

Surname	Initial(s)
Signature	

Paper Reference(s)

5010 5046

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

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.

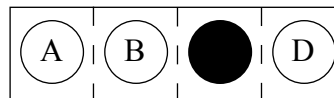
Before the test begins:

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.**

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

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	$\frac{1}{2}$ kg
B	$\frac{1}{2}$ 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

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

Describing waves

14. This diagram shows a wave.



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



A



B



C

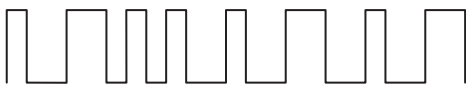


D

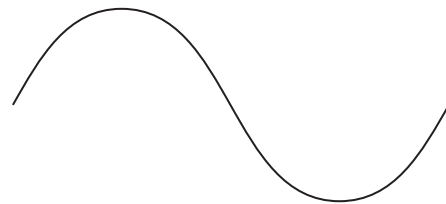
15. Which of these can **never** be a longitudinal wave?

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

16. Which of these is a digital signal?



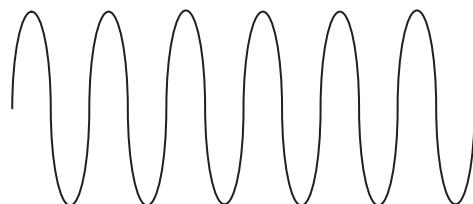
A



B



C



D

**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.

Its weight is measured in kg.

Alice

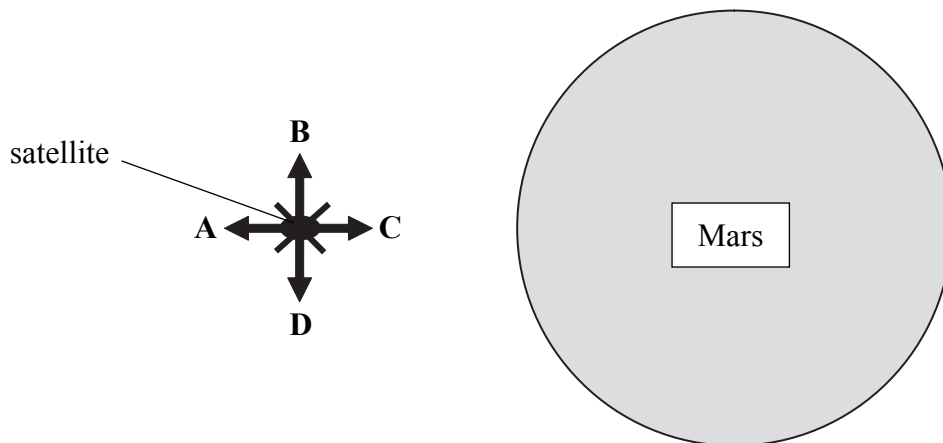
Its weight becomes zero at the top of the atmosphere.

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 5N. The gravitational field strength in N/kg on Mars is
- A 5×2
 - B $5 \div 2$
 - C $5 + 2$
 - D $5 - 2$

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

Use this information to answer questions 23 and 24.

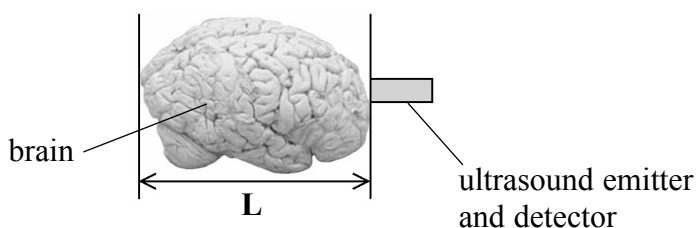
The table shows the speed of ultrasound in different substances in the body.

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

23.

$$\text{speed} = \text{distance} \div \text{time}$$

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 $0.002 \times 1540 \div 2$
 - B $0.002 \div 1540 \div 2$
 - C $0.002 \times 1540 \times 2$
 - D $0.002 \div 1540 \times 2$
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.

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 \times 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

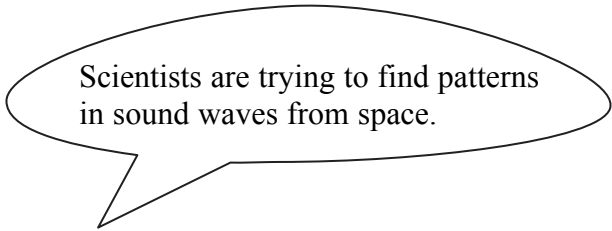
29.

