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22.

weight = mass × gravitational field strength

The telescope has a mass of 350 kg.
The gravitational field strength on the Earth is 10 N/kg.
What was the weight of the telescope on Earth?

A 0.029 N
B 0.29 N
C 35.0 N
D 3500 N

23.

force = mass × acceleration

In space, the telescope accelerates at 5 m/s^2.
The telescope has a mass of 350 kg.
What is the size of the force accelerating the telescope?

A 70 N
B 70 kg
C 1750 N
D 1750 kg

24. A small rocket engine is used to accelerate the telescope.
It accelerates because

A the Earth pushes on hot gases
B hot gases push on the Earth
C hot gases push on the vacuum of space
D hot gases push on the rocket engine

TOTAL FOR FOUNDATION TIER PAPER: 24 MARKS

Foundation tier candidates do not answer any more questions after question 24.

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Questions 25 to 40 must be answered by Higher tier candidates only.
Foundation tier candidates do not answer questions 25 to 40.

Darkness and intelligence

25. Black holes

A give objects mass
B emit only black light
C have weight but no mass
D have a large gravitational field strength

26. Which of these statements is correct?

A scientists do not know what dark matter is
B scientists know that dark matter does not exist
C scientists have always known what dark matter is
D scientists have recently found out what dark matter is

27. Which of these describes SETI?

A SETI sends satellites to orbit other planets
B SETI sends probes to land on other planets
C SETI looks for patterns of stars in space
D SETI looks for patterns in waves from space

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Tsunamis, earthquakes and waves

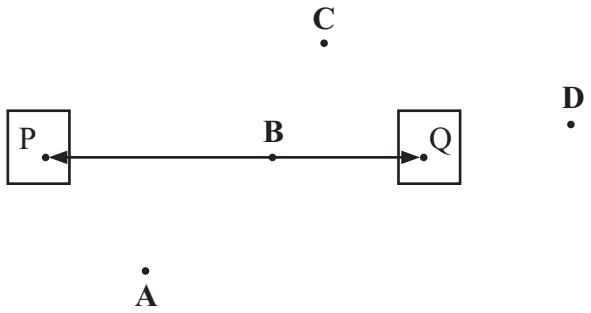
28. One reason why tsunamis are difficult to predict is that

A they cause volcanoes
B they create earthquakes
C there is not enough data about the Earth's crust
D much of the Earth's surface is covered in water

29. The Earth's crust and mantle are solid.
Its core contains liquid.
Which row of the table is correct for these parts of the Earth?

	longitudinal waves can pass through	**transverse waves can pass through**
A	crust and mantle	mantle and core
B	mantle and core	crust, mantle and core
C	crust, mantle and core	crust, mantle and core
D	crust, mantle and core	crust and mantle

30. Two earthquake stations, P and Q, detect earthquakes.
The stations are 500 km apart.
An earthquake happened 400 km from P and 200 km from Q.
This diagram is drawn to scale.



Which of the points **A**, **B**, **C** or **D** could be where the earthquake happened?

31.

speed = distance/time

A wave takes 480 s to travel vertically down from the Earth's surface to the core and back again.
Its average speed is 12 km/s.
How far down, in km, is the core?

A 0.0125
B 0.025
C 2880
D 5760

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32. Which of these pairs of waves has the biggest difference in speed?

A microwaves and X-rays
B ultrasound and infrared
C gamma and radio
D visible and ultraviolet

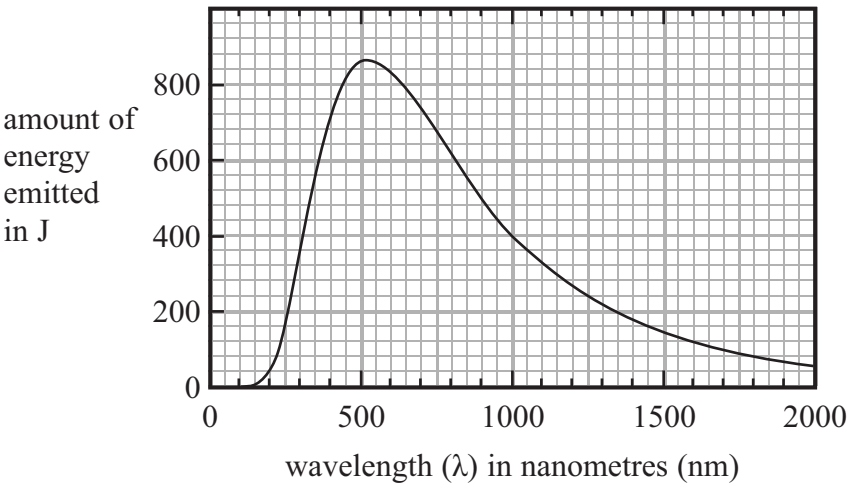
33. Ultraviolet waves are more dangerous if they have a high frequency.
Which row of the table gives the conditions for ultraviolet waves to be most dangerous?

	amount of energy on each cm^2 of skin	**size of wavelength**
A	small	short
B	small	long
C	large	long
D	large	short

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Hot objects

34. The graph shows the amount of energy emitted at different wavelengths from an object at high temperature.



The maximum amount of energy is emitted at about

A 180 nm
B 510 nm
C 870 nm
D 2000 nm

35.

speed = frequency × wavelength

The speed of light is 300 000 000 m/s $(3 \times 10^{8}$ m/s)
1 nm = 1 / 1 000 000 000 m $(1 \times 10^{-9}$ m).

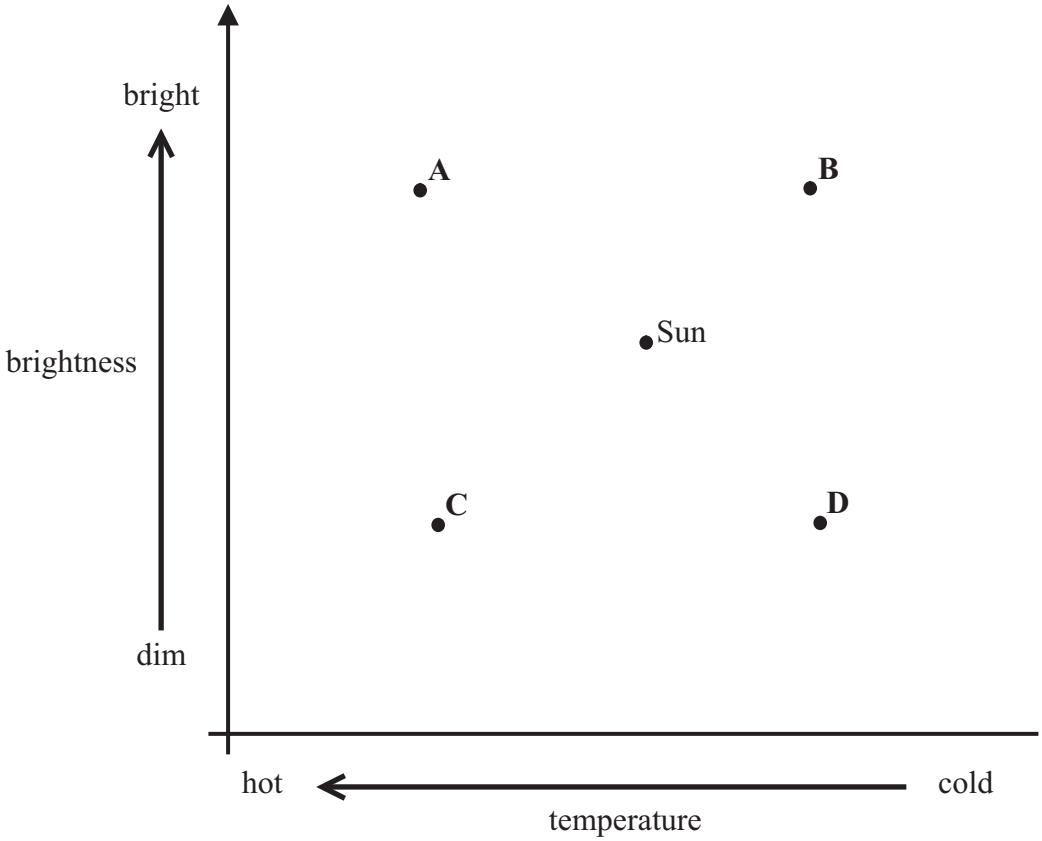
The frequency of electromagnetic radiation corresponding to 1000 nm is

A 0.0003 Hz $(3 \times 10^{-4}$ Hz)
B 0.3 Hz $(3 \times 10^{-1}$ Hz)
C 300 000 000 000 000 Hz $(3 \times 10^{14}$ Hz)
D 300 000 000 000 000 000 Hz $(3 \times 10^{17}$ Hz)

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Star diagrams

36. Astronomers draw diagrams like this to describe stars.
The diagram represents stars in terms of their temperature and brightness.

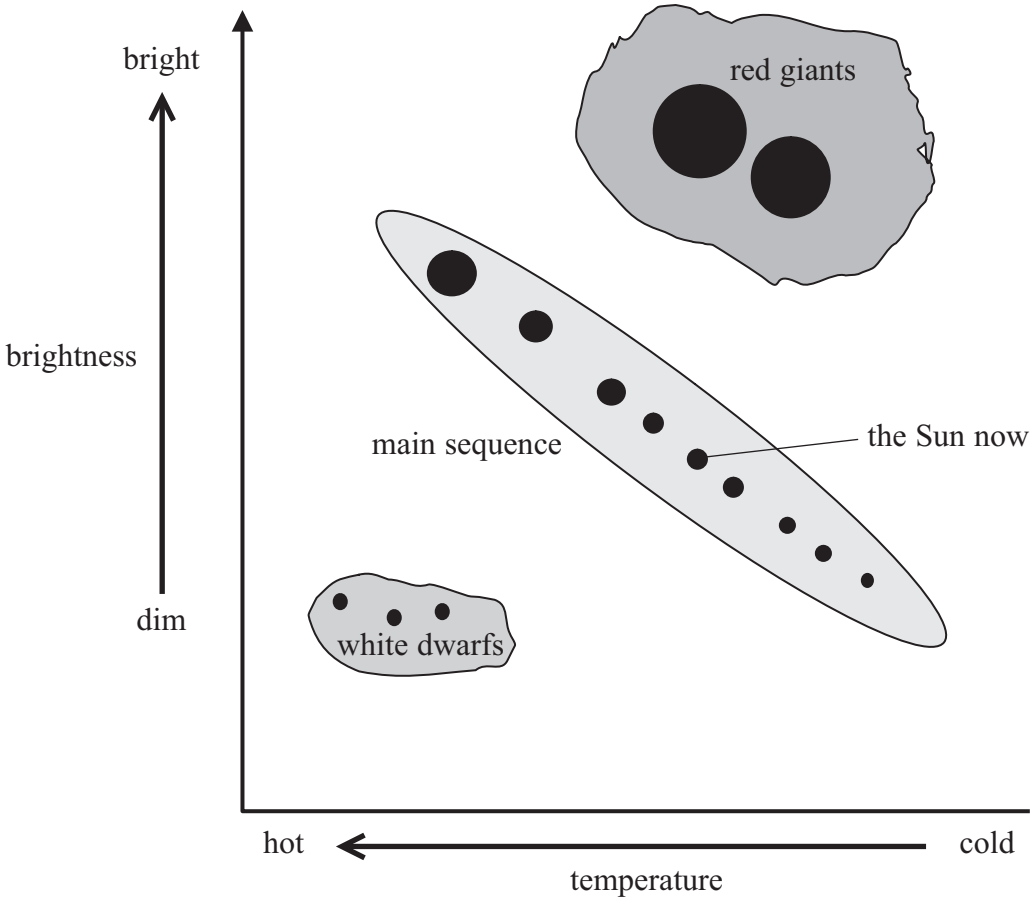


Which star **A**, **B**, **C** or **D** is colder and brighter than the Sun?

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Use this information to answer questions 37 to 40.

The diagram below shows three groups of stars – red giants, main sequence and white dwarfs.
The Sun is an average main sequence star.
The size of the dot on the diagram indicates the relative size of the star only.



37. After the main sequence, the Sun next becomes

A brighter and bigger
B dimmer and bigger
C brighter and smaller
D dimmer and smaller

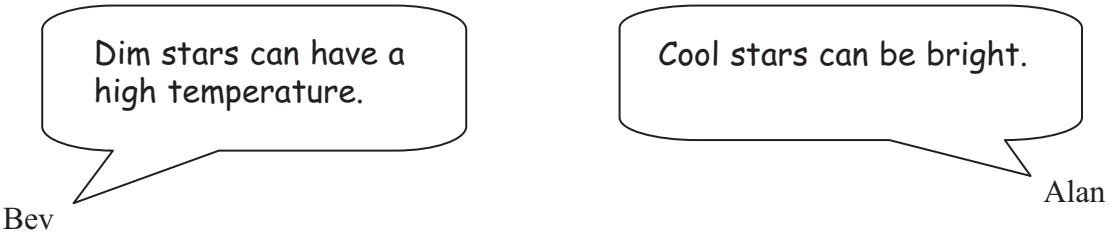
38. After a long time, a white dwarf will evolve towards a black dwarf and should be plotted in a new position.

Which of these arrows shows the direction from the old position to the new position?

A ↗
B ↘
C ↖
D ↙

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39. Bev and Alan discuss the types of stars shown on the diagram.



From the data in the diagram, who is correct?

A Bev only
B Alan only
C both Bev and Alan
D neither

40. From the data in the diagram, which of these is correct for the main sequence stars?

A the hotter they are, the brighter they are
B the hotter they are, the dimmer they are
C the dimmer they are, the bigger they are
D the brighter they are, the smaller they are

TOTAL FOR HIGHER TIER PAPER: 24 MARKS

END

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360Science

GCSE Science
Multiple Choice Paper P1b (5010/01)

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March 2011

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5010 & 5048 (P1b) Mark Scheme

Unit P1b - 5010	
Topics 11 & 12	
1	A
2	C
3	C
4	A
5	D
6	C
7	C
8	A
9	C
10	D
11	B
12	B
13	D
14	B
15	A
16	D

Unit P1b - 5010	
Topics 11 & 12	
17	A
18	B
19	A
20	A
21	B
22	D
23	C
24	D

Unit P1b - 5010	
Topics 11 & 12	
25	D
26	A
27	D
28	C
29	D
30	C
31	C
32	B
33	D
34	B
35	C
36	B
37	A
38	B
39	C
40	A

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Science (5010)

Physics (5046)

P1b – Topics 11 and 12

Foundation and Higher Tier

Friday 12 November 2010 – Afternoon

Time: 20 minutes

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

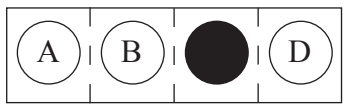
Instructions to Candidates

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.

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

Waves in hospitals

1. This picture shows a broken bone.



Pictures of broken bones are produced using

A X-rays
B ultraviolet waves
C beta rays
D microwaves

2. This picture is a scan of an unborn baby.



The unborn baby is scanned using

A microwaves
B ultrasound waves
C infrared waves
D ultraviolet waves

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3. Gamma rays are used in hospitals to

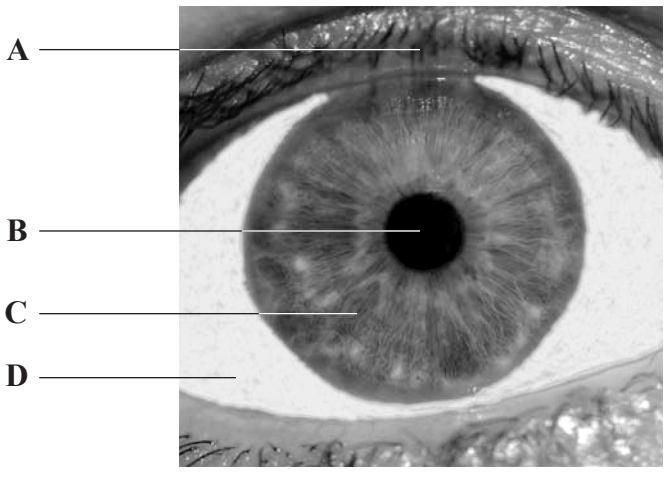
A take temperatures
B repair muscle damage
C heal wounds
D kill cancer cells

Identification

4. The photograph shows a machine used to identify a person.
The machine scans the eye.



Which part at the front of the eye is used for identification?



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5. This bank note has a strip which glows in ultraviolet light.



The strip helps to

A kill bacteria on the note
B make the note last longer
C detect forgeries
D protect people from ultraviolet light

6. Fire-fighters rescue people from smoke filled rooms.
The fire-fighters use thermal imaging cameras to help them.



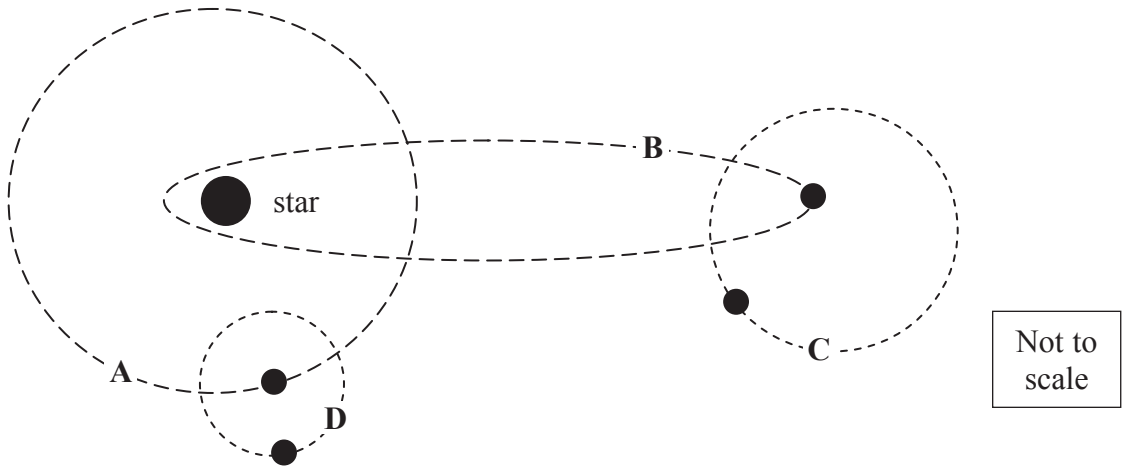
The image in the camera is produced because

A people absorb ultraviolet radiation
B people emit ultraviolet radiation
C people absorb infrared radiation
D people emit infrared radiation

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Stars and planets

7. Which of these shows the orbit of a planet?



8. In its next stage of development, our Sun will change from a main sequence star to

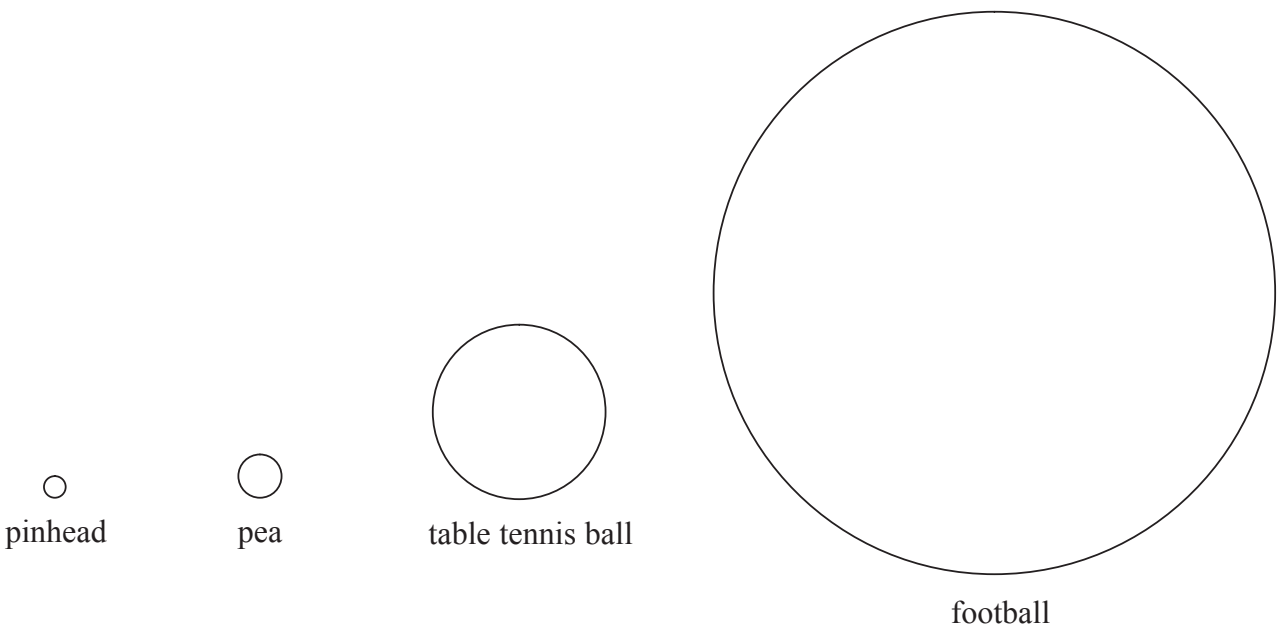
A a white dwarf
B a red dwarf
C a red giant
D a white giant

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9. Some students found this data about the Solar System.

object	diameter (km)
Sun	1 400 000
Mercury	4 900
Earth	13 000
Jupiter	140 000

The students make a scale model of the Sun and these three planets.
They use these objects to represent the Sun and planets



Which row of the table shows the best choice of objects for the model?

	Sun	Mercury	Earth	Jupiter
A	football	pea	table tennis ball	pinhead
B	football	pea	pinhead	table tennis ball
C	football	pinhead	pea	table tennis ball
D	football	table tennis ball	pea	pinhead

10. Scientists think the Big Bang happened when

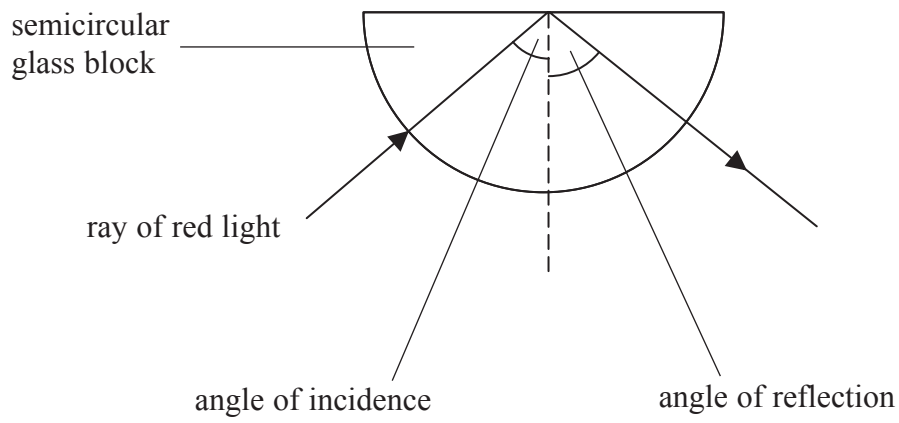
A the Sun began to shine
B two galaxies collided
C a black hole became a supernova
D the Universe began

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Total internal reflection

Use this information to answer questions 11 to 13.

Some students use this equipment to investigate total internal reflection in glass.



