GCSE

Specimen Papers and Mark Schemes

Edexcel GCSE
Physics A (1540)

For First Examination
Summer 2003

Edexcel
Success through qualifications

Contents

1522/3F   1540/1F

Edexcel GCSE

Science: Double Award A [1522]

Paper 3F

Physics A [1540]

Paper 1F

FOUNDATION TIER

Specimen Paper

Time: 1 hour 30 minutes   **N0000**

Materials required for the examination   **Items included with these question papers**
None   None

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your signature, your surname and other names, then tick the box to show the correct paper reference for your examination.

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Answer ALL questions in the spaces provided in this book.

Show all stages in any calculations and state the units. Calculators may be used.

Include diagrams in your answers where these are helpful.

Information for Candidates

The marks for the various parts of questions are shown in round brackets: e.g. (**2**).

This paper has 10 questions. There are no blank pages.

Advice to Candidates

This symbol shows where the quality of your written answer will also be assessed.

Additional Answer Sheets may be used.

Turn over

FORMULAE

You may find the following formulae useful.

$$\text{power} = \frac{\text{work done}}{\text{time taken}} \qquad\qquad P = \frac{W}{t}$$

$$\text{frequency} = \frac{1}{\text{time period}} \qquad\qquad f = \frac{1}{T}$$

1. The table shows some data about the planets of the Sun.

Planet	Distance from Sun (millions of km)	Average surface temperature (°C)	Density (kg/m³)	Surface gravity (N/kg)	Time of orbit (years)
Venus	108	470	5200	9	0.6
Earth	150	15	5500	10	1.0
Mars	228	-30	4000	5	1.9
Jupiter	778	-150	1300	26	12
Saturn	1427	-180	700	11	30
Pluto	5900	-230	500	4	248

Use information from the table to answer the following questions.

(a) Which planet takes the longest time to go round the Sun?

....

(1)

(b) Use words from the box to complete the paragraph.

decreases	Earth	heat	increases	light	Pluto

The planet …………………………….. has the lowest surface temperature. This is

because less …………………………..energy arrives at the surface of a planet as the

distance from the Sun ……………………………… **(3)**

(c) Pluto is mainly gas.
How can we tell this from the table?

....

(1)

(d) (i) What information suggests that Jupiter has the largest mass?

....

(1)

(ii) On which planet would you have the least weight?

....

(1)

(Total 7 marks)

2. (a) The table shows the power rating and operating current for a number of household electrical appliances.

Appliance	Power (watt)	Current (ampere)
cooker	6000	25.0
iron	960	4.0
food mixer	480	2.0
television	180	0.75
table lamp	60	0.25

(i) Which appliance costs most to run for an hour?

Give a reason for your answer.

Appliance...

Reason ....

....

(2)

(ii) Each of the appliances listed uses 240 volts.

Explain why the cooker has the smallest resistance of these appliances.

....

....

....

....

(2)

(iii) A cooker is always on a separate circuit with a thick cable.

Tick the two boxes to show the reasons for this.

☐   Thick cables have a lower resistance.

☐   Thick cables are easy to insulate.

☐   Thick cables melt at a higher temperature.

☐   Thick cables produce less heat.

(2)

(b) Electrical lighting in a house uses parallel circuits instead of series circuits.

State **two** reasons why parallel circuits are used for domestic lighting circuits.

1. ....

....

2. ....

....

(2)

(Total 8 marks)

TURN OVER FOR QUESTION 3

3. (a) Complete the table below to describe how friction is used in the situation described. As an example, the first line has been completed for you.

Situation	Part played by friction
A person walking along a footpath	The frictional force between the soles of the shoe and the ground allows the foot to push back on the ground and the person to move forward
A car travelling along a road.	……………………………………………………………………… ……………………………………………………………………… ……………………………………………………………………… ………………………………………………………………………
Rubbing your hands together on a cold day	……………………………………………………………………… ……………………………………………………………………… ……………………………………………………………………… ………………………………………………………………………

(5)

(b) The diagram shows a book resting on a table.

Add arrows to the diagram to show the forces that are acting on the book.

Label the arrows with the names of the forces.

(4)

(Total 9 marks)

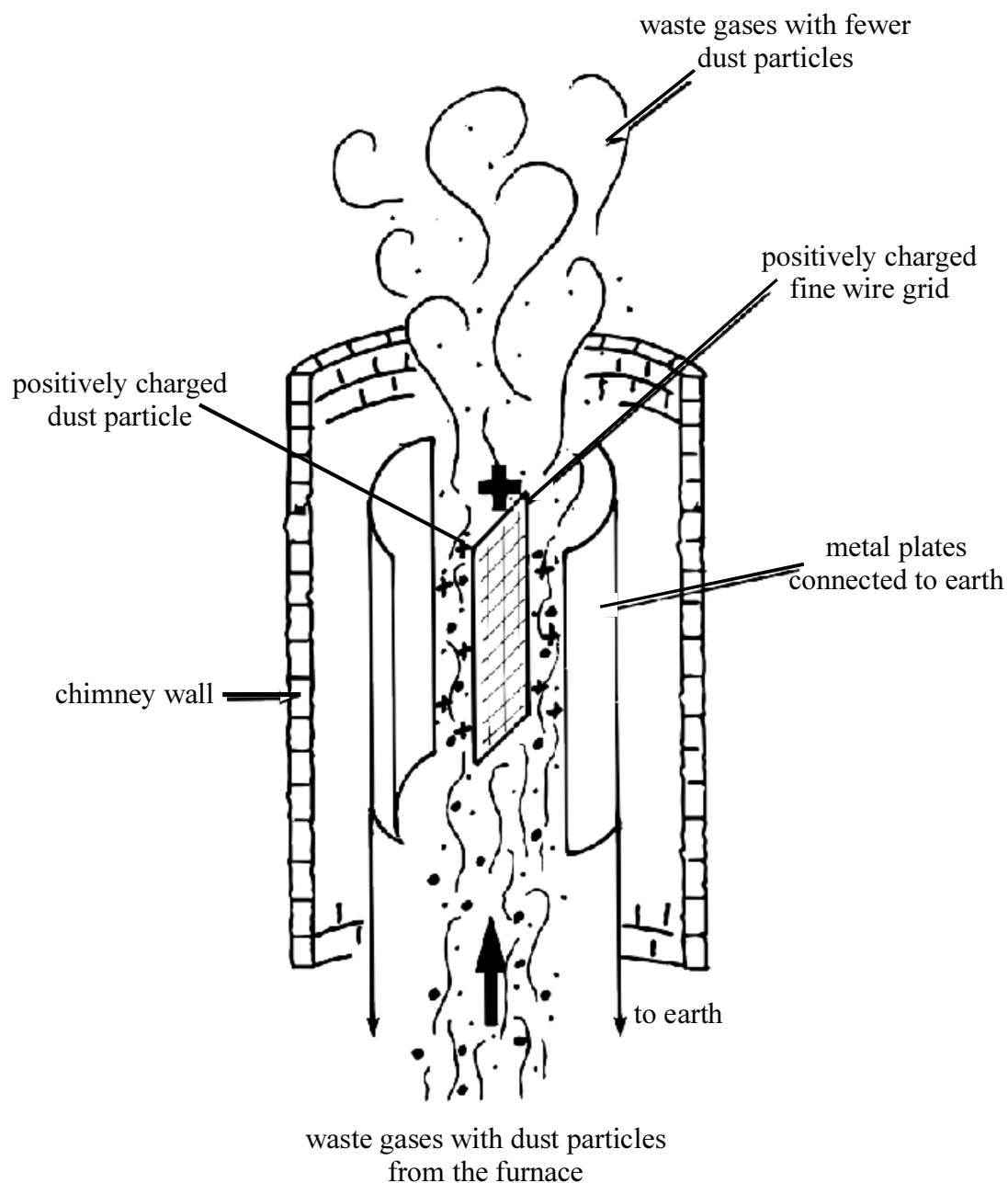**4.** (a) Use words from the box to complete the passage below.

attract	electrons	electrostatic	friction	protons	repel

When Jacquie takes off her woollen jumper she hears a crackling

sound and sees small flashes of light. It is thought that the

………………………………… between her jumper and blouse is

producing ………………………………… charges. The jumper

becomes positively charged because …………………………………

are being removed from it. Because the jumper and blouse have

opposite charges they ………………………………… each other and

this makes it difficult for the jumper to be removed.

(4)

QUESTION 4 CONTINUES ON NEXT PAGE

(b) The diagram shows the inside of a simple electrostatic precipitator. This is a device for removing dust from the waste gases in chimneys of factories and power stations. As the dust particles move up past the fine wire grid they gain a positive charge.

waste gases with fewer dust particles

positively charged fine wire grid

positively charged dust particle

metal plates connected to earth

chimney wall

to earth

waste gases with dust particles from the furnace

(i) Show, with an arrow, the direction of movement of the positively charged particles between the grid and the earth plate.

(1)

(ii) Explain why the positively charged particles move in the direction you have shown.

....

....

....

....

(2)

(iii) From time to time the earthed metal plates are hit with a hammer.

Suggest a reason for this.

....

....
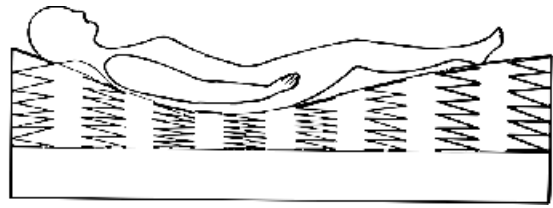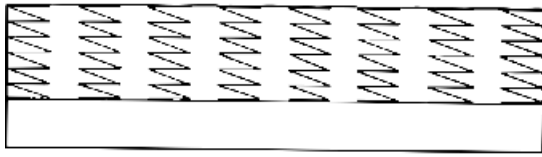
(1)

(Total 8 marks)

TURN OVER FOR QUESTION 5

5. The mattress of a bed contains springs. The diagrams show the change that takes place when a person lies on the bed.

(a) (i) How do the springs change when a person lies on the bed?

....

(1)

(ii) Circle the spring that has the greatest force on it.

(1)

(iii) How can you tell that this spring has the greatest force acting on it?

....

(1)

(b) A manufacturer makes a mattress that sags less in the middle when a person lies on it.

Suggest **two** ways of doing this.

1 ....

....

2 ....

....

(2)

(c) One force acting on the person is the upward push of the springs.

(i) Another force acts on the person.

Draw an arrow on the diagram to show the direction of this force.

(1)

(ii) Use words from the box to complete the sentence.

downward	Earth	mattress	upward

The other force on the person is the ....………… pull of the

.............................………… .

(2)

(Total 8 marks)

TURN OVER FOR QUESTION 6

6. (a) A wind powered generator is used to produce electrical power when the wind is blowing. The table shows the electrical power generated by the wind for different wind speeds.

Power generated (watts)	0	0	140	900	1100	1160	1160
Wind speed (km/h)	0	2	5	10	12	15	20

(i) On the axes below draw a graph to show how the power generated changes with wind speed.

Power generated in watts

Wind speed in km/h
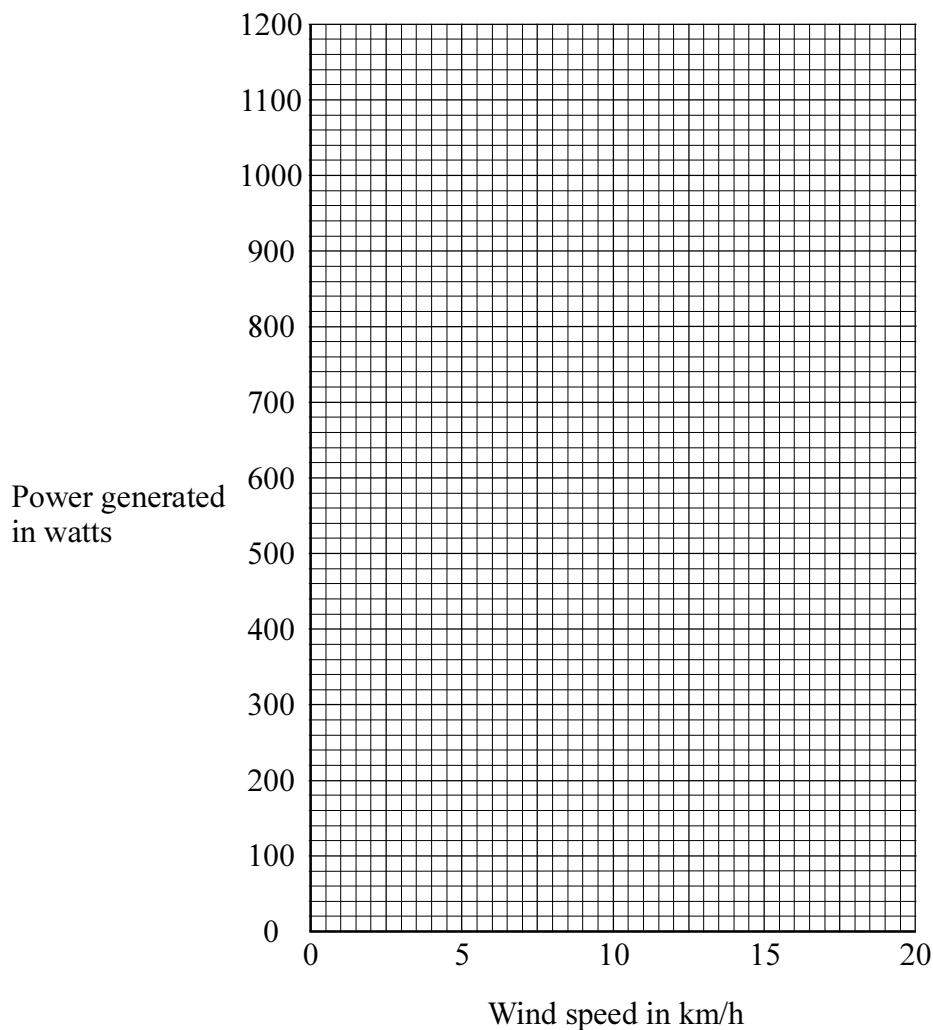
(3)

(ii) What is the lowest wind speed needed to generate power?

