Physics
Standard Grade

Unit 1
Telecommunications
General & Credit Past Paper Questions

Record Sheet

General - Section	Question	Attempted	RED	AMBER	GREEN
Multiple Choice	1				
	2				
	3				
	4				
	5				
	6				
	7				
1. Communicating Using Waves	8				
	9				
	10				
	11				
	12				
2. Waves	13				
	14				
	15				
	16				
3. Radio and Television	17				
	18				
	19				
	20				
4. Optical Fibres	21				
5. Satellites & Dish Aerials	22				

Credit - Section	Question	Attempted	RED	AMBER	GREEN
1. Communicating Using Waves	23				
	24				
2. Waves	25				
	26				
3. Radio and Television	27				
	28				
	29				
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	32				
4. Optical Fibres	33				
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	35				
5. Satellites & Dish Aerials	36				
	37				
	38				
	39				

RED - I don't understand the question
I NEED HELP!

AMBER - I understand most of the question
I NEED TO REVISE A LITTLE MORE!

GREEN - I got the correct answer first time!!
I UNDERSTAND THIS TOPIC

General Level

Answer questions in your Homework Jotter.
Show working for each question.

1.

Which of the following is the part of a radio receiver that selects one station from many?

A Aerial
B Tuner
C Decoder
D Amplifier
E Loudspeaker

2.

Which of the following gives the correct order of **increasing** wavelength for the colours named.

A Blue, green, red
B Blue, red, green
C Green, blue, red
D Red, blue, green
E Red, green, blue

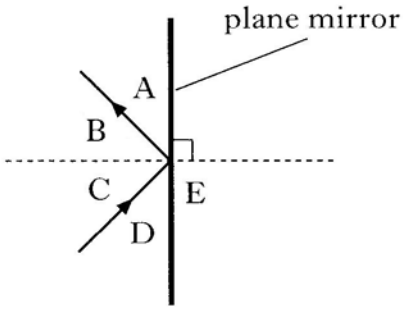
3.

During mobile telephone communication, micro-waves travel through air at a speed that is

A less than the speed of sound
B equal to the speed of sound
C less than the speed of light
D equal to the speed of light
E greater than the speed of light.

4.

The diagram shows a ray of light reflected from a plane mirror.



Which of the labelled angles is the angle of reflection?

5.

The International Space Station has an orbital height of 352 kilometres and a period of 92 minutes.

A geostationary satellite has an orbital height of 35 900 kilometres and a period of 1440 minutes.

Which of the following gives the orbital height of a satellite that has a period of 102 minutes?

A 144 kilometres
B 352 kilometres
C 833 kilometres
D 35 900 kilometres
E 44 100 kilometres

6.

Which part of a television receiver picks up all signals?

A Tuner
B Modulator
C Decoder
D Amplifier
E Aerial

General Level

Answer questions in your Homework Jotter.
Show working for each question.

7.

Which part of a radio receiver separates the audio signal from the carrier wave?

A Aerial

B Tuner

C Decoder

D Amplifier

E Loudspeaker

General Level

Answer questions in your Homework Jotter.
Show working for each question.

KU	PS

8. A camper on a mountain ridge sees a flash of lightning in the distance. The camper hears the thunder 20 seconds later.

(*a*) Explain why there is a delay between the camper seeing the lightning and hearing the thunder. **1**

(*b*) Calculate the distance between the camper and the flash of lightning.

[The speed of sound in air is 340 metres per second.] **2**

(*c*) The camper later measures the time between seeing another flash of lightning and hearing the thunder, as 15 seconds.

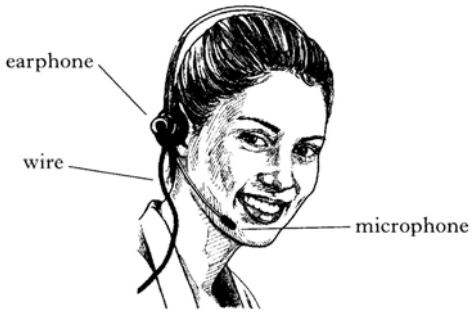
Explain why the time delay is now shorter. **1**

9. A worker in a telephone call centre wears a headset that has an earphone and a microphone.

(*a*) State the energy transformation that takes place in the

(i) earphone

(ii) microphone. **2**



(*b*) In the passage below, circle **one** phrase in each set of brackets to make the statement correct.

{An electrical signal / A light beam / A sound wave} is transmitted along the wire

at a speed {less than / equal to / greater than} the speed of sound. **2**

General Level

Answer questions in your Homework Jotter.
Show working for each question.

KU	PS

10.

A girl is at a fireworks display.

(*a*) The girl notices that when a firework explodes high in the air, she sees the flash before she hears the bang from the firework.

Explain why there is a delay between seeing the flash and hearing the bang. **1**

(*b*) The girl wants to calculate how far away the firework is when it explodes. She uses a stopwatch to measure the time interval between the flash and the bang from the firework. The reading on the stopwatch is 0·8 second.

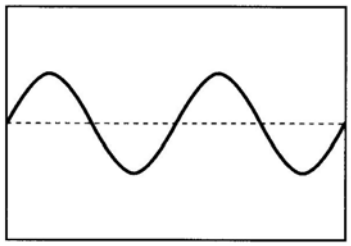
(i) What additional information is needed to calculate this distance? **1**

(ii) Explain why the distance calculated by the girl is likely to be inaccurate. **2**

11.

Two students are investigating a telephone system in a laboratory.

A



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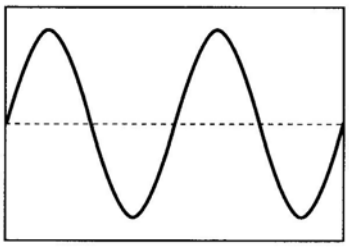
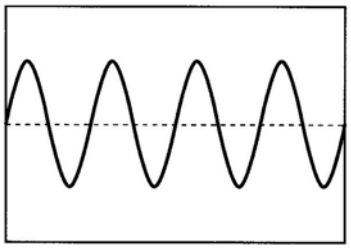
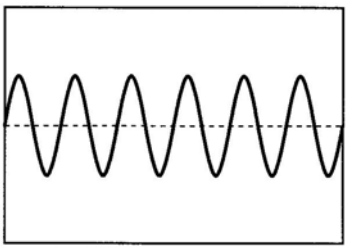
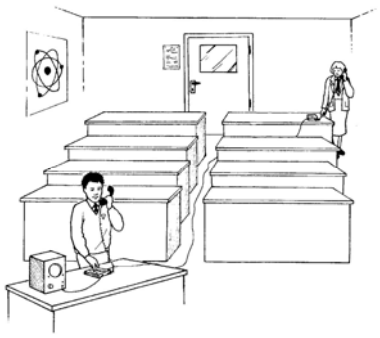


C



D





(*a*) An oscilloscope is connected to the microphone in one of the telephones. One student whistles several times into this microphone and the electrical signals shown are obtained.