Here are some of their results.

angle of incidence	angles of reflection		
	1st try	2nd try	3rd try
50°	48°	48°	51°
60°	58°	61°	53°
70°	68°	70°	69°
80°	79°	78°	82°

Using these results:

11. When the angle of incidence is 50° the average angle of reflection is

A 48°
B 49°
C 50°
D 147°

12. One of the results for the 3rd try is anomalous.
The anomalous result is

A 51°
B 53°
C 69°
D 82°

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13. Why did the students take three results at each angle of incidence?

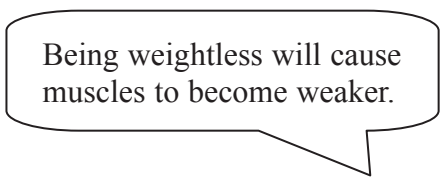
A to make the experiment more reliable
B to get one accurate result
C to get the same results
D to make it a fair test

Mass and weight

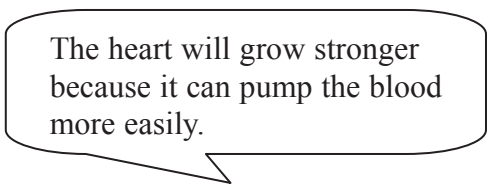
14. An object on Earth has a mass of 1 kg.
Which row of the table is correct for this object on the Moon?

	mass on the Moon	**weight on the Moon**
A	same as on Earth	same as on Earth
B	same as on Earth	less than on Earth
C	less than on Earth	less than on Earth
D	less than on Earth	same as on Earth

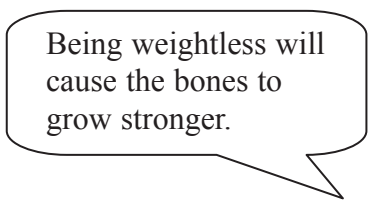
15. Some students discuss the effects of long space flights.



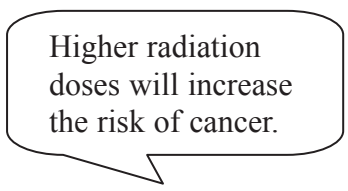
Amy



Bella



Carl



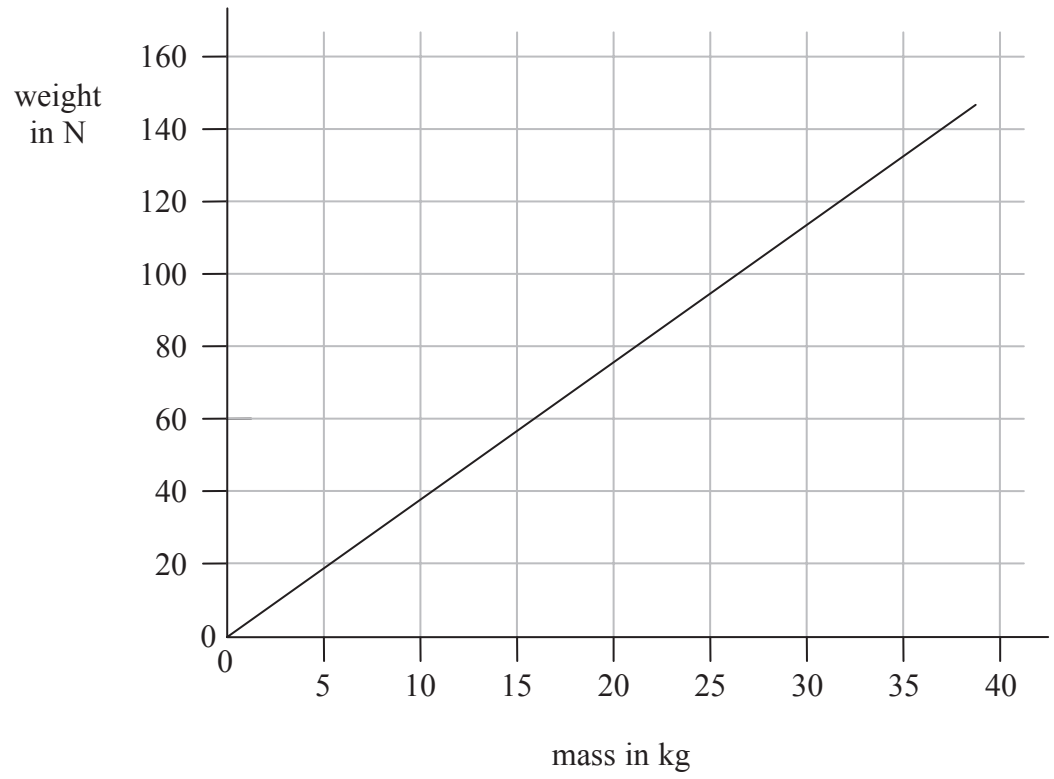
Dave

Which **two** students are correct?

A Amy and Bella
B Bella and Carl
C Amy and Dave
D Carl and Dave

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16. The graph shows the relationship between mass and weight for objects on Mars.



On Mars, an object of mass 20 kg weighs about

A 68 kg
B 68 N
C 75 kg
D 75 N

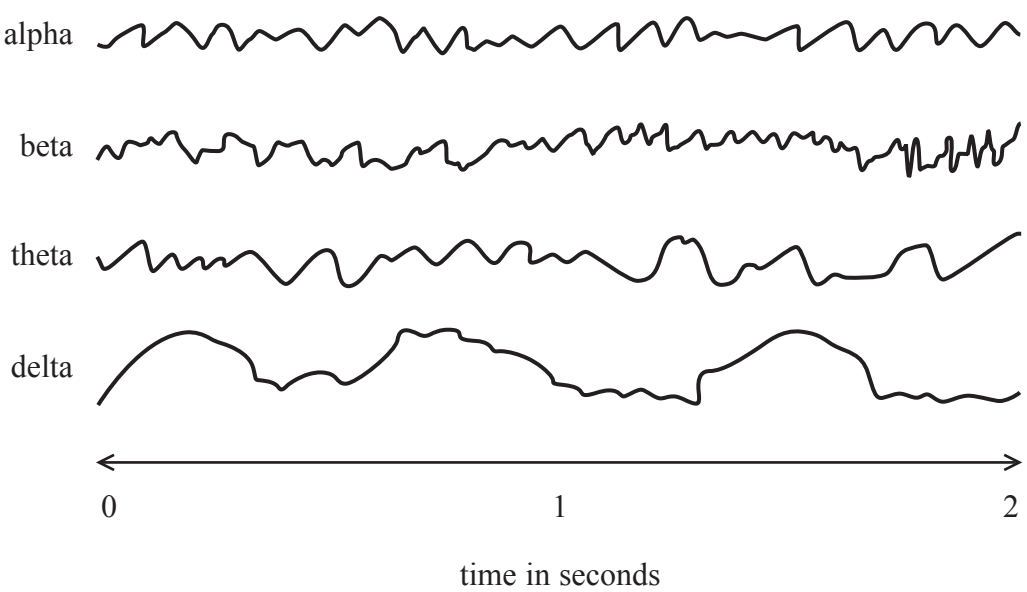
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Higher tier candidates start at question 17 and answer questions 17 to 40.
Questions 17 to 24 must be answered by all candidates: Foundation tier and Higher tier

Waves

Use this information to answer questions 17 and 18.

The diagram shows four types of brain wave.



17. The brain wave with the biggest amplitude is

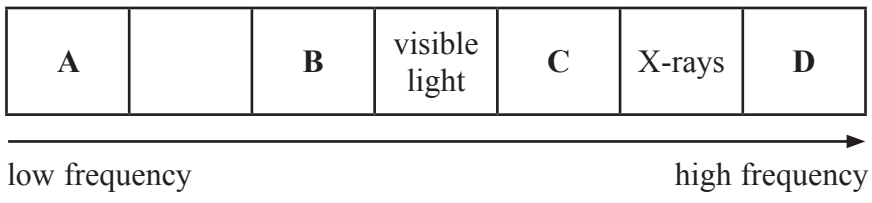
A alpha
B beta
C theta
D delta

18. The brain wave with the lowest frequency is

A alpha
B beta
C theta
D delta

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19. The chart shows the electromagnetic spectrum.
The sections for visible light and X-rays have been labelled.



Where should the infrared label be placed?

20. Which row of the table is correct?

	ultrasound waves are	**ultraviolet waves are**
A	longitudinal	transverse
B	longitudinal	longitudinal
C	transverse	transverse
D	transverse	longitudinal

Discovering new planets

The Kepler space telescope was launched in 2009.
The photograph shows the launch of the rocket.



21. The gases are pushed downwards by the rocket engine with a force of 478 kN.
Which row of the table is correct for the force of the gases on the rocket engine?

	size of force on rocket engine	**direction of force on rocket engine**
A	equal to 478 kN	downwards
B	equal to 478 kN	upwards
C	greater than 478 kN	downwards
D	greater than 478 kN	upwards

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22.

force = mass × acceleration

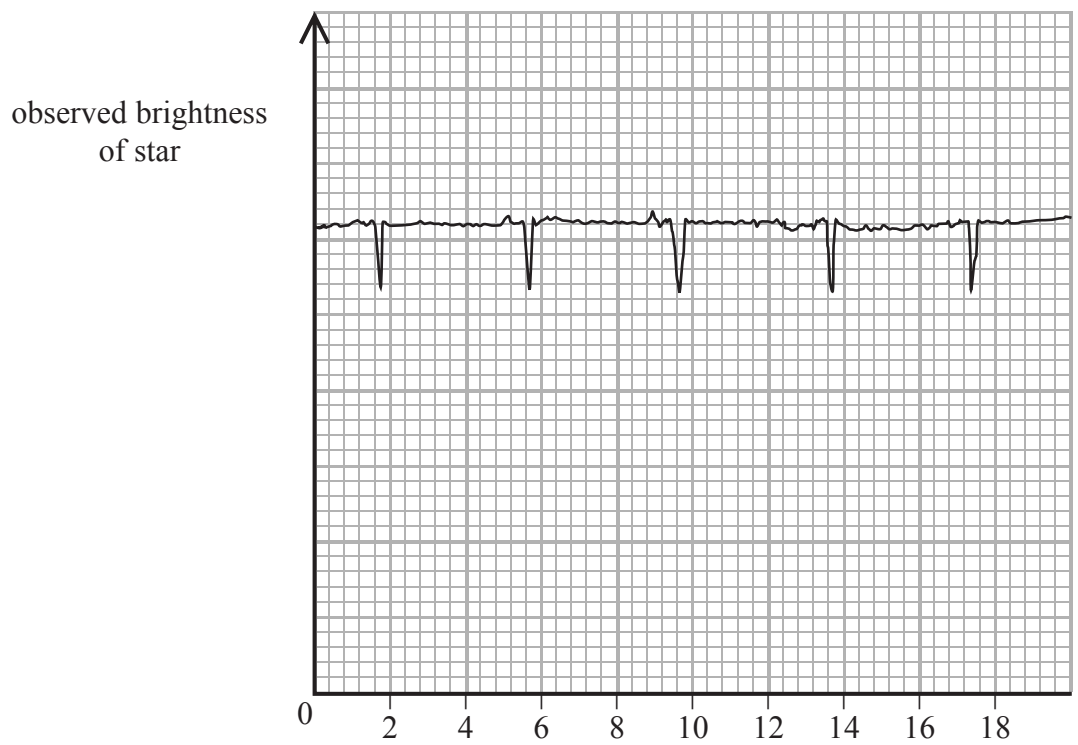
In space, when the rocket's mass is 2000 kg, its acceleration is 0.25 m/s^2.
The force needed to produce this acceleration is

A 500 N
B 5 000 N
C 8 000 N
D 80 000 N

Use this information to answer questions 23 and 24.

The Kepler telescope is designed to search for new planets.
When a planet passes in front of a star, the telescope detects a tiny decrease in brightness.

23. A planet is passing between its star and the telescope.
The graph shows what the Kepler telescope could find.

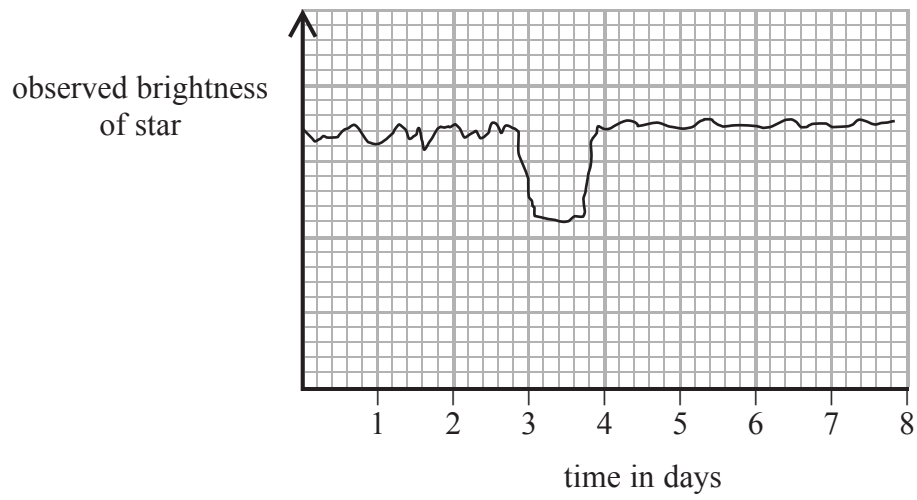


Approximately how many years does it take the planet to orbit its star?

A 0.1 years
B 2 years
C 4 years
D 16 years

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24. The graph below shows how the observed brightness of another star varies over several days as a planet passes between the star and the telescope.



Which of these is shown by the graph?

A the planet takes about a day to pass in front of the star
B the planet spins on its axis once every day
C the star cannot be seen when the planet passes in front of it
D the planet takes one day to orbit the star

TOTAL FOR FOUNDATION TIER PAPER: 24 MARKS

Foundation tier candidates do not answer any more questions after question 24.

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Questions 25 to 40 must be answered by Higher tier candidates only.
Foundation tier candidates do not answer questions 25 to 40.

25. The gravitational field strength of a planet should be measured in

A m/s
B N/kg
C kg/N
D $(m/s)^2$

26. Which row of the table is correct for interplanetary space?

	temperature (°C)	**the atmosphere is the same as**
A	0	at the top of Mount Everest
B	0	on the Moon
C	–270	on the Moon
D	–270	at the top of Mount Everest

Waves and space

27. Which row of the table is correct for electromagnetic waves travelling in a vacuum?

	speed of radio waves ($\times 10^6$ m/s)	**speed of ultraviolet waves ($\times 10^6$ m/s)**	**speed of gamma rays ($\times 10^6$ m/s)**
A	300	300	300
B	280	300	320
C	320	300	280
D	300	280	320

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28. This bank note has a strip which glows in ultraviolet light.



Which row of the table explains why the strip glows?

	ultraviolet light is	**visible light is**
A	absorbed by the strip	absorbed by the strip
B	emitted by the strip	absorbed by the strip
C	absorbed by the strip	emitted by the strip
D	emitted by the strip	emitted by the strip

29. Which of these shows the correct order of some stages in the evolution of a star like our Sun?

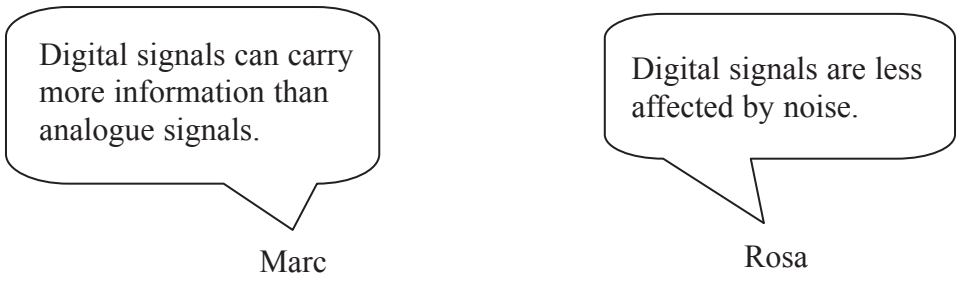
A nebula → main sequence → red giant → white dwarf
B nebula → main sequence → red giant → supernova
C white dwarf → red giant → main sequence → supernova
D white dwarf → main sequence → supernova → black hole

30. People can see visible light from stars and asteroids.
Which row of the table is correct for this light?

	the light from stars is	**the light from asteroids is**
A	emitted	emitted
B	reflected	emitted
C	emitted	reflected
D	reflected	reflected

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31. Two students discuss advantages of digital signals compared to analogue signals.



Who is correct?

A Marc only
B Rosa only
C both Marc and Rosa
D neither

32. Scientists think that Saturn is too cold for life to have developed there.
Scientists have found a new planet orbiting a distant star.

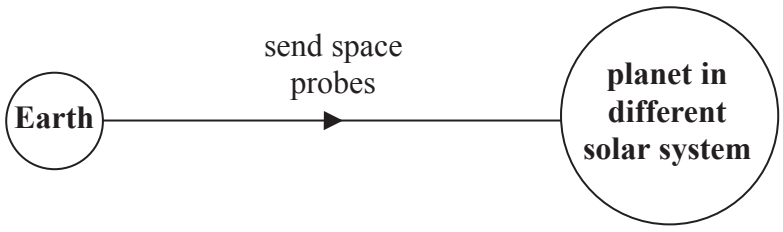
Which row of the table shows the conditions that make it **least** likely for life to have developed on the new planet?

	the star gives out	**the radius of the planet's orbit is**
A	half the energy of our Sun	larger than Saturn's
B	half the energy of our Sun	equal to Saturn's
C	twice the energy of our Sun	larger than Saturn's
D	twice the energy of our Sun	equal to Saturn's

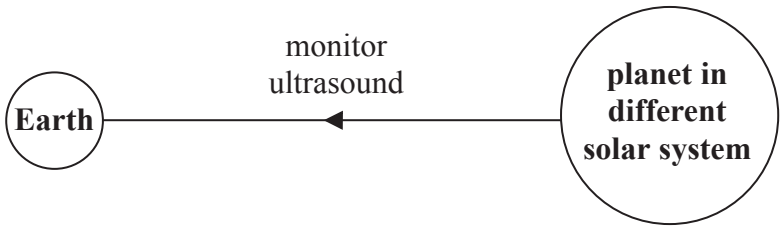
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33. Scientists are trying to find evidence for life on planets other than Earth.
Which of these best shows the method used by the Search for Extraterrestrial Intelligence (SETI)?

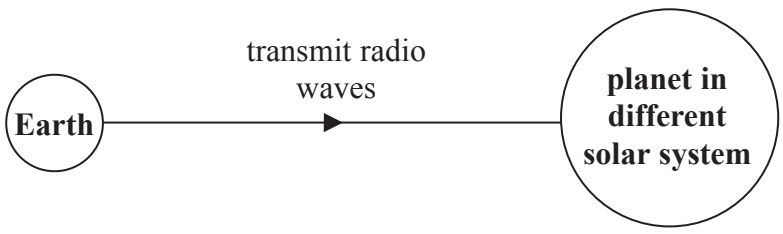
A



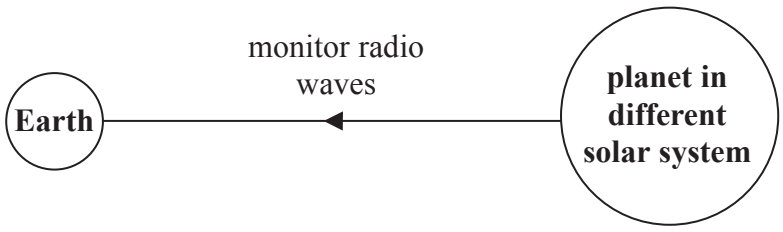
B



C



D

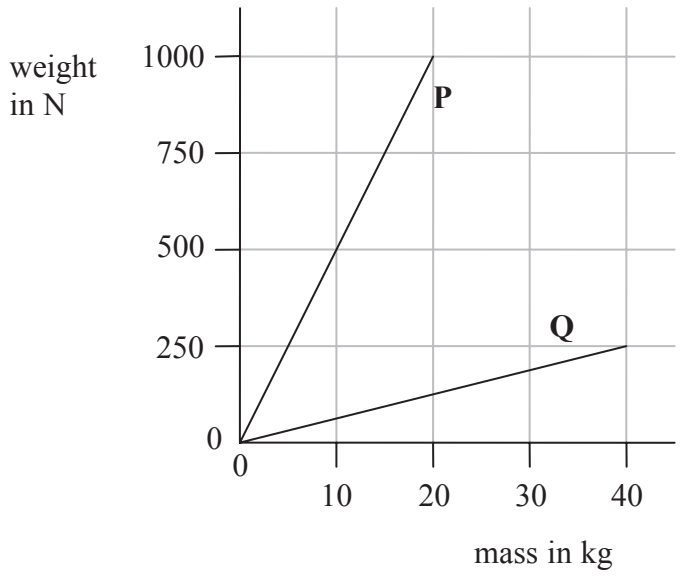


34. Red shift gives evidence that the Universe is

A becoming hotter
B becoming colder
C expanding
D contracting

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35. The graph shows the relationship between mass and weight on planets **P** and **Q**.



Which statement is correct for gravitational field strength on planets **P** and **Q**?

A gravitational field strength on planet **P** doubles every 10 kg
B gravitational field strength on planet **P** increases four times for every 10 kg
C gravitational field strength on planet **P** is four times that on planet **Q**
D gravitational field strength on planet **P** is eight times that on planet **Q**

36. In May 2009, the Planck space platform was launched.
Two of its major objectives are

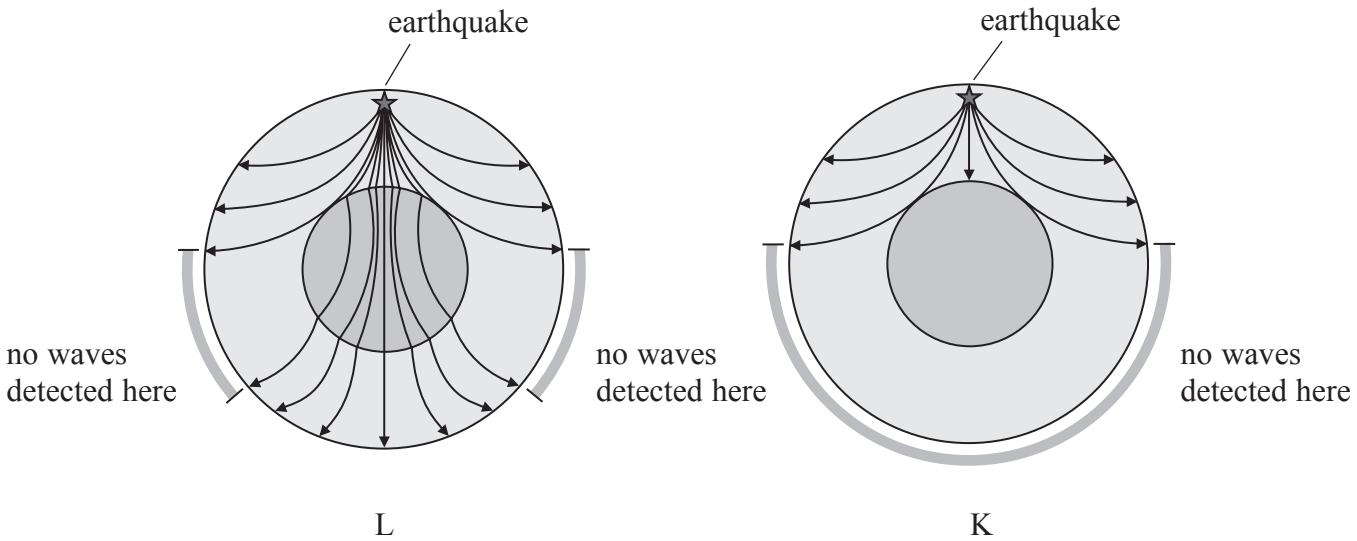
- to measure cosmic microwave background radiation
- to determine the amount of 'dark matter' in the Universe

Which row of the table is correct?

	cosmic microwave background radiation provides evidence for	**scientists think that there is dark matter because of**
A	stellar evolution	its strong gravitational pull on normal matter
B	the Big Bang	its strong gravitational pull on normal matter
C	stellar evolution	the red shift of microwave background radiation
D	the Big Bang	the red shift of microwave background radiation

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37. Scientists use seismic waves to explain the structure of the Earth.
Diagram L shows how one type of wave travels through the Earth.
Diagram K shows how a different type of wave travels through the Earth.