....

(1)

(iii) What is the maximum power generated by the wind?

....

(1)

(iv) Explain **one** disadvantage of using only a wind generator as the source of electrical power.

....

....

(1)

(b) Complete the sentence to show the energy transfer taking place in the wind powered generator.

………………………… energy is transferred to ………………………… energy.

(2)

(Total 8 marks)

TURN OVER FOR QUESTION 7

7. (a) The main heat energy losses from a house are shown in the diagram.

roof (5%)

window (10%)

doors (10%)

walls

(………… %)

draughts (10%)

(i) Complete the diagram to show the percentage heat energy loss through the walls.

(1)

(ii) Complete the table below to show how the heat energy loss from each part of the house can be reduced. The first one has been done for you.

Part of the house	Method used for reducing heat energy loss
roof	glass-fibre insulation in the loft
walls	…………………………………………………………….. ……………………………………………………………..
floor	…………………………………………………………….. ……………………………………………………………..

(2)

14

(b) Double glazing is used to reduce the heat energy loss from houses through the windows. The table compares the heat loss for ordinary windows and for double glazed windows.

Type of window	Heat energy passing through (joules per second)
ordinary window	224
double-glazed window	116

The size of the windows and the temperature inside and outside the house are the same in each case.

(i) How many joules per second does using double glazing save?

....

(1)

(ii) How much energy would pass through an ordinary window in one hour?

....

....

.... joules

(3)

(c) A double glazing salesman claims that by replacing ordinary windows with double glazed windows, the heating bills of a house will be halved.

Use the information given earlier to show whether this claim is true or not.

....

....

....

....

....

....

(3)

(Total 10 marks)

TURN OVER FOR QUESTION 8

8. Radon is a radioactive gas. It escapes from underground rocks and causes a large part of the natural background radiation in the United Kingdom.

    (a) Radon-220 ($^{220}_{86}$Rn) is an isotope of radon.

        (i) How many protons are there in a nucleus of radon-220?

        ....

        (1)

        (ii) How many neutrons are there in a nucleus of radon-220?

        ....

        (1)

        (iii) Explain what is meant by the statement: "This element has three isotopes".

        ....

        ....

        ....

        ....

        (2)

(b) • Radon-220 has a short half-life and emits α-particles.

• Alpha particles are easily stopped by material and only travel a short distance in air.

• Radon gas is thought to produce harmful effects.

When home owners, in areas where radon gas is produced, were told of the risks, very few took notice.

(i) Explain why the presence of radon gas in buildings is a health hazard.

....

....

....

....

....

....

(3)

(ii) Discuss why, you think, so few people took any action to reduce the risks due to radon gas.

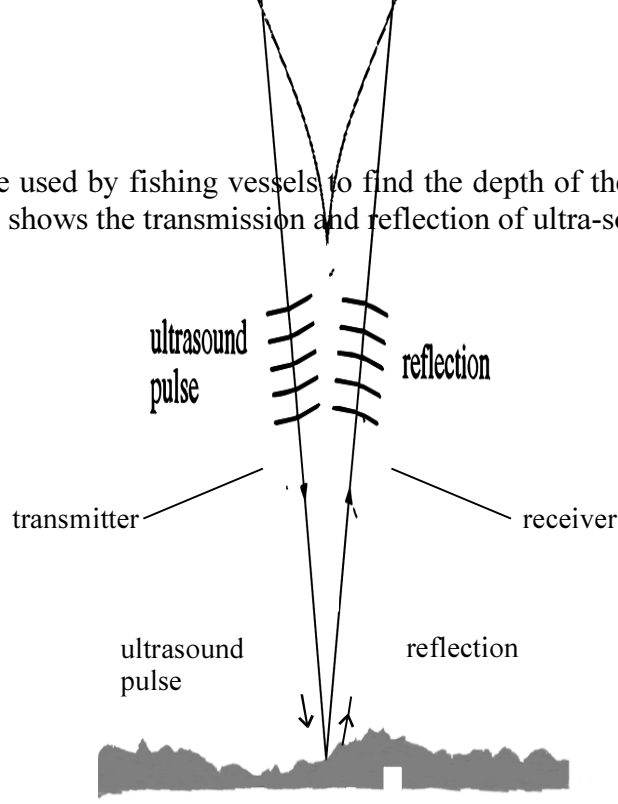...

....

....

....

....

....

....

(4)

(Total 11 marks)

TURN OVER FOR QUESTION 9

9. Ultrasound can be used by fishing vessels to find the depth of the sea or to locate shoals of fish. The diagram shows the transmission and reflection of ultra-sound from a fishing vessel.

(a) What is ultrasound?

....

....

....

....

(2)

(b) The speed of ultrasound in water is 1500 m/s.

   (i) The frequency of the ultrasound used for depth finding is 50 000 Hz.

     Calculate the wavelength of the ultrasound.

     ....

     ....

     ....

                                                (4)

   (ii) On the diagram the depth of the sea is 1200 m.

     Calculate the time it would take for the ultrasound wave to travel from the transmitter to the sea-bed and back to the receiver.

     ....

     ....

     ....

                                                (4)

(c) Waves with small wavelengths spread out (diffract) less than those with long wavelengths. Use this information to suggest why ultrasound is much better than ordinary sound for finding the depth of the sea.
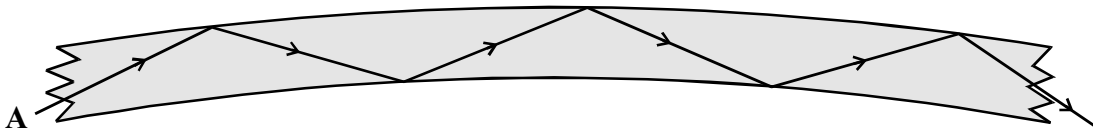
....

....

....

....

....

....

                                                (3)

(Total 13 marks)

TURN OVER FOR QUESTION 10

10. (a) The diagram shows the passage of light beam **A** travelling down an optical fibre.

(i) State the name of the process that takes place as the light **A** beam travels down the optical fibre.

....

(1)

(ii) Complete the diagram to show the passage of the light beam **B** down the same optical fibre.

(1)

(iii) Suggest why beam **B** will take slightly longer to travel down the fibre than beam **A**.

....

....

....

....

(2)

(b) Optical fibres are used to carry information. The information is carried by the light beam in the form of a digital signal.

(i) Draw a diagram to show what is meant by a digital signal.

(1)

(ii) The signal from a microphone is an analogue signal. How does an analogue signal differ from a digital signal?

....

....

(1)

(c) When signals are sent through optical fibres they lose energy.

(i) State what happens to the brightness of the light beam as it loses energy.

....

(1)

(ii) State **one** disadvantage of losing energy as the light beam travels through the optical fibre.

....

....

(1)

(Total 8 marks)

TOTAL MARK 90

END

1540/2F

Edexcel GCSE

Physics A [**1540**]
Paper 2F
FOUNDATION TIER
Specimen Paper

Time: 1 hour   **N0000**

Materials required for the examination   **Items included with these question papers**
None   None

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Turn over

Edexcel
Success through qualifications

FORMULAE

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$$\text{frequency} = \frac{1}{\text{time period}} \qquad\qquad f = \frac{1}{T}$$

$$\frac{\text{pressure}}{\text{temperature}} = \text{constant} \qquad\qquad \frac{P_1}{T_1} = \frac{P_2}{T_2}$$

$$\text{orbital speed} = \frac{2\pi \times \text{orbital radius}}{\text{time period}} \qquad\qquad v = \frac{2 \times \pi \times r}{T}$$

$$\text{kinetic energy} = \text{electronic charge} \times \text{accelerating voltage} \qquad KE = e \times V$$

1. (a) Complete the diagram to link physical quantity with its unit. One has been done for you.

energy	———————	joule

temperature		m/s

wavelength		kelvin

current		ampere

pressure		pascal

wave speed		m
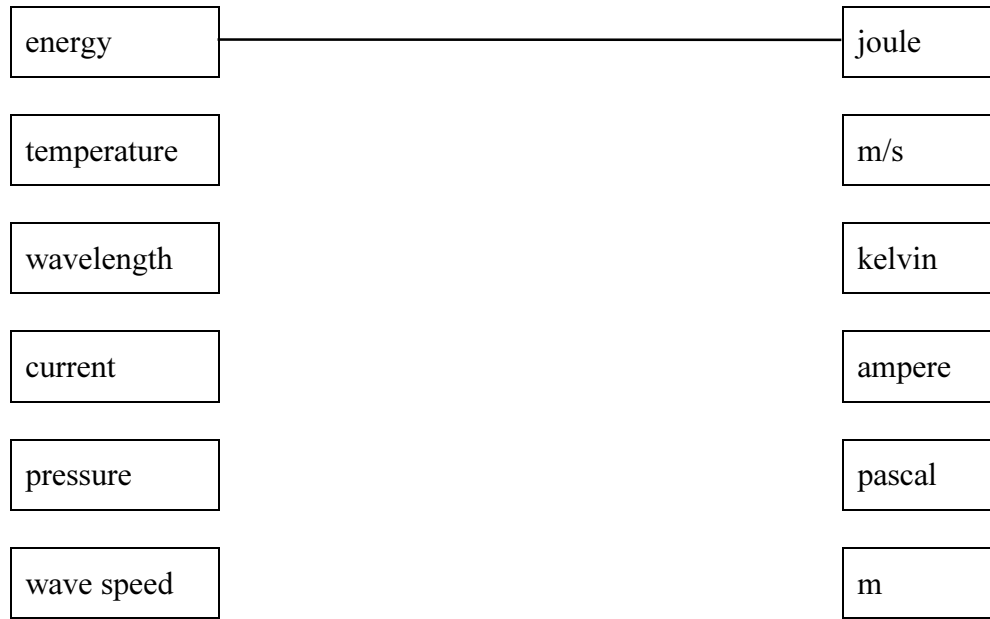
(4)

(b) Communications systems can be broken down into a number of blocks. Each block has a different function.
Use the blocks listed to complete the paragraph.

| **amplifier**	**decoder**	**encoder**	**receiver**	**storage**

When light is used to carry information through optical fibres, it is converted

to a digital signal using the ………………………………….... Because of

energy losses along the optical fibre, the …………………………………. is

used to boost the signal. The ………………………………….... detects the

signal at the far end of the cable where it is sent through the

………………………………….... so that the information it carries can be

understood. Sometimes the information arriving will be recorded on a

………………………………….... system so that it can be played back at any

time.

