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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

Thursday 22 November 2007 – 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.

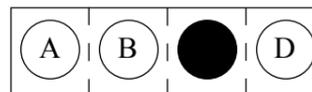
Before the test begins:

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.

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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.**

The hospital visit

Sam is in hospital.
He has a broken leg.



Alice works at the hospital.
She uses a machine to make a picture showing the broken bone.

1. The type of radiation used to show Sam's broken bone is
 - A X-ray
 - B microwave
 - C infrared
 - D ultraviolet

2. Alice must stand behind a lead screen when the machine is emitting radiation.
The screen reduces the risk of
 - A Alice infecting Sam
 - B damage to Alice's cells
 - C Sam infecting Alice
 - D damage to the machine

3. Sam is asked **not** to use his mobile phone.
This is because radiation from the phone may
- A cause global warming
 - B infect his leg
 - C interfere with some hospital equipment
 - D damage Alice's cells

4. Sam's phone emits microwave radiation.
Which part of the electromagnetic spectrum, below, represents microwave radiation?

| | | | | | | |
|-------|----------|----------|---------|-------------|----------|----------|
| radio | A | B | visible | ultraviolet | C | D |
|-------|----------|----------|---------|-------------|----------|----------|

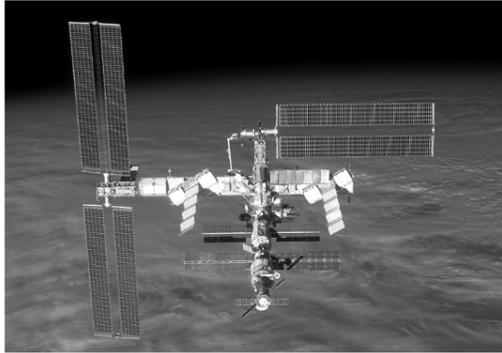
5. All waves in the electromagnetic spectrum have
- A the same frequency in a vacuum
 - B the same speed in a vacuum
 - C the same colour in a vacuum
 - D the same wavelength in a vacuum

6. Sam sees a poster warning about the dangers of sunbathing.
The radiation that causes skin cancer is
- A microwaves
 - B visible light waves
 - C infrared waves
 - D ultraviolet waves

7. Alice treats another patient.
This time she uses a machine that emits gamma radiation.
Gamma radiation is used to
- A kill cancer cells
 - B ease strained muscles
 - C repair broken bones
 - D remove unwanted tattoos

Holidays in space

Some students are researching a project about possible future holidays in space. They find that the conditions in space may cause problems for the space tourists.



8. People in space are almost weightless because there is very little
- A atmosphere
 - B oxygen
 - C gravity
 - D sunlight
9. Heart muscles can become weaker when you are weightless in space. This is because
- A your heart is often upside down
 - B your heart does not work as hard as on Earth
 - C your heart works much harder than on Earth
 - D your heart does not know which way to pump your blood
10. Infrared waves from the Sun can make a spacecraft overheat. The outer surface of the spacecraft is shiny white so that the infrared waves are
- A reflected
 - B transmitted
 - C absorbed
 - D refracted
11. The students think we need more data about the soil on other planets. The best way to collect this data would be to use a
- A pair of binoculars
 - B radio telescope
 - C space probe to orbit the planet
 - D space probe to put a lander on the surface of the planet