L K

Which row of the table is correct?

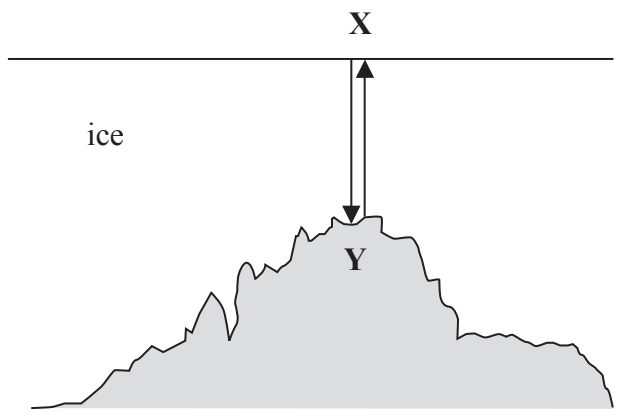
	longitudinal P-waves are shown in diagram	**transverse S-waves are shown in diagram**
A	L	L
B	L	K
C	K	L
D	K	K

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38.

speed = distance / time

Scientists have discovered mountains under the ice near the South Pole.
They use sound waves to measure the thickness of the ice.



not to scale

The sound waves travel vertically between **X** and **Y**.
The average speed of sound waves in ice is 3000 m/s.
The time needed for the sound waves to reach point **Y** and return to point **X** is 2 seconds.

The thickness of the ice between **X** and **Y** is

A 1 500 m
B 3 000 m
C 6 000 m
D 12 000 m

39.

speed = frequency × wavelength

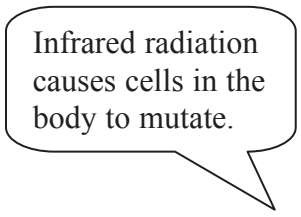
The sound waves in the ice have a frequency of 1.5 kHz.
The average speed of sound in ice is 3000 m/s.

What is the average wavelength of the sound waves in ice?

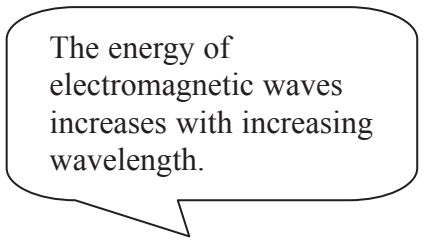
A 0.0005 m
B 2 m
C 2 000 m
D 4 500 000 m

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40. Two students discuss the dangers of electromagnetic waves.



Peter



Rick

Who is correct?

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

TOTAL FOR HIGHER TIER PAPER: 24 MARKS

END

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November 2010

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5010 Science/ 5046 Physics (P1b)

Unit P1b - 5010	
Topics 11 & 12	
1	A
2	B
3	D
4	C
5	C
6	D
7	A
8	C
9	C
10	D
11	B
12	B
13	A
14	B
15	C
16	D

Unit P1b - 5010	
Topics 11 & 12	
17	D
18	D
19	B
20	A
21	B
22	A
23	C
24	A

Unit P1b - 5010	
Topics 11 & 12	
25	B
26	C
27	A
28	C
29	A
30	C
31	C
32	A
33	D
34	C
35	D
36	B
37	B
38	B
39	B
40	D

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Foundation and Higher Tier

Thursday 24 June 2010 – Afternoon

Time: 20 minutes

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

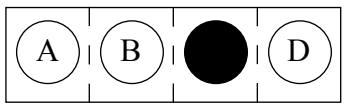
Instructions to Candidates

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.

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

Space

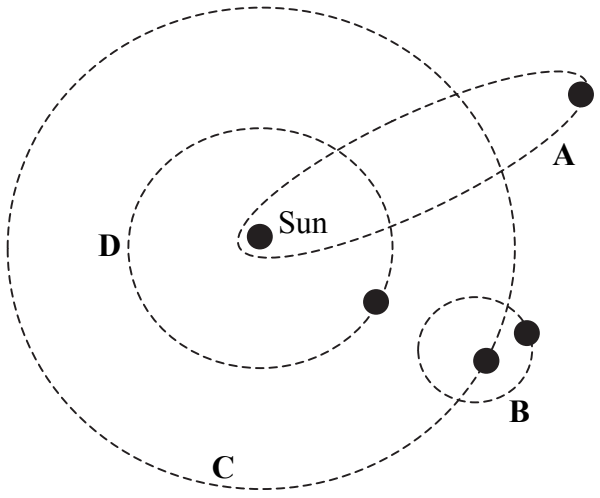
1. The Sun, with its planets, their moons and asteroids are called the

A Milky Way
B Universe
C Galaxy
D Solar System

2. Stars and planets are formed when dust and gas are pulled together by a force.
This force is called

A friction
B thrust
C gravity
D magnetism

3. Which of these dotted lines shows the orbit of a comet?



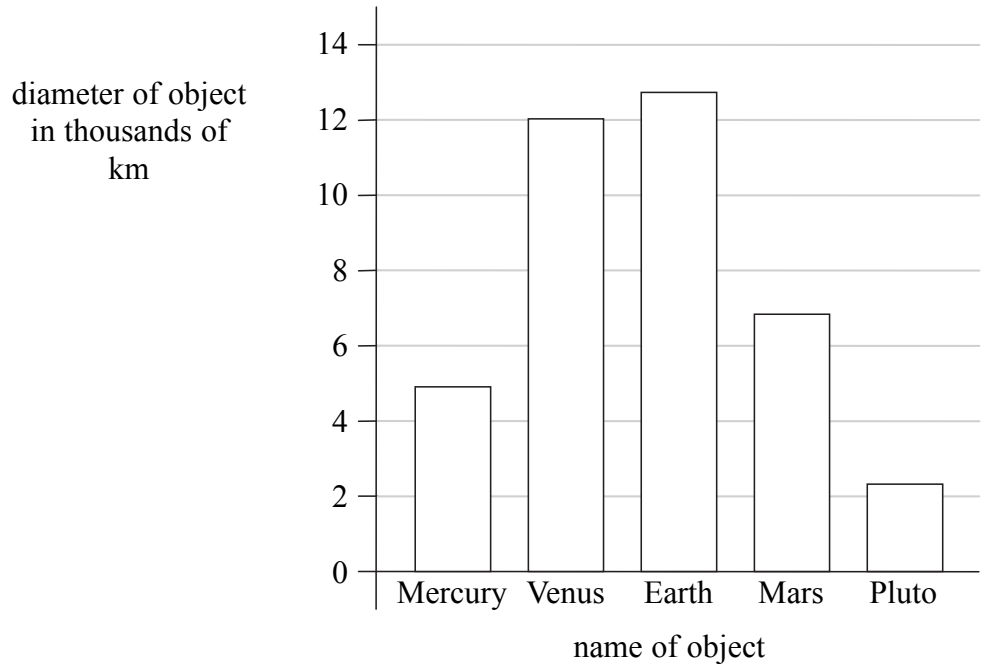
Not to scale

4. Which of these is most likely to collide with the Earth?

A a comet
B a planet
C a moon
D a star

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5. The bar chart shows the diameter of some objects that orbit the Sun.



The object with almost the same diameter as Earth is

A Mercury
B Venus
C Mars
D Pluto

6. All planets

A have at least one moon
B have rings around them
C are made of gas
D are in orbit around a star

7. Which of these provides evidence for the possibility of life on Mars?

A photographs of Mars show that it has extinct volcanoes
B a day on Mars lasts almost the same time as a day on Earth
C mars has summer and winter because its axis is tilted
D soil samples collected on Mars contain ice

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8. Which of these is correct about extraterrestrial life forms?

A scientists have proved that these life forms exist
B scientists will never prove that these life forms exist
C scientists do not know if these life forms exist
D during this century, scientists will prove that these life forms exist

Waves in medicine

9. Mobile phones can interfere with some hospital equipment.
The radiation used to send and receive calls is

A infrared radiation
B microwave radiation
C ultrasound radiation
D ultraviolet radiation

Use this information to answer questions 10 and 11.

A scanner shows an image of a developing fetus.



10. The fetus is scanned using

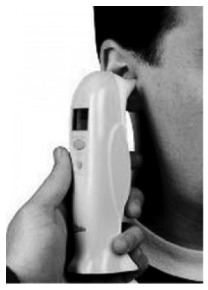
A gamma rays
B X-rays
C ultrasound waves
D ultraviolet waves

11. The scanner forms the image from waves that are

A absorbed by the fetus
B emitted by the fetus
C radiated by the fetus
D reflected by the fetus

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12. Sometimes doctors measure a patient's temperature using an ear thermometer.



This thermometer measures temperature by scanning for

A infrared radiation absorbed by the eardrum
B infrared radiation emitted by the eardrum
C ultrasound radiation absorbed by the eardrum
D ultrasound radiation emitted by the eardrum

13. Doctors use images of broken bones.



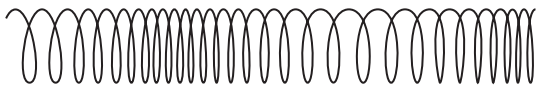
These images are formed because

A some X-rays are emitted by bones in the hand
B some X-rays are absorbed by bones in the hand
C some ultraviolet rays are emitted by bones in the hand
D some ultraviolet rays are absorbed by bones in the hand

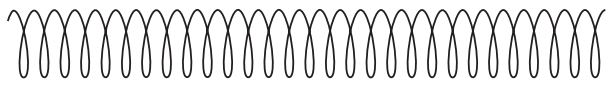
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Investigating waves

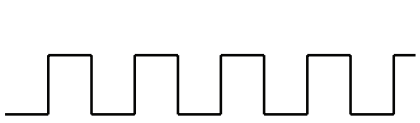
14. Which of these shows a longitudinal wave?



A



B



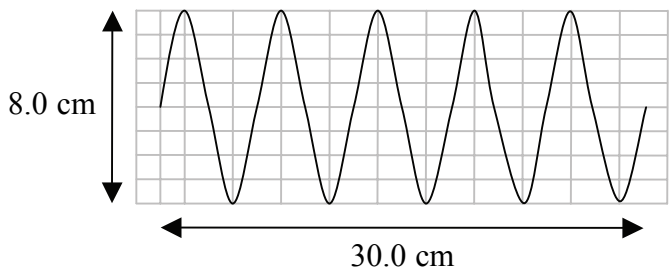
C



D

Use this information to answer questions 15 and 16.

A student draws this image of a wave.



15. The amplitude of the wave is

A 4.0 cm
B 6.0 cm
C 8.0 cm
D 30.0 cm

16. The wavelength of the wave is

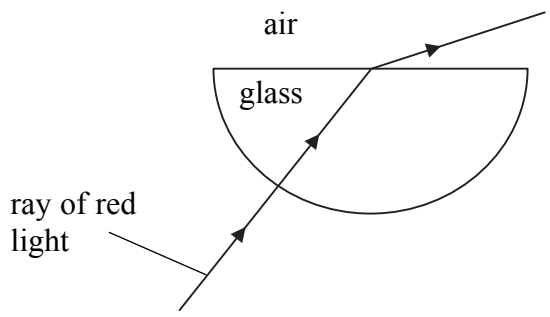
A 4.0 cm
B 6.0 cm
C 8.0 cm
D 30.0 cm

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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.

Light and waves

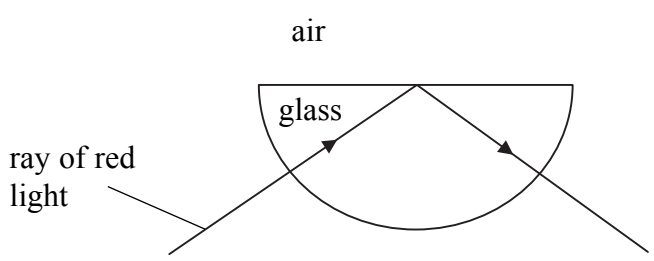
The diagram shows the path of a ray of red light through a glass block.



17. The ray of light is refracted as it travels from glass into air because

A its speed changes
B its amplitude changes
C its frequency changes
D it is not white light

18. A student discovers that some rays follow a different path.



Which row of the table is correct for this path?

	reason for direction change	this is used in
A	total internal reflection	optical fibres
B	total internal reflection	spectacles
C	total internal refraction	optical fibres
D	total internal refraction	spectacles

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19. Electromagnetic waves transfer

A energy but not matter
B matter but not energy
C both energy and matter
D neither energy nor matter

20. Which row of the table is correct for a radio wave compared to other parts of the electromagnetic spectrum?

	the wavelength of a radio wave is	**the frequency of a radio wave is**
A	longest	highest
B	shortest	lowest
C	longest	lowest
D	shortest	highest

Acceleration

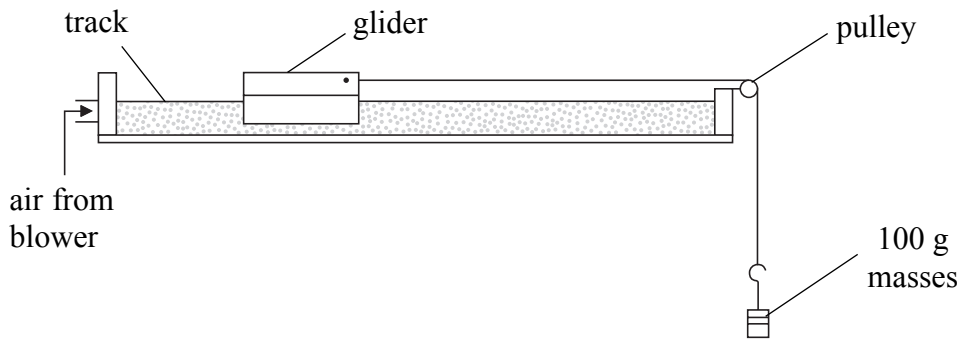
21. A rocket is accelerating upwards.
Which row of the table is correct for the rocket?

	the kinetic energy of the rocket is	**the gravitational potential energy of the rocket is**
A	decreasing	decreasing
B	increasing	decreasing
C	decreasing	increasing
D	increasing	increasing

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Use this information to answer questions 22 and 23.

Some students investigate the motion of a glider on an air track.
The glider moves over a cushion of air and so there is very little friction.



weight = mass × gravitational field strength

Gravitational field strength = 10 N/kg

22. In one experiment the students used three 100 g masses to accelerate the glider.
The total weight of the three masses is

A 3 N
B 30 N
C 300 N
D 3000 N

23. The students discuss their investigation.

Reducing friction will make the experiment a fair test.

Amit

We should use an electronic timer to measure the acceleration.

Brendan

Doubling the weight will double the acceleration.

Colyn

When we repeat the experiment we must use a glider with the same mass.

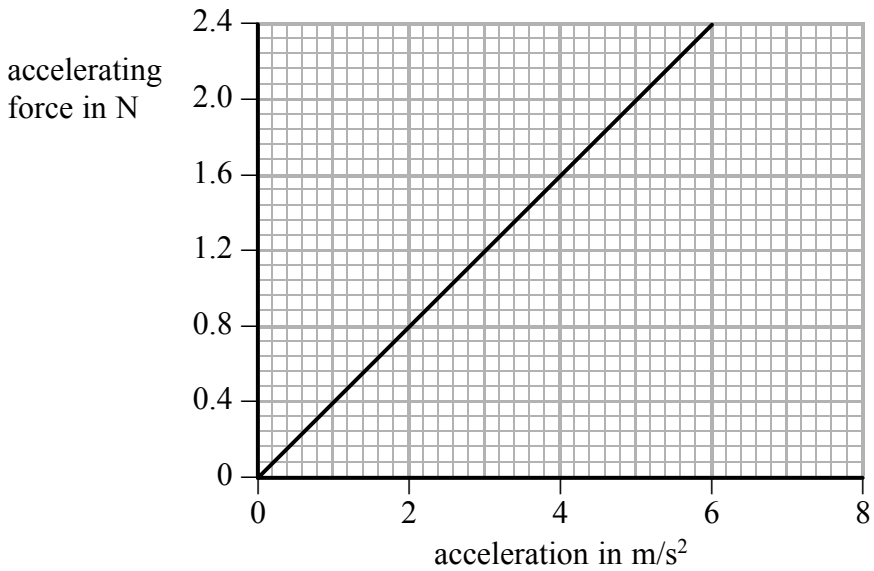
Dermot

Who has made a prediction for the investigation?

A Amit
B Brendan
C Colyn
D Dermot

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24. The students plot their results on a graph.



The acceleration produced by an accelerating force of 1.0 N would be

A 0.40 m/s^2
B 2.25 m/s^2
C 2.5 m/s^2
D 3.0 m/s^2

TOTAL FOR FOUNDATION TIER PAPER: 24 MARKS

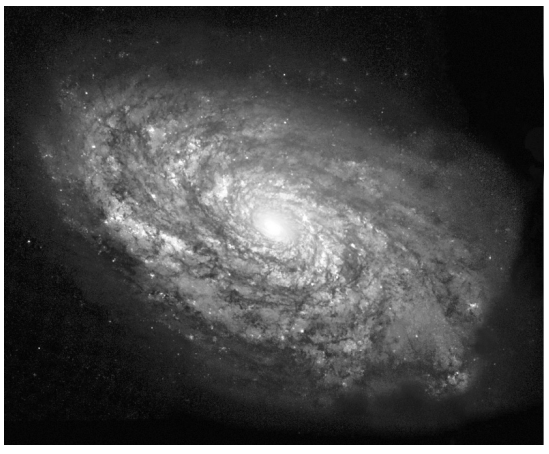
Foundation tier candidates do not answer any more questions after question 24.

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Questions 25 to 40 must be answered by Higher tier candidates only.
Foundation tier candidates do not answer questions 25 to 40.

Space

25. The photograph shows millions of stars.



This group of stars is

A a Universe of stars
B a galaxy of stars
C a nebula
D the Big Bang

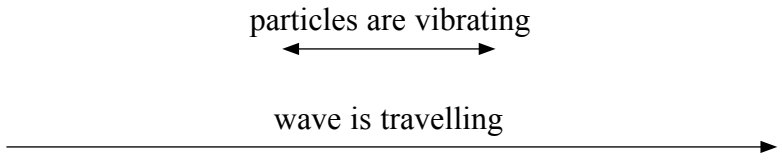
26. Which row of the table best describes conditions in space far from any planet?

	gravitational field strength	**temperature is about**
A	same as on Earth	–270 °C
B	much less than on Earth	–270 °C
C	same as on Earth	0 °C
D	much less than on Earth	0 °C

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Waves

27. The diagram shows the direction in which particles of a wave are vibrating.
It also shows the direction the wave is travelling.



The wave could be

A a radio wave
B a light wave
C a sound wave
D an ultraviolet wave

28. An astronaut on the Moon can see a spacecraft.
The astronaut sends a microwave signal, a light signal and a radio signal to the spacecraft.
The signals all leave at the same time.

In which order do the signals arrive at the spacecraft?

A light first, then radio, then microwave
B radio first, then light, then microwave
C light first, then microwave, then radio
D they all arrive at the same time

29. The table gives information about three types of ultraviolet (UV) radiation.

type of radiation	UVA	UVB	UVC
range of wavelengths (nanometres)	400–320	320–280	280–100

UVC is the most dangerous form of ultraviolet radiation because it has the

A least energy
B highest speed
C longest wavelength
D highest frequency

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30. Optical fibres are often used instead of copper cables for sending signals.
Which row of the table is correct for using optical fibres instead of copper cables?

	in optical fibres	**in optical fibres**
A	more energy is lost per km	less information can be sent per second
B	more energy is lost per km	more information can be sent per second
C	less energy is lost per km	more information can be sent per second
D	less energy is lost per km	less information can be sent per second

31.

speed = distance/time

Amy sees a lightning flash.
She hears the thunder from the flash 5 seconds later.
The sound travels at 340 m/s.

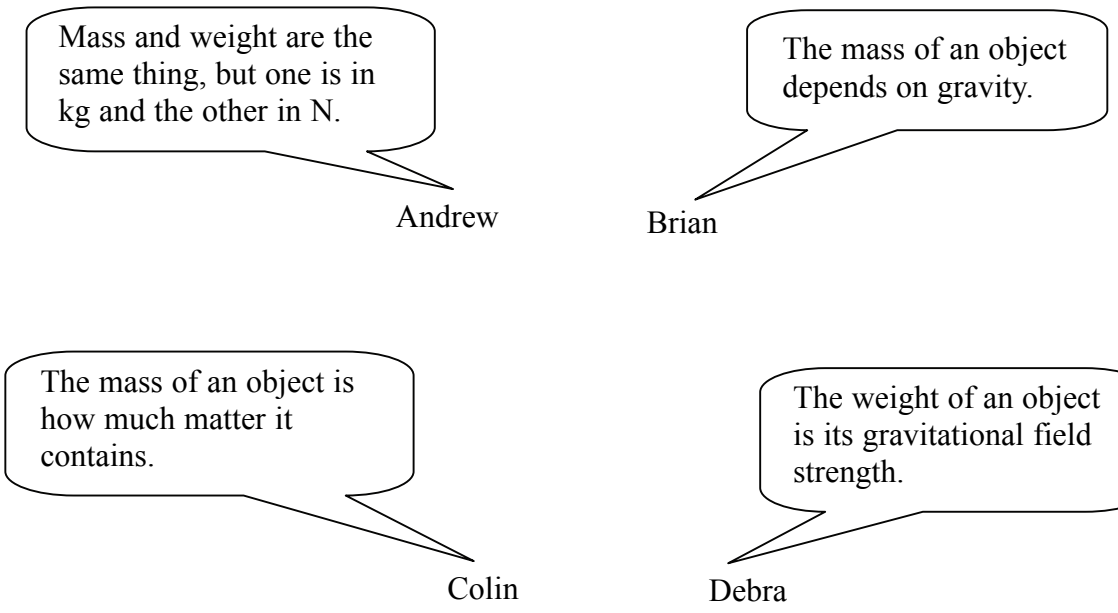
How far away was the lightning?

A 68 m
B 850 m
C 1700 m
D 3400 m

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Mass, force and weight

32. Some students are discussing mass and weight.



Who has made a correct statement?