All the traces shown are obtained without changing the controls on the oscilloscope.

Which of these electrical signals is caused by

(i) the highest frequency sound

(ii) the loudest sound? **2**

KU	PS

11. continued

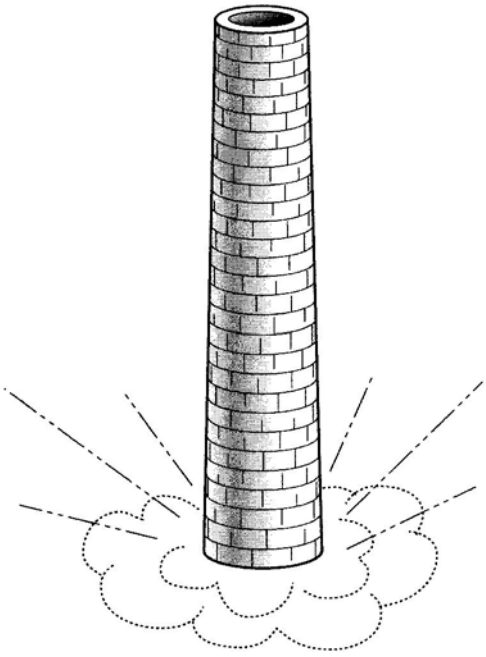
(*b*) In the telephone system, electrical signals carry the information from the transmitter to the receiver.

One student makes a loud sound. The other student hears this sound through the telephone and also directly through the air.

Explain which sound reaches the student first. **2**

12.

A factory chimney is demolished using explosives.



A crowd of people watches from a safe distance. A person in the crowd hears the sound 2·5 seconds after seeing the explosion.

(*a*) Explain why there is a delay between seeing the explosion and hearing the sound. **1**

(*b*) Calculate the distance between the chimney and the person in the crowd. (The speed of sound in air is 340 metres per second.) **2**

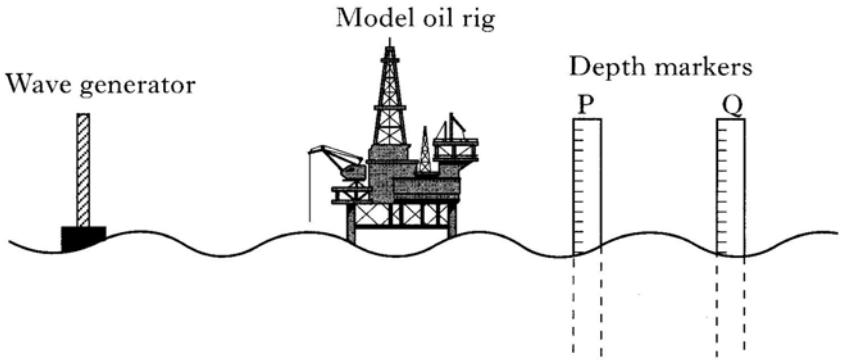
(*c*) Why should the demolition worker who sets off the explosives wear ear protectors to reduce the noise level to below 80 decibels? **1**

General Level

Answer questions in your Homework Jotter.
Show working for each question.

KU	PS

13. The diagram shows part of an experimental wave tank used to test model oil rigs.



There is a wave generator at one end of the tank. Two depth markers, P and Q, are fixed to the bottom of the tank.

(*a*) (i) Ten waves are made in 5 seconds.
Calculate the frequency of the waves. **2**

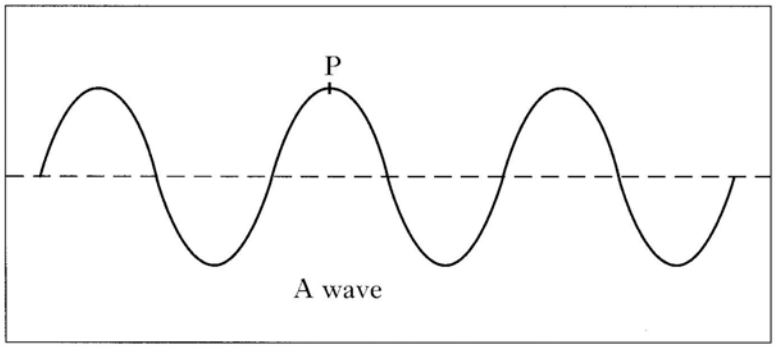
(ii) The distance from the wave generator to the other end of the tank is 12 metres. Eight complete waves are made in this distance.
Calculate the wavelength of the waves. **2**

(iii) Calculate the speed of the waves. **2**

(*b*) (i) As the waves travel along the tank, the length of depth marker P seen above the water changes from 15 centimetres to 13 centimetres.
Calculate the amplitude of the waves at depth marker P. **2**

(ii) Why is the amplitude of the waves at depth marker Q smaller than at P? **1**

14. A diagram of a wave is shown below.



(*a*) (i) On the diagram, mark a point Q that is exactly one wavelength from P. **1**

(ii) On the diagram, draw a line to mark an amplitude. **1**

General Level

Answer questions in your Homework Jotter.
Show working for each question.

KU	PS

14. continued

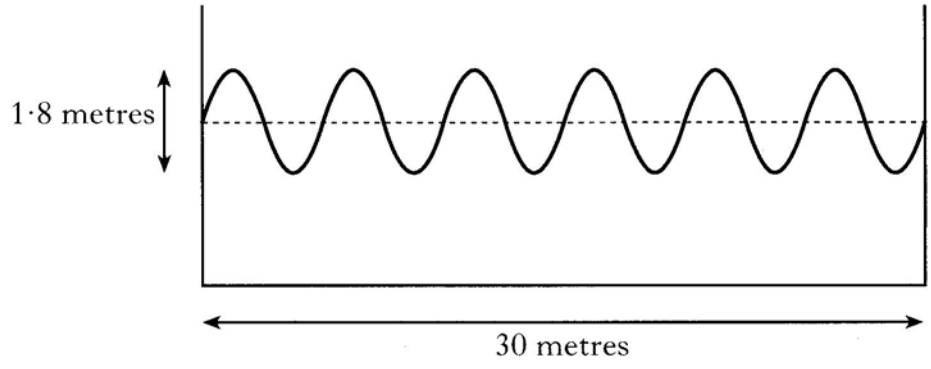
(*b*) Some notes on waves taken by a physics student are shown below. The notes are incomplete.

Use your knowledge of waves to complete the table.

Quantity	*Definition*	*Unit*
wavelength	The shortest distance before the wave pattern repeats	.....
.....	Number of waves that pass a point in one second	.....
speed	....	.....
amplitude	Distance from the rest position to the top of a crest or the bottom of a trough	.....

4

15. In a research laboratory, water waves are generated in a tank. During one test the wave shown travels along the tank at 2·5 metres per second.