(5)

(Total 9 marks)

TURN OVER FOR QUESTION 2

2. The graph shows how the orbit time of an artificial satellite depends on its height above the Earth's surface.
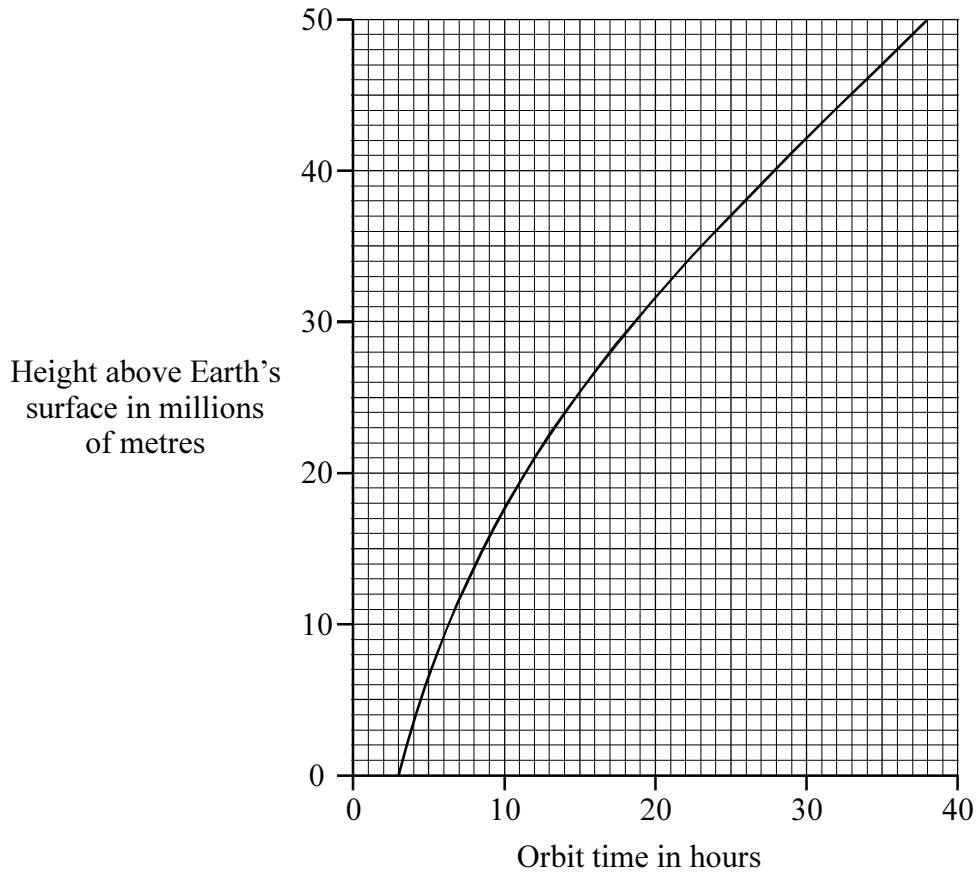
(a) How does the orbit time change with increasing height above the Earth's surface?

....

(1)

(b) Some communications satellites are in geostationary orbit. They remain above the same point on the Earth's surface.

(i) Write down the orbit time of a geostationary satellite.

....

(1)

(ii) Use the graph to find the height above the Earth's surface of a geostationary satellite.

....

(2)

26

(iii) Describe **two** different uses of communications satellites that are in geostationary orbit.

1 ....

....

2 ....

....

(2)

(c) Some weather satellites occupy very low orbits, close to the surface of the Earth. Describe **two** advantages of a low orbit for a weather satellite.

1 ....

....

2 ....

....

(2)

(d) Over a period of time, a satellite in orbit around the Earth loses energy and slows down because of frictional forces acting on it.

Describe what is likely to happen to the satellite over a period of time.
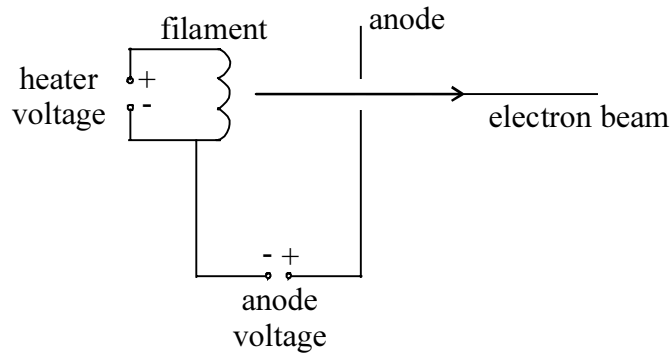
....

....

....

....

....

....

....

(4)

(Total 12 marks)

TURN OVER FOR QUESTION 3

3. (a) The diagram shows the basic construction of an electron gun.

(i) What is boiled off the hot metal filament?

....

(1)

(ii) Use words from the box to complete the following sentences.

anode	**attracted**	**cold**	**filament**	**hot**	**negative**	**positive**	**repelled**

When the heater votage is reversed, an electron beam is still produced. This is

because the ………………………….. still becomes ……………………………..

when a current is passed in it.

When the anode voltage is reversed, no electron beam is produced. This is because

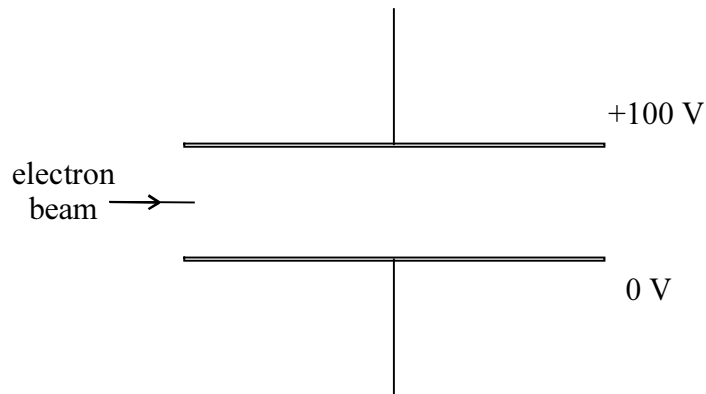electrons are ………………………….. and are …………………………….. by

the negative "anode".

(4)

28

(b) The diagram shows the deflection of an electron beam as it passes between parallel plates. The plates have a voltage of 50 V placed across them.
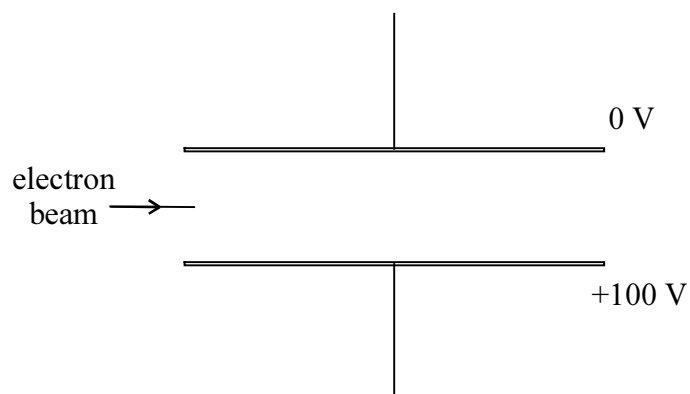
+50 V

electron beam

0 V
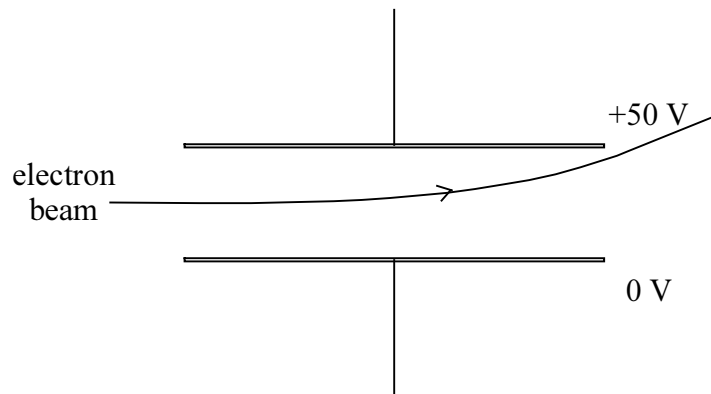
(i) Show on the diagram below the path of the electron beam between the plates when the voltage is increased to 100 V.

+100 V

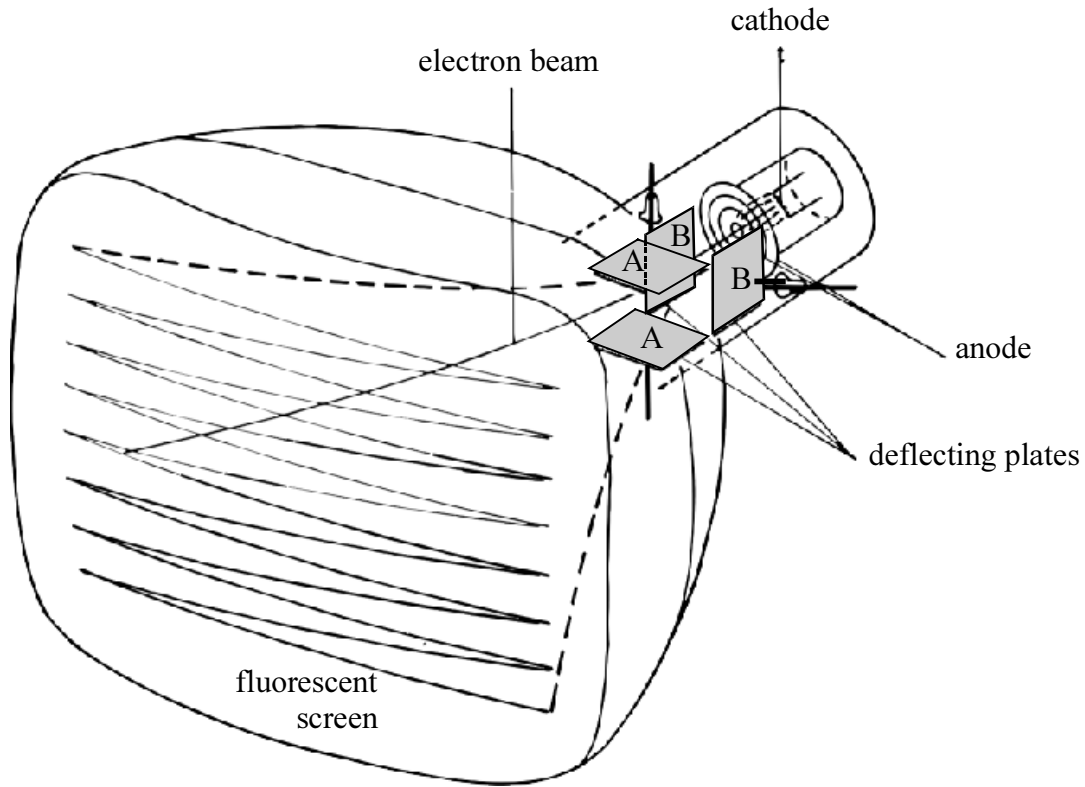electron beam

0 V

(1)

(ii) Show on the diagram the path of the electron beam between the plates when the voltage is reversed.

0 V

electron beam

+100 V

(2)

QUESTION 3 CONTINUES ON NEXT PAGE

(c) The diagram below shows a possible construction for a television tube and the path followed by the electron beam as it moves across the screen.

(i) Which pair of plates is used to deflect the electron beam from left to right across the screen?

....

(1)

(ii) What type of energy is produced when the electron beam lands on the fluorescent screen?

....

(1)

(iii) Describe **one** effect on the image produced on the screen when the number of electrons arriving is increased.

....

....

(1)

(Total 11 marks)

4. (a) Most telephone signals are sent through cables in the form of electrical signals. One disadvantage of this is that they can only travel a limited distance before they need to be amplified. A second disadvantage is that stray signals can affect the original signal.

(i) Explain why the electrical signals lose energy as they travel through the cable.

....

....

....

....

(2)

(ii) What is the function of the amplifier?

....

(1)

(iii) When the stray signals are amplified, a 'hissing' is heard. What term is used to describe this type of signal distortion?

....

(1)

(b) A signal can be sent through the cable in either digital or analogue form.

(i) Which method is used to avoid interference due to stray signals?

....

(1)

(ii) Digital signals have an advantage over analogue signals since more information can be sent along the cable.
Explain this.

....

....

....

....

(2)

(c) Name the transducer used in the ear piece of the telephone used for converting the electrical signals received to sound.

....

(1)

(Total 8 marks)

5. (a) There are three main ways by which radio waves arrive at the receiver from the transmitter. One of these is by **ground waves**. Name the other two.

1. ....

2. ....

(2)

(b) Ground waves do not travel in a straight line. They follow the curvature of the Earth. Name the effect that causes them to travel in this way.

....

(1)

(c) A radio station in La Coruna, Spain broadcasts MW radio waves of wavelength 639 m. These waves travel through the air at 300×10^6 m/s.

Calculate the frequency of these waves.

....

....

....

....

(4)

32

(d) The ionosphere is part of the Earth's upper atmosphere. It is affected by the Sun. Radio waves from La Coruna are absorbed by the ionosphere during the day and reflected by it at night. Scientists wanted to use this during an eclipse to help them to study the Sun.

Read this passage published by "The Radiocommunications Agency" at the time of the total solar eclipse in the UK in 1999.

> Scientists from Oxfordshire's Rutherford Appleton Laboratory are asking the public to help with some unique experiments during the total solar eclipse on August 11th this year. At this time, RAL, in partnership with The Daily Telegraph and BBC Online are asking for your help in answering the question "Is our Sun getting brighter?"
>
> You can help us by simply listening to your radio.
>
> One station, La Coruna in northern Spain, broadcasts on 639 MW. In the UK, this station can only be heard at night. If we hear it on the morning of August 11th, we will know the eclipse has had a dramatic effect on the ionosphere.