A Andrew
B Brian
C Colin
D Debra

33.

force = mass × acceleration

A rocket has an acceleration of 3.0 m/s^2 at lift-off.
The resultant force on the rocket at lift-off is 6 000 000 N.

The mass of the rocket at lift-off is

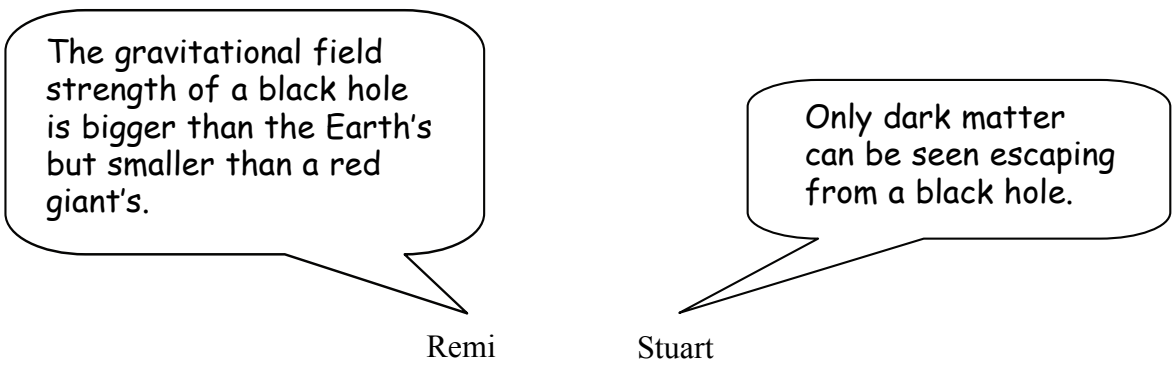
A 2 000 000 N
B 2 000 000 kg
C 18 000 000 N
D 18 000 000 kg

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34. The reaction force on the rocket is caused by the action force pushing gases out of the rocket. Which row of the table is correct for the reaction force on the rocket compared to the action force?

	the direction of the reaction force is	**the size of the reaction force is**
A	the opposite	the same
B	the opposite	bigger
C	the same	the same
D	the same	bigger

35. Two students discuss black holes.



Who is correct?

A Remi only
B Stuart only
C both Remi and Stuart
D neither

Waves

36. Scientists find it difficult to predict earthquakes because

A the Earth's outer core is liquid
B transverse earthquake waves cannot travel through liquids
C parts of the Earth's crust are in constant motion
D scientists do not know enough about the processes that cause earthquakes

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37. speed = frequency × wavelength

The table gives information about three radio waves.

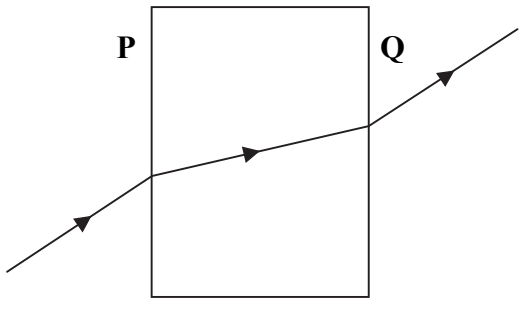
name	frequency (MHz)	wavelength (m)
UHF	3000	0.1
VHF	300	1
HF	30	10

This information shows that the speeds of the radio waves are

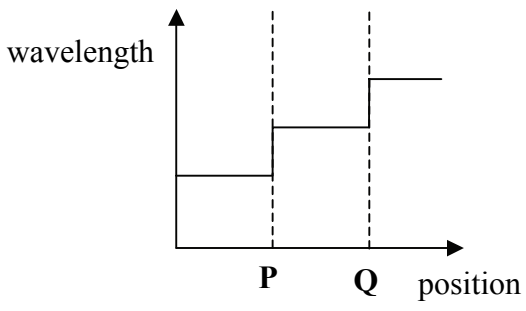
A the same
B steadily increasing with frequency
C steadily decreasing with frequency
D 300 m/s

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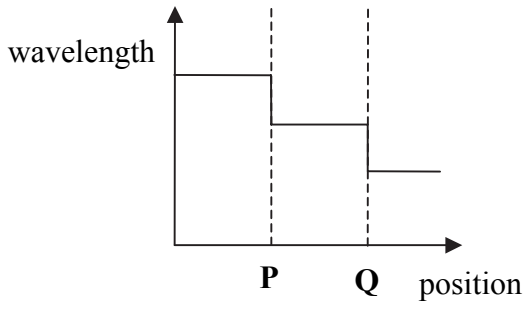
38. The diagram shows a ray of light passing through a glass block in air.
P and **Q** are the sides of the block.



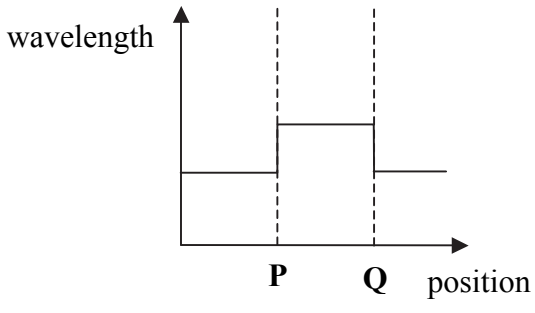
The frequency of the light does not change.
Which of these shows the changes in wavelength of the ray?



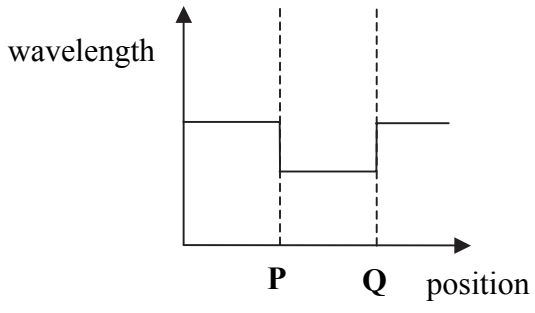
A



B



C



D

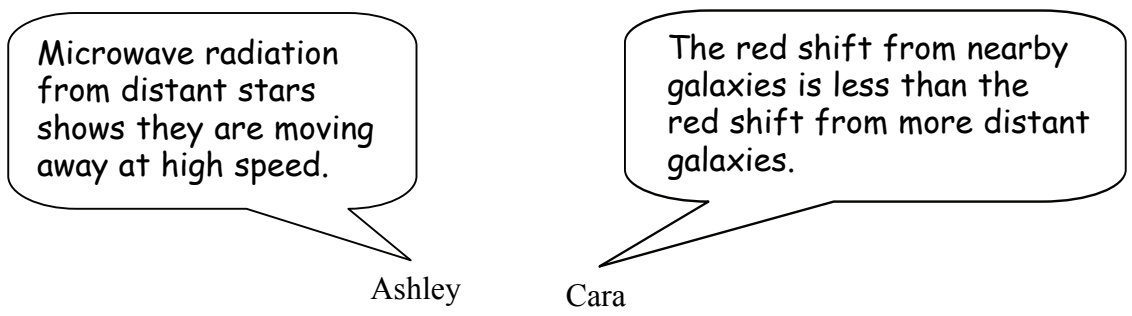
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Astronomy

39. Which row of the table is correct for a main sequence star that is much more massive than the Sun?

	can we be certain that the more massive star has a planet that supports life?	**the massive star will next be**
A	yes	a white dwarf
B	no	a supernova
C	no	a white dwarf
D	yes	a supernova

40. Two students discuss evidence for the Big Bang theory.



Who is correct?

A Ashley only
B Cara only
C both Ashley and Cara
D neither

TOTAL FOR HIGHER TIER PAPER: 24 MARKS

END

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Summer 2010

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360Science

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Multiple Choice Paper P1b (5010)

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Summer 2010

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5010 Science/ 5046 Physics (P1b)

Unit P1b - 5010	
Topics 11 & 12	
1	D
2	C
3	A
4	A
5	B
6	D
7	D
8	C
9	B
10	C
11	D
12	B
13	B
14	A
15	A
16	B

Unit P1b - 5010	
Topics 11 & 12	
17	A
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20	C
21	D
22	A
23	C
24	C

Unit P1b - 5010	
Topics 11 & 12	
25	B
26	B
27	C
28	D
29	D
30	C
31	C
32	C
33	B
34	A
35	D
36	D
37	A
38	D
39	B
40	B

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Science (5010)

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P1b – Topics 11 and 12

Foundation and Higher Tier

Friday 5 March 2010 – Morning

Time: 20 minutes

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

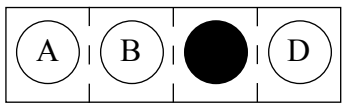
Instructions to Candidates

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.

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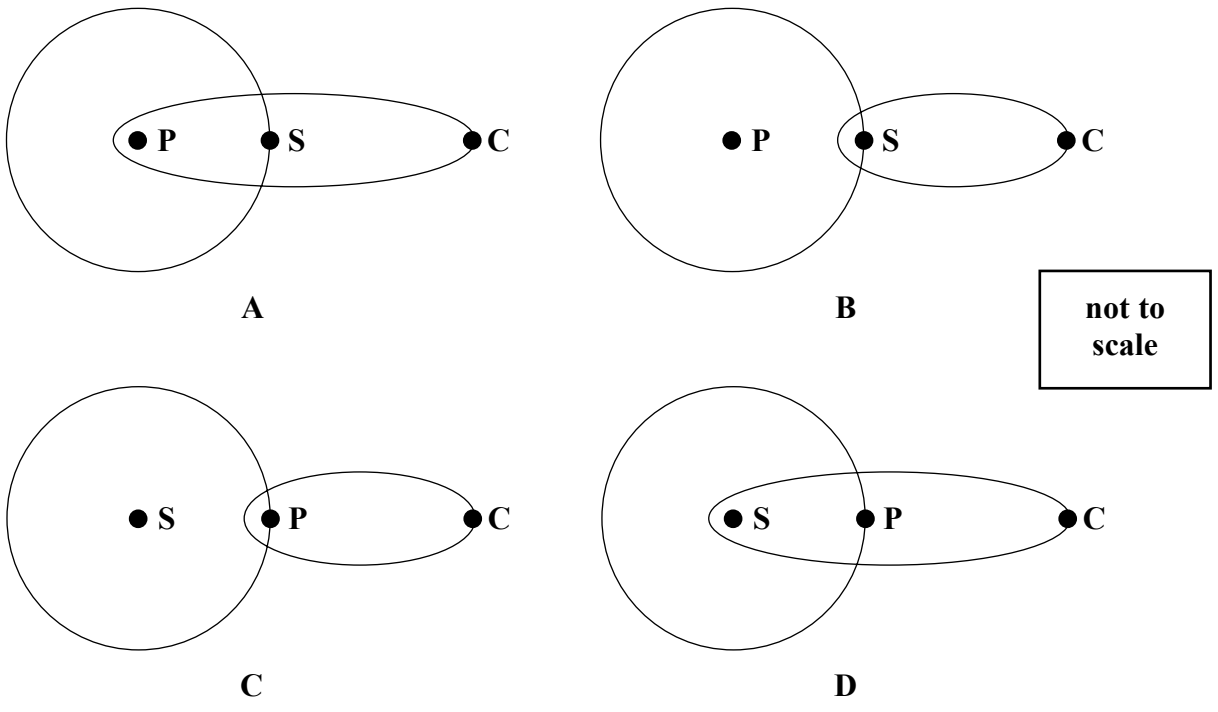
Questions 1 to 16 must be answered by Foundation tier candidates only.
Higher tier candidates start at question 17.

Space

1. An astronaut in space does no exercise.
This is most likely to affect his

A skin
B heart
C teeth
D hair

2. Which of these shows the orbits of a planet (**P**) and a comet (**C**) round the Sun (**S**)?



3. Which of these contains the largest number of stars?

A a comet
B a galaxy
C the Universe
D the Solar System

4. Which of these is a weight?

A 20 watts
B 20 joules
C 20 kilograms
D 20 newtons

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Our Moon

5. Our Moon has

A an atmosphere
B a high temperature
C no gravity
D a planet to orbit

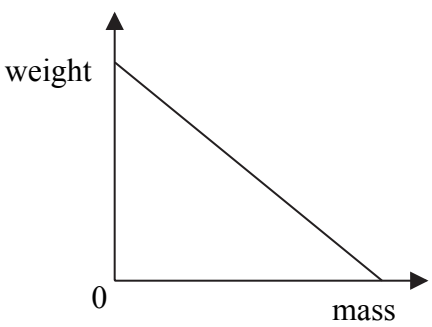
6. The following statement appeared in a newspaper.

> A full moon has occurred closer to the Earth than at any other time during the past 15 years.

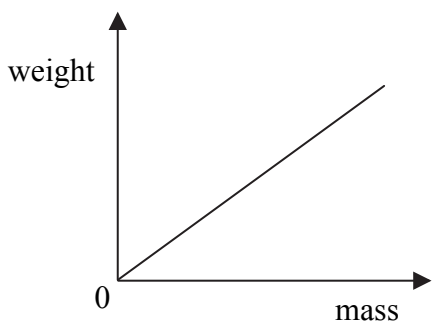
This suggests that the Moon might

A have an egg-shaped orbit
B have no atmosphere
C have a low temperature
D take a month to orbit the Earth

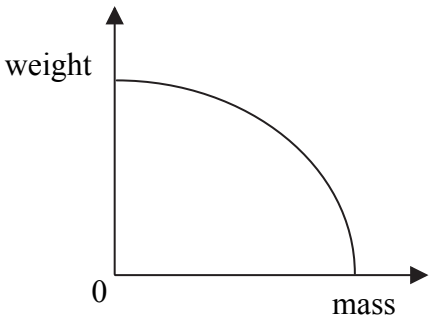
7. Which of these shows how the weights of objects vary with their masses on the Moon?



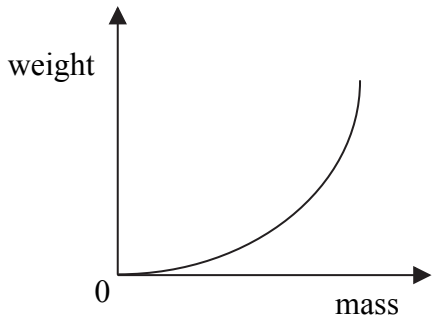
A



B



C



D

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8. The first man to stand on the Moon pushed down on the Moon with a force of 200 N. The Moon pushed back on him with a force

A of 0 N
B less than 200 N
C equal to 200 N
D more than 200 N

Tsunamis

Tsunamis are giant water waves that can move across oceans.



9. One day in 2004, a tsunami caused a lot of damage when it reached the coast. This shows us that

A a tsunami carries energy
B a tsunami only travels during the day
C tsunamis were discovered in 2004
D all damage at the coast is caused by tsunamis

Use this information about a tsunami to answer questions 10 and 11.

- The wavelength of the tsunami is about 100 km
- The peaks arrive about one hour (3600 s) apart
- The height of the tsunami is around 30 m
- Tsunamis can cross an ocean 5000 km wide

10. The amplitude of this tsunami is closest to

A 30 m
B 100 km
C 3600 s
D 5000 km

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11. The frequency, in Hz, of this tsunami is about

A 1/3600
B 1/100
C 1
D 3600

Ultraviolet waves

12. Too much ultraviolet radiation causes

A deafness
B lung cancer
C brain tumours
D damage to eyes

13. Ultraviolet radiation is used to

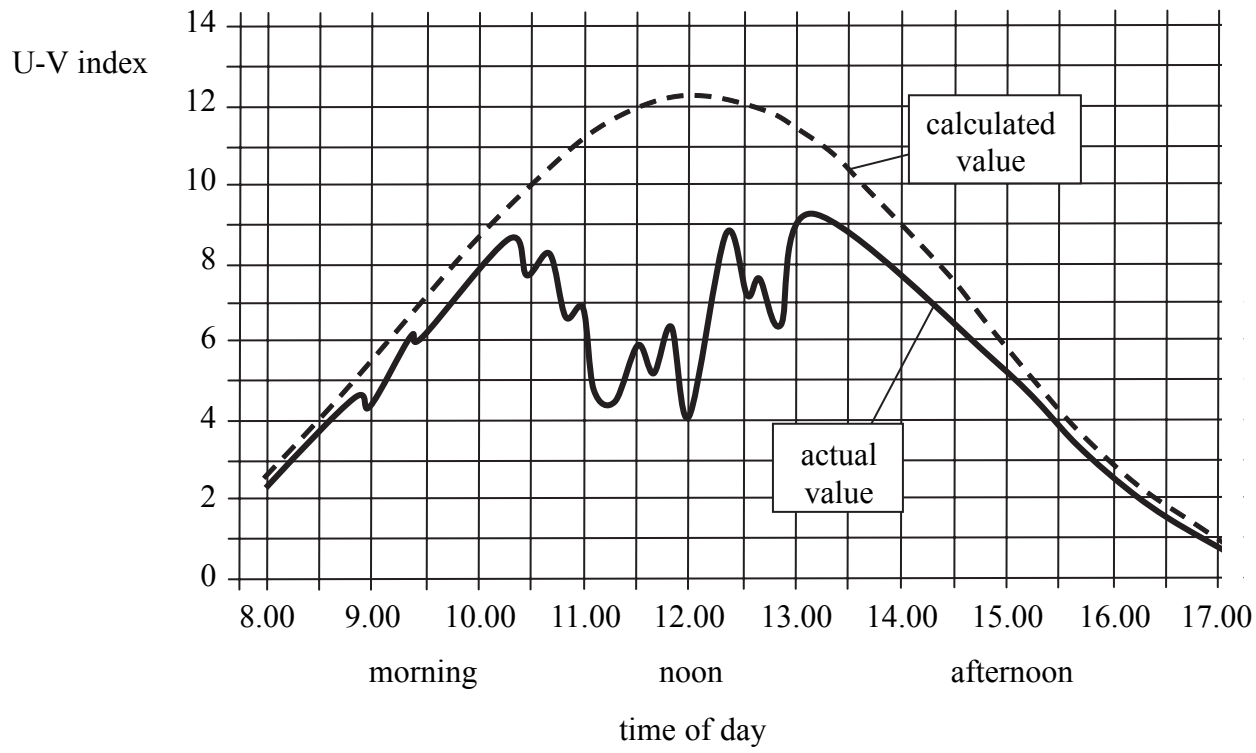
A toast bread
B make fluorescent ink glow
C monitor rainfall
D measure the depth of the sea

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Use this information to answer questions 14 to 16.

The ultraviolet (U-V) index shows the strength of ultraviolet radiation.
A U-V index of 0 corresponds to no sunlight.

The graphs show the calculated value and the actual value at a place on Earth during one day.



14. The highest actual value of the U-V index shown on the graph is about

A 2.3
B 4.0
C 9.2
D 12.2

15. The table below gives the level of danger for different U-V index values.

U-V index	1–2	3–5	6–7	8–10	11+
danger is	low	moderate	high	very high	extreme

At which of these times on the graph does the U-V index show the danger is moderate?

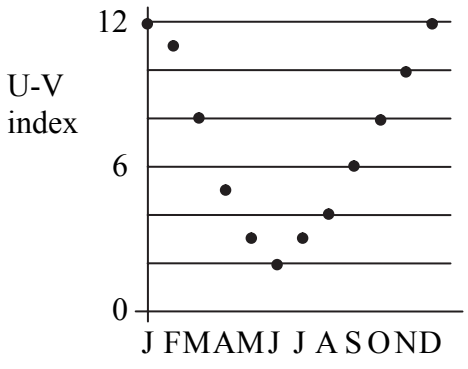
A 09.30 hours
B 11.15 hours
C 14.30 hours
D 17.00 hours

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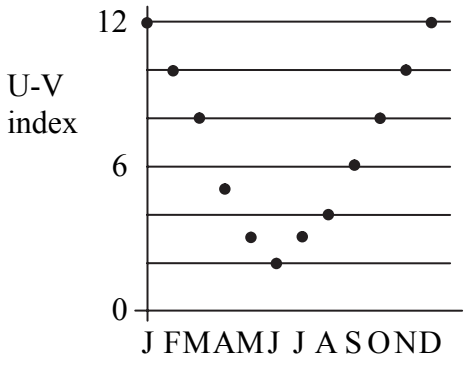
16. The table below shows the monthly average U-V index for a city in Australia.

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
12	11	8	5	3	2	3	4	6	8	10	12

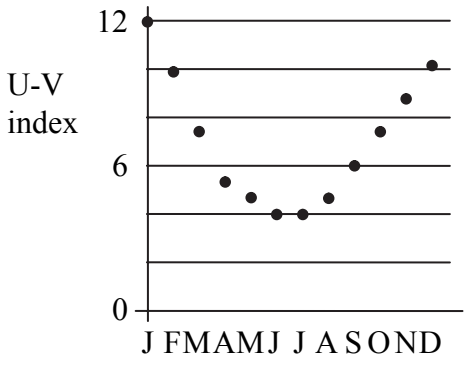
Four students each plot a graph using this data.
Which graph is correct?



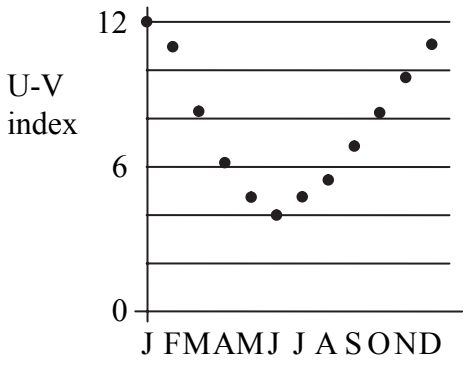
A



B



C



D

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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

Waves and signals

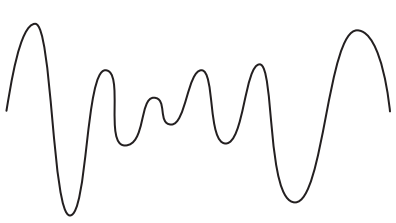
17. In space, all types of electromagnetic waves

A are longitudinal
B move at the same speed
C have the same frequency
D are absorbed by the vacuum

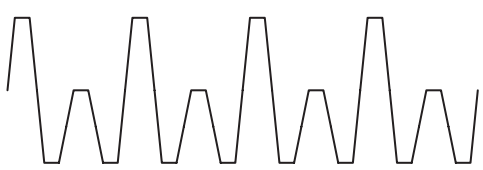
18. Visible, infrared and gamma radiation pass from the Sun to the Earth.
Which row of the table is correct?

	the wavelength of infrared is	**the frequency of gamma is**
A	shorter than visible	higher than visible
B	longer than visible	higher than visible
C	shorter than visible	lower than visible
D	longer than visible	lower than visible

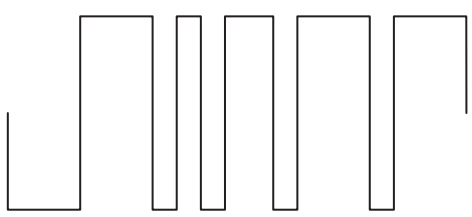
19. Which of these shows a digital signal?



