Paper Reference(s)

5010   5046

Edexcel GCSE

Science (5010)

Physics (5046)

P1b – Topics 11 and 12

Foundation and Higher Tier

Friday 20 June 2008 – Morning

Time: 20 minutes

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.
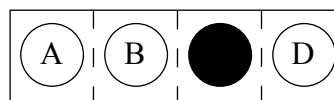All candidates are to answer questions 17 – 24.

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.

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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.

Earth and Space Project

Alan is doing research for a project on Space.

1.   For hundreds of years, scientists have found information about the stars and planets using

        A   telescopes
        B   microscopes
        C   space probes
        D   seismometers

2.   Stars like our Sun are formed from

        A   clouds of dust and gas
        B   planets colliding
        C   comet tails
        D   galaxies collapsing

3.   Alan learns about galaxies.
        Our galaxy is called

        A   The Nebula
        B   The Constellation
        C   The Milky Way
        D   The Solar System

**Mobile Phones**

Colin is finding out about mobile phones.

4.   Mobile phones send information using

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

5.   Some scientists think that mobile phones are a danger to health.
        They think this because they know that some of the radiation emitted by the phone

        A   is reflected by body tissue
        B   is absorbed by body tissue
        C   can cause burns to skin tissue
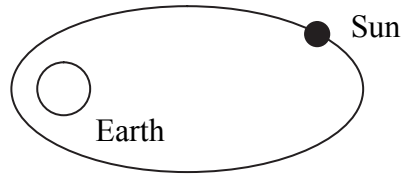   D   can cause skin cancer

The Solar System

Jo and Kim are doing research for a project on the Solar System

6. Jo drew diagrams of the Earth in orbit.
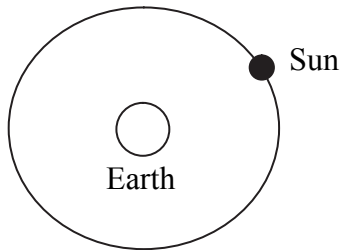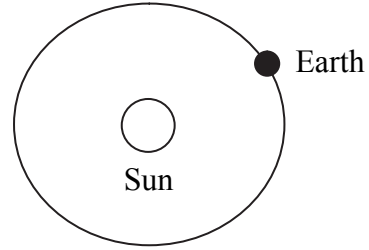Which of these is correct?

Earth

Sun

A

Sun

Earth

B

Not to
scale

Sun

Earth

C

Earth

Sun

D

3
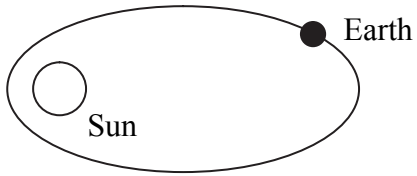
Use this information to answer Questions 7 to 11.

Jo and Kim selected the following information from the Internet.

planets in order of distance from the Sun	Mercury	Venus	Earth	Mars	Jupiter	Saturn
average distance from the Sun (millions of km)	57.9	108	150	128	778	1427
time for 1 orbit (Earth years)	0.2	0.6	1.0	1.9	11.9	29.5
average diameter (thousands of km)	4.87	12.1	12.8	6.80	143	120

7.   Kim saw an error in the information about the average distance of the planets from the Sun. For which of these planets is the information wrong?

    A   Mercury
    B   Venus
    C   Mars
    D   Jupiter

8.   Which planet is about the same size as Earth?

    A   Mercury
    B   Venus
    C   Mars
    D   Saturn

9.   The time taken for Jupiter to complete one orbit is

    A   1.9 Earth years
    B   11.9 Earth years
    C   29.5 Earth years
    D   65.4 Earth years

10.   A scientist measures the time it takes for light to travel to the Moon and back. By repeating her measurements the scientist makes her results

    A   more valid
    B   more reliable
    C   error free
    D   a fair test

11. Jo and Kim read that it is too cold for people to live on Jupiter.
Which planet will be even colder than Jupiter?

    A   Saturn
    B   Venus
    C   Mars
    D   none of the planets

Uses and Dangers of Radiation

Amarni and Sophie are writing an article about uses and dangers of radiation.
Sophie researches some uses of radiation.