(i) The last time a total solar eclipse was seen in the UK was in 1927. Why was this experiment not done then?

....

....

(1)

(ii) Why do you think the Rutherford Appleton Laboratory asked the Daily Telegraph and BBC Online to help?

....

....

(1)

(iii) The Daily Telegraph and BBC Online did not publish the full text of the Rutherford Appleton Laboratory's research project. Suggest a reason why not.

....

....

(1)

(Total 10 marks)

TURN OVER FOR QUESTION 6

6. (a) When air is pumped into a bicycle tyre the pressure inside the tyre increases. As more air is pumped in, it becomes increasingly difficult to push down the piston in the pump.

(i) Explain, in terms of air particles, how pressure is produced inside the tyre.

....

....

....

....

....

....

(4)

(ii) Explain why the pressure in the tyre increases as more air is put in it.

....

....

....

(2)

(b) Absolute zero of temperature is -273 °C.

(i) Explain why gases at this temperature would not produce a gas pressure.

....

....

....

(2)

(ii) What temperature scale uses the absolute zero of temperature as its zero?

....

(1)

(iii) What temperature would 100 °C be on this temperature scale?

....

(1)

(Total 10 marks)

TOTAL MARKS 60

END

1522/6H   1540/3H

Edexcel GCSE

Science: Double Award A
[1522]
Paper 6H

Physics A [1540]
Paper 3H

HIGHER TIER
Specimen Paper

Time: 1 hour 30 minutes   **N0000**

Question Number	Leave Blank
1	
2	
3	
4	
5	
6	
7	
8	
Total	

For Examiner's use only

For Team Leader's use only

Materials required for the examination	**Items included with these question papers**
None	None

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Answer ALL questions in the spaces provided in this book.

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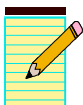
Include diagrams in your answers where these are helpful.

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Advice to Candidates

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Additional Answer Sheets may be used.

Turn over

FORMULAE

You may find the following formulae useful.

energy transferred = current × voltage × time $\qquad E = I \times V \times t$

pressure × volume = constant $\qquad P_1 \times V_1 = P_2 \times V_2$

$\text{frequency} = \dfrac{1}{\text{time period}} \qquad\qquad\qquad f = \dfrac{1}{T}$
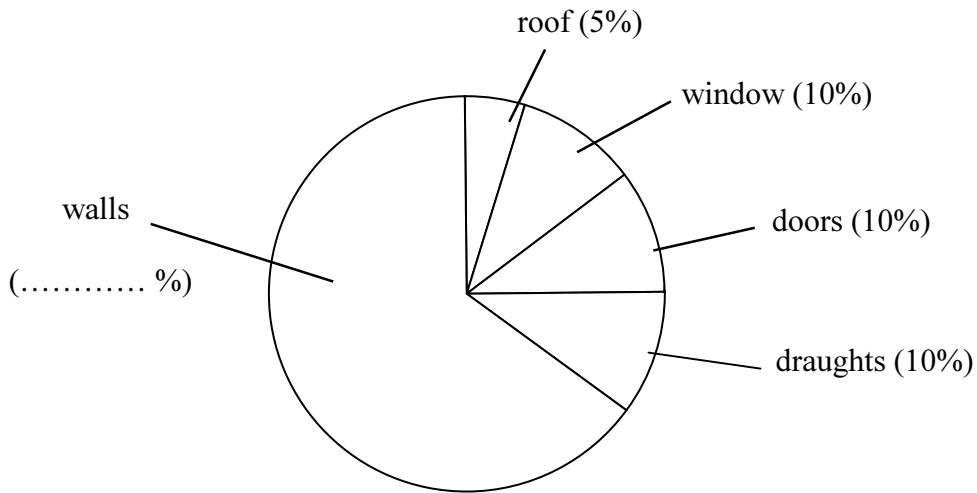
$\text{power} = \dfrac{\text{work done}}{\text{time taken}} \qquad\qquad\qquad P = \dfrac{W}{t}$

TURN OVER FOR QUESTION 1

1. (a) The main heat energy losses from a house are shown in the diagram.

roof (5%)

window (10%)

walls

(............ %)

doors (10%)

draughts (10%)

(i) Complete the diagram to show the percentage heat energy loss through the walls.

(1)

(ii) Complete the table below to show how the heat energy loss from each part of the house can be reduced. The first one has been done for you.

Part of the house	Method used for reducing heat energy loss
roof	glass-fibre insulation in the loft
walls	……………………………………………………………….. ………………………………………………………………..
floor	……………………………………………………………….. ………………………………………………………………..

(2)

(b) Double glazing is used to reduce the heat energy loss from houses through the windows. The table compares the heat loss for ordinary windows and for double glazed windows.

Type of window	Heat energy passing through (joules per second)
ordinary window	224
double-glazed window	116

The size of the windows and the temperature inside and outside the house are the same in each case.

(i) How many joules per second does using double glazing save?

....

(1)

(ii) How much energy would pass through an ordinary window in one hour?

....

....

....joules

(3)

(c) A double glazing salesman claims that by replacing ordinary windows with double glazed windows, the heating bills of a house will be halved.

Use the information given earlier to show whether this claim is true or not.

....

....

....

....

....

....

(3)

(Total 10 marks)

TURN OVER FOR QUESTION 2

2. Radon is a radioactive gas. It escapes from underground rocks and causes a large part of the natural background radiation in the United Kingdom.

(a) Radon-220 ($^{220}_{86}$Rn) is an isotope of radon.

(i) How many protons are there in a nucleus of radon-220?

....

(1)

(ii) How many neutrons are there in a nucleus of radon-220?

....

(1)

(iii) Explain what is meant by the statement: "This element has three isotopes".

....

....

....

....

(2)

(b) • Radon-220 has a short half-life and emits α-particles.

   • Alpha particles are easily stopped by material and only travel a short distance in air.

   • Radon gas is thought to produce harmful effects.

When home owners, in areas where radon gas is produced, were told of the risks, very few took notice.

(i) Explain why the presence of radon gas in buildings is a health hazard.

....

....

....

....

....

....

(3)

(ii) Discuss why, you think, so few people took any action to reduce the risks due to radon gas.
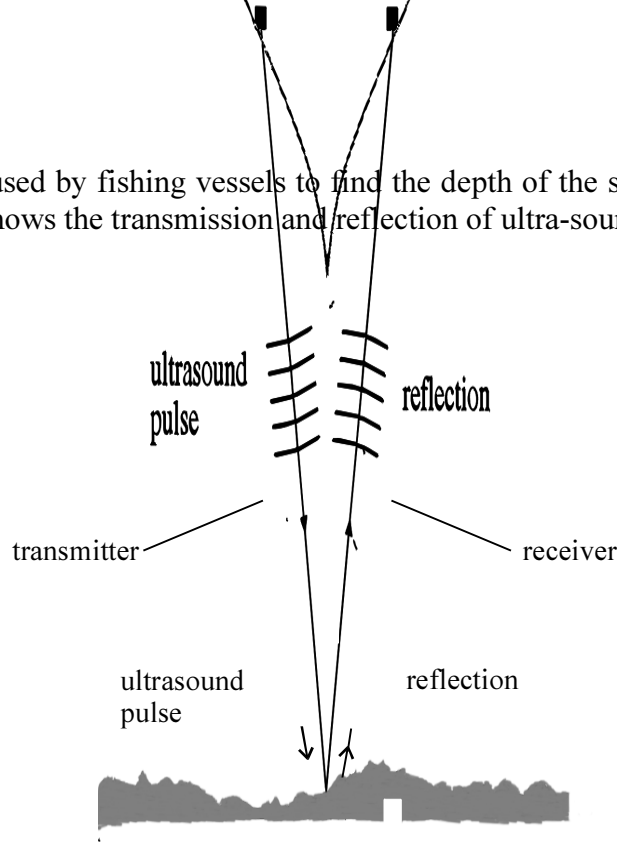
....

....

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....

....

....

....

(4)

(Total 11 marks)

TURN OVER FOR QUESTION 3

3. Ultrasound can be used by fishing vessels to find the depth of the sea or to locate shoals of fish. The diagram shows the transmission and reflection of ultra-sound from a fishing vessel.

(a) What is ultrasound?

....

....

....

....

(2)

(b) The speed of ultrasound in water is 1500 m/s.

(i) The frequency of the ultrasound used for depth finding is 50 000 Hz.

Calculate the wavelength of the ultrasound.

....

....

....

(4)

(ii) On the diagram the depth of the sea is 1200 m.

Calculate the time it would take for the ultrasound wave to travel from the transmitter to the sea-bed and back to the receiver.

....

....

....

(4)

(c) Waves with small wavelengths spread out (diffract) less than those with long wavelengths. Use this information to suggest why ultrasound is much better than ordinary sound for finding the depth of the sea.

....

....

....

....

....

....

(3)

(Total 13 marks)

TURN OVER FOR QUESTION 4

4. (a) The diagram shows the passage of light beam **A** travelling down an optical fibre.

(i) State the name of the process that takes place as the light **A** beam travels down the optical fibre.

....

(1)

(ii) Complete the diagram to show the passage of the light beam **B** down the same optical fibre.

(1)

(iii) Suggest why beam **B** will take slightly longer to travel down the fibre than beam **A**.

....

....

....

....

(2)

(b) Optical fibres are used to carry information. The information is carried by the light beam in the form of a digital signal.

(i) Draw a diagram to show what is meant by a digital signal.

(1)

(ii) The signal from a microphone is an analogue signal. How does an analogue signal differ from a digital signal?

....

....

(1)

(c) When signals are sent through optical fibres they lose energy.

(i) State what happens to the brightness of the light beam as it loses energy.

....

(1)

(ii) State **one** disadvantage of losing energy as the light beam travels through the optical fibre.

....

....

(1)

(Total 8 marks)

TURN OVER FOR QUESTION 5

5. (a) The diagram shows the construction of a simple electrical generator. When the coil is rotated, an alternating voltage is produced at the output.
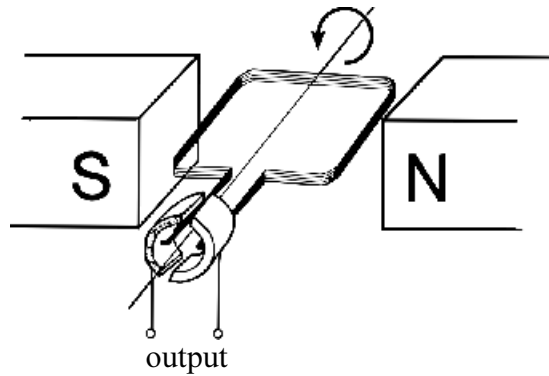
output

(i) Explain what is meant by an alternating voltage.

....

....

(1)

(ii) State **two** ways in which the voltage output could be increased.

1 ....

2 ....

(2)

(b) The generators at a power plant produce a voltage of 25 000 V. For long distance transmission, on overhead power lines, this is stepped up to 400 000 V. It is later stepped down to 240 V for domestic use.

(i) Explain why the voltage is stepped up to 400 000 V.

....

....

....

....

(2)

(ii) A transformer is used to step up the voltage. Calculate the ratio of primary turns to secondary turns needed for this transformer.

....

....

....

(3)

(c) Give **one** advantage and **one** disadvantage of increasing the thickness of overhead power lines.

Advantage...

....

Disadvantage ....

....

(2)

(Total 10 marks)

TURN OVER FOR QUESTION 6

6. The diagram shows the arrangement used for copper-plating an object. The electrolyte used is copper sulfate which when dissolved in water produces positive copper (Cu^{2+}) ions and negative sulfate ($SO_4{}^{2-}$) ions.
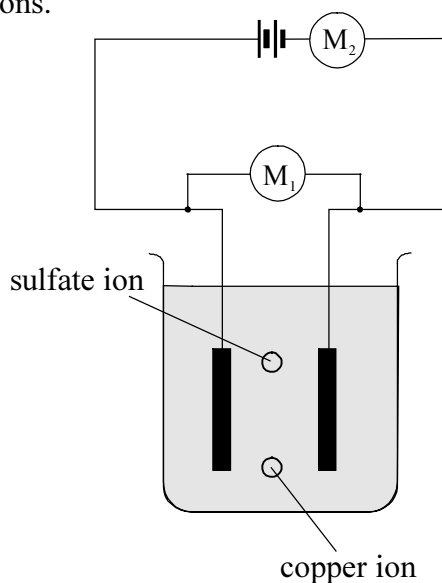
(a) (i) On the diagram, add arrows to show which way the ions move.

(1)

(ii) Which meter reading shows that the ions are moving through the electrolyte? Explain your answer.

