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 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.

A B D

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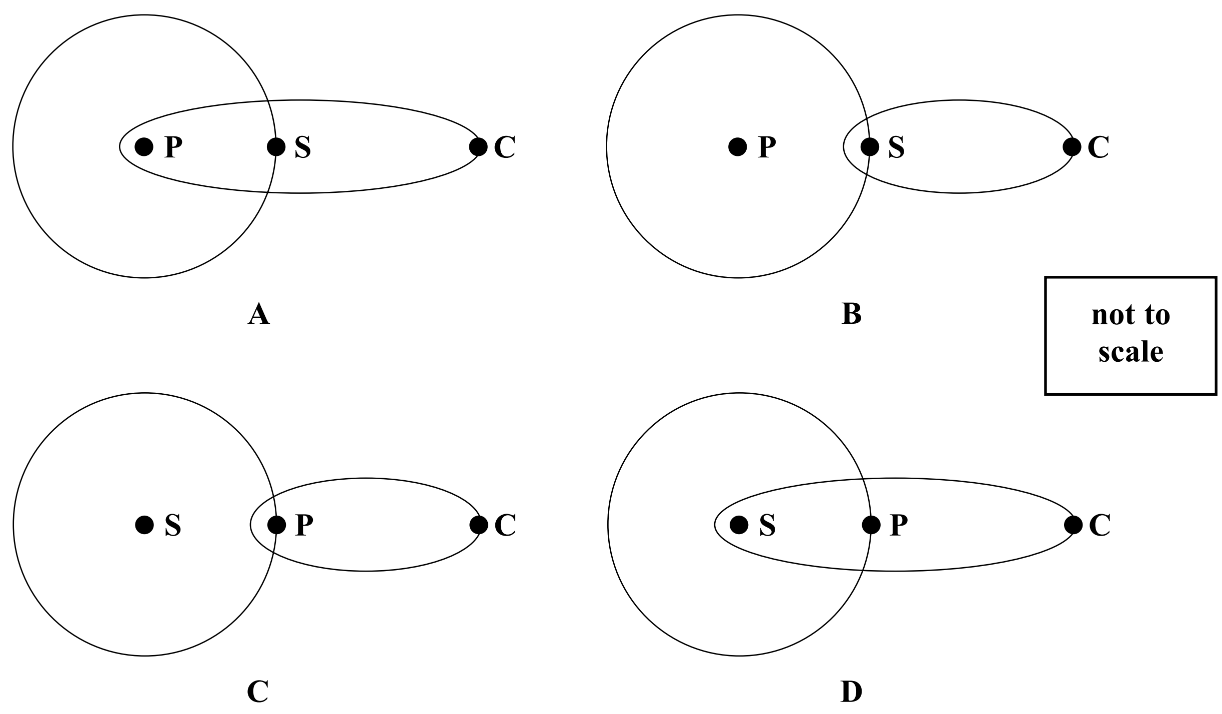
Questions 1 to 16 must be answered by Foundation tier candidates only.
Higher tier candidates start at question 17.

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

Our Moon

5. Our Moon has

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

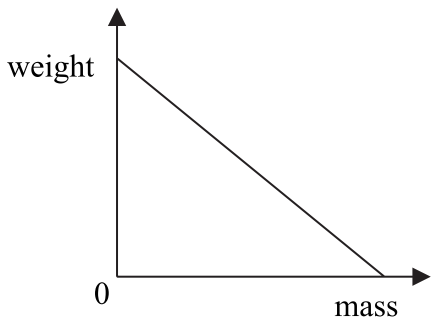
6. The following statement appeared in a newspaper.