12. Sophie studies some X-ray images of broken bones.
The images of the broken bones are produced because

    A   some light can pass through the break in the bone
    B   some X-ray radiation is absorbed by the bone
    C   all X-ray radiation is transmitted by the bone
    D   all X-ray radiation is reflected by the bone

13. Sophie and Amarni discuss how an unborn fetus is usually scanned.
The image is produced because body tissue

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

14. Sophie compares genuine and forged bank notes.
Part of the genuine note fluoresces in ultraviolet light but the forgery does not.
The fluorescence is caused by chemicals that

    A   absorb visible light
    B   absorb ultraviolet light and emit visible light
    C   absorb ultraviolet light and emit infrared waves
    D   reflect ultraviolet light

15. Amarni researches some dangers of radiation.
Amarni found that there is concern over the increasing number of skin cancers.
Skin cancer is mainly caused by too much exposure to

    A   microwave radiation
    B   X-rays
    C   infrared radiation
    D   ultraviolet radiation

16. Sophie and Amarni discuss the use of radiation in weather forecasting.

Satellites detect infrared radiation to monitor temperatures.

Sophie

Microwave radiation is used to monitor water in clouds.

Amarni

Who is correct?

A Sophie only
B Amarni only
C both Sophie and Amarni
D neither

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

Use this information to answer Questions 17 to 19.

Hayley, Kendall, Robyn and Shelley visit an exhibition about waves.
They see some demonstrations about wave properties using a ripple tank.
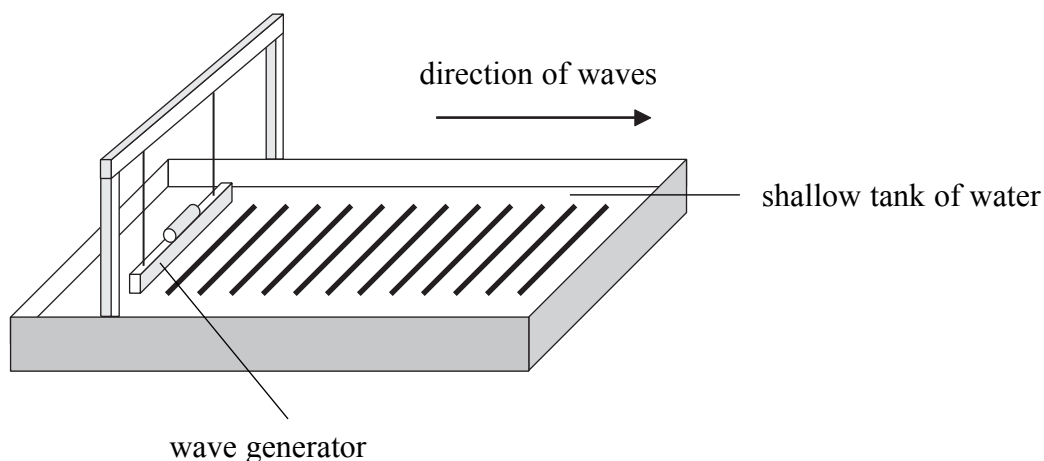
The waves travel at a steady speed across the surface of the water.
The girls measure the speed of the waves using a metre rule and a stopwatch.
Here are some of their results.

distance travelled by wave (cm)	10	10	10	20	20	35	35
time taken for wave (s)	0.5	0.3	0.7	0.8	1.1	1.8	1.7

17.   Kendall correctly calculated the average time for the three results for 10 cm.
Her answer is

    A   0.3 s
    B   0.5 s
    C   0.75 s
    D   1.5 s

18. The students discuss the experiment.

Doubling the distance doubles the time taken.