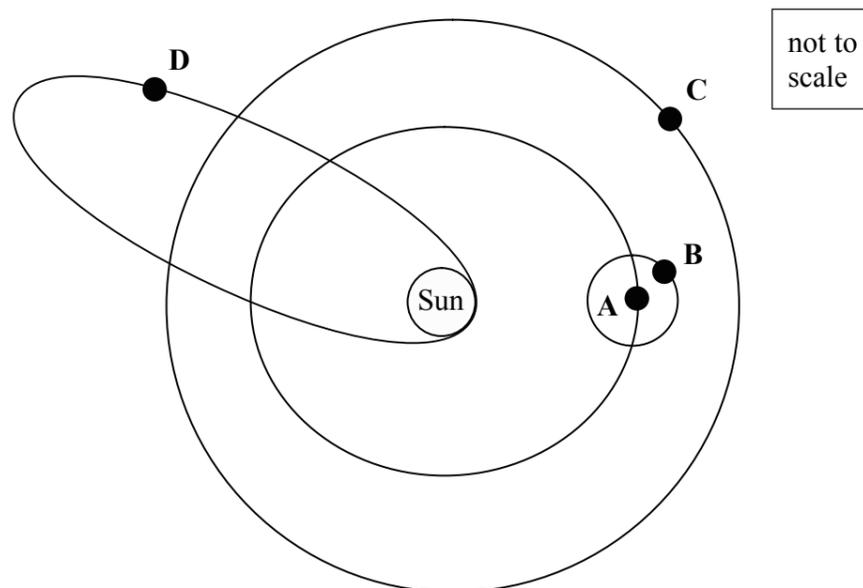
Heavens above

Some science students visit a planetarium. They learn many new ideas about planets and stars.

12. Stars are formed when dust and gas are pulled together by the force of

- A friction
- B magnetism
- C electricity
- D gravity

13. The students saw a diagram showing the orbits of some objects in the Solar System. Which of these objects could be an asteroid in the Asteroid Belt?



14. The students try to put some objects in order of size, starting with the smallest.

Solar System, galaxy,
Sun, then Universe

Andy

Sun, galaxy, Solar
System, then Universe

Brian

Sun, Solar System,
galaxy, then Universe

Cassie

Universe, Sun, Solar
System, then galaxy

Donna

The correct student is

- A Andy
 - B Brian
 - C Cassie
 - D Donna
15. Andy estimated the number of stars in the Milky Way galaxy.
The best estimate is
- A one star
 - B a few thousand stars
 - C a few million stars
 - D many billions of stars
16. The students were shown a photograph of a supernova.
A supernova can produce
- A a red giant
 - B a black hole
 - C a main sequence star
 - D a protostar

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.

Police Camera Action

Jane and Mutinde visit a police station to find out about some crime fighting techniques.

- 17.** Jane uses a system for identifying people by scanning their eyes.
Which part of the eye is scanned?

- A** lens
- B** pupil
- C** eyelid
- D** iris

- 18.** Mutinde uses ‘invisible’ ink to write his post code on his mp3 player.
When ultraviolet waves are shone onto the writing, it glows.
Which row of the table is correct for the ‘invisible’ ink?