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

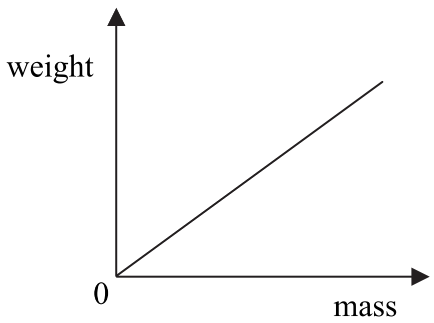
This suggests that the Moon might

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



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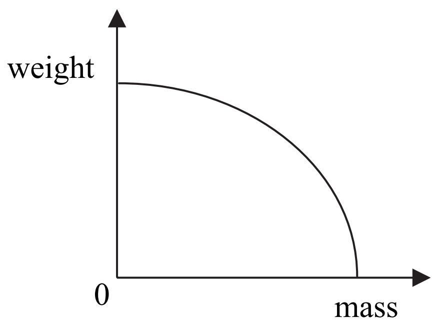
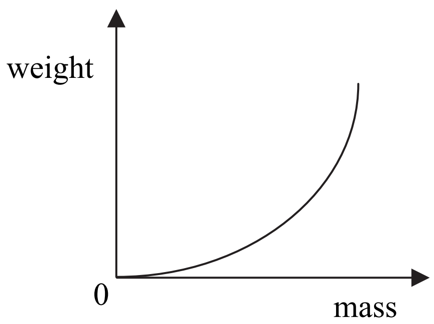