Hayley

We should work out an average value of wave speed.

Kendall

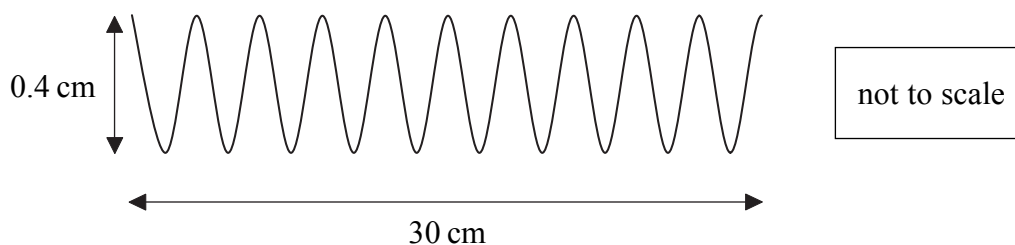Some water splashed over the side.

Robyn

The times for 35 cm are the most reliable.

Shelley

Who is evaluating the data?

A   Hayley
B   Kendall
C   Robyn
D   Shelley

19. The diagram shows a side view of the waves in the ripple tank.

0.4 cm

not to scale

30 cm

The wavelength of the waves is

A   0.2 cm
B   0.4 cm
C   3 cm
D   30 cm

20. The speed of visible light in a vacuum is 300 000 000 m/s.
Which row of the table is correct for ultraviolet waves?

	speed in a vacuum (m/s)	type of wave
A	300 000 000	transverse
B	200 000 000	longitudinal
C	200 000 000	transverse
D	300 000 000	longitudinal

21. Which chart shows the electromagnetic waves in order of increasing wavelength?

shortest waves ———————————————————→ longest waves

A	gamma rays	X-rays	ultraviolet	visible	microwave	infrared	radio

B	radio	infrared	microwave	visible	ultraviolet	X-rays	gamma rays

C	gamma rays	X-rays	ultraviolet	visible	infrared	microwave	radio

D	radio	microwave	infrared	visible	ultraviolet	X-rays	gamma rays

A Weighty Matter

Phil and Jane research what is meant by mass and weight.

22. Phil and Jane discuss some ideas.

> The mass of an object is the same in space and on Earth.
>
> Phil

> The weight of an object is caused by air pressure.
>
> Jane

Who is correct?

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

23.

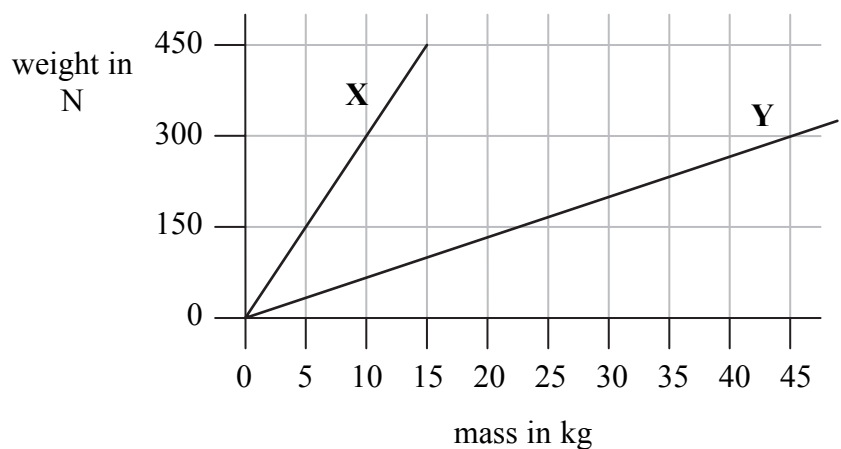| weight = mass × gravitational field strength $W = m \times g$ |
| --- |

The gravitational field strength on the Moon is 1.6 N/kg.
A piece of rock has a mass of 8 kg.
The weight of the rock on the Moon is

A   zero
B   5 N
C   8 N
D   12.8 N

24.   The graph shows the relationship between mass and weight on planets **X** and **Y.**

An object has a mass of 15 kg.
Which row of the table shows the correct weights of the object on planets **X** and **Y**?

	weight on planet X (N)	weight on planet Y (N)
A	150	100
B	100	450
C	450	150
D	450	100

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.