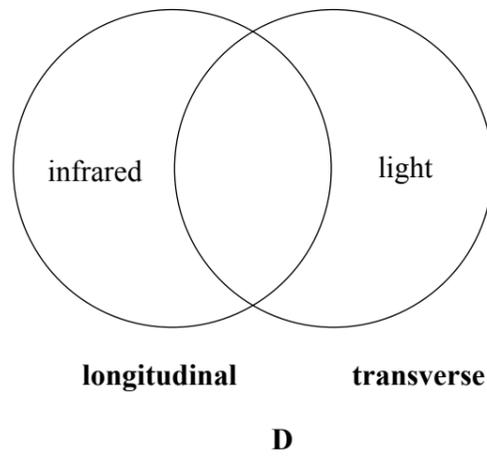
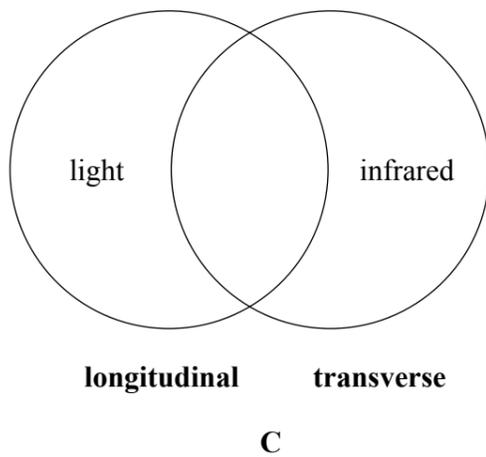
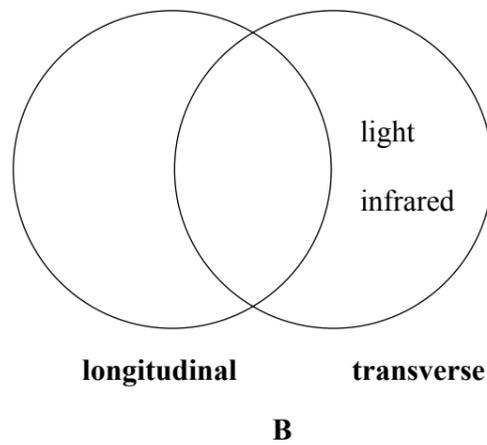
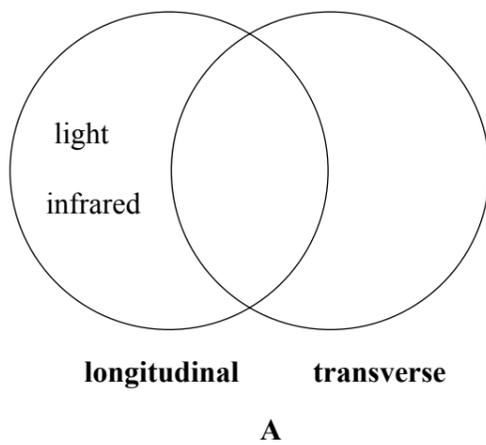
| | the ink absorbs | the ink emits |
|----------|------------------------|----------------------|
| A | ultraviolet waves | visible light waves |
| B | ultraviolet waves | ultraviolet waves |
| C | visible light waves | ultraviolet waves |
| D | visible light waves | visible light waves |



Use this information to answer questions 19 and 20.

Mutinde and Jane are shown around a police helicopter. It is fitted with an ordinary camera and an infrared camera.

19. Mutinde correctly classified the light and infrared waves used by the cameras. Which is his chart?



20. Which row of the table correctly describes how an infrared camera can be used to observe a suspect?

| | the suspect's body | the camera |
|----------|--------------------|------------------|
| A | absorbs infrared | absorbs infrared |
| B | absorbs infrared | emits infrared |
| C | emits infrared | absorbs infrared |
| D | emits infrared | emits infrared |

The great space debate

Scientists are continually finding new evidence to challenge current theories about space. A group of scientists discussed ideas and evidence with a group of students.

- 21.

| object | distance from the Sun |
|-------------------------|-----------------------|
| Earth | 150 000 000 km |
| Mars | 228 000 000 km |
| nearest star to our Sun | 4.2 light years |

The students thought that in the future it may only take one month to reach Mars. They discussed how long it might take to reach our nearest star travelling at the same speed.

The table shows us that it will take 4.2 years.

Alf

We need to convert light years to km to compare the distances.

Babs

We can't work out how far it is from the Earth to the star.

Colin

It will take much less than a month to get to the star.

Diane

The correct student is

- A** Alf
- B** Babs
- C** Colin
- D** Diane

22. Which of these is evidence that the Universe is expanding?
- A It takes millions of light years for light to reach us from some stars
 - B The Universe began with the Big Bang
 - C Galaxies are moving further away from each other
 - D Some stars in the Milky Way are accelerating towards our Sun

23. The scientists were discussing the possibility of life elsewhere in the Universe. They asked four students for their views.

There is definitely life on other planets.

Alan

If there was life elsewhere in the Universe one of our space probes would have found it by now.

Betty

There is no other life because they haven't contacted us.

Chris

There are so many stars in the Universe that life is almost certain to have developed elsewhere.

Donna

Who agrees with up-to-date scientific thinking?

- A Alan
- B Betty
- C Chris
- D Donna

24. Scientists have discovered a number of planets orbiting distant stars. These planets make the stars seem to wobble or move from side to side. Jane and Adam discussed an article about these discoveries.

The planets must be very large to produce enough gravitational force to affect a star.

Jane

The planet must have a very big orbit to affect the star.