C



D

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

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

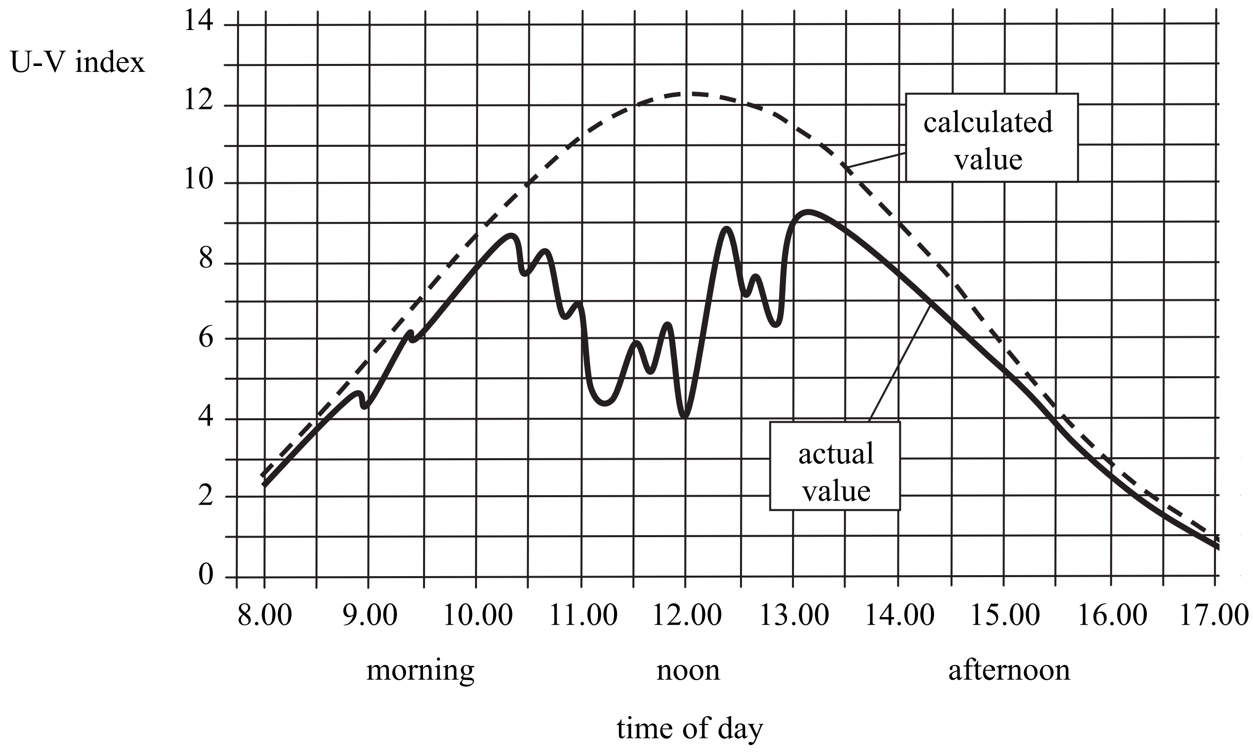
13. Ultraviolet radiation is used to

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

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

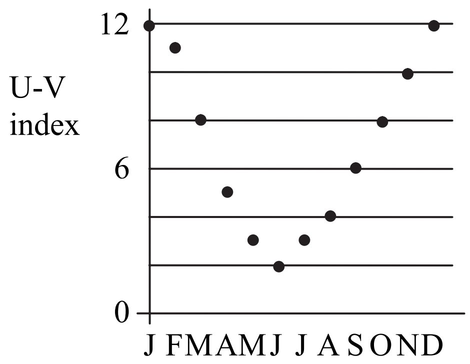
At which of these times on the graph does the U-V index show the danger is moderate?

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

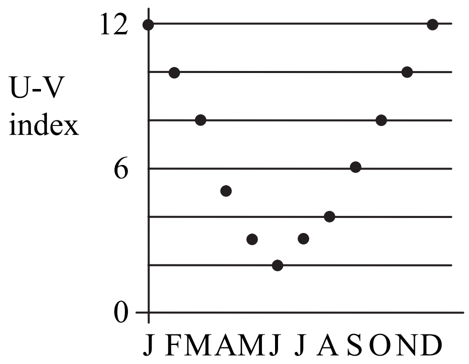
16. The table below shows the monthly average U-V index for a city in Australia.

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



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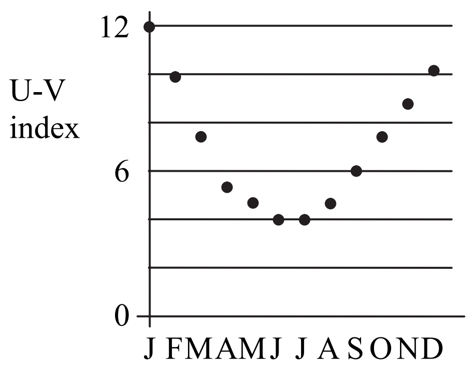

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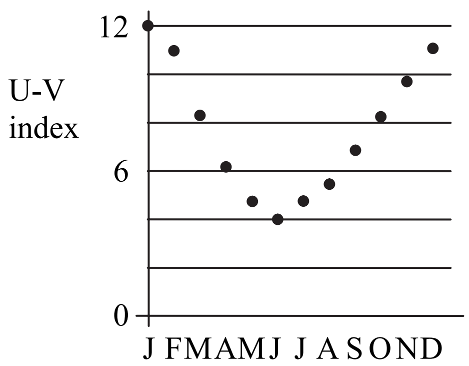


D

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

Waves and signals

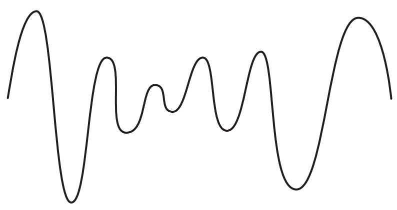
17. In space, all types of electromagnetic waves

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

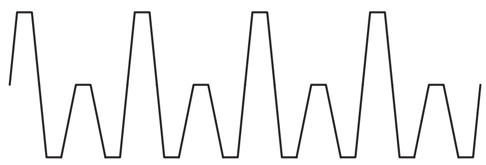
18. Visible, infrared and gamma radiation pass from the Sun to the Earth.
Which row of the table is correct?

	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

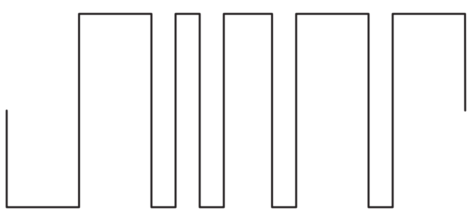
19. Which of these shows a digital signal?