Use the graph in question 24 to answer questions 25 and 26.

25.   The gravitational field strength in N/kg on planet **X** is given by

   A $10 + 300$
   B $10 \div 300$
   C 300×10
   D $300 \div 10$

26.   An object weighs 300 N on planet **X.**
           Its weight on planet **Y** is about

   A   10 kg
   B   45 kg
   C   67 N
   D   300 N

STARS

Use this information to answer questions 27 to 31.

These stars are called "The Winter Triangle".

☆ Procyon 11.5 light years from Earth

Sirius ☆   ☆ Betelgeuse
8.6 light years   425 light years
from Earth   from Earth

Not to scale

Betelgeuse is a red supergiant star.
Sirius is really two stars – Sirius A and Sirius B.
- Sirius A is a bright main sequence star
- Sirius B is a white dwarf star
- Sirius A and Sirius B orbit each other closely

27. Light from Sirius A takes about 8.6 years to reach the Earth.
    How long will it take X-rays from Sirius B to reach Earth?

    A   The X-rays will arrive almost immediately
    B   The X-rays will take about 4.3 years
    C   The X-rays will take about 8.6 years
    D   The X-rays will take about 17.2 years

28. Scientists want to find out if any planets are in orbit around Procyon.
    What is the best way to get this information?

    A   look on the Internet
    B   use the Hubble space telescope
    C   send a space probe to orbit The Winter Triangle
    D   send a space probe to land on Procyon

29. Which row of the table is correct?

	could form a supernova	will not form a supernova
A	neutron star	Betelgeuse
B	Betelgeuse	neutron star
C	Sirius A	Betelgeuse
D	Betelgeuse	Sirius A

30. Light from a galaxy shows red shift.
Red shift gives evidence that

  A   a main sequence star is turning into a red giant
  B   galaxies are moving away from each other
  C   the Big Bang was at the centre of the Universe
  D   red giants collapse to form white dwarfs

31. Imagine Betelgeuse and Sirius A each have a habitable planet similar to Earth.
Which row of the table correctly compares the orbit of each planet to that of the Earth?

	orbit of planet around Betelgeuse	**orbit of planet around Sirius A**
A	similar to Earth orbit	similar to Earth orbit
B	larger than Earth's orbit	similar to Earth orbit
C	larger than Earth's orbit	closer than Earth's orbit
D	similar to Earth orbit	closer than Earth's orbit

Space Exploration

32.

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

A rocket has an acceleration of $1.4 \, \text{m/s}^2$ at lift off.
The resultant force on the rocket at lift off is 2 800 000 N.

The mass of the rocket at lift off is

  A   1 000 000 kg
  B   2 000 000 kg
  C   4 000 000 kg
  D   20 000 000 kg

33. The thrust on the rocket is produced by gases from the rocket engine.
The gases provide thrust because

  A   the gases push against the Earth
  B   the gases push against the atmosphere
  C   the amount of force pushing the gases out of the rocket equals the amount of force pushing the rocket
  D   the amount of force pushing the gases out of the rocket is larger than the amount of force pushing the rocket

34. The United States is planning to send a manned mission to Mars.
Which row of the table correctly shows a possible medical problem and its solution?

	medical problem	solution
A	deterioration of bones	make spacecraft rotate
B	deterioration of muscles	increase the air pressure
C	deterioration of bones	shield astronauts from X-rays
D	deterioration of muscles	astronauts must remain seated

Signals and Waves

John and Imran are investigating waves and electrical signals.