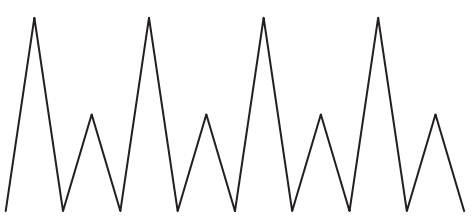
A



B



C



D

20. Compared to analogue signals, digital signals are better because

A they travel faster
B they travel slower
C they are more affected by noise
D they are less affected by noise

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Bode and the planets

In 1772, a scientist called Bode suggested a pattern about the orbits of planets.
Some of the planets have been discovered recently.
He used this pattern to calculate the distance from the Sun to each planet that he knew about.
These calculated distances did not quite match the measured distances.

planet	measured distance from Sun (in millions of km)	Bode's pattern	Bode's calculated distance from Sun (in millions of km)	percentage difference (%)
Mercury	58	4	58	0
Venus	108	4 + 3	102	6
Earth	150	4 + 6	145	3
Mars	228	4 + 12	232	2
X		4 + **Y**		
Jupiter	778	4 + 48	754	3
Saturn	1427	4 + 96	1450	2

21. Bode's pattern suggests that there should be a planet **X** orbiting the Sun.
X should be between Mars and Jupiter, but there is no planet **X**.
Instead, the objects that orbit between Mars and Jupiter are

A stars
B moons
C comets
D asteroids

22. Look at Bode's pattern in the middle column.
The pattern suggests **Y** should be

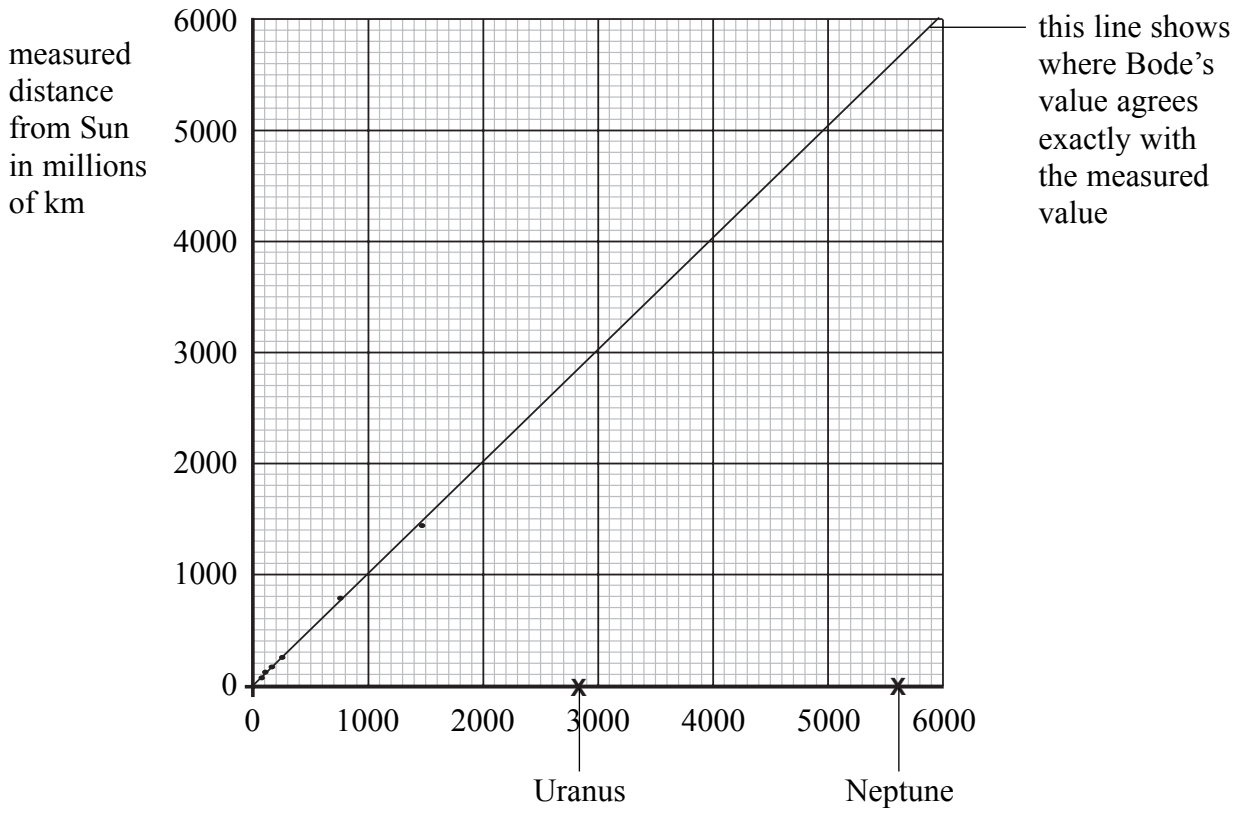
A 18
B 24
C 36
D 42

23. To accept Bode's pattern as a law, it would be best to

A repeat the calculations for all values for yourself
B ask a scientist to repeat the calculations
C test the pattern by predicting the distance for the next planet after Saturn
D use the Internet to search for information about Bode

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24. John calculated the Bode distances for the next two planets in the pattern.
These are the planets we now call Uranus and Neptune.
They are marked on the horizontal x-axis of the graph below.



Bode's calculated distance from Sun in millions of km

The measured distances for Uranus and Neptune are given below.

planet	**measured distance from Sun (millions of km)**
Uranus	2871
Neptune	4492

Which row of the table below is correct for these two planets?

	Does the measured distance for Uranus support Bode's pattern?	**Does the measured distance for Neptune support Bode's pattern?**
A	yes	no
B	yes	yes
C	no	yes
D	no	no

TOTAL FOR FOUNDATION TIER PAPER: 24 MARKS

Foundation tier candidates do not answer any more questions after question 24.

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Questions 25 to 40 must be answered by Higher tier candidates only.
Foundation tier candidates do not answer questions 25 to 40.

Astronauts

25. Astronauts in a spacecraft have an exercise machine.
They must use it to keep fit because space has no

A atmosphere
B temperature
C gravity
D pressure

26. Astronauts are affected by X-rays and infrared waves in space.
X-rays are more dangerous than infrared waves.
Which row of the table correctly compares X-rays to infrared waves?

	energy of an X-ray is	**frequency of an X-ray is**
A	higher	higher
B	higher	lower
C	lower	lower
D	lower	higher

27. An astronaut is in orbit round the Earth.
He wants to send a visible light signal, an X-ray signal and an infrared signal to Mars.
He wants them all to arrive at the same time.
Which row of the table shows the times he could send them?

	visible	**X-ray**	**infrared**
A	09.00	09.01	09.01
B	09.01	09.01	09.00
C	09.00	09.00	09.00
D	09.01	09.00	09.01

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Ultrasound in the Dead Sea

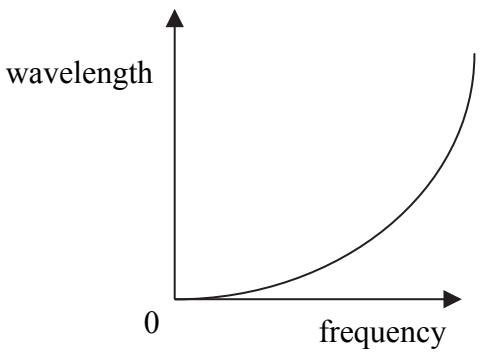
28.

speed = wavelength × frequency

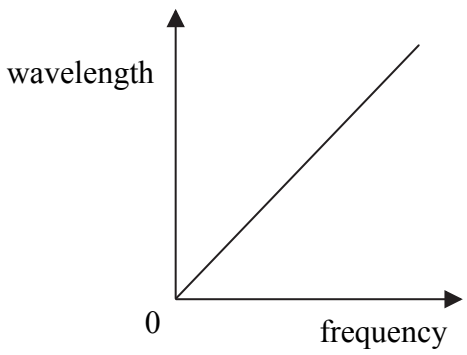
The speed of an ultrasound wave is 1790 m/s.
The frequency of the wave is 50 kHz.
The wavelength of the wave is

A 0.0358 m
B 27.9 m
C 35.8 m
D 27 900 m

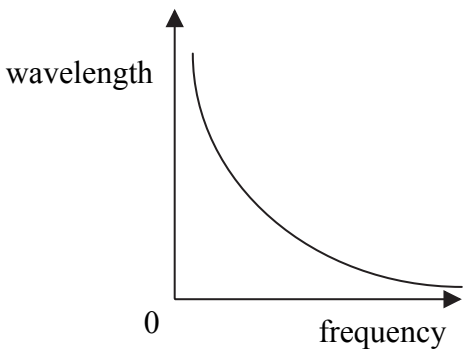
29. Different ultrasound waves travel through pure water at the same speed.
Which graph best shows how their wavelength changes with frequency?



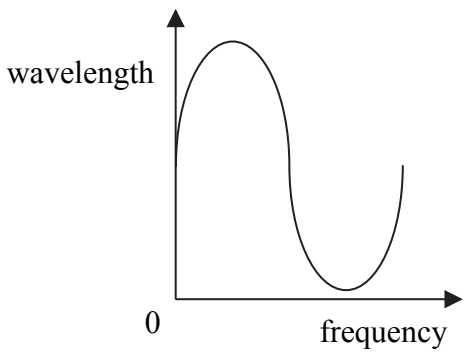
A



B



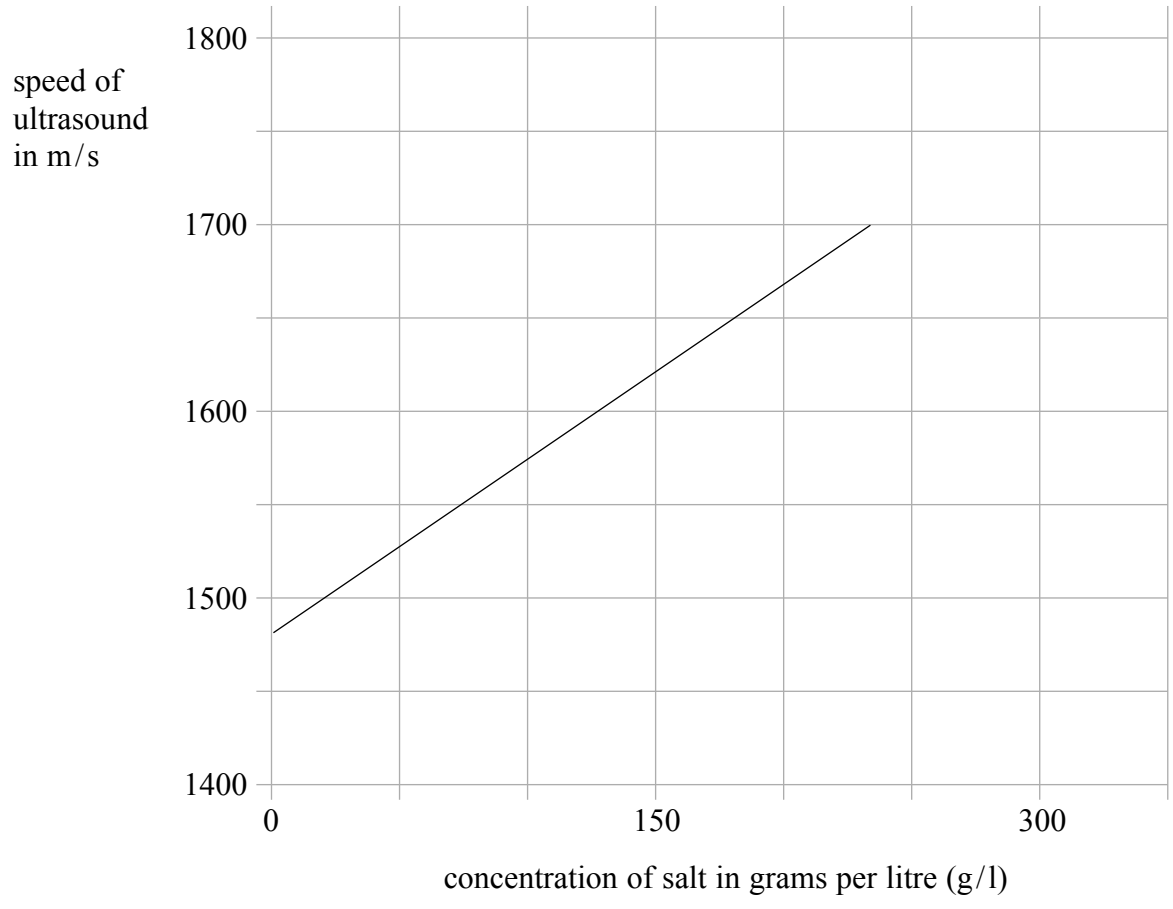
C



D

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30. In the Dead Sea, the water is very salty.
The graph shows how the speed of ultrasound waves changes with the concentration of salt in water.



Scientists send an ultrasound wave through the water in the Dead Sea.
The speed of the ultrasound is 1790 m/s.
The concentration of salt in the Dead Sea is probably about

A 300 g/l
B 330 g/l
C 350 g/l
D 400 g/l

31. Carlos used the Internet to find out the maximum depth of the Dead Sea.
He looked at data on a number of websites.
He found several different values for the maximum depth.

There is a range of maximum values because

A scientists are not measuring accurately enough
B the Dead Sea has a range of maximum depths
C the density of salt is not constant
D the Internet is not reliable

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Space

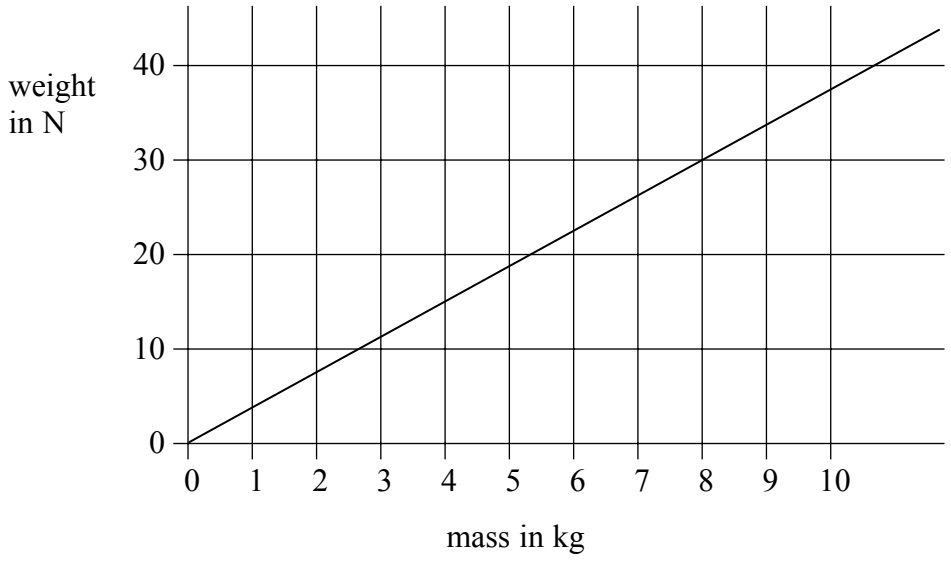
32. Which of these provides evidence for the Big Bang?

A microwave background radiation
B ultrasound background radiation
C gamma background radiation
D X-ray background radiation

33.

W = mg

The graph shows how the weight and mass of objects on Mars are related.

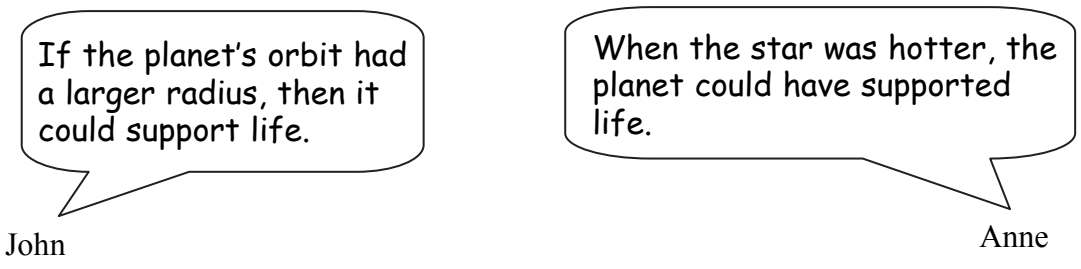


What is the gravitational field strength on Mars?

A 0.26 N/kg
B 0.38 N/kg
C 3.8 N/kg
D 10.5 N/kg

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34. John and Anne discuss a planet that orbits a distant star.
The planet is too cold to support life.



Who is correct?

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

35. Gas-giant planets have no solid surface.
Some gas-giant planets orbit stars at distances which give similar conditions to Earth.
Scientists hope that some of the planets may have moons.

Scientists are interested in these planets and moons because

A the moons may support life
B planets with moons are always gas-giants
C the moons may shine on the planets at night
D the moons may have no atmosphere

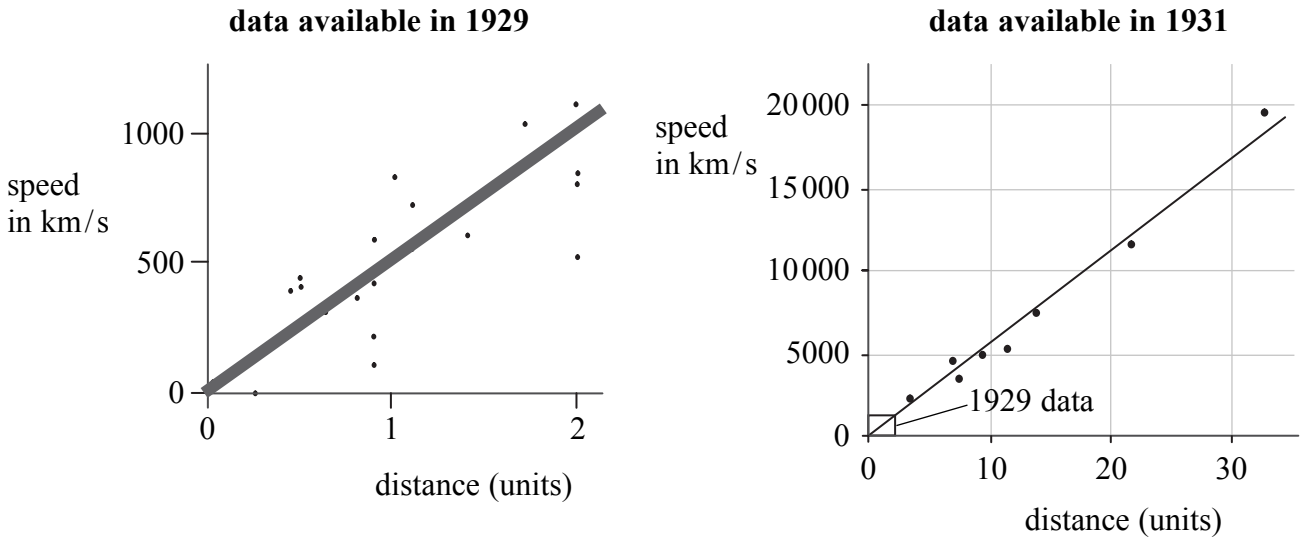
36. A black hole

A is at the centre of the Solar System
B gives out black light only
C is produced by a red shift
D has a strong gravitational field

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Hubble's idea

The graphs below show the speed of some galaxies plotted against their distance away from Earth.



37. The speed of galaxies can be calculated from

A the microwave radiation from the galaxies
B the red shift of radiation from their stars
C the colour of the stars they contain
D the age of the stars they contain

38. Hubble developed his idea using the data in the 1929 graph.
The graph from 1931 shows the results of a test that is more valid because

A fewer points are plotted
B the line of best fit is thinner
C a wider range of speed is used
D the graph has grid lines

Hubble's idea is described by the following equation.

speed of galaxy moving away from Earth = Hubble constant × distance of galaxy from Earth

39. The average value of the Hubble constant from the 1931 data is about

A 0.0012 units/km/s
B 0.0012 km/s/unit
C 570 units/km/s
D 570 km/s/unit

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40.

speed = distance / time

The Hubble constant has the same unit of measurement as

A time
B speed
C distance
D frequency

TOTAL FOR HIGHER TIER PAPER: 24 MARKS

END

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5010 Science/ 5046 Physics (P1b)

Unit P1b - 5010	
Topics 11 & 12	
1	B
2	D
3	C
4	D
5	D
6	A
7	B
8	C
9	A
10	A
11	A
12	D
13	B
14	C
15	B
16	A

Unit P1b - 5010	
Topics 11 & 12	
17	B
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Unit P1b - 5010	
Topics 11 & 12	
25	C
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32	A
33	C
34	B
35	A
36	D
37	B
38	C
39	D
40	D

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Science (5010)

Physics (5046)

P1b – Topics 11 and 12

Foundation and Higher Tier

Friday 20 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

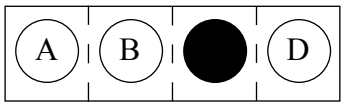
Instructions to Candidates

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

Waves

1. Which of these is used to detect forged banknotes?

A radio waves
B ultraviolet waves
C infrared waves
D gamma waves

2. Optical fibres can be used instead of wires.
Optical fibres are better because

A signals can travel slower
B much more information can be sent
C signals can be sent through space
D signals of lower frequency can be sent

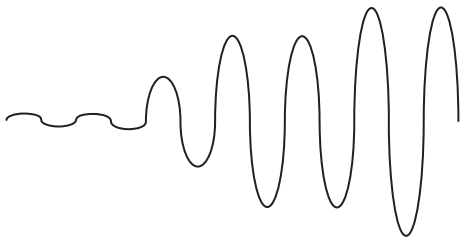
3. The temperature of different parts of the body can be monitored using scanning by

A emission
B transmission
C reflection
D refraction

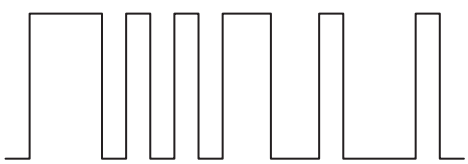
4. Which of these shows a digital signal?



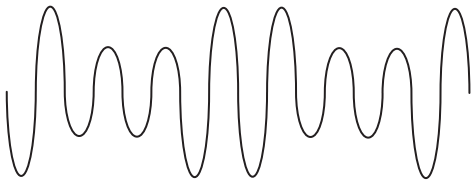
A



B



C



D

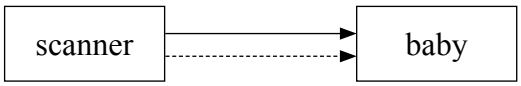
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5. Digital signals are better than analogue signals for sending information.
This is because

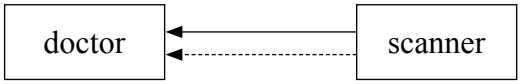
A digital signals have a higher frequency
B digital signals are less affected by noise
C digital signals travel faster through space
D digital signals use newer technology

6. A doctor scans the fetus inside a pregnant woman.
Which of these best shows the movement of the waves?

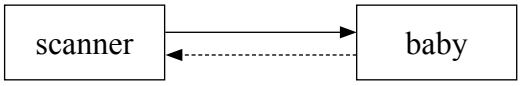
A



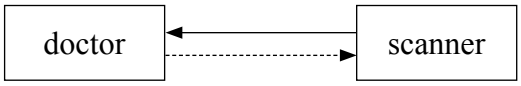
B

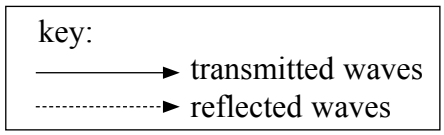


C



D





7. A tsunami is a giant water wave.
Which of these is correct for a tsunami?

A wave speed is measured in seconds
B wave frequency is measured in seconds
C wave amplitude is measured in metres
D wavelength is measured in Hertz

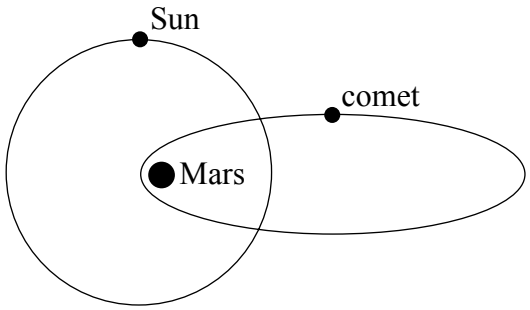
8. Which of these waves is **always** transverse?