....

....

....

(2)

48

(b) In an electrolysis experiment, a voltage of 6 V produced a current of 0.5 A. The current passed for 5 minutes.

(i) Calculate the charge passing through the electrolyte during this time.

....

....

....

....

(4)

(ii) The charge on a copper ion (Cu^{2+}) is 3.2×10^{-19} coulombs. Calculate the total number of copper ions moving through the electrolyte in 5 minutes.

....

....

....

(2)

(iii) How much energy is used in moving each copper ion through the electrolyte?

....

....

....

....

(3)

(Total 12 marks)

TURN OVER FOR QUESTION 7

7. A sky-diver of mass 70 kg jumps from a plane. The graph shows how the vertical velocity of the sky-diver varies with time. Parts of the graph have been labelled **A**, **B**, **C**, **D** and **E**.
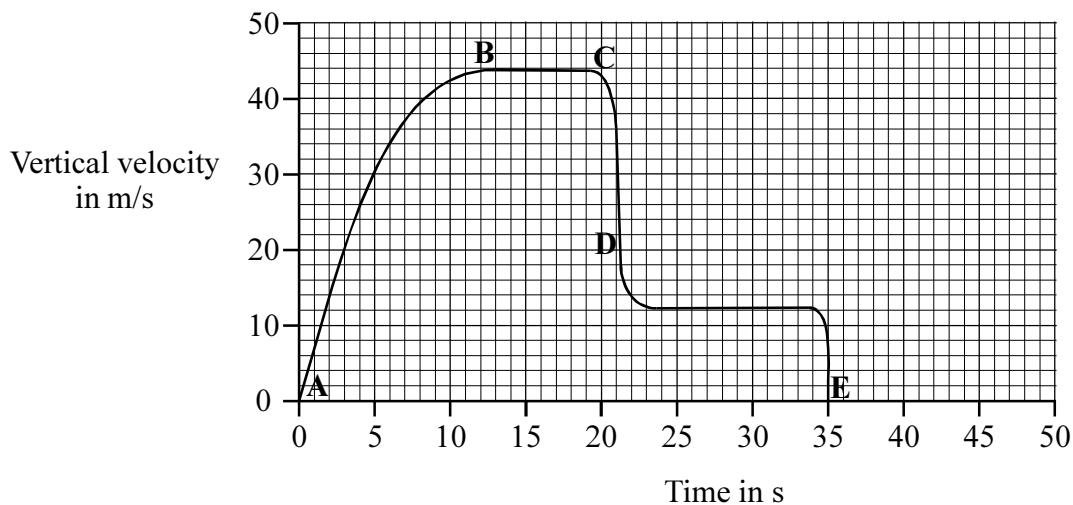
(a) At **A**, the sky-diver has an acceleration equal to the acceleration due to gravity of 10 m/s^2. Calculate the resultant force acting on the sky-diver at this instant.

....

....

....

(3)

(b) How can you tell from the graph that in the time period from **B** to **C** the resultant force acting on the sky-diver is zero?

....

....

....

....

(2)

(c) Describe and explain the motion of the sky-diver from **C** until he lands at **E**.

....

....

....

....

....

....

....

(4)

(d) A sky-diver, of the same mass, falls from the same height but uses a parachute with a larger surface area. On the grid, sketch a graph to show his motion.

(2)

(Total 11 marks)

TURN OVER FOR QUESTION 8

8. (a) The nearest star to the Earth is the Sun. Heat and light from the Sun arrive at the Earth's surface after travelling many millions of kilometres through space.

(i) How does this confirm that heat and light are electromagnetic radiation?

....

....

(1)

(ii) Which part of the electromagnetic spectrum is associated with heat radiation?

....

(1)

(iii) The Sun also emits ultraviolet radiation.

What are the health hazards of this type of radiation?

....

....

....

....

(2)

(b) Stars are formed from very large clouds of gases, mainly hydrogen and helium, and some dust. These clouds collapse under the action of gravity.

(i) Describe the energy changes taking place as clouds of gas and dust particles collapse under the action of gravity.

....

....

....

....

(2)

(ii) Explain why nuclear reactions take place if a sufficiently large cloud of material collapses under the action of gravity.

....

....

....

....

(2)

(c) The fusion of hydrogen takes place in the core of the Sun to produce helium. This process releases considerable amounts of energy.

Describe the sequence of events which may occur as a star uses up its supply of hydrogen.

....

....

....

....

....

....

....

(4)

(d) One of the theories concerned with the origin of the universe is the 'Big Bang' theory. Describe this theory and state what evidence there is to support it.

....

....

....

....

....

....

(3)

(Total 15 marks)

TOTAL MARK 90

END

Centre Number					Paper Reference **1540/4H**		Surname	Other Names
Candidate Number							Signature	

1540/4H

Edexcel GCSE

Physics A [1540]
Paper 4H
HIGHER TIER
Specimen Paper

Time: 1 hour   **N0000**

For Examiner's use only

For Team Leader's use only

Question Number	Leave Blank
1	
2	
3	
4	
5	
6	
Total	

Materials required for the examination	**Items included with these question papers**
None	None

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your signature, your surname and other names, then tick the box to show the correct paper reference for your examination.

The paper reference is shown below the boxes.

Answer ALL questions in the spaces provided in this book.

Show all stages in any calculations and state the units. Calculators may be used.

Include diagrams in your answers where these are helpful.

Information for Candidates

The marks for the various parts of questions are shown in round brackets: e.g. (**2**).

This paper has 6 questions. There is one blank page.

Advice to Candidates

This symbol shows where the quality of your written answer will also be assessed.

Additional Answer Sheets may be used.

Turn over

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Success through qualifications

FORMULAE

You may find the following formulae useful.

energy transferred = current × voltage × time

$$E = I \times V \times t$$

pressure × volume = constant

$$P_1 \times V_1 = P_2 \times V_2$$

$$\frac{\text{pressure}}{\text{temperature}} = \text{constant}$$

$$\frac{P_1}{T_1} = \frac{P_2}{T_2}$$

$$\text{frequency} = \frac{1}{\text{time period}}$$

$$f = \frac{1}{T}$$

$$\text{power} = \frac{\text{work done}}{\text{time taken}}$$

$$P = \frac{W}{t}$$

$$\text{orbital speed} = \frac{2\pi \times \text{orbital radius}}{\text{time period}}$$

$$v = \frac{2 \times \pi \times r}{T}$$

$$\text{force} = \frac{\text{mass} \times (\text{orbital speed})^2}{\text{radius}}$$

$$F = \frac{m \times v^2}{r}$$

energy released = mass change × (speed of light)^2

$$E = m \times c^2$$

kinetic energy = electronic charge × accelerating voltage

$$KE = e \times V$$

1. (a) Most telephone signals are sent through cables in the form of electrical signals. One disadvantage of this is that they can only travel a limited distance before they need to be amplified. A second disadvantage is that stray signals can affect the original signal.

(i) Explain why the electrical signals lose energy as they travel through the cable.

....

....

....

....

(2)

(ii) What is the function of the amplifier?

....

(1)

(iii) When the stray signals are amplified, a 'hissing' is heard. What term is used to describe this type of signal distortion?

....

(1)

(b) A signal can be sent through the cable in either digital or analogue form.

(i) Which method is used to avoid interference due to stray signals?

....

(1)

(ii) Digital signals have an advantage over analogue signals since more information can be sent along the cable.
Explain this.

....

....

....

....

(2)

(c) Name the transducer used in the ear piece of the telephone used for converting the electrical signals received to sound.

....

(1)

(Total 8 marks)

2. (a) There are three main ways by which radio waves arrive at the receiver from the transmitter. One of these is by **ground waves**. Name the other two.

1. ....

2. ....

(2)

(b) Ground waves do not travel in a straight line. They follow the curvature of the Earth. Name the effect that causes them to travel in this way.

....

(1)

(c) A radio station in La Coruna, Spain broadcasts MW radio waves of wavelength 639 m. These waves travel through the air at 300×10^6 m/s.

Calculate the frequency of these waves.

....

....

....

....

(4)

(d) The ionosphere is part of the Earth's upper atmosphere. It is affected by the Sun. Radio waves from La Coruna are absorbed by the ionosphere during the day and reflected by it at night. Scientists wanted to use this during an eclipse to help them to study the Sun.

Read this passage published by "The Radiocommunications Agency" at the time of the total solar eclipse in the UK in 1999.

> Scientists from Oxfordshire's Rutherford Appleton Laboratory are asking the public to help with some unique experiments during the total solar eclipse on August 11th this year. At this time, RAL, in partnership with The Daily Telegraph and BBC Online are asking for your help in answering the question "Is our Sun getting brighter?"
>
> You can help us by simply listening to your radio.
>
> One station, La Coruna in northern Spain, broadcasts on 639 MW. In the UK, this station can only be heard at night. If we hear it on the morning of August 11th, we will know the eclipse has had a dramatic effect on the ionosphere.

(i) The last time a total solar eclipse was seen in the UK was in 1927. Why was this experiment not done then?

....

....

(1)

(ii) Why do you think the Rutherford Appleton Laboratory asked the Daily Telegraph and BBC Online to help?

....

....

(1)

(iii) The Daily Telegraph and BBC Online did not publish the full text of the Rutherford Appleton Laboratory's research project. Suggest a reason why not.

....

....

(1)

(Total 10 marks)

TURN OVER FOR QUESTION 3

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3. (a) When air is pumped into a bicycle tyre the pressure inside the tyre increases. As more air is pumped in, it becomes increasingly difficult to push down the piston in the pump.

(i) Explain, in terms of air particles, how pressure is produced inside the tyre.

....

....

....

....

....

....

(4)

(ii) Explain why the pressure in the tyre increases as more air is put in it.

....

....

....

(2)

(b) Absolute zero of temperature is -273 °C.

(i) Explain why gases at this temperature would not produce a gas pressure.

....

....

....

(2)

(ii) What temperature scale uses the absolute zero of temperature as its zero?

....

(1)

(iii) What temperature would 100 °C be on this temperature scale?

....

(1)

(Total 10 marks)

TURN OVER FOR QUESTION 4

4. (a) A geostationary satellite is at a height of 36 000 km above the Earth's surface and is used to receive and transmit television signals from the Earth.

   (i) The satellite is described as being an active satellite rather than a passive satellite.

   Explain the difference between these two types of satellite.

   ....

   ....

   ....

   ....

   (2)

   (ii) The television signals from the Earth travel through the ionosphere to reach the satellite. What type of transmission wave is able to do this?

   ....

   (1)

   (iii) Explain how the satellite is able to keep in orbit around the Earth without having its motors running or using energy.

   ....

   ....

   ....

   ....

   (2)

   (iv) Over a period of time, a satellite in orbit around the Earth loses energy because of frictional forces acting on it.
   Explain what is likely to happen to the satellite over a period of time.

   ....

   ....

   ....

   ....

   ....

   ....

   ....

   (3)

(b) The transmitter on the satellite beams 100 W of radiation to the Earth.

(i) Explain how the size of the transmitting dish affects the power per square metre that arrives at the Earth's surface from the satellite.

....

....

....

....

....

....

(3)

(ii) Some energy is lost from the transmitting wave as it travels from space through the Earth's atmosphere. What name is given to this reduction in the energy of the wave?

....

(1)

(Total 12 marks)

TURN OVER FOR QUESTION 5

5. (a) At the end of the nineteenth century, physicists considered that the atom consisted of evenly distributed electrons and protons.

(i) Which famous experiment, at the start of the twentieth century, suggested the existence of the nucleus?

....

....

(1)

(ii) Give an outline of what the experiment involved and how the results led to this the nuclear model of the atom.

....

....

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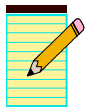
(4)

(iii) Protons and electrons were initially considered to be **fundamental particles**.

Explain what this term means and state which of the two particles named is still considered to be a fundamental particle.

....

....

....

....

(2)

(b) The neutron was detected much later than either the electron or the proton although it was known to exist.

(i) Suggest why neutrons were much more difficult to detect than protons or electrons.

....

....

....

....

(2)

(ii) Quarks are fundamental particles. What is the connection between quarks, protons and neutrons?

....

....

....

....

(2)

(Total 11 marks)

TURN OVER FOR QUESTION 6

6. (a) The following arrangement was used to investigate the effect of firing electrons into gas atoms.
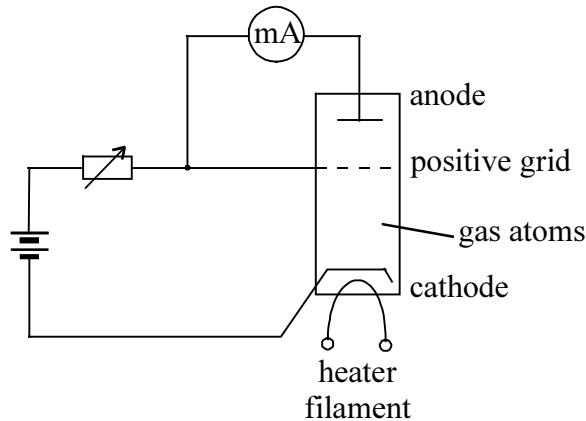
The experiment involves attracting the electrons from the filament towards and through the positive grid. The electrons hit gas atoms, as they move between the heater filament, through the grid and on to the anode.