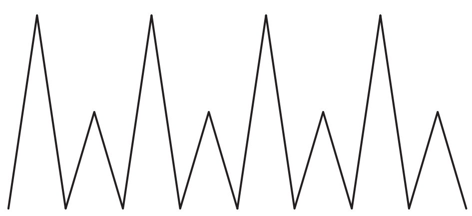
A



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

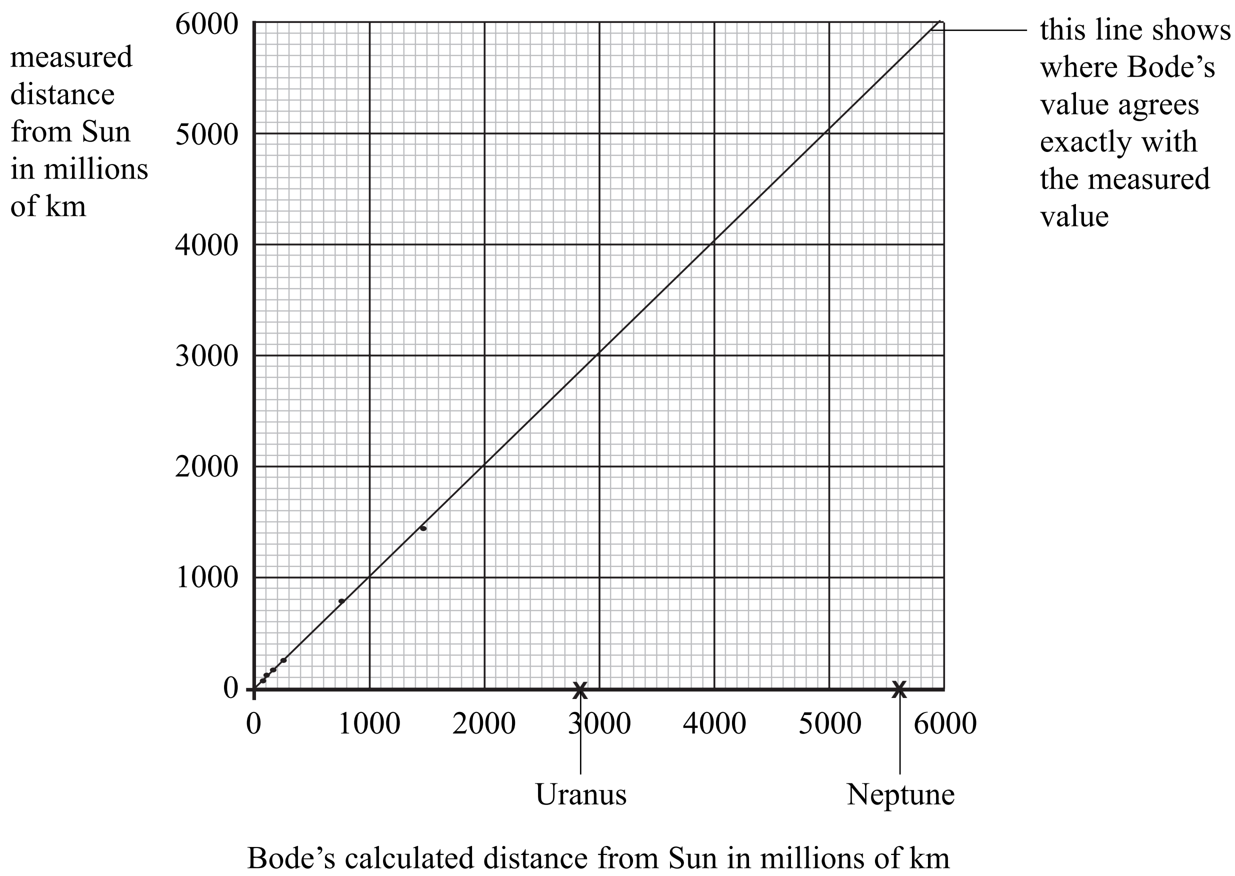
22. Look at Bode's pattern in the middle column.
The pattern suggests **Y** should be

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

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.