A sound waves
B electromagnetic waves
C seismic waves
D ultrasound waves

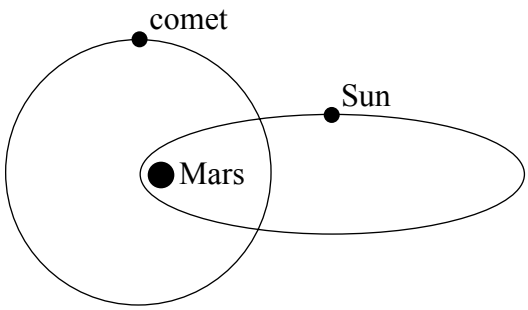
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Life on planet Mars (and elsewhere)

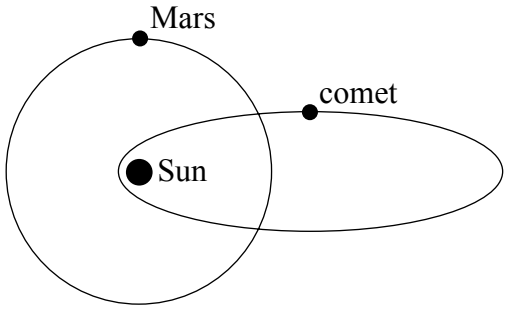
9. Which of these best shows the orbits of Mars and a comet?



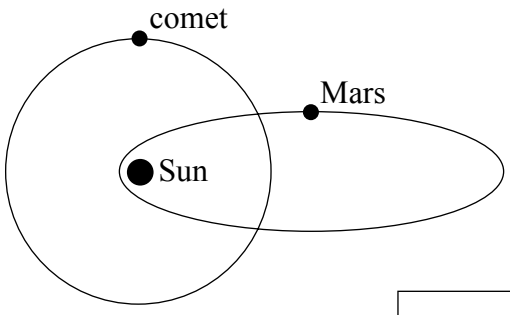
A



B



C



D

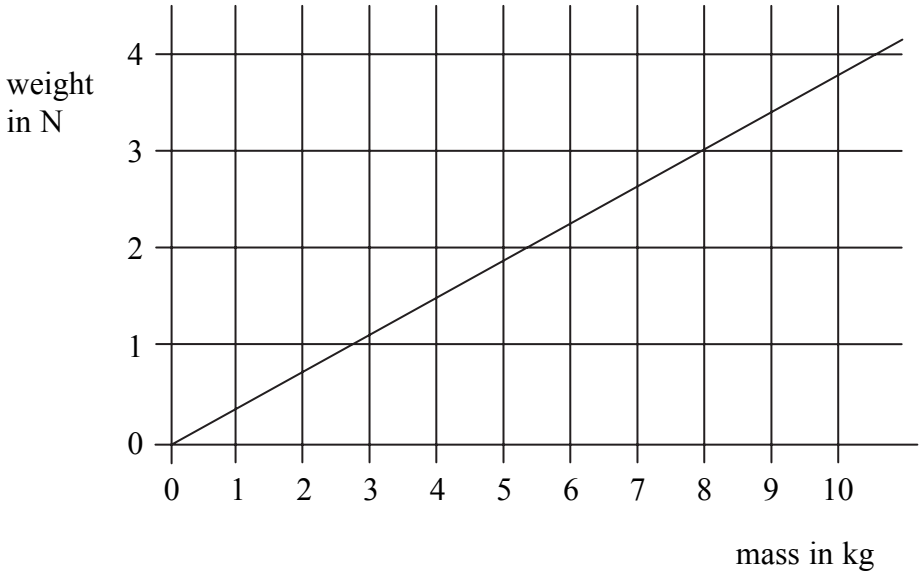
not to scale

10. A space probe falls from space through the atmosphere of Mars.
Which of these could stay the same as the probe falls?

A the mass of the probe
B the gravitational potential energy
C the temperature of probe
D the atmospheric pressure on the probe

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11. The graph shows how the mass and weight of objects on Mars are related.



Which row of the table is correct?

	mass	**weight**
A	3 N	8 kg
B	3 kg	8 N
C	8 N	3 kg
D	8 kg	3 N

12. A rocket takes off towards Mars.
Which row of the table is correct one minute after lift off?

	Does the rocket have kinetic energy?	**Does the rocket have gravitational potential energy?**
A	yes	no
B	yes	yes
C	no	no
D	no	yes

13. Which of these is the unit of gravitational field strength?

A N
B kg
C kg/N
D N/kg

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Use this information to answer questions 14 to 16.

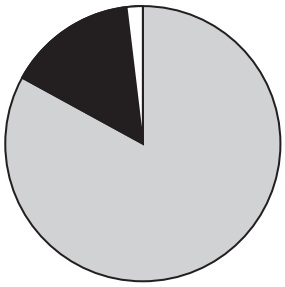
The table gives the percentages of the three main gases in the atmosphere of four planets.

planet	hydrogen	helium	methane
Jupiter	90	10	0.070
Saturn	96	3	0.4
Uranus	83	15	2.0
Neptune	80	19	1.5

14. The percentage of helium on Saturn is

A 96
B 10
C 3
D 0.4

15. The data for Uranus as a pie chart looks like this



Which of these is the correct key?

A

helium
hydrogen
methane

B

helium
methane
hydrogen

C

hydrogen
helium
methane

D

hydrogen
methane
helium

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16. Which of these is **not** needed by astronauts on long space flights?

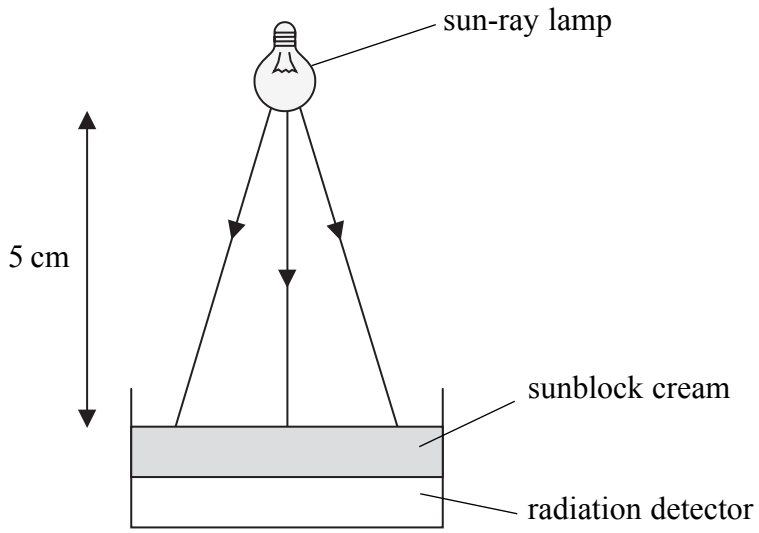
A oxygen
B carbon dioxide
C radiation shield
D exercise machine

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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.

Investigating waves

Mehta and Carlos investigate how four different sunblock creams protect the skin by absorbing radiation.
Their apparatus is shown below.



Their plan is

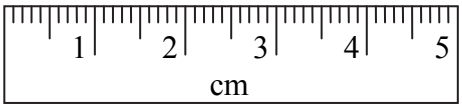
- to pass radiation through different types of sunblock cream
- to use the same depth of each cream
- to keep a constant distance between the lamp and the surface of the cream
- to use the same lamp at the same brightness
- to detect the amount of radiation passing through the cream

17. The radiation from the Sun that causes skin cancer is

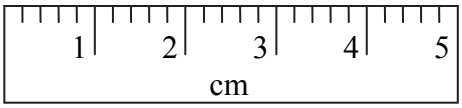
A ultrasound
B ultraviolet
C infrared
D microwave

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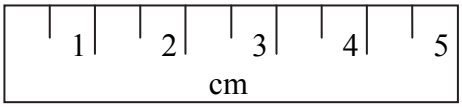
18. Which of these rulers would be best for measuring the depth of the sunblock cream?



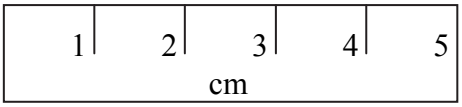
A



B



C

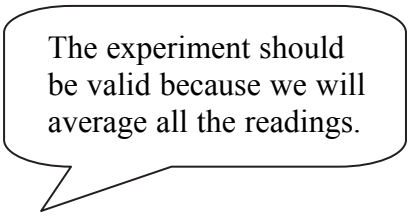


D

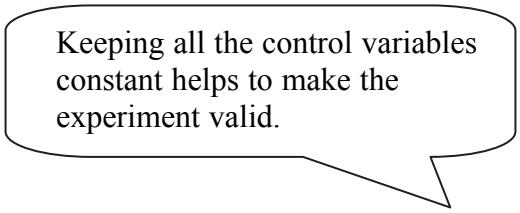
19. Which of these is the independent variable in this experiment?

A the type of cream
B the distance between lamp and cream
C the brightness of the lamp
D the depth of the cream

20. Mehta and Carlos discuss the validity of their experiment.



Mehta



Carlos

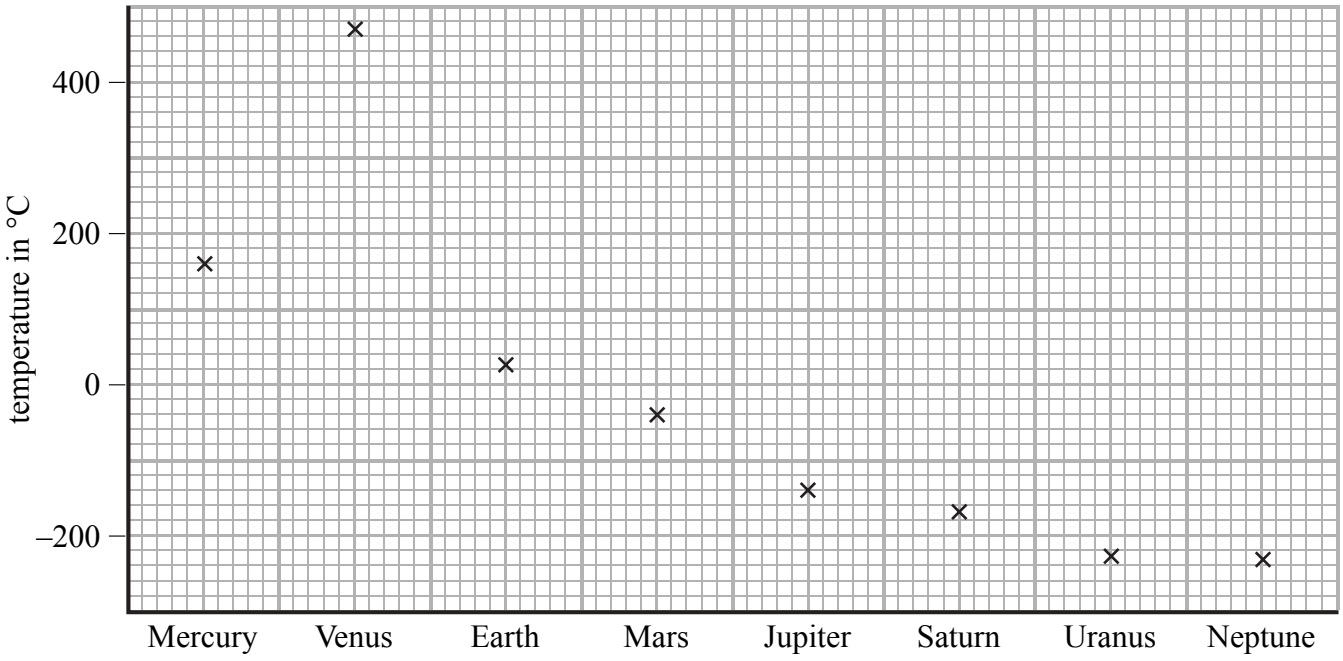
Who is correct?

A Mehta only
B Carlos only
C both Mehta and Carlos
D neither

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The planets

The chart shows the average temperature on the surface of the planets.
The planets are arranged in order of their distance from the Sun.



21. The average surface temperature of Saturn is about

A 170 °C
B 230 °C
C –170 °C
D –230 °C

22. The temperature of one planet seems anomalous.
Perhaps the temperature shown for **Venus** is wrong.
From the pattern of results, the expected value for Venus would be about

A –10 °C
B 90 °C
C 160 °C
D 470 °C

23. The temperature of one planet seems anomalous.
Perhaps the temperature shown for **Mercury** is wrong.
Assuming the temperature for Venus is correct, the pattern of results shows the expected value for Mercury would be about

A 100 °C
B 300 °C
C 500 °C
D 700 °C

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24. A scientist checks the results.
All the temperatures are correct.
Which of these facts explains the low temperature for Mercury?

A Mercury spins very slowly
B Mercury has no atmosphere
C Mercury has no surface water
D Mercury has no moons

TOTAL FOR FOUNDATION TIER PAPER: 24 MARKS

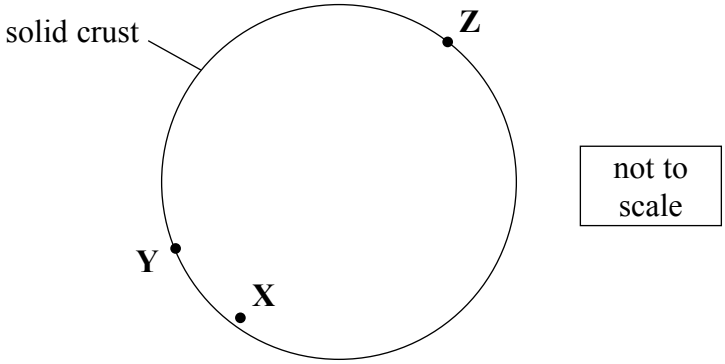
Foundation tier candidates do not answer any more questions after question 24.

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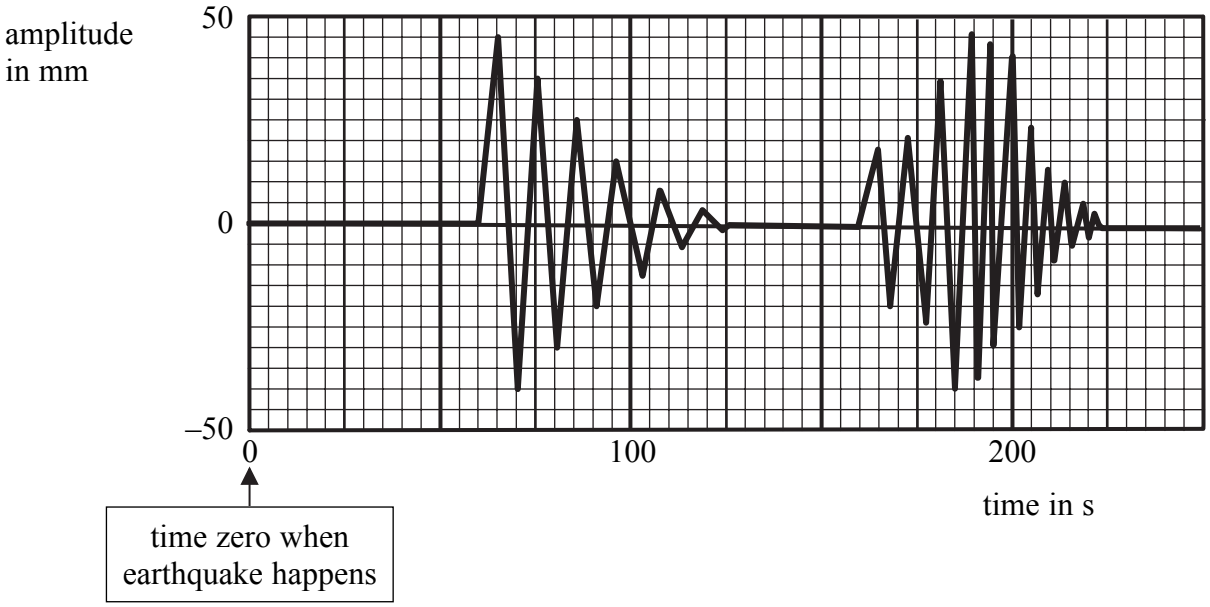
Questions 25 to 40 must be answered by Higher tier candidates only.
Foundation tier candidates do not answer questions 25 to 40.

An earthquake

The diagram shows a section through the Earth.



An earthquake happens at point **X**.
The graph shows a seismometer trace for seismic waves detected at **Y**.



25. John says that

- only transverse (S) waves should arrive at **Y**
- only longitudinal (P) waves should arrive at **Z**

Why is John incorrect?

A Longitudinal waves should also arrive at **Y**
B Transverse waves should **not** arrive at **Y**
C Longitudinal waves should **not** arrive at **Z**
D Transverse waves should arrive at **Z**

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26. What is the maximum amplitude of the first wave to arrive at **Y**?

A 45 mm
B 60 s
C 85 mm
D 125 s

27.

speed = distance / time

The seismometer is 480 km from the site of the earthquake.
What is the fastest possible average speed of the first wave?

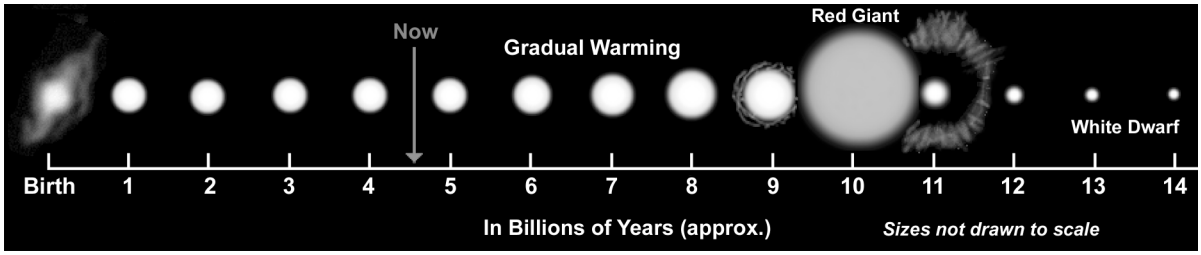
A 0.008 km/s
B 8 km/s
C 28 800 km/s
D 28 800 000 km/s

28. Point **Z** is 25 times further from the earthquake than point **Y**.
Waves from the earthquake, however, take more than 25 times as long to reach point **Z**.
This is because

A the primary wave travels faster near the centre of the Earth
B the primary wave is stopped by the core
C the primary wave travels slower in liquids than in solids
D the primary wave does not travel as fast as the secondary wave

Ageing stars

The chart shows stages in the evolution of yellow stars like our Sun.



29. In about how many years from now will our Sun become a Red Giant?

A 5 million years
B 4.5 billion years
C 5.0 billion years
D 9.5 billion years

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30. A star which is much more massive than our Sun could become

A a proton star
B a red dwarf
C a neutron star
D a white hole

31. Three stars form a pattern in the sky.



Which of these could show the three stars in the future, if the pattern stays the same?



A



B



C



D

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32. John and Anne discuss how this pattern of stars may change in the future.



John: The pattern may stay as a triangle but the triangle they make will probably become larger.

Anne: The pattern may change because the Sun is moving through space towards them.

Who is correct?

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

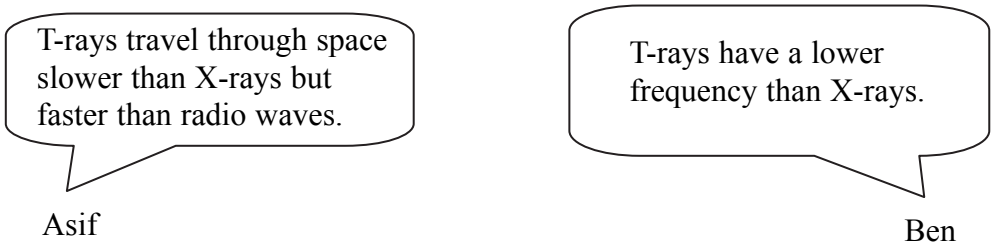
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T-rays

There is now a camera that can 'see' weapons hidden under clothing from 25 metres.
It is based on so-called 'terahertz', or T-ray, technology.

- The camera does not produce the invisible T-rays – it only receives them
- The camera 'sees' a person as a glowing shape
- T-rays can pass through clothing, paper and plastics
- T-rays cannot pass through metal or water

33. The human body produces T-rays.
T-rays are part of the electromagnetic spectrum.
Asif and Ben discuss T-rays.



Who is correct?

A Asif only
B Ben only
C both Asif and Ben
D neither

34. The T-ray camera can 'see' a metal object because it scans by

A transmission
B absorption
C reflection
D refraction

35.

$$\text{speed} = \text{frequency} \times \text{wavelength}$$

The wavelength of T-rays is between 0.1 and 1 mm.
The speed of light is 300 000 000 m/s.
Which of the following is a T-ray frequency?

A 3 000 Hz
B 300 000 Hz
C 300 000 000 Hz
D 300 000 000 000 Hz

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Comets, meteorites etc.