(*a*) Calculate the amplitude of the wave shown. 1

(*b*) Calculate the wavelength of the wave shown. 2

(*c*) Calculate the frequency of the wave shown. 2

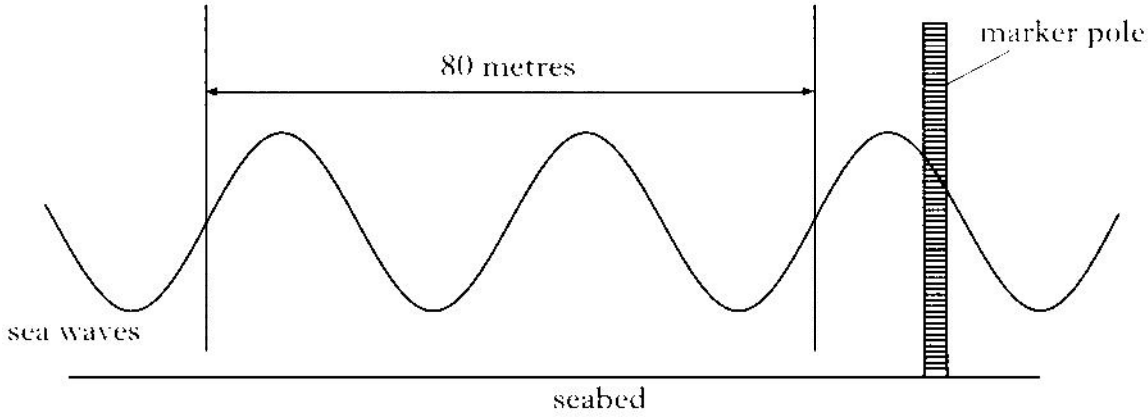
General Level

Answer questions in your Homework Jotter.
Show working for each question.

KU	PS

16. A surfer rides the waves near a beach.

(*a*) The diagram below shows a wave some distance from the beach.

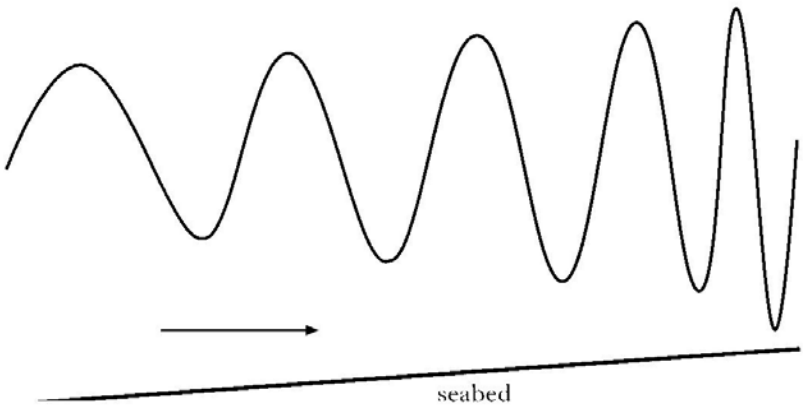


(i) Using information from the diagram, calculate the wavelength of the wave. **2**

(ii) The time between one crest and the next crest passing the marker pole is 5 seconds.
Calculate the speed of the wave. **2**

(iii) Calculate the frequency of the wave. **2**

(*b*) The drawing below shows changes in the wave as it approaches the beach.



Complete the sentences below by circling the correct answers.

(i) As the wave approaches the beach, its wavelength {decreases / increases / stays the same}. **1**

(ii) As the wave approaches the beach, its amplitude {decreases / increases / stays the same}. **1**

General Level

Answer questions in your Homework Jotter.
Show working for each question.

KU	PS

17. The frequency range and some uses of different radio wavebands are shown.

Waveband	*Frequency range (megahertz)*	*Uses*
HF	3 to 30	amateur radio, military communication
VHF	30 to 300	FM radio, air traffic control
UHF	300 to 3000	radar, local TV
SHF	3000 to 30 000	satellite TV, microwave communication

(*a*) Give a use, **from the table**, for a radio wave which has a frequency of 106 megahertz. **1**

(*b*) TV is broadcast in the United Kingdom on the UHF waveband.
What is the **range** of frequencies in this waveband? **1**

18. Two different communication systems are used at a concert. One is for public announcements and the other is used by security staff.

(*a*) Public announcements are made using a microphone and are heard by the audience from loudspeakers.
What energy transformation takes place in

(i) the microphone **1**

(ii) the loudspeakers? **1**

(*b*) Two members of the security staff communicate using two-way radios.
Each radio consists of a transmitter and a receiver.

(i) At what speed do signals travel between the two-way radios? **1**

(ii) Explain why no cables are needed to carry the signals between one radio and the other. **2**

(*c*) For each communication system, give **one** reason why it is suitable for its purpose.

Public announcement system

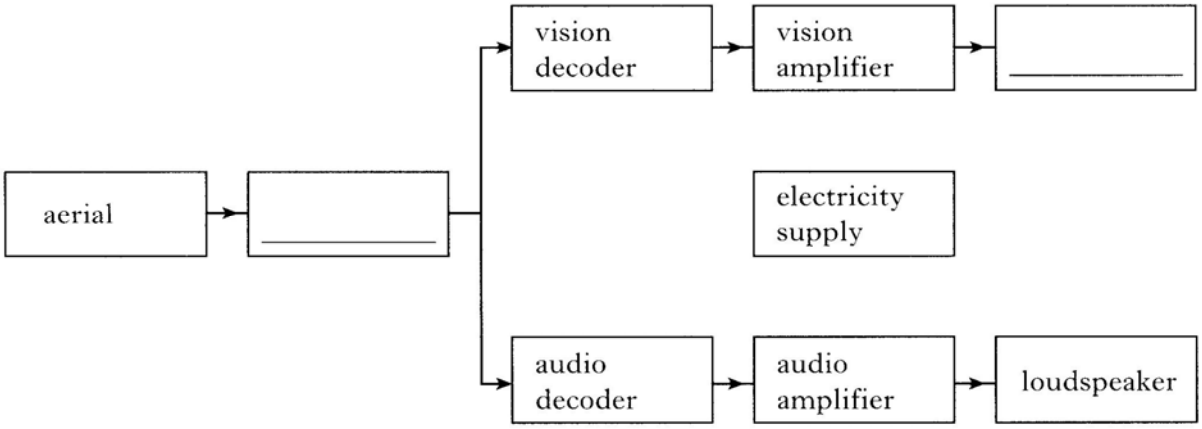
Two-way radios **2**

General Level

Answer questions in your Homework Jotter.
Show working for each question.