The current in the tube is measured as the anode voltage is gradually increased.

(i) What name is given to the process where electrons are produced from a hot filament?

....

(1)

(ii) How would you know that electrons from the filament are reaching the anode plate?

....

....

(1)

(iii) The charge on one electron is -1.6×10^{-19} C and the voltage between the grid and the filament is 6.0 V.

How much energy will an electron gain in moving between the heater filament and the grid?

....

....

....

....

(2)

(b) The graph shows how the reading on the milliammeter changes as the voltage between the filament and the grid is increased.
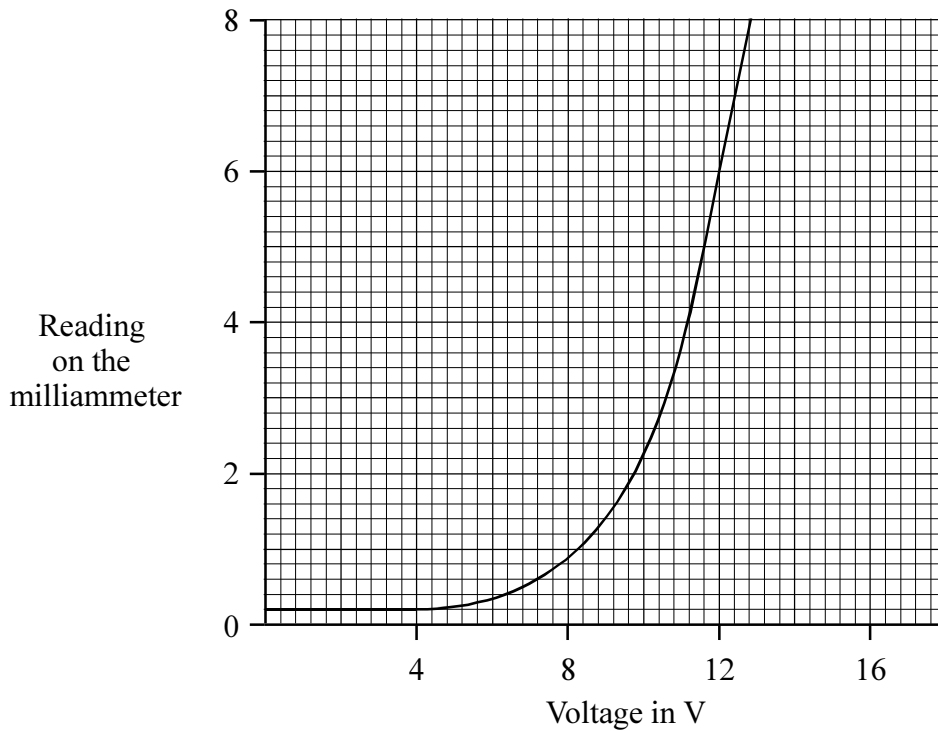
(i) What is the difference in the reading on the milliammeter when the voltage is increased from 4 V to 12 V?

....

(1)

(ii) The charge on one electron is -1.6×10^{-19} C.
Calculate the number of electrons per second arriving at the anode when the voltage is 12 V.

....

....

....

(3)

(iii) Suggest why there is a sharp increase in the reading on the milliammeter at voltages above 6V.

....

....

(1)

(Total 9 marks)

TOTAL MARKS 60

END

Syllabus 1540

Physics A

Specimen Paper 1F

MARK SCHEME

First Examination Summer 2003

Edexcel
Success through qualifications

USING THE MARK SCHEME

1.   This mark scheme gives you;   * an idea of the type of response expected
                                                * how individual marks are to be awarded
                                                * the total mark for each question
                                                * examples of responses that should not receive credit.

2.   ; separates points for the award of each mark.

3.   / means that the responses are **alternatives** and either answer should receive full credit.

4.   ( ) means that a phrase/word is not essential for the award of the mark but helps the examiner to get the sense of the expected answer.

5.   Phrases/words in **bold** indicate that the <u>meaning</u> of the phrase/word is **essential** to the answer.

6.   OWTTE (or words to that effect) and eq (equivalent) indicate that valid alternative answers (which have not been specified) are acceptable.

7.   'Ignore' means that this answer is not worth a mark but does not negate an additional correct response.

8.   'Reject' means that the answer is wrong and negates any additional correct response for that specific mark.

9.   ORA (or reverse argument) indicates that the complete reverse is also valid for the award of marks.

10.   ecf (error carried forward) means that a wrong answer given in an earlier part of a question is used correctly in answer to a later part of the same question.
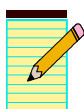
MARKING

1.   You must give a tick (in red) for every mark awarded. The tick must be placed on the script close to the answer. The mark awarded for part of a question should be written in the margin close to the sub-total.

2.   The sub-total marks for a question should be added together and the total mark written and ringed at the end of the question then transferred to the front of the script.

3.   Suggestion/explanation questions should be marked correct even when the suggestion is contained within the explanation.

4.   **Do not** award marks for repetition of the stem of the question.

5.   Make sure that the answer makes sense. Do not give credit for correct words/phrases which are put together in a meaningless manner. Answers must be in the correct scientific context.

AMPLIFICATION

1.   In calculations, full credit must be given for a <u>bald</u>, correct answer. If a numerical answer is incorrect, look at the working and award marks according to the mark scheme.

2.   Consequential marking should be used in calculations. This is where a candidate's working is correct but is based upon a previous error. When consequential marks have been awarded write "ecf" next to the ticks.

3.   If candidates use the mole in calculations they must be awarded full marks for a correct answer even though the term may not be on the syllabus at their level.

4.   If candidates use chemical formulae instead of chemical names, credit can only be given if the formulae are correct.

QUALITY OF WRITTEN COMMUNICATION

This logo indicates where students will be assessed on their ability to:

- present relevant information in a form that suits its purpose
- ensure that spelling, punctuation and grammar are accurate, so that the meaning is clear
- use a suitable structure and style of writing.

1. (a)   Pluto;   1

    (b)   Pluto;
                 heat;
                 icreases;   3

    (c)   low density;   1

    (d) (i)   largest value of surface gravity;   1

        (ii)   Pluto;   1

Total 7 marks

2. (a) (i)   cooker;
                   highest power/most current;   2

        (ii)   biggest current for same voltage/needs high current/
                   high power;
                   largest current with lowest resistance;   2

        (iii)   thick cables have a lower resistance;
                   thick cables produce less heat;   2

    (b)   each lamp has its own circuit/
                 each lamp can be switched separately;
                 each lamp has the same voltage/
                 each can operate at own power;   2

Total 8 marks

3. (a)   friction for grip/so tyre can push back on ground;
             car moves forward/forward push of ground;   2

             friction between hands;
             produces heat energy/keeps hands warm;   2

             plus 1 communication mark for using a suitable structure and
             style of writing;   1

    (b)   upward arrow;
                 labelled reaction/push of table;
                 downward arrow;
                 labelled weight/pull of Earth;   4

Total 9 marks

4.	(a)		friction;	
			electrostatic;	
			electrons;	
			attract;	4
	(b)	(i)	correct direction of movement shown (towards metal plates);	1
		(ii)	An explanation to include:	
			• repelled from positive grid;	
			• attracted to negative plates;	2
			[Allow like charges repel/unlike charges attract for 1 mark]	
		(iii)	to make dust particles fall off/	
			in order to collect dust particles/to clean the plates;	1

Total 8 marks

5.	(a)	(i)	become compressed/compacted/smaller/squashed/	
			decrease in size/go down/pushed together;	1
		(ii)	smallest spring circled;	1
		(iii)	most compressed/smallest spring/OWTTE;	
			[a comparative statement is needed]	1
	(b)		Two suggestions from:	
			• use more springs (in the middle);	
			• use stiffer/stronger springs (in the middle);	
			• sensible use of material;	
			• more coils in the spring;	2
	(c)	(i)	arrow pointing down;	1
			[Ignore point of action]	
		(ii)	downward;	
			Earth;	2

Total 8 marks

6.	(a)	(i)	points plotted correctly;;	
			smooth curve drawn;	3
		(ii)	about 3 km/h;	1
		(iii)	1160 watts;	1
		(iv)	not always windy/variable output/too much land needed;	1
	(b)		kinetic/movement;	
			electrical;	2

Total 8 marks

7. (a) (i) 65%;   1

    (ii) walls- draught excluder/curtains/cavity wall insulation;
          floor- carpets/wooden floors;   2
          [Accept damp proofing for 1 mark]

    (b) (i) 108 W;   1

    (ii) 224×3600;;
          8.06×10^5 (J);   3
          [Allow 2 marks where 3600 sec has been missed/224×60]

    (c) An explanation to include two of:
         • approx 50% of heat lost through window saved;
         • windows only account of 10% of energy lost;
         • only approx 5% saving on heating bills;
         • makes connection between energy and cost;
         plus 1 communication mark for presenting relevant
         information in a form that suits its purpose;   3
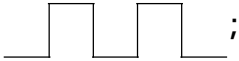
                                                                            Total 10 marks

8. (a) (i) 86;   1

    (ii) 134;   1

    (iii) An explanation to include particles with:
           • same number of protons;
           • different numbers of neutrons;   2

    (b) (i) An explanation to include:
             • gas breathed in;
             • α - particles cannot pass through living tissue;
             • named health risk;   3

    (ii) A discussion to include three of:
          • lack of understanding of dangers;
          • evidence;
          • cost;
          • information not widely known;
          • complacency;
          • information did not spell out dangers clearly;
          • regional variation;
          plus 1 communication mark for ensuring that spelling,
          punctuation and grammar are accurate, so that the meaning
          is clear;   4

                                                                            Total 11 marks

9. (a)   (very) high frequency sound;
             beyond human hearing/humans cannot hear this frequency;   2

    (b) (i) $v = f\lambda$;

                 $\lambda = \dfrac{v}{f}$;

                 $\dfrac{1500}{50\,000}$ /0.03;

                 m;   4

         (ii)   Total distance = 2400 m;

                 t = $\dfrac{2400}{1500}$;

                   = 1.65;

                 s;   4
                 [Allow 3 marks max, if total distance taken as 1200 m]

    (c)   A suggestion to include:
             • ordinary sound spreads more;
             • concentration less/less intense/
               amplitude decreases rapidly;
             • range limited/cannot travel far;   3

                                                                        Total 13 marks

10. (a) (i)   total internal reflection;   1

         (ii)   should show more reflections;   1

         (iii)   An explanation to include:
                 • more reflections/hits side more often;   2
                 • greater distance to travel;

    (b) (i)   ⌐⌐⌐ ;   1

                 (sharp on/off pulses)

         (ii)   continuously variable (or diag)/voltage changing all the time/   1
                 can have any value (allow mark if shown on diagram);

    (c) (i)   decreases/dims/less intense;   1

         (ii)   limits range/travels less/ cannot go as far/amplitude less;   1

                                                                         Total 8 marks

                                                                        TOTAL MARKS 90

Syllabus 1540

Physics A

Specimen Paper 2F

MARK SCHEME

First Examination Summer 2003

Edexcel
Success through qualifications

USING THE MARK SCHEME

1. This mark scheme gives you;   * an idea of the type of response expected
    * how individual marks are to be awarded
    * the total mark for each question
    * examples of responses that should not receive credit.

2. ; separates points for the award of each mark.

3. / means that the responses are **alternatives** and either answer should receive full credit.

4. ( ) means that a phrase/word is not essential for the award of the mark but helps the examiner to get the sense of the expected answer.

5. Phrases/words in **bold** indicate that the <u>meaning</u> of the phrase/word is **essential** to the answer.

6. OWTTE (or words to that effect) and eq (equivalent) indicate that valid alternative answers (which have not been specified) are acceptable.

7. 'Ignore' means that this answer is not worth a mark but does not negate an additional correct response.

8. 'Reject' means that the answer is wrong and negates any additional correct response for that specific mark.

9. ORA (or reverse argument) indicates that the complete reverse is also valid for the award of marks.

10. ecf (error carried forward) means that a wrong answer given in an earlier part of a question is used correctly in answer to a later part of the same question.

MARKING

1. You must give a tick (in red) for every mark awarded. The tick must be placed on the script close to the answer. The mark awarded for part of a question should be written in the margin close to the sub-total.

2. The sub-total marks for a question should be added together and the total mark written and ringed at the end of the question then transferred to the front of the script.