Adam

Who is correct?

- A Jane only
- B Adam only
- C both Jane and Adam
- 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.**

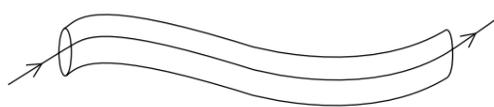
Understanding waves

Paul and Chris are researching a project about waves.

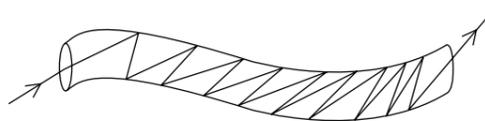
- 25.** Paul found that digital signals are different from analogue signals.
Which of these is an **advantage** of digital signals?

- A** Digital signals can be regenerated to remove the effect of noise
- B** Digital signals always travel faster than analogue signals
- C** Digital signals can carry less information than analogue signals
- D** Digital signals always have a lower frequency than analogue signals

- 26.** Chris drew some diagrams to show the total internal reflection of light as it travelled through an optical fibre.
The correct diagram is



A



B



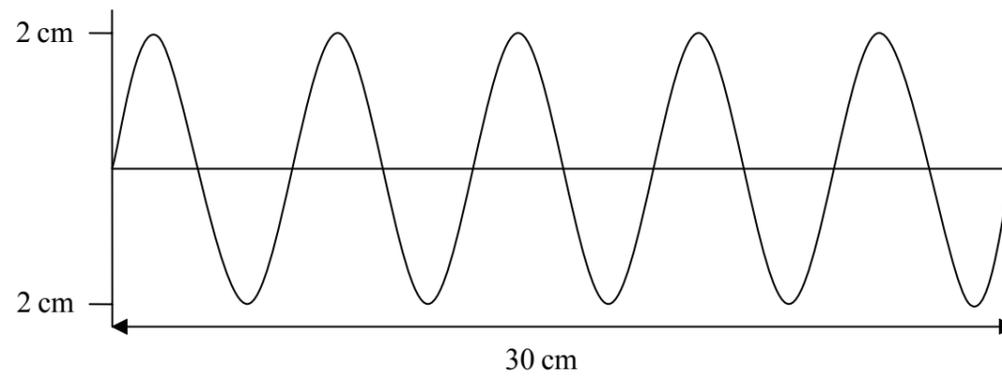
C



D

Use this information to answer questions 27 to 30.

Paul found this diagram which shows the waves sent out by a source in a time of 0.1s.



27. Paul correctly stated that the amplitude of the wave was

- A 2 cm
- B 4 cm
- C 5 cm
- D 6 cm

28. Paul used the diagram to find the wavelength of the wave.
The wavelength is

- A 2 cm
- B 2.5 cm
- C 6 cm
- D 30 cm

29.
$$\text{speed} = \frac{\text{distance}}{\text{time}}$$

Paul used the information to find the speed of the wave.
The speed is

- A 3 cm/s
- B 5 cm/s
- C 30 cm/s
- D 300 cm/s

30. Paul used the information to find the frequency of the wave.
The frequency is

- A 0.5 Hz
- B 5 Hz
- C 6 Hz
- D 50 Hz

- 31.

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

Paul and Chris investigated the reflection of sound waves.
They found it took 0.20s for a sound wave to go to a wall and return.
The speed of sound was 330 m/s.
How far away was the wall?