36. A planet is more likely to be hit by a comet than by another planet.
This is because

A planets are bigger than comets
B comets are bigger than planets
C planets travel in very elliptical orbits
D comets travel in very elliptical orbits

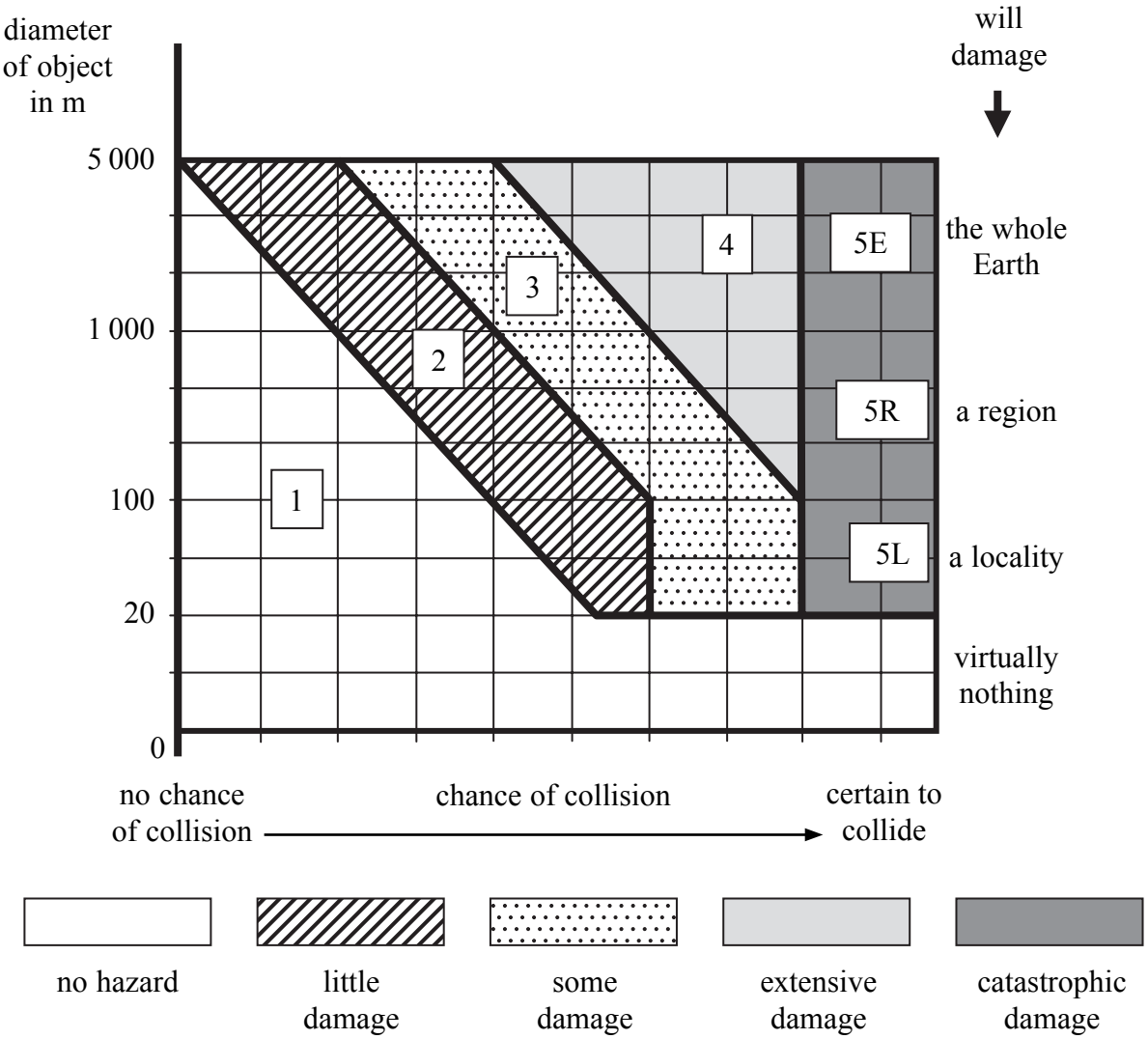
37. Which of these is likely to be the result of an object from space striking the Earth?

A the Big Bang
B a red shift
C a tsunami
D dark matter

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Use this information to answer questions 38 to 40.

If an object like a comet or meteorite hits the Earth, it may cause damage.
The potential for damage depends on the diameter of the object and the chance of collision.
Anne found the chart below on the Internet. It shows the possible effect of a collision.



38. Which number on the chart corresponds to an object of diameter 100 m which causes some damage?

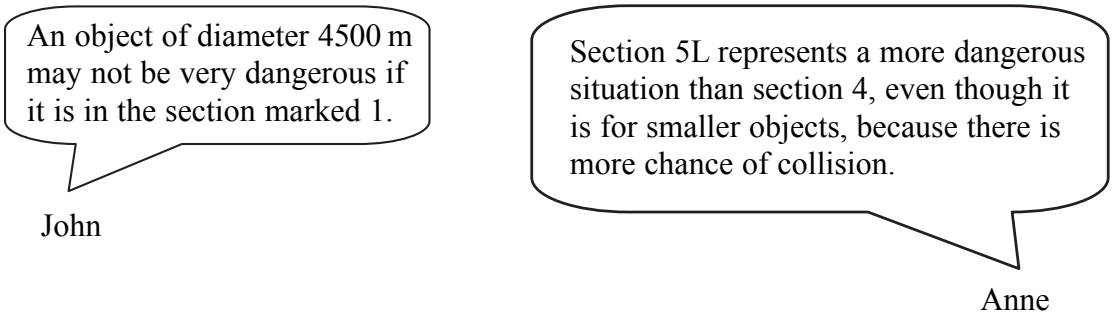
A 1
B 2
C 3
D 4

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39. Which of these is the diameter of an object that could cause catastrophic damage to a 'region' of the Earth.

A 5 000 m
B 500 m
C 50 m
D 5 m

40. John and Anne discuss some sections of the chart.



Who is correct?

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

TOTAL FOR HIGHER TIER PAPER: 24 MARKS

END

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Mark Scheme (Results)
November 2009

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360Science

GCSE Science
Multiple Choice Paper P1b (5010)

GCSE Physics
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November 2009

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5010 Science/ 5046 Physics (P1b)

Unit P1b - 5010	
Topics 11 & 12	
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2	B
3	A
4	C
5	B
6	C
7	C
8	B
9	C
10	A
11	D
12	B
13	D
14	C
15	C
16	B

Unit P1b - 5010	
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35	D
36	D
37	C
38	C
39	B
40	C

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Additional Science (5010)

Physics (5046)

P1b – Topics 11 and 12

Foundation and Higher Tier

Friday 19 June 2009 – 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.

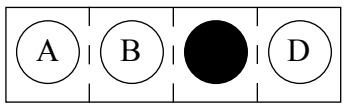
Foundation tier candidates: answer questions 1 – 24.
Higher tier candidates: answer questions 17 – 40.
All candidates are to answer questions 17 – 24.

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.

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

Testing times

1. Which part of the electromagnetic spectrum is used to detect broken bones?

A X-rays
B infrared
C ultraviolet
D microwaves

2. Endoscopes contain optical fibres which transmit light round curves using

A magnifying mirrors
B microwave energies
C total internal refraction
D total internal reflection

3. Pregnant women have their fetus scanned using

A infrared waves
B ultrasound waves
C ultraviolet waves
D X-rays

4. Which of these could be a longitudinal wave?

A a microwave
B a seismic wave
C an X-ray
D an ultraviolet wave

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Galaxies

A galaxy is a group of stars.

5. Our galaxy is called

A the Solar System
B the Milky Way
C the Universe
D the asteroids

6. Which of these is bigger than our galaxy?

A the Universe
B the asteroids
C the Moon
D the Sun

7. The waves that travel between galaxies must be

A transverse
B longitudinal
C both longitudinal and transverse waves
D sound waves

8. Which of these is true for visible light and radio waves as they travel between galaxies?

A Light travels slower than radio waves
B Light always travels faster than radio waves
C Light and radio waves travel at the same speed
D Light sometimes travels faster than radio waves

9. The distance between the Earth and the Sun is 150 000 000 km.
The average distance between stars in a galaxy is

A less than 150 000 000 km
B between 150 000 000 km and 200 000 000 km
C between 200 000 000 km and 250 000 000 km
D more than 250 000 000 km

10. Which of these is true?

A People have always known that galaxies exist
B A galaxy is an imaginary pattern of a few stars in the sky
C A high speed collision between two galaxies caused the Big Bang
D People once thought that some galaxies were just a single star

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Mobile phones

Some people say mobile phones are a danger to health.

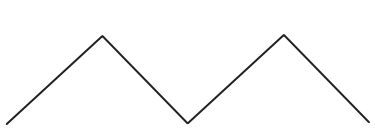
11. The radiation used in mobile phones is thought to be dangerous because it can be

A reflected by the brain
B refracted by the brain
C absorbed by the brain
D transmitted by the brain

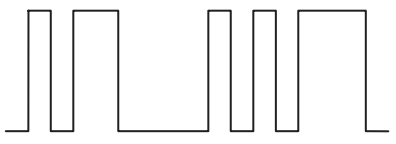
12. Mobile phones use

A microwaves
B seismic waves
C ultrasound radiation
D ultraviolet radiation

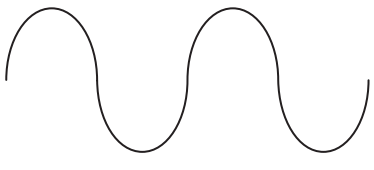
13. Mobile phones use digital signals.
Which of these is a digital signal?



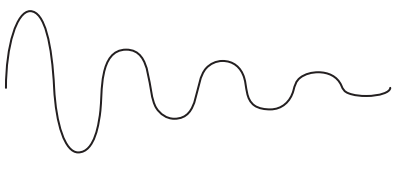
A



B



C



D

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Stars

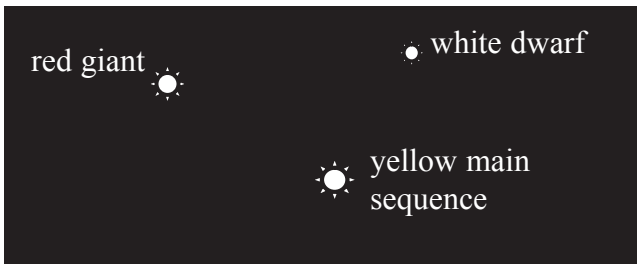
14. Most scientists think that all stellar material originally came from

A a black hole
B outer space
C the Big Bang
D a white dwarf

15. A star which is much more massive than our Sun could become

A a nebula
B a red dwarf
C a neutron star
D a white hole

16. The photograph shows three stars in the sky which have masses about the same as our Sun.



The white dwarf star could become

A blue
B red
C yellow
D black

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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.

About the Sun

17. People have always studied stars using

A radio waves
B visible light waves
C gamma waves
D microwaves

Use this information to answer questions 18 and 19.

> William Herschel was worried about the harmful effects of the Sun's rays.
>
> Herschel
>
> - found that part of the spectrum gave a lot of light but little heat
> - found that other parts gave a lot of heat but little light
> - noticed an increasing trend in the heating effects from violet to red
> - investigated whether the trend continued further
> - found that just outside the visible region the heating effect was even greater
>
> He had discovered a new invisible type of radiation.

18. Herschel discovered invisible radiation because he

A investigated various colours of light
B noticed that the heating effects were not equally divided
C noticed a trend in the effects of different colours
D investigated to see if the trend continued further

19. Which of these did Herschel discover?

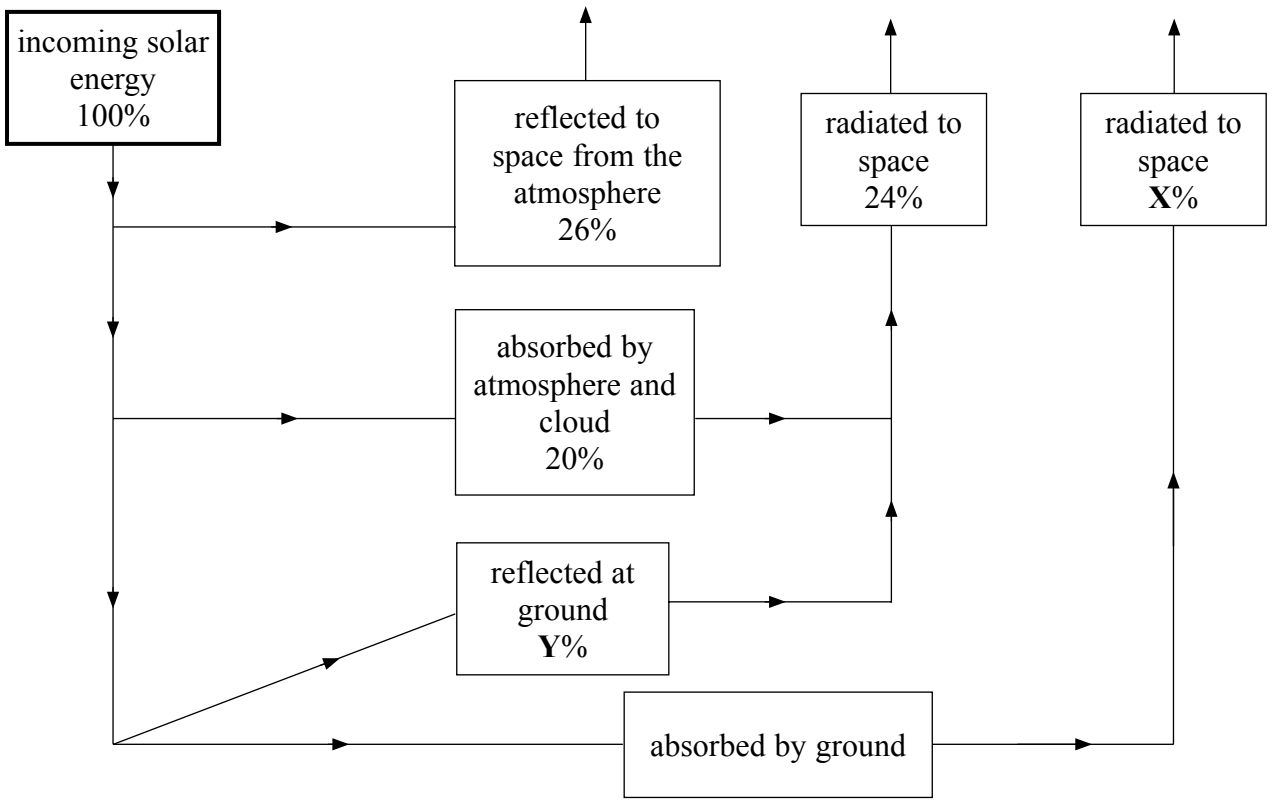
A microwaves
B infrared waves
C ultrasound waves
D X-ray waves

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Radiation from Space

Use this information to answer questions 20 and 21.

The diagram shows what happens to solar energy striking the Earth's upper atmosphere.



20. The Earth generally sends to space the same amount of energy that it receives.
This means its temperature stays constant.
Under these conditions, what is the value of **X** (the percentage radiated to space from the ground)?

A 50
B 54
C 74
D 100

21. The percentage of energy reflected at the ground (**Y**%) is

A 4%
B 50%
C 70%
D 100%

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Life and living

Use this information to help you answer questions 22 and 23.

100 people were asked “What do you think unidentified flying objects (UFOs) are?”.
The table gives the results.

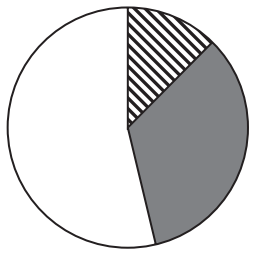
answers	number
wrong identification of a common object	36
people telling lies	58
alien spacecraft	11

22. Why does the number of answers **not** add up to 100?

A Surveys are always less than 100%
B Only one answer is bigger than 50
C Some people gave more than one answer
D Some people gave a wrong answer

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23. Alan drew this chart of the results



Which of the keys below is correct?

A

- people telling lies
- wrong identification of a common object
- alien spacecraft

B

- alien spacecraft
- people telling lies
- wrong identification of a common object

C

- people telling lies
- alien spacecraft
- wrong identification of a common object

D

- wrong identification of a common object
- people telling lies
- alien spacecraft

24. John and Anne discuss water and the possibility of life on another planet.

John: Life as we know it is certain if there is liquid water there.

Anne: Life as we know it is impossible if there is no liquid water there.

Who is correct?

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

TOTAL FOR FOUNDATION TIER PAPER: 24 MARKS

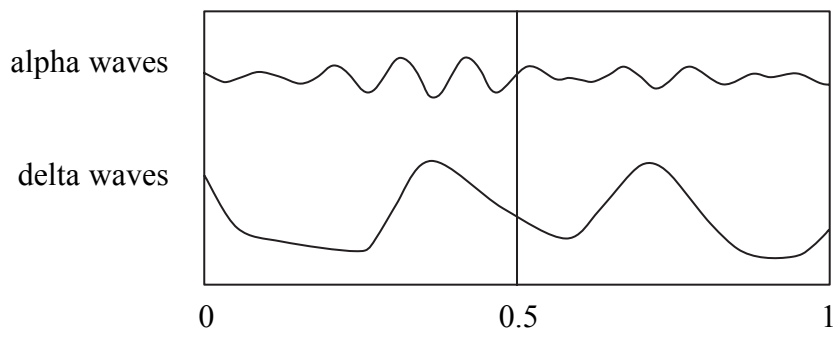
Foundation tier candidates do not answer any more questions after question 24.

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Questions 25 to 40 must be answered by Higher-tier candidates only.
Foundation-tier candidates do not answer questions 25 to 40.

Brain waves

The diagram shows two types of brain wave.



25. Which row of the table correctly compares alpha and delta waves?

	the amplitude of alpha is	**the frequency of alpha is**
A	smaller	higher
B	larger	higher
C	smaller	lower
D	larger	lower

26. The frequency of alpha waves is about

A 0.1 Hz
B 1 Hz
C 10 Hz
D 100 Hz

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Lift off

The picture shows a space shuttle lifting off.



27. The thrust from the rocket engine is caused by hot gases.
Which row of the table correctly explains this thrust after lift-off?

	the rocket pushes	**the hot gases push**
A	on the Earth	on the rocket
B	on the gases	on the Earth
C	on the Earth	on the Earth
D	on the gases	on the rocket

28. force = mass × acceleration

Which of these is the equation used to calculate the acceleration of the rocket at lift off ?

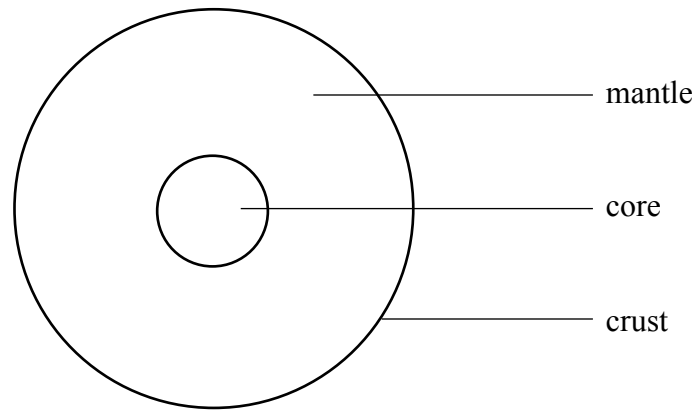
A $W = T + ma$
B $T - W = ma$
C $T = W - ma$
D $W - T = ma$

key
m mass of rocket
W weight of rocket
T thrust from the rocket engine
a acceleration of rocket

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Down to Earth

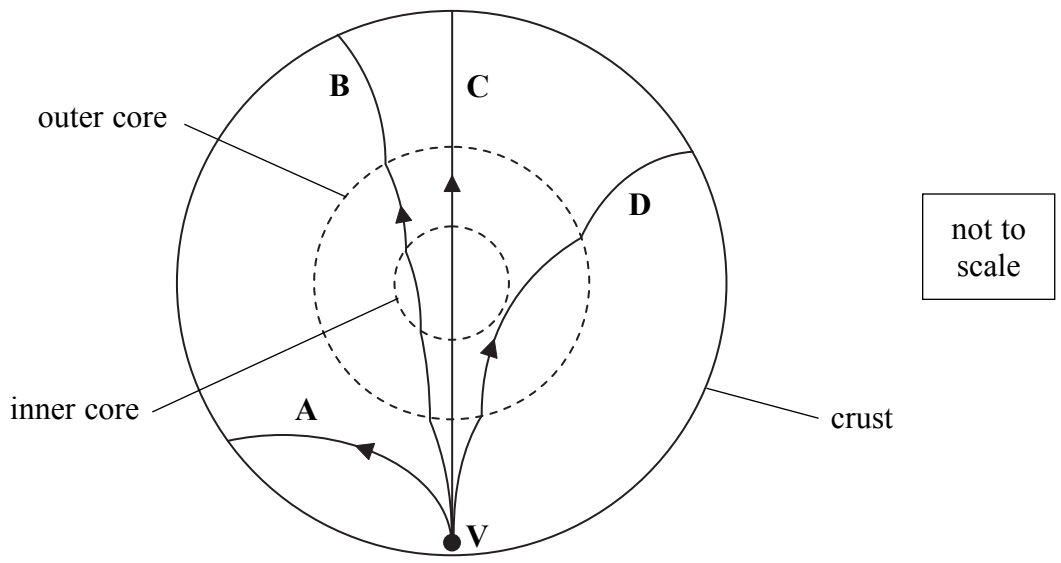
People study the inside of the Earth using earthquakes.



29. Through which parts of the Earth do longitudinal (P) waves travel?

A core only
B crust and mantle only
C mantle and core only
D crust, mantle and core

30. The diagram shows some waves passing through the Earth from an earthquake at **V**.



Which of the paths shown can be taken by transverse waves?

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31.

speed = frequency × wavelength

An earthquake wave has a wavelength of 3 m when it travels at 12 km/s.
What is its frequency?

A 4 Hz
B 36 Hz
C 4 000 Hz
D 36 000 Hz

32.

speed = distance / time

A seismic wave travels vertically downwards from the Earth's surface to the boundary between the mantle and the outer core.
The reflected wave is detected after 1000 s.
The wave's average speed is 6 km/s.
How deep is the mantle outer core boundary?

A (1000 × 6) km

B $\left[\frac{1000 \times 6}{2}\right]$ km

C $\left[\frac{1000 \times 2}{6}\right]$ km

D $\frac{1000}{6}$ km

33. Many seismic waves follow curved paths because

A their speed remains constant
B their speed changes
C they are longitudinal
D they are transverse

34. It is difficult to predict earthquakes because

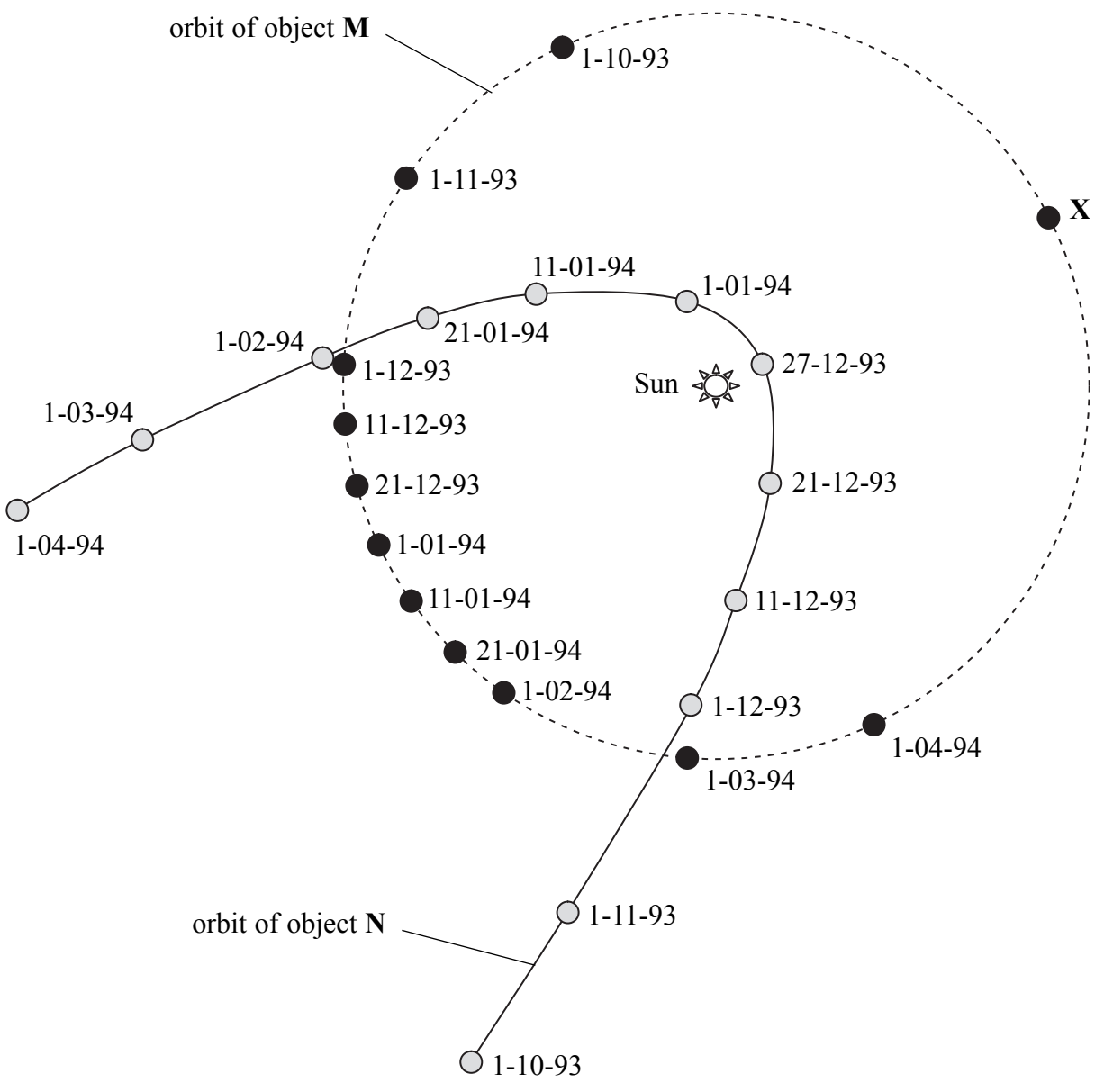
A they often occur in remote places
B new rock is constantly being formed
C scientists do not have enough data about the structure of the Earth
D earthquakes often happen at the boundary between mantle and core

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Part of the Solar System

Use this information to answer questions 35 to 40.