KU	PS

19. The block diagram shows the main parts of a television receiver. The labels in two of the blocks are missing.

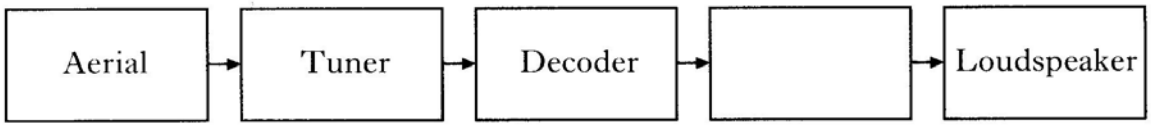


(*a*) Complete the block diagram by filling in the two missing labels. **1**

(*b*) Which part of a television receiver picks up the incoming signals? **1**

(*c*) What is the purpose of the electricity supply in a television receiver? **1**

20. The block diagram below shows some of the main parts of a radio receiver. The label in one of the blocks is missing.

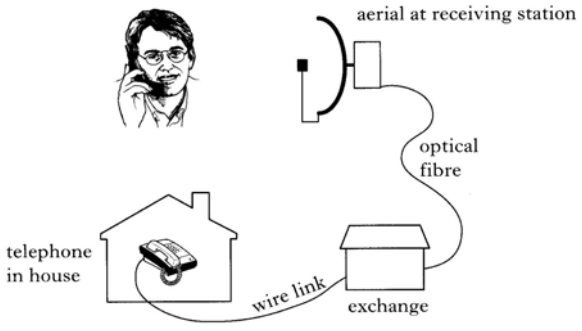


(*a*) Complete the block diagram by filling in the missing label. **1**

(*b*) What is the purpose of the block that is unlabelled? **1**

(*c*) The electricity supply is not shown on the block diagram.
What is the purpose of the electricity supply in a radio receiver? **1**

21. A caller makes a telephone call using a mobile phone. The call is received at a telephone in a house.



KU	PS

21. continued

The message from the caller reaches the person receiving the call in four stages.

Stage 1—The caller speaks into the mobile phone.
Stage 2—The mobile phone transmits a signal to an aerial at a receiving station.
Stage 3—The signal is transmitted along an optical fibre to an exchange.
Stage 4—The exchange is connected by a wire link to the telephone in the house.

(*a*) (i) Use words from the list below to show how the message is transmitted at each of the above stages.

electrical **light** **microwave** **sound**

Stage	*How the message is transmitted*		
1			1
2			1
3			1
4		1	

(ii) During which stage (from the table above) does the message travel **most slowly**? 1

(*b*) Complete the diagram below to show the effect of the curved reflector at the receiving station.

2

(*c*) A section of the optical fibre used in Stage 3 is shown below.

Complete the diagram to show how the signal is transmitted along the optical fibre. 2

General Level

Answer questions in your Homework Jotter.
Show working for each question.

KU	PS

22.

A television reporter uses a videophone to send news reports, via a communications satellite, to a television station. The videophone has a dish aerial, which transmits microwave signals. The signals are received at a curved dish on the satellite.

(*a*) What is the speed of the microwave signals? **1**

(*b*) Why is the signal that is received stronger when a curved dish is used on the satellite than when there is no reflector?
You may use a diagram in your answer. **2**

(*c*) Fill in the gaps in the following passage.

The communications satellite stays in the same place above the Earth in its orbit. It is therefore described as a ..... satellite.

The satellite has a period of ..... .

The signal is retransmitted from the satellite back to Earth, and is received at a ..... .

The signal is then sent on using ..... links. **4**

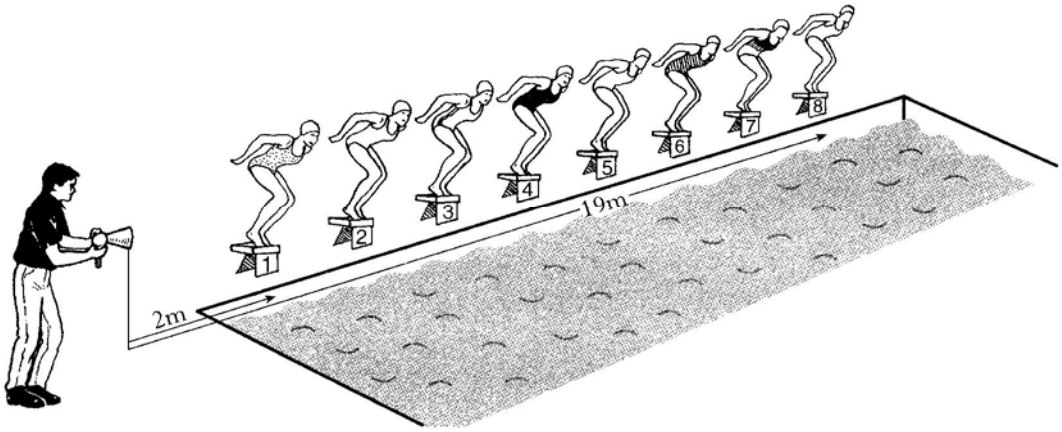
Credit Level

Answer questions in your Homework Jotter.
Show working for each question.

KU	PS

23.

At a local swimming gala, the swimmers start when they hear the sound of the starting horn. This horn also sends an electronic signal to start timing the race.



At the start of the race, the swimmer in lane 1 is a distance of 2 m from the horn and the swimmer in lane 8 is a distance of 19 m from the horn.

(*a*) The swimmer in lane 1 hears the sound of the horn first. Calculate how much later the swimmer in lane 8 hears this sound. **3**

(*b*) As each swimmer finishes the race, an electronic touch sensor detects the swimmer's arrival at the finishing point. After the race, the scoreboard gives the following information.

Place	*Lane*	*Time* (s)
1st	1	20·52
2nd	8	20·55
3rd	5	21·91

(i) Using your answer to part (*a*), or otherwise, explain why the swimmer in lane 8 should have been awarded first place. **2**

(ii) Suggest an improvement to the starting, or timing, system that would reduce the unfairness of the timing. **1**

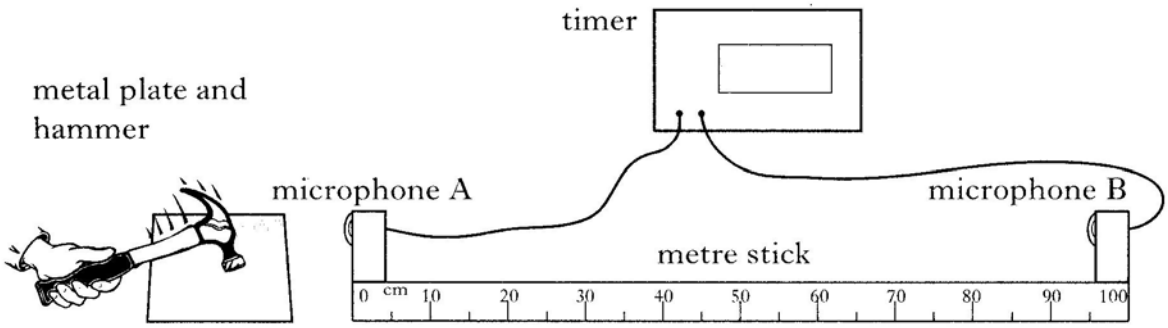
Credit Level

Answer questions in your Homework Jotter.
Show working for each question.

KU	PS

24.

A student sets up the apparatus **exactly** as shown to measure the speed of sound in air.



Striking the metal plate with the hammer produces a sound. Timing starts when the sound reaches microphone A, and stops when the same sound reaches microphone B.