- A 33 m
- B 66 m
- C 1650 m
- D 3300 m

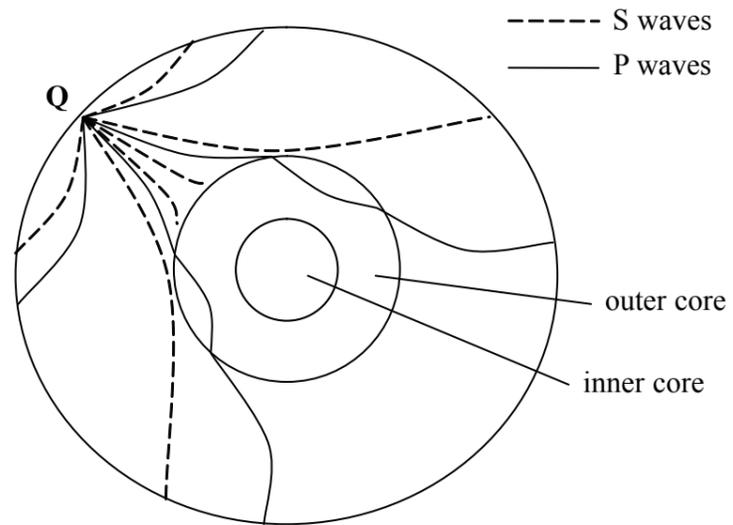
32. A wave is travelling in the direction shown below.



Which row of the table correctly shows the motion of the particles in each type of wave?

| | motion of particles in a transverse wave | motion of particles in a longitudinal wave |
|----------|---|---|
| A | ↑ | → |
| B | ↕ | ↔ |
| C | → | → |
| D | ↔ | ↕ |

33. The diagram shows seismic waves from an earthquake at **Q**.



Paul and Chris discuss the diagram.

The large change in direction when P waves enter the outer core proves that the outer core is made from water.

Paul

S waves are repelled by the solid iron and nickel inner core.

Chris

Who is correct?

- A** Paul only
- B** Chris only
- C** both Paul and Chris
- D** neither

Discussing space

Abby and Sophie are trying to understand some ideas about space.

34. They discuss the mass and weight of a space probe.
Abby correctly explains that

- A mass and weight are the same thing
- B mass depends on gravity but weight does not
- C weight depends on gravity but mass does not
- D weight and mass both depend on gravity

- 35.

$$\text{weight} = \text{mass} \times \text{gravitational field strength} \quad W = mg$$

Abby finds that the weight of the Mars Rover is 684 N on Mars.
The mass of the Mars Rover is 180 kg.
The gravitational field strength on Mars is

- A 0.26 kg/N
- B 0.26 N/kg
- C 3.8 N/kg
- D 3.8 kg/N

36. Abby and Sophie discuss space travel.

Mercury orbits closer to the Sun than the Earth does, so astronauts travelling to Mercury would not need to heat their spaceship.

Abby

On a trip to Mars we would need to keep the rocket engines burning all the way to overcome friction.

Sophie

Who is correct?

- A Abby only
- B Sophie only
- C both Abby and Sophie
- D neither

37. Abby and Sophie discuss the way scientists search for life outside our Solar System. Which row of the table is correct for the search?

| | scientists search for | scientists are |
|----------|--------------------------------------|---------------------------------|
| A | changes to the atmosphere of planets | sending space probes to planets |
| B | patterns in electromagnetic signals | sending space probes to planets |
| C | patterns in electromagnetic signals | using radio telescopes |
| D | changes to the atmosphere of planets | using radio telescopes |

38. Abby and Sophie discuss 'dark matter'.

'Dark matter' is non-visible matter but it does have gravitational effects.

Abby

'Dark matter' is evidence of the Big Bang that started the Universe.

Sophie

Who is correct?

- A** Abby only
B Sophie only
C both Abby and Sophie
D neither

39. Abby tries to explain black holes to Sophie. Which row of the table is correct for black holes?

| | the gravitational field of a black hole | a black hole is formed when |
|----------|---|-----------------------------|
| A | allows only electromagnetic radiation to escape | a nebula collapses |
| B | allows nothing to escape | a neutron star collapses |
| C | allows nothing to escape | a nebula collapses |
| D | allows only electromagnetic radiation to escape | a neutron star collapses |

40. Abby and Sophie discuss the origin of the Universe.

Background microwave radiation is evidence for the Big Bang theory.

Abby

Distant stars that only give out red light are evidence for the Big Bang theory.

Sophie

Who is correct?

- A Abby only
- B Sophie only
- C both Abby and Sophie
- D neither

TOTAL FOR HIGHER TIER PAPER: 24 MARKS

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