3. Suggestion/explanation questions should be marked correct even when the suggestion is contained within the explanation.

4. **Do not** award marks for repetition of the stem of the question.

5. Make sure that the answer makes sense. Do not give credit for correct words/phrases which are put together in a meaningless manner. Answers must be in the correct scientific context.

AMPLIFICATION

1. In calculations, full credit must be given for a <u>bald</u>, correct answer. If a numerical answer is incorrect, look at the working and award marks according to the mark scheme.

2. Consequential marking should be used in calculations. This is where a candidate's working is correct but is based upon a previous error. When consequential marks have been awarded write "ecf" next to the ticks.

3. If candidates use the mole in calculations they must be awarded full marks for a correct answer even though the term may not be on the syllabus at their level.

4. If candidates use chemical formulae instead of chemical names, credit can only be given if the formulae are correct.

QUALITY OF WRITTEN COMMUNICATION

This logo indicates where students will be assessed on their ability to:

* present relevant information in a form that suits its purpose

* ensure that spelling, punctuation and grammar are accurate, so that the meaning is clear

* use a suitable structure and style of writing.

1. (a)

energy	———————————	joule
temperature		m/s
wavelength		kelvin
current	———————————	ampere
pressure		pascal
wave speed		m

five correct   - 4 marks
three correct   - 3 marks
two correct   - 2 marks
one correct   - 1 mark   4

    (b)   encoder;
           amplifier;
           receiver;
           decoder;
           storage;   5

Total 9 marks

2. (a)   increases;   1

    (b)   (i)   24 hrs;   1

          (ii) 36;
                million m;   2
                [Allow ecf from part (b)(I)]

          (iii) television/radio;
                telephone;   2

    (c)   detail seen;
                can pass over whole Earth during a day/   2
                not just observe one place all the time;

(d)   A description to include three of:
- as it slows, drawn inwards/radius of orbit decreases;
- by pull of Earth;
- enters atmosphere;
- burns up;

plus 1 communication mark for ensuring that spelling, punctuation and grammar are accurate, so that the meaning is clear;

         4

Total 12 marks

3. (a) (i)   electrons;   1

     (ii)   filament;
hot;
negative;
repelled;   4

(b) (i)   curved up more;   1

     (ii)   curved down;
curvature similar to part (i);   2

(c) (i)   B;   1

     (ii)   light;   1

     (iii)   brighter;   1

Total 11 marks

4. (a) (i)   An explanation to include:
- cable has electrical resistance;
- energy lost as heat;

     2

     (ii)   to replace lost energy/boost the signal/increase amplitude;   1

     (iii)   noise;   1

(b) (i)   digital;   1

     (ii)   An explanation to include:
- very short time interval between pulses;   2
- lots can be placed close together;

(c)   loudspeaker;   1

Total 8 marks

5.   (a)   sky waves;
                    space waves;   2

      (b)   diffraction;   1

      (c) $v = f \times \lambda$;
                    $3 \times 10^8 = 639 \times f$;
                    469;
                    kHz;   4

      (d)   (i)   few (if any) households had radios/
                    early days of ionospheric research;   1

           (ii)   gather more evidence/data/
                    publicise their research/institution;   1

           (iii)   language/content too difficult/technical for non-scientists/
                    may put people off helping;   1

Total 10 marks

6.   (a)   (i)   An explanation to include:
- particles moving;
- collisions with walls/hitting walls;
- force produced;

plus 1 communication mark for ensuring that spelling, punctuation and grammar are accurate, so that the meaning is clear;   4

           (ii)   An explanation to include:
- more collisions;
- more particles present;   2

      (b)   (i)   An explanation to include:
- not moving/all gases in solid state;
- no K.E.;   2

           (ii)   kelvin;   1

           (iii)   (+)373(K)   1

Total 10 marks

TOTAL MARKS 60

Syllabus 1540

Physics A

Specimen Paper 3H

MARK SCHEME

First Examination Summer 2003

Edexcel
Success through qualifications

USING THE MARK SCHEME

1. This mark scheme gives you;   * an idea of the type of response expected
   * how individual marks are to be awarded
   * the total mark for each question
   * examples of responses that should not receive credit.

2. ; separates points for the award of each mark.

3. / means that the responses are **alternatives** and either answer should receive full credit.

4. ( ) means that a phrase/word is not essential for the award of the mark but helps the examiner to get the sense of the expected answer.

5. Phrases/words in **bold** indicate that the <u>meaning</u> of the phrase/word is **essential** to the answer.

6. OWTTE (or words to that effect) and eq (equivalent) indicate that valid alternative answers (which have not been specified) are acceptable.

7. 'Ignore' means that this answer is not worth a mark but does not negate an additional correct response.

8. 'Reject' means that the answer is wrong and negates any additional correct response for that specific mark.

9. ORA (or reverse argument) indicates that the complete reverse is also valid for the award of marks.

10. ecf (error carried forward) means that a wrong answer given in an earlier part of a question is used correctly in answer to a later part of the same question.

MARKING

1. You must give a tick (in red) for every mark awarded. The tick must be placed on the script close to the answer. The mark awarded for part of a question should be written in the margin close to the sub-total.

2. The sub-total marks for a question should be added together and the total mark written and ringed at the end of the question then transferred to the front of the script.

3. Suggestion/explanation questions should be marked correct even when the suggestion is contained within the explanation.

4. **Do not** award marks for repetition of the stem of the question.

5. Make sure that the answer makes sense. Do not give credit for correct words/phrases which are put together in a meaningless manner. Answers must be in the correct scientific context.

AMPLIFICATION

1. In calculations, full credit must be given for a <u>bald</u>, correct answer. If a numerical answer is incorrect, look at the working and award marks according to the mark scheme.

2. Consequential marking should be used in calculations. This is where a candidate's working is correct but is based upon a previous error. When consequential marks have been awarded write "ecf" next to the ticks.

3. If candidates use the mole in calculations they must be awarded full marks for a correct answer even though the term may not be on the syllabus at their level.

4. If candidates use chemical formulae instead of chemical names, credit can only be given if the formulae are correct.

QUALITY OF WRITTEN COMMUNICATION

This logo indicates where students will be assessed on their ability to:

- present relevant information in a form that suits its purpose

- ensure that spelling, punctuation and grammar are accurate, so that the meaning is clear

- use a suitable structure and style of writing.

1. (a) (i) 65%;   1

        (ii) walls- draught excluder/curtains/cavity wall insulation;
               floor - carpets/wooden floors;   2
               [Accept damp proofing for 1 mark]

    (b) (i) 108 W;   1

        (ii) 224×3600;;
               8.06×10^5 (J);   3
               [Allow 2 marks where 3600 sec has been missed/224×60]

    (c)   An explanation to include two of:
               • approx 50% of heat lost through window saved;
               • windows only account of 10% of energy lost;
               • only approx 5% saving on heating bills;
               • makes connection between energy and cost;
               plus 1 communication mark for presenting relevant
               information in a form that suits its purpose;   3
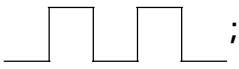
                                                                              Total 10 marks

2. (a) (i) 86;   1

        (ii) 134;   1

        (iii) An explanation to include particles with:
               • same number of protons;
               • different numbers of neutrons;   2

    (b) (i) An explanation to include:
               • gas breathed in;
               • α - particles cannot pass through living tissue;
               • named health risk;   3

        (ii) A discussion to include three of:
               • lack of understanding of dangers;
               • evidence;
               • cost;
               • information not widely known;
               • complacency;
               • information did not spell out dangers clearly;
               • regional variation;
               plus 1 communication mark for ensuring that spelling,
               punctuation and grammar are accurate, so that the meaning
               is clear;   4

                                                                              Total 11 marks

3. (a) (very) high frequency sound;
beyond human hearing/humans cannot hear this frequency;　　2

(b) (i) $v = f\lambda$;

$\lambda = \dfrac{v}{f}$;

$\dfrac{1500}{50\,000}$ /0.03;

m;　　4

(ii) Total distance = 2400 m;

$t = \dfrac{2400}{1500}$;

= 1.65;

s;　　4

[Allow 3 marks max, if total distance taken as 1200 m]

(c) A suggestion to include:
- ordinary sound spreads more;
- concentration less/less intense/ amplitude decreases rapidly;
- range limited/cannot travel far;　　3

Total 13 marks

4. (a) (i) total internal reflection;　　1

(ii) should show more reflections;　　1

(iii) An explanation to include:
- more reflections/hits side more often;
- greater distance to travel;　　2

(b) (i) ⎍⎍⎍ ;　　1

(sharp on/off pulses)

(ii) continuously variable (or diag)/voltage changing all the time/ can have any value (allow mark if shown on diagram);　　1

(c) (i) decreases/dims/less intense;　　1

(ii) limits range/travels less/ cannot go as far/amplitude less;　　1

Total 8 marks

5.   (a)   (i)   changing polarity,   1

           (ii)   Any two from:
- stronger magnet;
- more turns;
- increase speed rotation;
- placing coil on soft iron core;   2

   (b)   (i)   An explanation to include:
- higher V, less I;
- less I, lower heating effect;   2

           (ii) $\dfrac{N_p}{N_s} = \dfrac{V_p}{V_s}$; $= \dfrac{25000}{400\,000} = \dfrac{1}{16}$ $\left(\text{or } \dfrac{16}{1} \text{ if secondary to primary}\right)$;;   3

   (c)   Advantage: less resistance;
           Disadvantage: heavier;   2

Total 10 marks

6.   (a)   (i)   copper ions towards negative plate ie to right
                 sulfate ions towards positive plate ie to left;   1

           (ii)   An explanation to include:
- ammeter/M_2;
- moving charges make a current;   2

   (b)   (i)   Q = It;
                 $= 0.5 \times 5 \times 60$;
                 $= 150$;
                  C;
                 [Max 3 marks where 60 sec has been omitted]   4

           (ii) $150/3.2 \times 10^{-19}$;
                 4.688×10^{20};
                 [Allow ecf from part (b)(i)]   2

           (iii)   6 J/C;
                 $6 \times (3.2 \times 10^{-19}) = 1.92 \times 10^{-18}$;
                 J;   3

Total 12 marks

7.   (a)   *F= m × a / W = m × g*;
                $= 70 \times 10$;
                $= 700$ N;   3

   (b)   speed constant;
                upward force = downward force/
                forces balanced/from F = ma if a = 0;   2

(c)   A description and an explanation to include:
- opens parachute at C;
- drag force increased/upward force increased;
- lower terminal velocity;

plus 1 communication mark for using a suitable structure and style of writing;   4

(d)   shows lower terminal velocity at D;
shows longer time to land;   2

Total 11 marks

8.   (a)   (i)   only electromagnetic waves can travel through space/vacuum;   1

(ii)   infra-red;   1

(iii)   cancer (skin);
one other identified danger eg damage to eyes;   2

(b)   (i)   A description to include:
- potential energy at distance/
  KE increases as particles move in;
- heat energy increases;   2

(ii)   An explanation to include:
- KE increasing therefore temperature increasing/
  total energy more;
- at high temperature nuclei can undergo fusion;   2

(c)   A description of events to include three from:
- hydrogen gone $\rightarrow$ centre cools;
- star pulled in, collapses;
- KE increased again, temp rises;
- fusion of heavier elements;
- Red giant;
- explosion;

plus 1 communication mark for presenting relevant information in a form that suits its purpose   4

(d)   A description to include three from:
- hot "super atom" erupted in a burst of energy;
- Universe is expanding/
  galaxies appear to be moving apart;
- background microwave radiation from every direction in space;
- red shift of emission spectrum;
- started with explosion;   3

Total 15 marks

TOTAL MARK 90

Syllabus 1540

Physics A

Specimen Paper 4H

MARK SCHEME

First Examination Summer 2003

Edexcel
Success through qualifications

USING THE MARK SCHEME

1. This mark scheme gives you;   * an idea of the type of response expected
             * how individual marks are to be awarded
             * the total mark for each question
             * examples of responses that should not receive credit.

2. ; separates points for the award of each mark.

3. / means that the responses are **alternatives** and either answer should receive full credit.

4. ( ) means that a phrase/word is not essential for the award of the mark but helps the examiner to get the sense of the expected answer.

5. Phrases/words in **bold** indicate that the <u>meaning</u> of the phrase/word is **essential** to the answer.

6. OWTTE (or words to that effect) and eq (equivalent) indicate that valid alternative answers (which have not been specified) are acceptable.

7. 'Ignore' means that this answer is not worth a mark but does not negate an additional correct response.

8. 'Reject' means that the answer is wrong and negates any additional correct response for that specific mark.

9. ORA (or reverse argument) indicates that the complete reverse is also valid for the award of marks.

10. ecf (error carried forward) means that a wrong answer given in an earlier part of a question is used correctly in answer to a later part of the same question.