(*a*) The student carries out the experiment three times and records the results shown in the table.

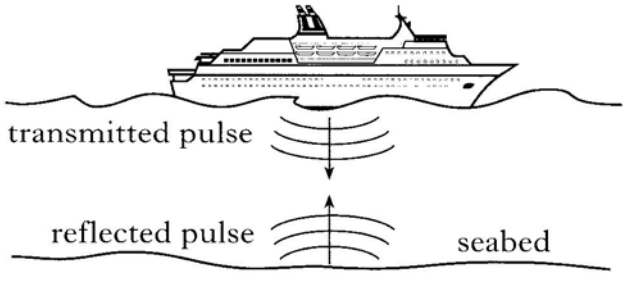
trial	*distance between microphones* (m)	*time recorded on timer* (s)
1	1·00	0·00287
2	1·00	0·00282
3	1·00	0·00286

Use **all** of the student's results to calculate the value of the speed of sound. **3**

(*b*) Suggest a reason why the student's results do **not** give the value of 340 m/s for the speed of sound in air, as quoted in the data sheet. **1**

25.

The depth of the seabed is measured using pulses of ultrasound waves. The ultrasound waves are transmitted from a stationary ship. The waves are reflected from the seabed as shown and are detected by equipment on the ship. The transmitted ultrasound waves have a frequency of 30 kHz.



Credit Level

Answer questions in your Homework Jotter.
Show working for each question.

KU	PS

25. continued

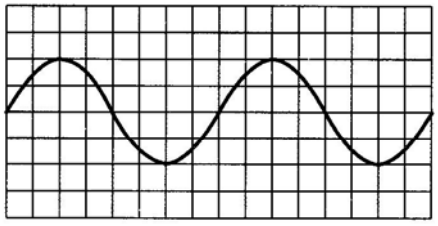
(*a*) One pulse of ultrasound waves is received back at the ship 0·2 s after being sent out.

(i) Use the data sheet to find the speed of the ultrasound waves in the water. **1**

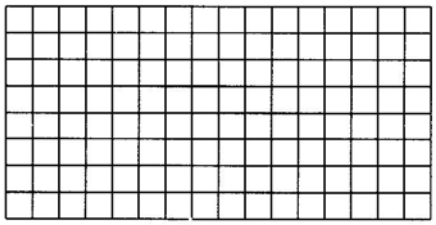
(ii) Calculate the depth of the seabed. **3**

(iii) Calculate the wavelength of the ultrasound waves in the water. **2**

(*b*) The ultrasound waves lose energy as they travel through the water. The transmitted wave is displayed on an oscilloscope screen as shown.



Transmitted



Reflected

On the bottom part of the diagram, sketch the trace produced by the reflected wave. **2**

(*c*) The frequency of the transmitted wave is increased to 60 kHz.

What happens to the time interval between the transmitted pulse and the reflected pulse?

Explain your answer. **2**

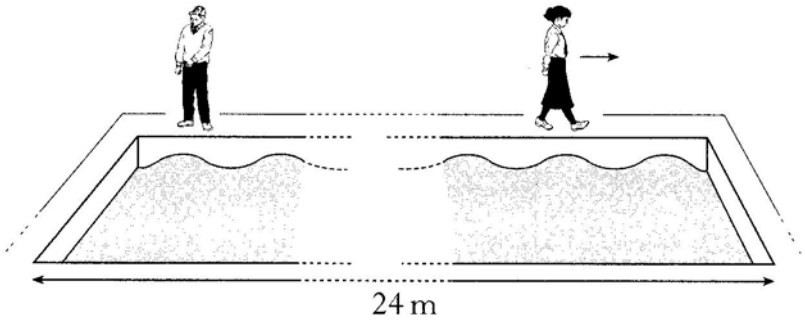
Credit Level

Answer questions in your Homework Jotter.
Show working for each question.

KU	PS

26.

Two students watch the waves produced by a wave machine at a swimming pool.



One student walks beside a wave as it travels along the pool. The wave goes from one end of the pool to the other in 20 s. The length of the pool is 24 m.

(*a*) Calculate the speed of the waves. **2**

(*b*) In the same time interval, the other student counts 5 waves going past the point where he is standing.

Calculate the frequency of the waves. **2**

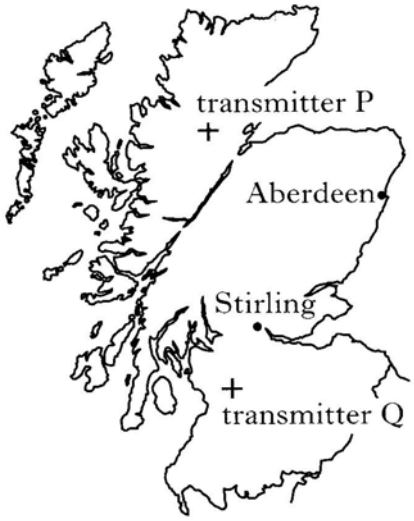
(*c*) The students note that there are 5 complete waves in the pool at any time.

Calculate the wavelength of the waves. **2**

(*d*) Explain why "distance divided by time" and "frequency times wavelength" are equivalent for a wave. **2**

27.

Radio Alba transmits on a range of frequencies from different transmitters throughout Scotland.



KU	PS

27. continued

On a car journey from Aberdeen to Stirling a driver listens to Radio Alba. At the start of the journey she tunes to the signal transmitted from transmitter P.

(*a*) Complete the following passage, using some of the words from the list below. Do not use any word more than once.

amplitude **audio** **carrier**
frequency **modulation** **radio**

The transmitter transmits a .....signal, which consists of an.....wave and a.....wave. The process of combining these waves is known as **2**

(*b*) During the journey the driver finds that the signal from transmitter P fades.

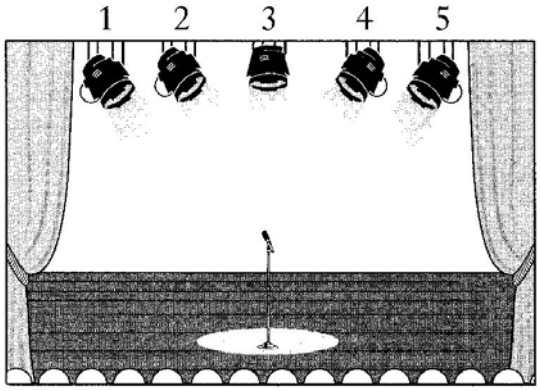
(i) Suggest a reason why the signal fades. **1**

(ii) To continue to listen to Radio Alba, the driver re-tunes the radio to pick up the signal from transmitter Q.

What is the difference between the carrier wave from transmitter P and that from transmitter Q? **1**

28.

A show uses five spotlights of equal brightness, pointing at the same place on the stage.



Spotlight	*Colour*
1	green
2	blue
3	red
4	blue
5	green

The spotlights can be turned on and off individually. The colour of light from each spotlight is shown in the table.

Credit Level

Answer questions in your Homework Jotter.
Show working for each question.