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.

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

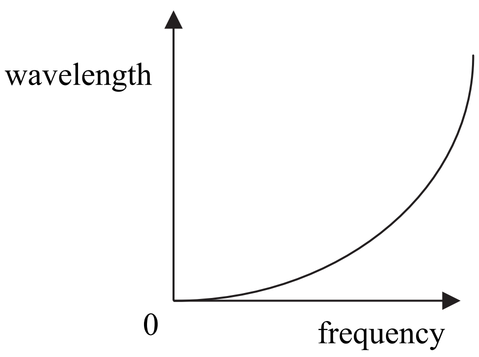
Ultrasound in the Dead Sea

28. $\boxed{\text{speed = wavelength × frequency}}$

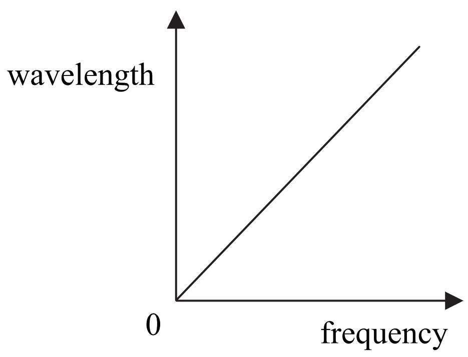
The speed of an ultrasound wave is 1790 m/s.
The frequency of the wave is 50 kHz.
The wavelength of the wave is

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



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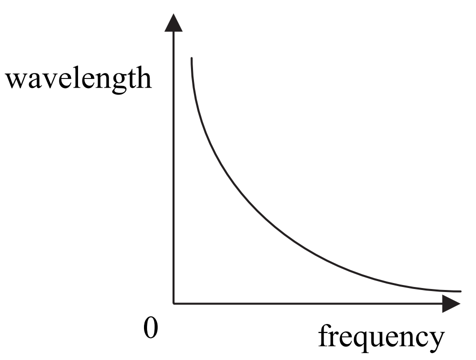