MARKING

1. You must give a tick (in red) for every mark awarded. The tick must be placed on the script close to the answer. The mark awarded for part of a question should be written in the margin close to the sub-total.

2. The sub-total marks for a question should be added together and the total mark written and ringed at the end of the question then transferred to the front of the script.

3. Suggestion/explanation questions should be marked correct even when the suggestion is contained within the explanation.

4. **Do not** award marks for repetition of the stem of the question.

5. Make sure that the answer makes sense. Do not give credit for correct words/phrases which are put together in a meaningless manner. Answers must be in the correct scientific context.

AMPLIFICATION

1. In calculations, full credit must be given for a <u>bald</u>, correct answer. If a numerical answer is incorrect, look at the working and award marks according to the mark scheme.

2. Consequential marking should be used in calculations. This is where a candidate's working is correct but is based upon a previous error. When consequential marks have been awarded write "ecf" next to the ticks.

3. If candidates use the mole in calculations they must be awarded full marks for a correct answer even though the term may not be on the syllabus at their level.

4. If candidates use chemical formulae instead of chemical names, credit can only be given if the formulae are correct.

QUALITY OF WRITTEN COMMUNICATION

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*   present relevant information in a form that suits its purpose

*   ensure that spelling, punctuation and grammar are accurate, so that the meaning is clear

*   use a suitable structure and style of writing.

1. (a) (i)   An explanation to include:
                • cable has electrical resistance;
                • energy lost as heat;   2

        (ii)   to replace lost energy/boost the signal/increase amplitude;   1

        (iii) noise;   1

    (b) (i)   digital;   1

        (ii)   An explanation to include:
                • very short time interval between pulses;   2
                • lots can be placed close together;

    (c)   loudspeaker;   1

                                                                        Total 8 marks

2. (a)   sky waves;
                space waves;   2

    (b)   diffraction;   1

    (c) $v = f \times \lambda$;
                $3 \times 10^8 = 639 \times f$;
                469;
                kHz;   4

    (d) (i)   few (if any) households had radios/
                early days of ionospheric research;   1

        (ii)   gather more evidence/data/
                publicise their research/institution;   1

        (iii) language/content too difficult/technical for non-scientists/
                may put people off helping;   1

                                                                        Total 10 marks

3. (a) (i)   An explanation to include:
                • particles moving;
                • collisions with walls/hitting walls;
                • force produced;
                plus 1 communication mark for ensuring that spelling,
                punctuation and grammar are accurate, so that the meaning
                is clear;   4

        (ii)   An explanation to include:
                • more collisions;
                • more particles present;   2

(b) (i) An explanation to include:
- not moving/all gases in solid state;
- no K.E.; 2

(ii) kelvin; 1

(iii) (+)373(K) 1

Total 10 marks

4. (a) (i) An explanation to include:
1. active – acts on received signal/
produces a change; 2
2. passive – does not change it/just reflects its;

(ii) space waves/VHF; 1

(iii) An explanation to include two from:
- gravitational pull;
- keeps satellite in orbit;
- responsible for its changing direction; 2

(iv) An explanation to include three of:
- as it slows/as speed decreases, drawn inwards;
- Earth provides centripetal force/pull;
- friction with atmosphere/air particles hit satellite;
- KE $\longrightarrow$ heat energy; 3

(b) (i) An explanation to include:
- wave diffracted /spread out by dish;
- wavelength to dish size ratio determines amount of diffraction/spreading;
- less energy per m^2 if spread out; 3

(ii) attenuation; 1

Total 13 marks

5. (a) (i) α-particle scattering/Rutherford/Geiger Marsden expt.; 1

(ii) An outline to include:
- α particles fired at gold foil;
- angles of scatter measured;
- a few scattered through large angles;
plus 1 communication mark for using a suitable structure and style of writing; 4

| (iii) | | An explanation to include:
• cannot be divided/ broken down further;
• electrons; | 2 |

| (b) | (i) | A suggestion to include:
• neutrons have no charge/cannot be deflected by E/B fields;
• (difficult to detect) travel though matter easily; | 2 |

| | (ii) | protons and neutrons contain 3 quarks;
different combinations of up and down quarks; | 2 |

Total 11 marks

6. (a) (i) thermionic emission;   1

      (ii) current measured/recorded;   1

      (iii) **Either**
            6eV;;
      or
            6 J/C $\times$ 1.6 $\times$ 10^{-19} C;
            9.6 $\times$ 10^{-19} J;   2

   (b) (i) 5.8 mA;   1

      (ii) current = 6 $\times$ 10^{-3} A;
           no. of electrons = $\dfrac{6\times10^{-3}}{1.6\times10^{-19}}$;
           = 3.75 $\times$ 10^{16};   3

      (iii) more electrons available/gas atoms ionised/
            electrons removed from gas atoms;   1

Total 9 marks

TOTAL MARKS 60

SPECIFICATION GRID   Specimen Paper

GCSE PHYSICS A

Syll. No. 1540   Paper 1F   Foundation Tier

Maximum mark for Paper 90   Page 1 of 2

YEAR of EXAM   2003   Post Revision Draft   Date 7 November 2000

Q	Spec.Ref.	Assessment Objective				Total Mark	Level of demand		SocEET aspects	Short ans./ Object.	Equⁿ & Calcⁿ.	Extended Prose		
		AO1		AO2	AO3		Low	Stand.						
		K & U												
		51 – 62					Low	Stand.				= 2	> 2	Comm.
		Recall	Other	Applicⁿ	Inv.Sc.		G-E	D-C		Object.	Calcⁿ.			
		17-21	34-41	28-39	0-5	90	45-54	36-45	✔	≤60	seeCQC	~18	~5	~3
1(a)	P4.01			1			1			1				
(b)	P4.01		3				3			3				
(c)	P4.01		1				1			1				
(d)	P4.01		1	1		7	2			2				
2(a)	P1.08/1.14	2	2	2			6			4		2		
(b)	P1.11	1	1			8	2			2				
3(a)	P2.09/10	2	1	2			5					4		1
(b)	P2.08		4			9	4			4				
4(a)	P1.23/24/25		4				4			4				
(b)	P1.26	1	1	2		8	4			2		2		
5(a)	P2.18		2	1			3			3				
(b)	P2.18		2				2			2				
(c)	P2.07/08		2	1		8	3			3				
6(a)	P5.14		4	2			6			3	3			
(b)	P5.02		1	1		8	2					2		
7(a)	P5.06	2	1					3		2	1			
(b)	P5.06			4				4			4			
(c)	P5.06		2	1		10		3				2		1
8(a)	P6.02/03		2	2				4		2		2		
(b)	P6.05/13	1	4	2		11		7					6	1

Q	Spec.Ref.	Assessment Objective				Total Mark	Level of demand		SocEET aspects	Short ans./ Object.	Equⁿ & Calcⁿ.	Extended Prose		
		AO1		AO2	AO3		Low	Stand.						
		K & U												
		51 – 62										= 2	> 2	Comm.
		Recall	Other	Applicⁿ	Inv.Sc.		G-E	D-C						
		17-21	34-41	28-39	0-5	90	45-54	36-45	✔	≤60	seeCQC	~18	~5	~3
9(a)	P3.22	2						2				2		
(b)	P3.05	4		4				8			8			
(c)	P3.08/20/22		3			13		3					3	
10(a)	P3.17	1	2	1				4		2		2		
(b)	P3.18		1	1				2		2				
(c)	P5.02	2				8		2		2				
	Total	18	44	28		90	48	42		44	16	18	9	3

SPECIFICATION GRID *Specimen Paper*

GCSE PHYSICS A

Syll. No. 1540   **Paper 2F**   **Foundation Tier**

Maximum mark for Paper 60   **Page 1 of 1**

YEAR of EXAM 2003   **Post Revision Draft**   **Date 7 November 2000**

Q	Spec.Ref.	AO1 Recall	AO1 Other	AO2 Applic	AO3 Inv.Sc.	Total Mark	Low G-E	Stand. D-C	SocEET aspects	Short ans./ Object.	Equ & Calc.	Ext. Prose =2	>2	Comm.
	K & U 34–41	11-14	22-27	19-26	0-3	60	30-36	24-30	✔	≤ 40	seeCQC	~12	~3	~2
1(a)	P7.01/8.01		4				4			4				
(b)	P7.03		5			9	5			5				
2(a)	P7.21			1			1			1				
(b)	P7.21/22	2		3			5			5				
(c)	P7.21/23	2					2			2				
(d)	P7.24/4.03		4			12	2	2					3	1
3(a)	P8.28/8.29	1		4			5			5				
(b)	P8.29			3			3			3				
(c)	P8.32/33		2	1		11	3			3				
4(a)	P7.03/08/09	2	2					4		2		2		
(b)	P7.05	1	2					3		1		2		
(c)	P7.07	1				8		1		1				
5(a)	P7.13	2						2		2				
(b)	P7.15	1						1		1				
(c)	P7.17	1		3				4			4			
(d)	P7.14			3		10		3		3				
6(a)	P8.05		3	3				6				2	3	1
(b)	P8.02/03/04	2	2			10		4		2		2		
Total		15	24	21		60	30	30		40	4	8	6	2

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SPECIFICATION GRID *Specimen Paper*

GCSE PHYSICS A

Syll. No. 1540   Paper 3H   Higher Tier

Maximum mark for Paper 90   Page 1 of 1

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Q	Spec.Ref.	AO1 K & U 51 – 62 Recall 17-21	AO1 Other 34-41	AO2 Applicⁿ 28-39	AO3 Inv.Sc. 0-5	Total Mark 90	Level of demand Stand. D-C 36-45	Level of demand High B-A* 45-54	SocEET aspects ✔	Short ans./ Object. ≤ 60	Equⁿ & Calcⁿ seeCQC	Extended Prose = 2 ~14	Extended Prose > 2 ~9	Extended Prose Comm. ~3
1(a)	P5.06	2	1				3			2	1			
(b)	P5.06			4			4				4			
(c)	P5.06		2	1		10	3					2		1
2(a)	P6.02/03		2	2			4			2		2		
(b)	P6.05/13	1	4	2		11	7						6	1
3(a)	P3.22	2					2					2		
(b)	P3.05	4		4			8				8			
(c)	P3.08/20/22		3			13	3						3	
4(a)	P3.17	1	2	1			4			2		2		
(b)	P3.18		1	1			2			2				
(c)	P5.02	2				8	2			2				
5(a)	P1.10/31/32		3					3		3				
(b)	P1.32/34	1	2	2				5			3	2		
(c)	P1.32/5.15		2			10		2		2				
6(a)	P1.20		1	2				3		3				
(b)	P1.18/21	3		6		12		9			9			
7(a)	P2.11	1		2				3			3			
(b)	P2.09		1	1				2				2		
(c)	P2.14		2	2				4					3	1
(d)	P2.10			2		11		2		2				
8(a)	P3.12/13	3	1					4		2		2		
(b)	P4.06		4					4				4		
(c)	P4.07		4					4					3	1
(d)	P4.09		3			15		3				3		
	Total	20	38	32		90	42	48		22	28	21	15	4

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GCSE PHYSICS A

Syll. No. 1540   Paper 4H   Higher Tier

Maximum mark for Paper 60   Page 1 of 1

YEAR of EXAM 2003   Post Revision Draft   Date 7 November 2000

Q	Spec.Ref.	Assessment Objective				Total Mark	Level of demand		SocEET aspects	Short ans./Object.	Equ^n & Calc^n.	Extended Prose		
		AO1		AO2	AO3		Stand.	High.						
		K & U												
		34 – 41					C-D	B-A*				= 2	> 2	Comm.
		Recall	Other	Applic^n	Inv.Sc.									
		11-14	22-27	19-26	0-3	60	24-30	30-36	✔	≤ 40	seeCQC	~9	~6	~2
1(a)	P7.03/8/9	2	2				4			2		2		
(b)	P7.05	1	2				3			1		2		
(c)	P7.07	1				8	1			1				
2(a)	P7.13	2					2				2			
(b)	P7.15	1					1				1			
(c)	P7.17	1		3			4					4		
(d)	P7.14			3		10	3				3			
3(a)	P8.05		3	3			6					2	3	1
(b)	P8.02/3/4	2	2			10	4				2			
4(a)	P4.03/7.13/19/24/25	1	7				1	7		1		4	3	
(b)	P3.08/7.08/15/16	1		3		12		4		1			3	
5(a)	P8.08/09/24/25	2	3	2				7		1		2	3	1
(b)	P6.02/8.25/27		4			11		4				4		
6(a)	P8.28/29/30	1	1	2				4		2	2			
(b)	P8.31		1	4		9	1	4		1	4			
	Total	15	25	20		60	30	30		18	10	18	12	2

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