KU	PS

28. continued

(*a*) State **three** spotlights that could be on to produce white light on the stage. **1**

(*b*) One scene requires yellow light.

State **two** spotlights that could be on to produce yellow light on the stage. **1**

(*c*) Another scene requires **pale** green light. This needs **four** of the spotlights to be on.

State **one** spotlight that could be **off** so that the other four produce pale green light. **1**

29.

A colour television receiver displays 25 images on the screen every second.

(*a*) Calculate the number of images displayed on the screen in one minute. **1**

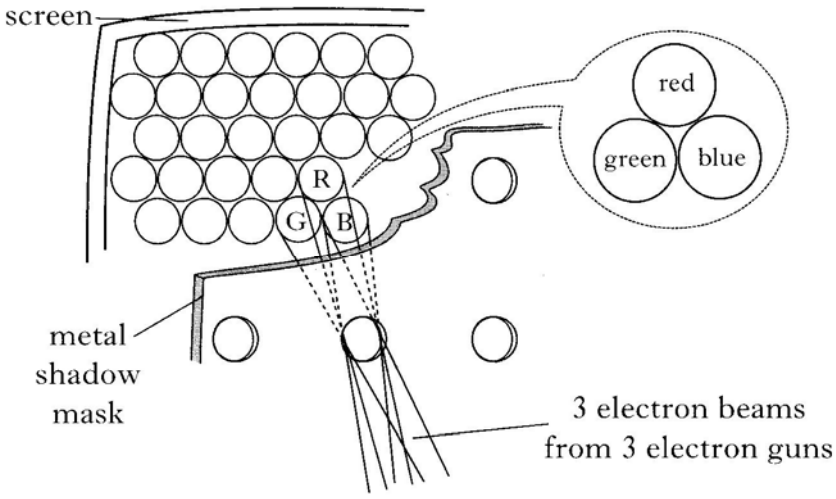
(*b*) The television receiver contains decoders.

State the function of a decoder. **1**

(*c*) In the colour television tube, three electron guns each send a beam of electrons to the screen.

(i) Why are **three** electron guns needed in a **colour** television tube? **1**

(ii) The diagram below shows the screen and the shadow mask in a colour television tube.



Use information from the diagram to explain why a shadow mask is needed. **2**

Credit Level

Answer questions in your Homework Jotter.
Show working for each question.

KU	PS

30. A car driver listens to a radio station broadcasting on 1500 kHz.

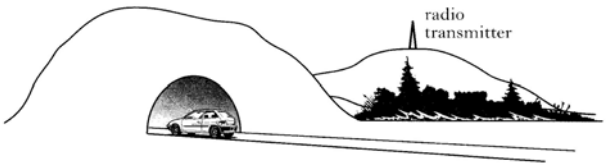
(*a*) Calculate the wavelength of the radio broadcast. **2**

(*b*) The table shows the frequency range of the different wavebands on the radio receiver. **1**

Waveband	*Frequency range*
long wave	30 kHz – 300 kHz
medium wave	300 kHz – 3 MHz
short wave	3 MHz – 30 MHz
F.M.	30 MHz – 300 MHz

From the table, write down the waveband of the radio station that the driver is listening to.

(*c*) A passenger in the car listens to a personal CD player.
The car enters a tunnel. **1**



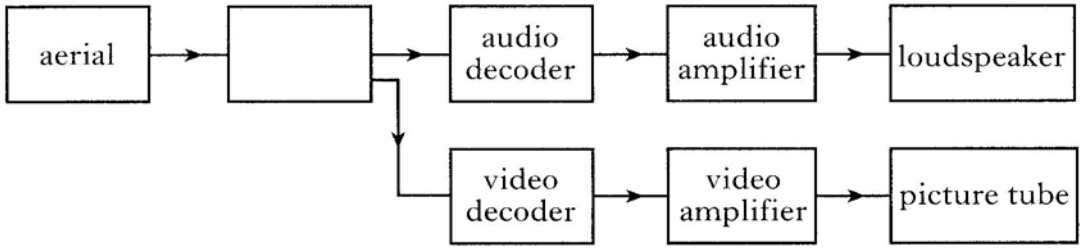
As the car enters the tunnel, the sound from the radio fades, but the sound from the CD player can still be heard.

(i) Explain why the sound from the radio fades. **1**

(ii) Explain why the sound from the CD player can still be heard. **1**

31. A television receiver is used to pick up a signal from a television transmitter.

(*a*) The block diagram represents a television receiver.



(i) On the diagram, label the part of the receiver that has been left blank. **1**

(ii) State the purpose of the aerial. **1**

Credit Level

Answer questions in your Homework Jotter.
Show working for each question.

KU	PS

31. continued

(iii) One other necessary part of the television receiver is not shown on the block diagram.

Name this part. **1**

(iv) Which part of the television receiver transforms electrical energy to light energy? **1**

(*b*) In the transmitter, a video signal is combined with a carrier wave to produce a signal for transmission.

(i) Circle the correct phrase to complete this sentence.

The carrier wave has a frequency that is {higher than / the same as / lower than} the frequency of the video signal. **1**

(ii) Why is the carrier wave needed for transmission? **1**

(iii) Name the process of combining the waves for transmission. **1**

32.

A pupil is sent exam results by a text message on a mobile phone. The frequency of the signal received by the phone is 1900 MHz.

The mobile phone receives radio waves (signals).

(*a*) What is the speed of radio waves? **1**

(*b*) Calculate the wavelength of the signal. **2**

(*c*) The pupil sends a video message from the mobile phone. The message is transmitted by microwaves. The message travels a total distance of 72 000 km.

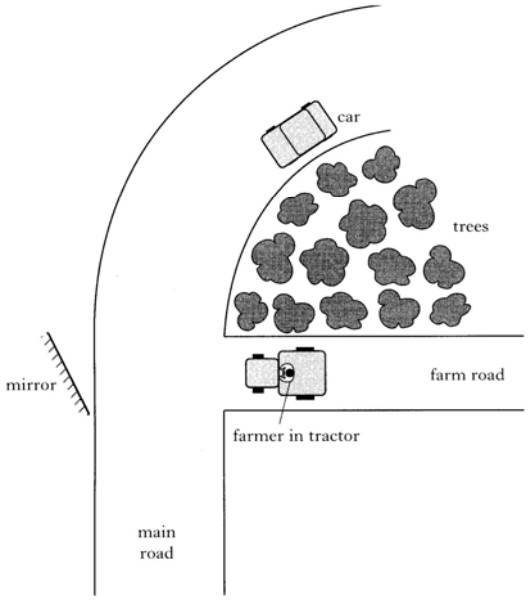
Calculate the time between the message being transmitted and received. **2**

Credit Level

Answer questions in your Homework Jotter.
Show working for each question.

KU	PS

33. A farm road joins a main road at a bend. The farmer has placed a mirror as shown so that he can see when cars are approaching.



(*a*) On the diagram, draw rays to show how the farmer in the tractor can see the car by using the mirror.