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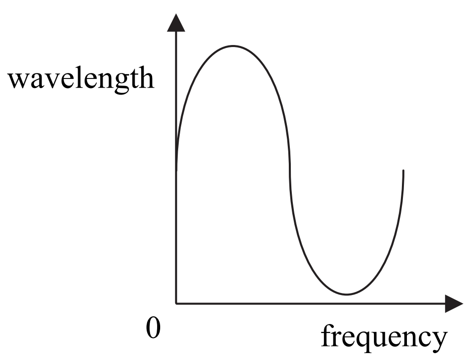
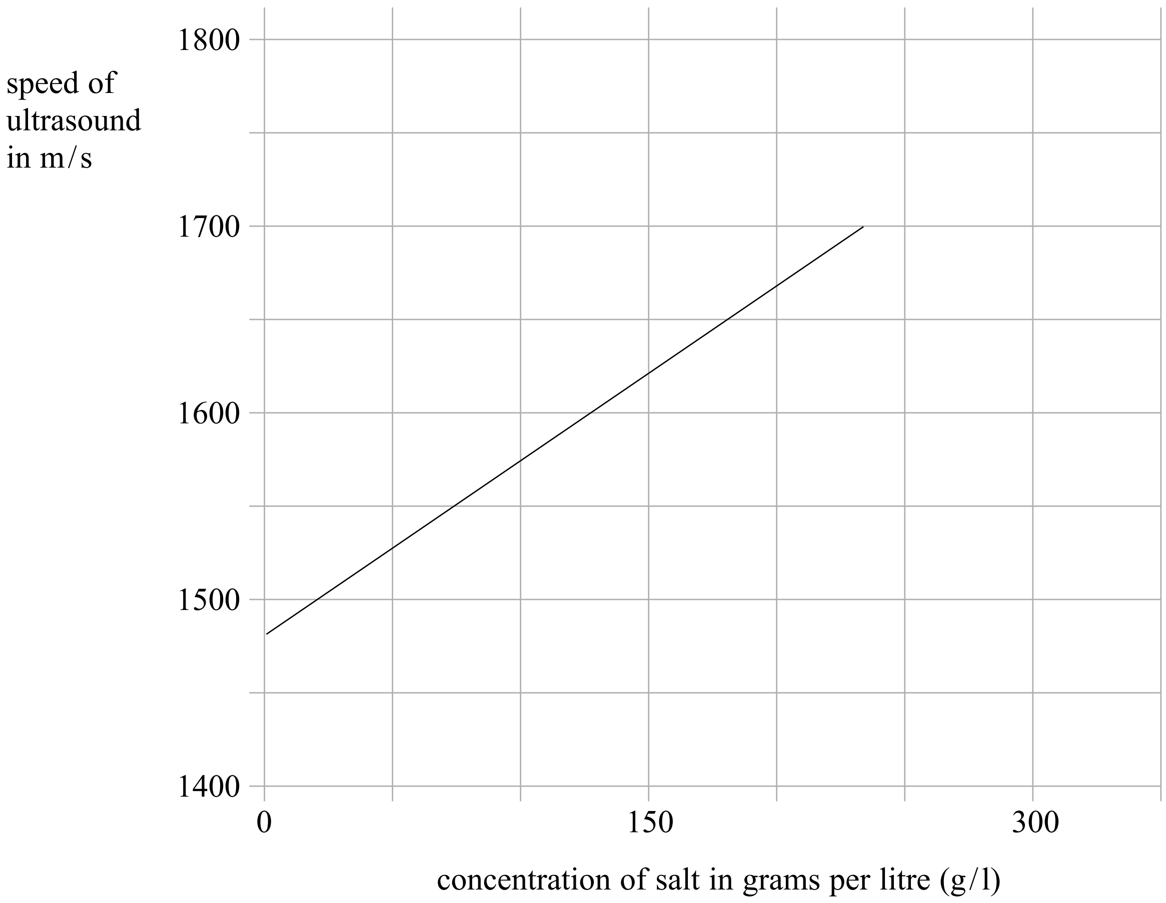