35. John and Imran discuss electromagnetic waves.
John correctly states that the most dangerous electromagnetic waves have

A   the highest frequencies and the longest wavelengths
B   the lowest frequencies and the shortest wavelengths
C   the highest frequencies and the shortest wavelengths
D   the lowest frequencies and the longest wavelengths

36. Imran correctly describes an electromagnetic wave.
Which row of the table gives Imran's description?

	type of wave	direction of travel	direction of vibration
A	transverse	→	↔
B	longitudinal	→	↔
C	longitudinal	→	↕
D	transverse	→	↕

37.

speed = distance ÷ time

John and Imran use an echo sounder to measure the depth of a lake.
The speed of sound in the lake is 1500 m/s and it takes 0.4 s for the sound to travel to the bottom and return to the surface.
The depth of the lake is

A   300 m
B   600 m
C   1875 m
D   3750 m
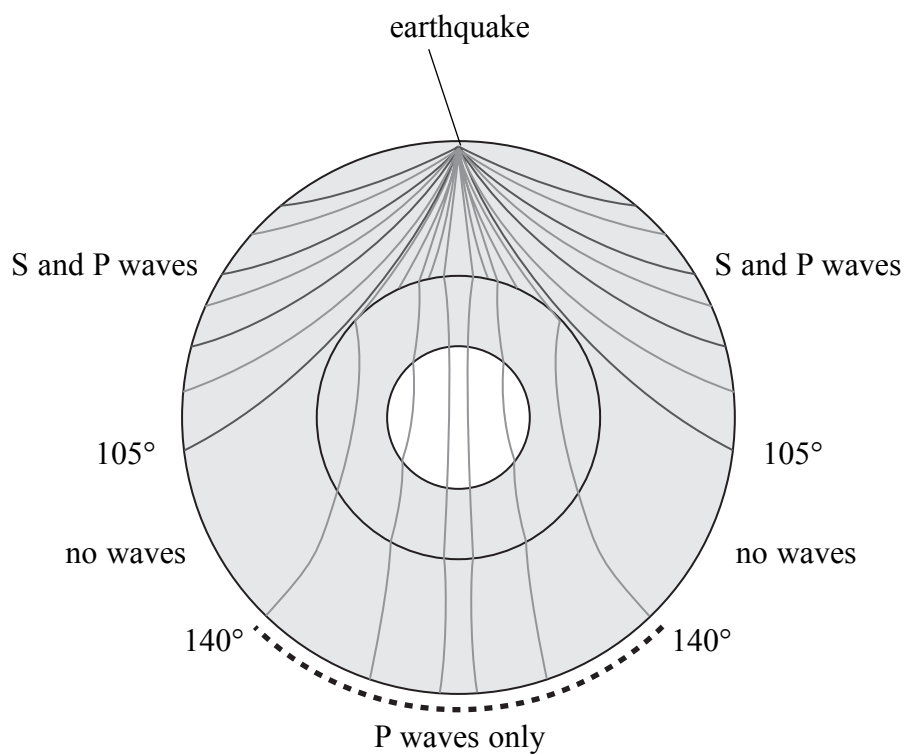
38.

speed = frequency × wavelength

The frequency of the ultrasound wave used to measure the depth of a lake is 50 kHz.
The speed of the wave is 1500 m/s.
What is the wavelength of the wave?

A   0.03 m
B   30 m
C   75 000 m
D   75 000 000 m

39.   John and Imran discuss the following diagram and the structure of the Earth.

Who is correct?

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

40. John and Imran discuss digital and analogue signals.

One advantage of analogue signals is that the loss of quality from interference can be restored.

John

One advantage of digital signals compared to analogue signals is that digital signals can be handled by microprocessors.

Imran

Who is correct?

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

TOTAL FOR HIGHER TIER PAPER: 24 MARKS

END