You must label the angle of incidence and the angle of reflection on your completed diagram. **3**

(*b*) State why the driver of the car can **also** see the tractor using the mirror. **1**

34. A mobile phone can send signals on 3 different frequencies, 900 MHz, 1800 MHz and 1900 MHz.

(*a*) (i) Which signal has the longest wavelength? **1**

(ii) Calculate the wavelength of the 1800 MHz signal. **3**

(*b*) At a base station, microwave signals from the mobile phone are converted into light signals for transmission along an optical fibre.

(i) State two advantages of sending light signals along an optical fibre compared to sending electrical signals along a wire. **2**

(ii) The time taken for light to travel along a glass optical fibre is 1·2 ms.

(A) State the speed at which signals travel along the optical fibre. **1**

(B) Calculate the length of the optical fibre. **2**

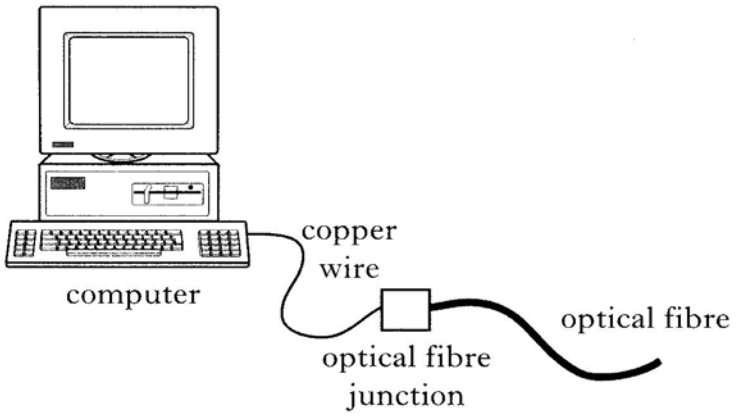
Credit Level

Answer questions in your Homework Jotter.
Show working for each question.

KU	PS

35.

A computer is connected to the Internet by means of a copper wire and a glass optical fibre as shown.



(*a*) In the table below, enter:

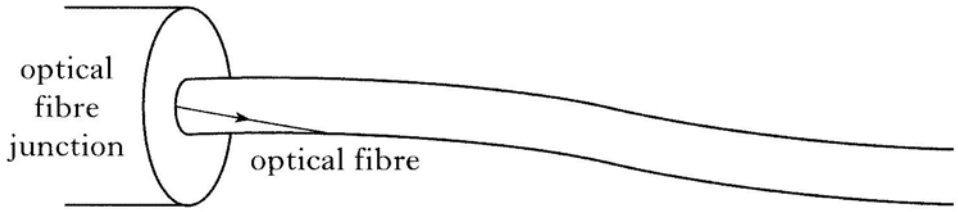
(i) the speed of the signal in each material;

(ii) the type of signal in each material. **2**

	Copper wire	*Glass optical fibre*
Speed of signal		
Type of signal		

2

(*b*) Complete the diagram to show how the signal travels along the optical fibre.



2

(*c*) Copper wire or glass optical fibre can be used in telecommunication systems.

(i) Explain which material, copper or glass, would need less repeater amplifiers over a long distance. **2**

(ii) A broadband communication system carries 100 television channels and 200 phone channels.

Explain which material, copper or glass, should be used in this system. **2**

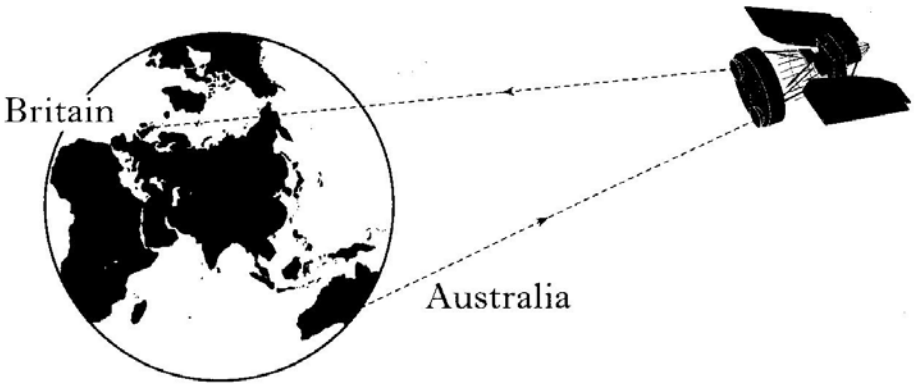
Credit Level

Answer questions in your Homework Jotter.
Show working for each question.

KU	PS

36.

Radio signals from the Olympic Games in Australia are transmitted to Britain. The signals are sent at a frequency of 6 GHz (6×10^9 Hz) to a satellite which is in a geostationary orbit. Using a different frequency, the satellite then retransmits the signals to a ground station in Britain.



(*a*) State what is meant by a geostationary orbit. **2**

(*b*) Calculate the wavelength of the signals which are sent to the satellite. **3**

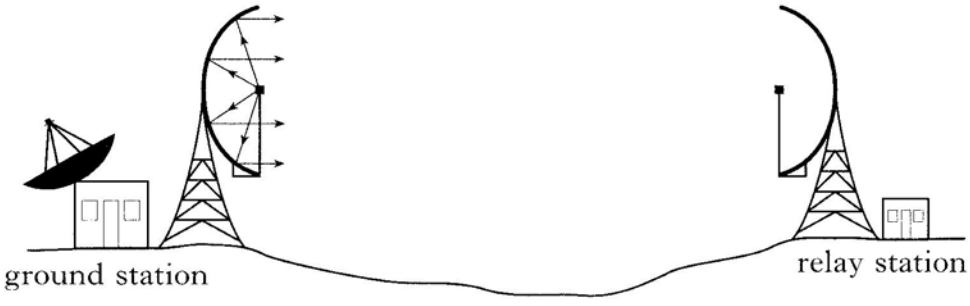
(*c*) One of the layers in the atmosphere is the ionosphere. The radio signals pass through the ionosphere as they travel between Earth and the satellite. Radio waves of frequencies below 30 MHz are reflected by the ionosphere.

Circle the frequency that is suitable for **retransmitting** the signals from the satellite to the Earth. **1**

20 MHz 4 GHz 6 GHz

(*d*) At the ground station in Britain, the signals are transmitted as a parallel beam of microwaves to a relay station, using curved reflectors.

Complete the diagram below to show the effect of the curved reflector at the relay station.



2

Credit Level

Answer questions in your Homework Jotter.
Show working for each question.

KU	PS

37.

The table gives information about artificial satellites that orbit the Earth.

Name of satellite	*Period* (minutes)	*Height above Earth* (km)	*Use*
Landsat	99	705	Land mapping
ERS-1		780	Monitoring sea levels
NOAA-12	102	833	Distribution of ozone layer
Early Bird	1440	35 900	Continuous telecommunication

(*a*) NOAA-12 uses radio waves to transmit signals relating to the ozone layer.