D

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

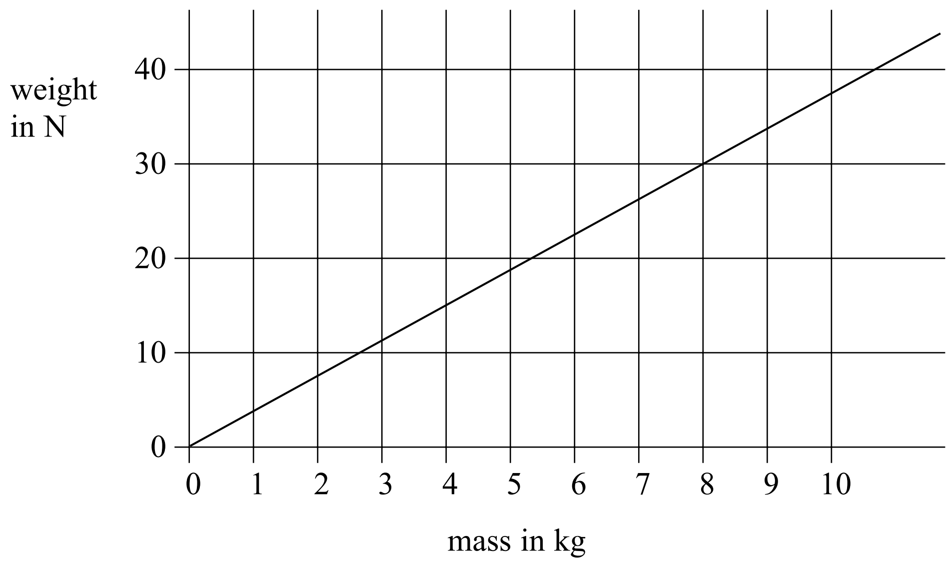
Space

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. $\boxed{W = mg}$

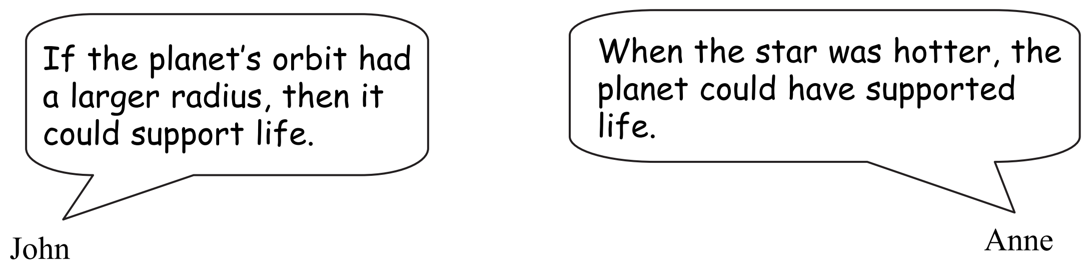
The graph shows how the weight and mass of objects on Mars are related.



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

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

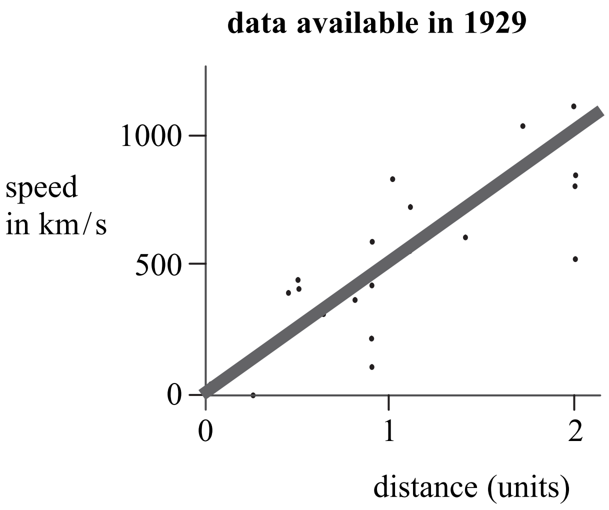
A the moons may support life
B planets with moons are always gas-giants
C the moons may shine on the planets at night
D the moons may have no atmosphere

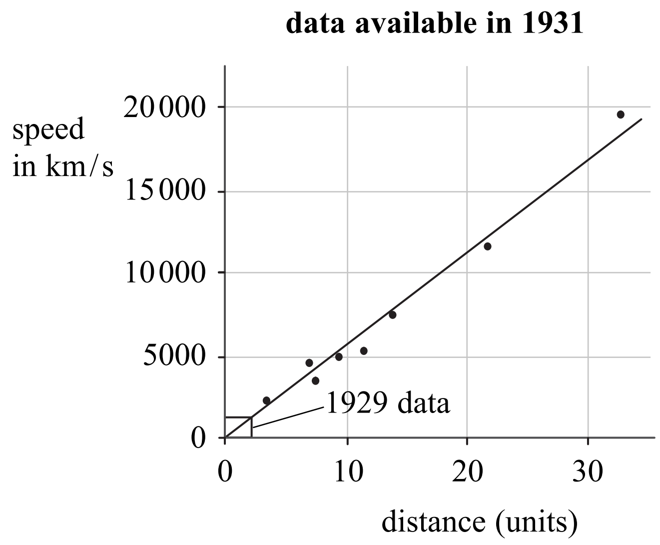
36. A black hole

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

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

40. $\boxed{\text{speed} = \text{distance/time}}$

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

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