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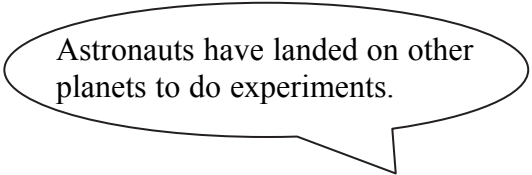
The speed of radio waves in space is 300 000 000 m/s (which is 3×10^8 m/s).
Their wavelength is 0.3 m (which is 3×10^{-1} m).
Their frequency in Hz is

- 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



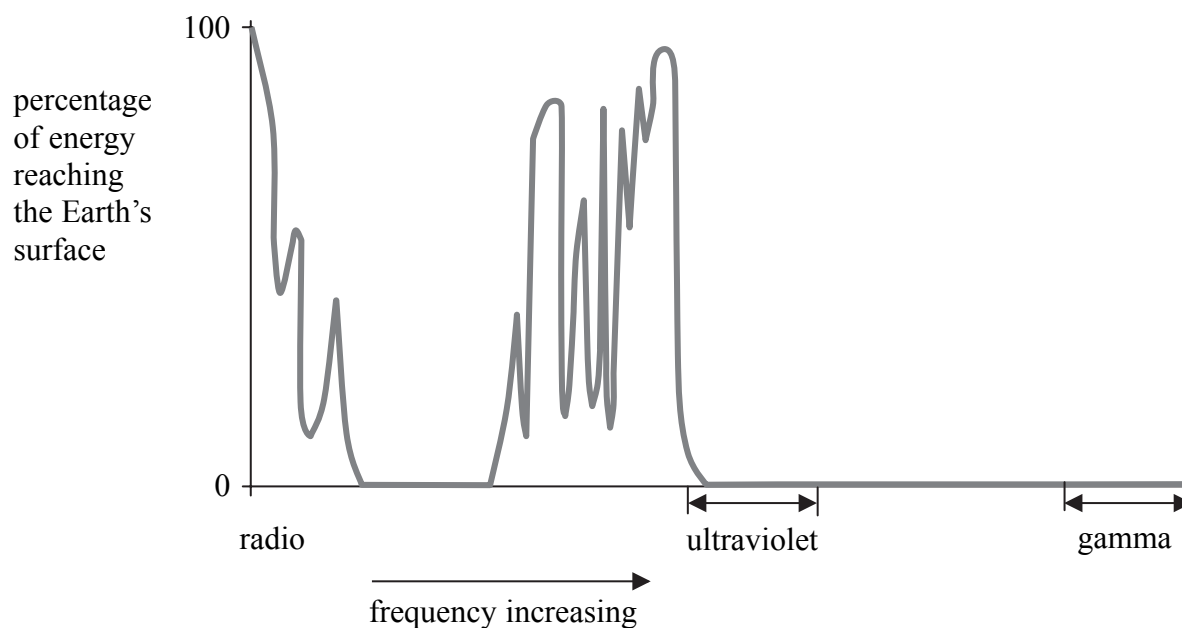
Jane

Who is correct?

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

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.

Ultraviolet waves have a longer wavelength than visible light.

Jane

On Earth, we are more protected from high frequency ultraviolet waves than we are in space.

Asif

Who is correct?

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

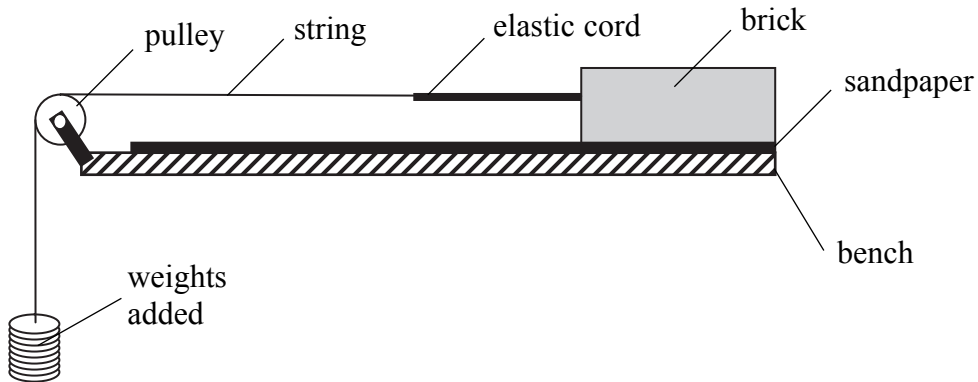
32. X-ray stars have only recently been discovered because

- 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

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.

More weights will be needed to move a heavier brick.

A

The elastic cord should stretch before the brick slides.

B

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

C

The sandpaper stops the brick from sliding as easily.

D

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

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

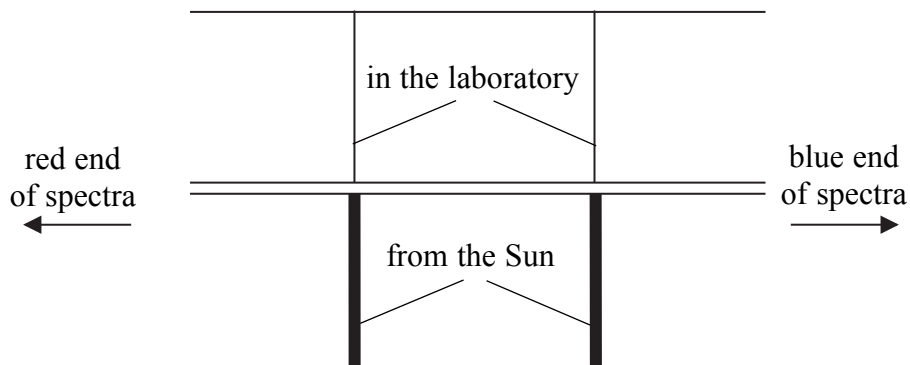
Gravity, red shift and the Universe

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

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 \times gravitational field strength

TOTAL FOR HIGHER TIER PAPER: 24 MARKS

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