Two objects, **M** and **N**, orbit the Sun.
The diagram shows their positions on various dates in 1993 and 1994.



35. The two objects **M** and **N** could be

A a planet and a comet
B an asteroid and a planet
C an asteroid and a moon
D a comet and a star

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36. At what date was **M** at position **X**?

A 1-07-93
B 1-05-94
C 1-09-94
D 27-12-94

37. On which of these dates were **M** and **N** closest together?

A 1-12-93
B 21-12-93
C 11-01-94
D 1-02-94

38. Which of these is correct?

A **N** moves slower than **M** when **N** is nearest the Sun
B **M** increases in speed in December
C **M** moves fastest when it is nearest **N**
D **N** moves fastest when it is nearest the Sun

39. John wanted to show changes in the speed of object **N**.
He would illustrate the changes best by showing its orbit

A by a dot every month
B by a dot every week
C by a dot every hour
D by a continuous line

40. Which row of the table is correct?

	temperatures will change most on	**because its distance from the Sun**
A	**M**	is constant
B	**N**	is constant
C	**M**	changes
D	**N**	changes

TOTAL FOR HIGHER TIER PAPER: 24 MARKS

END

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Edexcel GCSE

Science (5010)

Physics (5046)

P1b – Topics 11 and 12

Foundation and Higher Tier

Friday 6 March 2009 – Morning

Time: 20 minutes

Materials required for examination
Multiple Choice Answer Sheet
HB pencil, eraser and calculator

Items included with question papers
Nil

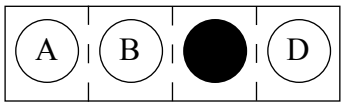
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Mark your answers on the separate answer sheet.

Foundation tier candidates: answer questions 1 – 24.
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Questions 1 to 16 must be answered by Foundation tier candidates only.
Higher tier candidates start at question 17.

The Solar System

Neil Armstrong was the first person to stand on the Moon.



1. The force of gravity on the Moon is

A zero
B less than on the Earth
C the same as on the Earth
D more than on the Earth

2. The Moon has no atmosphere.
This means that Neil

A had no weight
B needed no protection from radiation
C needed artificial gravity to stop him floating away
D needed breathing apparatus when he was outside the spacecraft

3. John hopes to go to Mars.
He will need to prevent his muscles from becoming weak on the long journey.
One way of doing this is to

A take frequent short sleeps
B breathe pure oxygen
C take calcium tablets
D exercise regularly

4. A comet orbits

A the Earth
B the Moon
C an asteroid
D the Sun

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5. Which row of the table is correct for a 1 kg object?

	1 kg on a comet has a mass of	**1 kg on an asteroid has a mass of**
A	2 kg	½ kg
B	½ kg	2 kg
C	1 kg	1 kg
D	0	0

6. There are some questions to which scientists cannot definitely answer 'yes'.
Which one of these questions can scientists definitely answer 'yes'?

A Can a person survive on the Moon?
B Can a person survive on Venus?
C Can a plant grow on Venus?
D Can a plant grow on Mars?

7. Our Sun is a main sequence star.
A much more massive main sequence star will become

A a red giant
B a red super giant
C a blue giant
D a blue super giant

8. Which row of the table is correct?

	smallest ⟶		**largest**
A	Solar System	Universe	Milky Way
B	Solar System	Milky Way	Universe
C	Universe	Milky Way	Solar System
D	Universe	Solar System	Milky Way

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Uses of waves

Many of our activities depend in some ways on waves.

9. Information is often sent in the form of digital rather than analogue signals.
Digital signals are better because they

A travel faster
B travel further
C can be made louder
D are less affected by noise

10. Too much of some types of waves can harm the body.
Which of these is most likely to cause skin cancer?

A visible light waves
B radio waves
C infrared waves
D ultraviolet waves

11. Microwaves are used

A to locate rainstorms
B to give a suntan
C to see bone fractures
D to treat cancer

12. The reason that X-rays are **not** used to scan a fetus during pregnancy is because

A they might pass straight through the fetus
B they might damage the cells of the fetus
C they are more expensive to detect
D they require a lot of safety equipment

13. The temperature of a star can be estimated by the waves

A it emits
B it reflects
C it refracts
D it absorbs

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Describing waves

14. This diagram shows a wave.



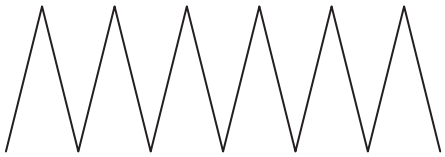
Which of these waves has the same amplitude but a smaller wavelength?



A



B



C

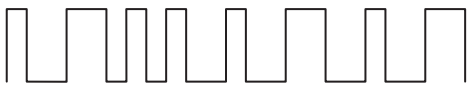


D

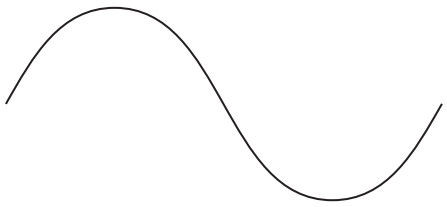
15. Which of these can **never** be a longitudinal wave?

A a sound wave
B an ultrasound wave
C an ultraviolet wave
D an earthquake wave

16. Which of these is a digital signal?



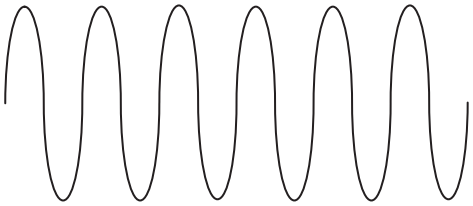
A



B



C



D

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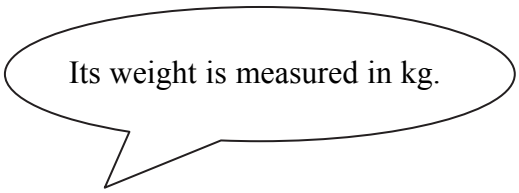
Higher tier candidates start at question 17 and answer questions 17 to 40.
Questions 17 to 24 must be answered by all candidates: Foundation tier and Higher tier.

Mars

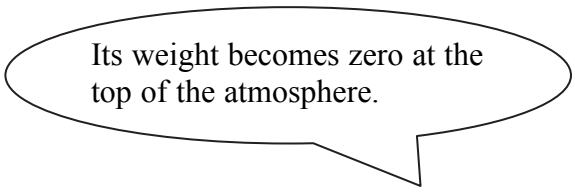
Astronauts from the USA hope to land on Mars within the next 15 years.



17. Alice and Boris are talking about the weight of an object on Mars.



Alice



Boris

Who is correct?

A Alice only
B Boris only
C both Alice and Boris
D neither

18. A comet is less likely to hit a satellite orbiting Mars than to hit Mars itself.
This is because the satellite

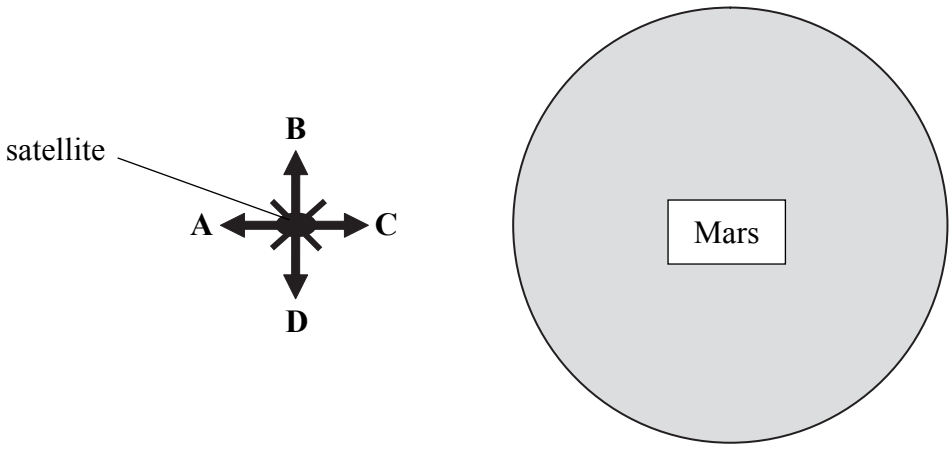
A is smaller than Mars
B is moving faster than Mars
C will be in an elliptical orbit
D changes direction faster than Mars

19. On Mars, a mass of 2 kg has a weight of 5 N.
The gravitational field strength in N/kg on Mars is

A 5×2
B $5 \div 2$
C $5 + 2$
D $5 - 2$

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20. The diagram shows a satellite in orbit around Mars.
The satellite is slowing down.



Which arrow shows the direction of the force of gravity on the satellite?

Ultrasound scans

Pregnant women have an ultrasound scan to show the fetus.
Doctors also scan other parts of the body with ultrasound.

21. The retina is a layer in a person's eye which can be scanned.
The image is formed when ultrasound waves are

A absorbed by the retina
B reflected by the retina
C refracted by the retina
D transmitted by the retina

22. When ultrasound waves meet a boundary between two layers of the body, only some of the waves pass through into the second material.

boundary between	percentage of waves passing through
air and skin	less than 1%
gel and skin	98%

A soft jelly-like material (gel) is used instead of the air between the ultrasound source and the skin.
The gel is used

A so the probe does not feel cold
B to stop the probe slipping over the skin
C to prevent the waves damaging the skin cells
D so that a higher percentage of waves enters the skin

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Use this information to answer questions 23 and 24.

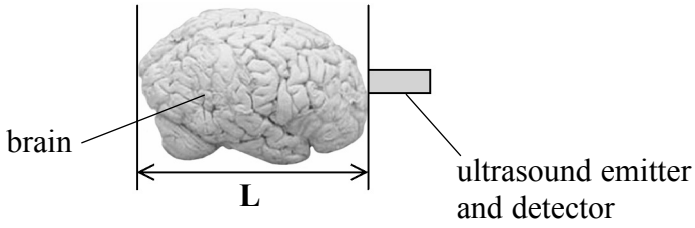
The table shows the speed of ultrasound in different substances in the body.

substance in the body	speed of ultrasound (m/s)
blood	1570
bone	4080
brain	1540
fat	1450

23.

speed = distance ÷ time

The time for an ultrasound pulse to travel through the brain and back to the detector is measured as 0.002 s.



The length **L** in metres of the brain is about

A 0.002 × 1540 ÷ 2
B 0.002 ÷ 1540 ÷ 2
C 0.002 × 1540 × 2
D 0.002 ÷ 1540 × 2

24. Between which pair of substances will the amount of refraction be the **least**?

A bone and fat
B fat and brain
C brain and blood
D blood and bone

TOTAL FOR FOUNDATION TIER PAPER: 24 MARKS

Foundation tier candidates do not answer any more questions after question 24.

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Questions 25 to 40 must be answered by Higher tier candidates only.
Foundation tier candidates do not answer questions 25 to 40.

Exploring space

25. The diagram shows a rocket just as it takes off.
The gases are pushed downwards from the rocket engine with a total force of 1 600 000 N.



The force from the gases on the rocket is

A equal to 1 600 000 N upwards
B more than 1 600 000 N downwards
C equal to 1 600 000 N downwards
D more than 1 600 000 N upwards

26.

force = mass × acceleration

Out in space the rocket accelerates at 0.5 m/s^2.
If the rocket's mass is 25 000 kg, the force producing this acceleration is

A 12 500 kg
B 12 500 N
C 50 000 kg
D 50 000 N

27. Astronauts detect radio stars by the radiation that these stars

A emit
B absorb
C reflect
D refract

28. An astronaut in space receives rays from two different stars.
A visible light ray is sent out by one star and an X-ray by the other star at exactly the same time.
The X-ray arrives before the visible wave.
Which of these statements **must** be true?

A the X-ray has travelled further
B the visible light ray has travelled further
C the X-ray has travelled faster than the visible light ray
D the visible light ray has travelled faster than the X-ray

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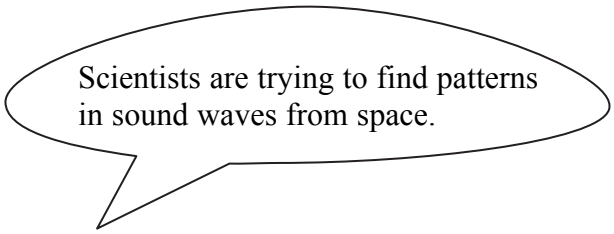
29.

speed = frequency × wavelength

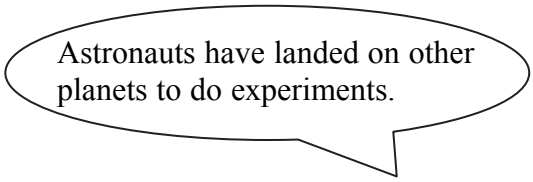
The speed of radio waves in space is 300 000 000 m/s (which is 3×10^8 m/s).
Their wavelength is 0.3 m (which is 3×10^{-1}m).
Their frequency in Hz is

A 0.00000001 (or 1×10^{-8})
B 0.00000009 (or 9×10^{-8})
C 90 000 000 (or 9×10^7)
D 1 000 000 000 (or 1×10^9)

30. John and Jane are discussing how scientists are searching for intelligent life on other planets.



John



Jane

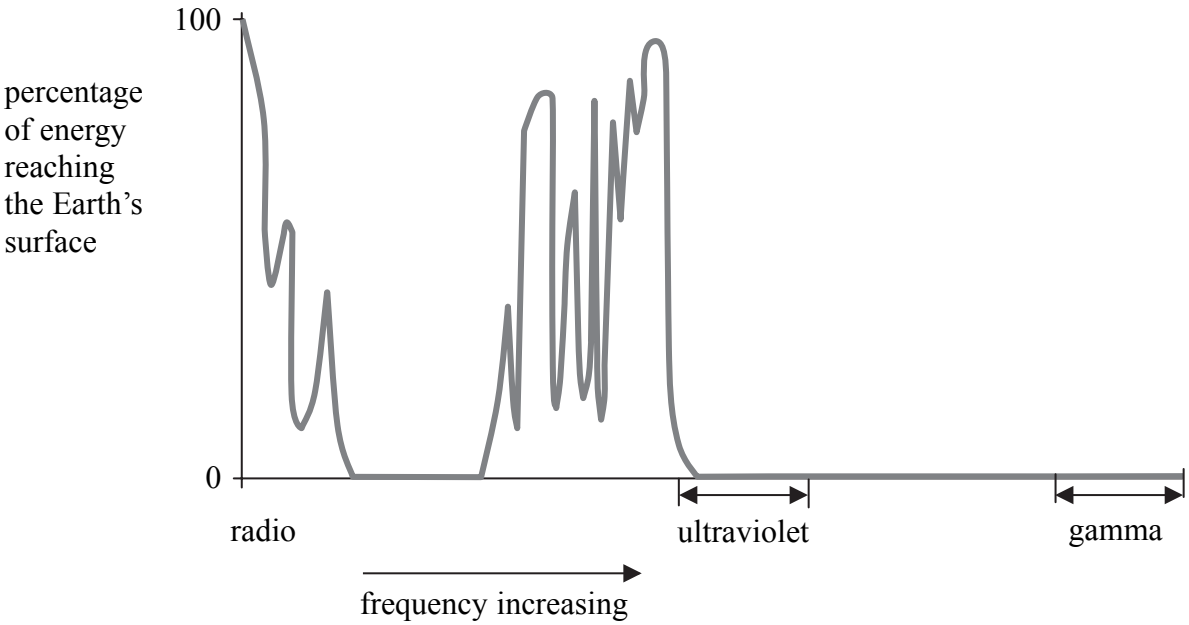
Who is correct?

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

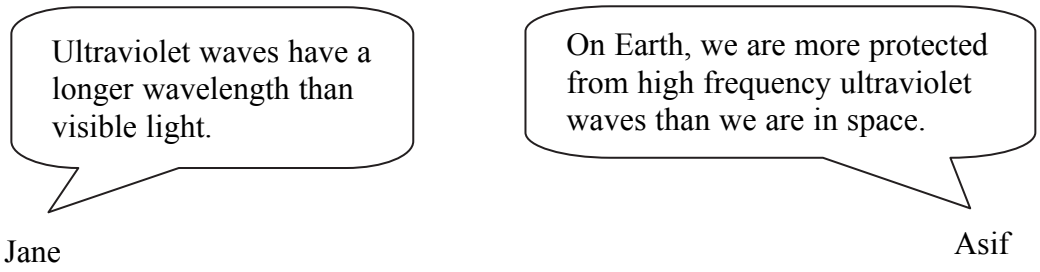
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Use this information to answer questions 31 and 32.

Electromagnetic wave energy reaches the Earth's surface from space.
The chart shows the percentage of this energy at different frequencies.



31. Jane and Asif were discussing ultraviolet waves.



Who is correct?

A Jane only
B Asif only
C both Jane and Asif
D neither

32. X-ray stars have only recently been discovered because

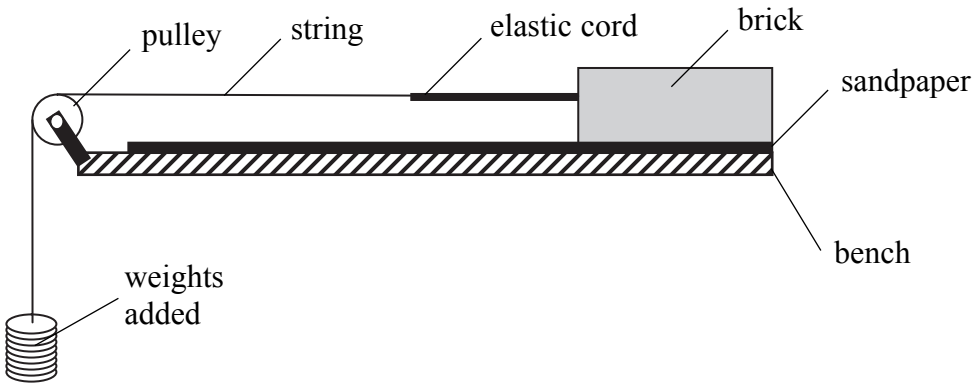
A X-rays cannot be seen
B X-rays do not affect photographic films
C X-ray stars have only recently developed
D X-rays are absorbed by the atmosphere

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Earthquakes

Use this information to answer questions 33 and 34.

Earthquakes happen when pieces of the Earth's crust slide against each other.
John was studying earthquakes and wanted to investigate how sliding works.
The diagram shows an experiment he tried.



Small weights are added carefully.
These stretch the elastic cord.
Suddenly the brick jerks to the left.

33. John and his friends had watched this initial experiment.
John's friends now made these statements.

A More weights will be needed to move a heavier brick.

B The elastic cord should stretch before the brick slides.

C I think John should use the same brick and elastic cord each time.

D The sandpaper stops the brick from sliding as easily.

Who has made a prediction?

34. John repeats the experiment.
He finds that different number of weights are needed to move the brick each time.
The results from this model explain why scientists find it difficult to

A detect longitudinal waves from an earthquake
B measure the size of an earthquake
C say when an earthquake will happen
D say where an earthquake has happened

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35. One type of seismic wave can be detected on the opposite side of the Earth to an earthquake.
This type of wave is

A digital
B electromagnetic
C transverse
D longitudinal

36. After a seismic event on the Moon, both of the different types of seismic waves were detected on the opposite side.
This means that

A the Moon is solid all the way through
B the Moon has a liquid inner core
C the Moon is hollow
D the scientists made a mistake

Gravity, red shift and the Universe

The Universe seems to be controlled by gravity.
We can learn about the Universe by studying gravity and the red shift of light from stars.

37. Imagine you are the same distance from some astronomical objects.
Which of these would have the biggest gravitational pull on you?

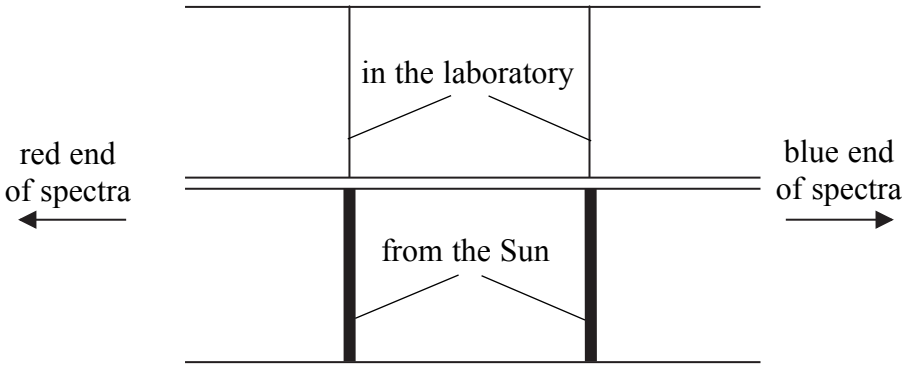
A a large planet
B a red giant
C a black hole
D a white dwarf

38. Red shift provides supporting evidence for

A the steady state theory of the Universe
B the Big Bang theory
C the existence of black holes
D the existence of the Milky Way

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39. The diagram shows two lines in the spectrum of the element sodium.
The thin lines were produced from a sodium flame in a laboratory.
The thick lines are the same two lines viewed in the spectrum from the Sun.



The difference between the two sets of lines (which is caused by both red and blue shifts) is most likely due to

A the Sun spinning on its axis
B the Earth spinning on its axis
C the Sun moving closer to the Earth
D the Sun moving away from the Earth

40. The Universe is likely to stop expanding and collapse if

A $E = mc^2$
B the mass of the Universe is large enough
C the mass of the Universe is small enough
D weight = mass × gravitational field strength

TOTAL FOR HIGHER TIER PAPER: 24 MARKS

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