(i) What is the speed of radio waves? **1**

(ii) Calculate the time for signals to travel from NOAA-12 to an Earth station immediately below the satellite. **2**

(iii) Signals transmitted from NOAA-12 have a frequency of 137·5 MHz.

Calculate the wavelength of these signals. **2**

(*b*) Using information about the period of Early Bird, explain why this satellite is used for continuous telecommunication between two points on the Earth's surface. **2**

(*c*) Give an approximate value, **in minutes**, for the period of orbit of ERS-1. **1**

(*d*) Landsat monitors heat emission from the land to build up a thermographic image.

Which part of the electromagnetic spectrum is detected by Landsat? **1**

(*e*) As well as artificial satellites, there is one natural satellite that orbits the Earth. Name this natural satellite. **1**

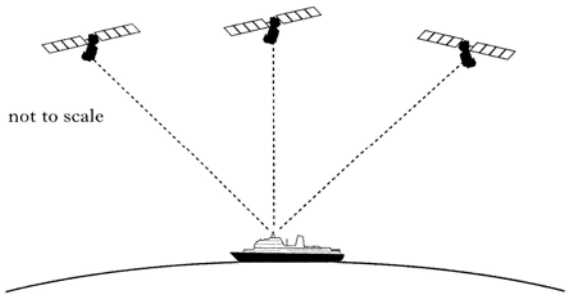
Credit Level

Answer questions in your Homework Jotter.
Show working for each question.

KU	PS

38.

A ship has a satellite navigation system. A receiver on the ship picks up signals from three global positioning satellites.



These satellites can transmit radio signals at three different frequencies, 1176 MHz, 1228 MHz and 1575 MHz. The satellites orbit at a height of 20 200 km above the Earth's surface.

(*a*) (i) State the speed of the radio signals. **1**

(ii) One of the satellites is directly above the ship.

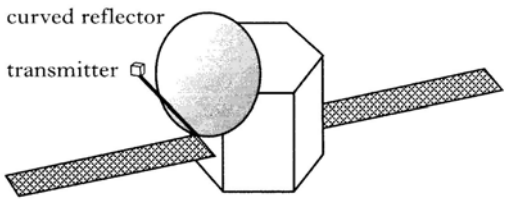
Calculate the time taken for the signal from this satellite to reach the ship. **2**

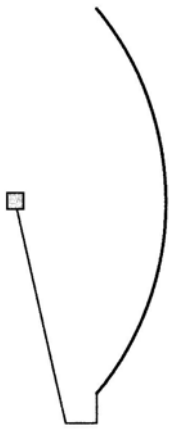
(iii) Calculate the wavelength of the 1228 MHz signal. **2**

(*b*) State which of the three signals has the shortest wavelength. **1**

(*c*) One of the global positioning satellites is shown below.

(i) Complete the diagram below to show the effect of the curved reflector on the transmitted signals.



 **2**

(ii) A satellite in orbit a few hundred kilometres above Earth has a period of one hour. A geostationary satellite orbits 36 000 km above Earth.

Suggest the period of the global positioning satellite. **1**

Credit Level

Answer questions in your Homework Jotter.
Show working for each question.

KU	PS

39.

Radio waves have a wide range of frequencies.

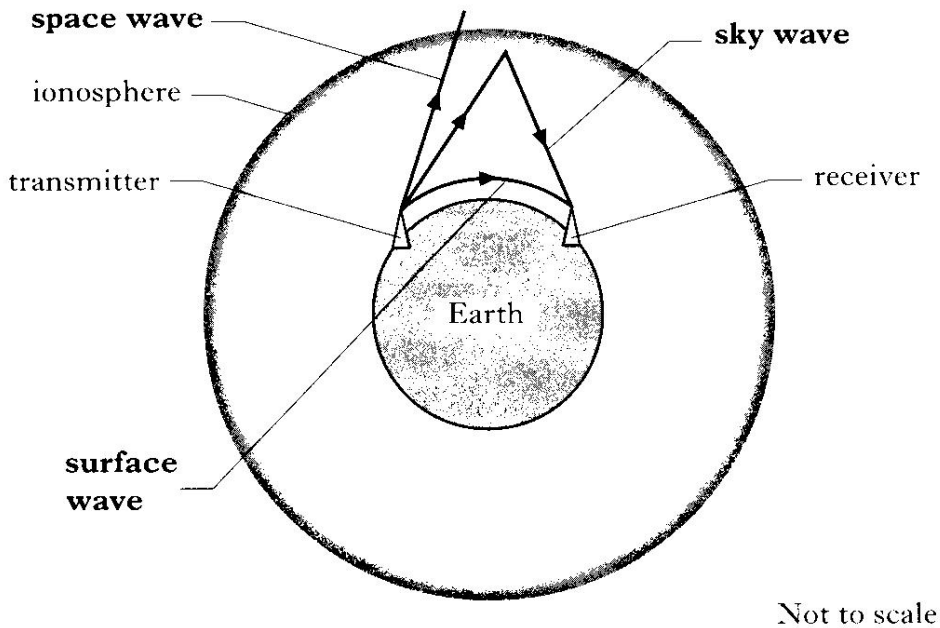
The table gives information about different wavebands.

Waveband	*Frequency Range*	*Example*
Low frequency (LF)	30 kHz – 300 kHz	Radio 4
Medium frequency (MF)	300 kHz – 3 MHz	Radio Scotland
High frequency (HF)	3 MHz – 30 MHz	Amateur radio
Very high frequency (VHF)	30 MHz – 300 MHz	Radio 1 FM
Ultra high frequency (UHF)	300 MHz – 3 GHz	BBC 1 and ITV
Super high frequency (SHF)	3 GHz – 30 GHz	Satellite TV

(*a*) Coastguards use signals of frequency 500 kHz.

What waveband do these signals belong to? **1**

(*b*) The diagram shows how radio signals of different wavelengths are sent between a transmitter and a receiver.



Not to scale

Credit Level

Answer questions in your Homework Jotter.
Show working for each question.

KU	PS

39 (b). continued

(i) Which of the waves in the diagram shows diffraction? — PS: 1

(ii) What does this indicate about the wavelength of the diffracted wave compared to the other two waves? — KU: 1

(iii) The Earth's ionosphere is shown on the diagram. The ionosphere is a layer of charged particles in the upper atmosphere. High frequency waves are transmitted as sky waves.

Explain how the transmitted waves reach the receiver. — PS: 1

(iv) Super high frequency (SHF) signals are shown as space waves on the diagram. Although they can only travel in straight lines, they can be used for communications on Earth between a transmitter and receiver.

Describe how the SHF signals get to the receiver. — KU: 2

SQA Source Papers

General - Section		Paper	Question
Multiple Choice	1	2001	1
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	3	2002	2
	4	2004	1
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1. Communicating Using Waves	8	2002	8
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Credit - Section	Question		
1. Communicating Using Waves	23	2000	2
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2. Waves	25	2001	1
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	28	2003	4
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	30	2005	1
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