Centre No.						Paper Reference (complete below)							Surname	Initial(s)
Candidate No.										/			Signature	

Paper Reference(s)

1522/6H 1540/3H

Edexcel GCSE

Science: Double Award A [1522]

Paper 6H

Physics A [1540]

Paper 3H

Higher Tier

Friday 15 June 2007 – Morning

Time: 1 hour 30 minutes

Materials required for examination
Calculator

Items included with question papers
Nil

Examiner's use only

Team Leader's use only

Question Number	Leave Blank
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
Total	

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname and initial(s), the paper reference and your signature. The paper reference is shown above. If more than one paper reference is shown, you should write the one for which you have been entered.
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 ten questions. There are no blank pages.

Advice to Candidates

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

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Turn over

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FORMULAE

You may find the following formulae useful.

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

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

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

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

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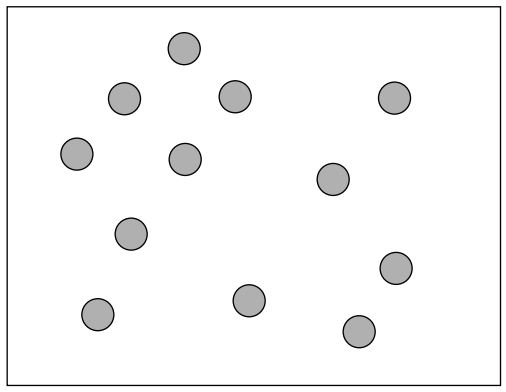
1. The diagram shows gas particles in a container at room temperature.



(a) Describe the motion of the gas particles.

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.....

(2)

(b) How would the motion change if the gas particles had less energy?

.....

(1)

(c) What would you need to do to the gas to reduce the energy of the gas particles?

.....

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(1)

(d) What is exerted on the wall of the container when a gas particle collides with it?

.....

(1)

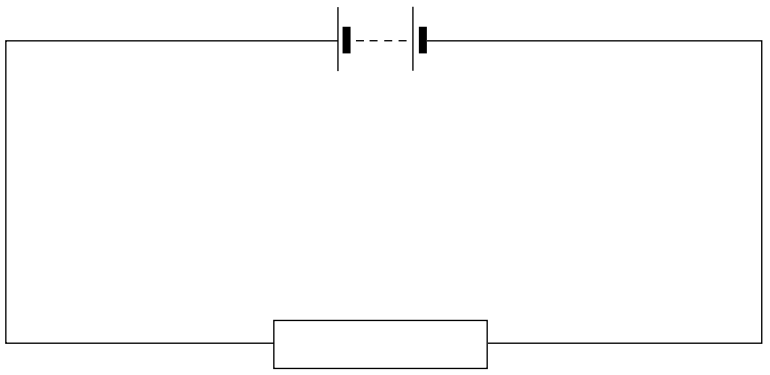
Q1

(Total 5 marks)

TURN OVER FOR QUESTION 2

Leave blank

2. The diagram shows a circuit used by a student to investigate the relationship between the resistance of a circuit and the current in the circuit.



(a) Using the correct symbol, add to the circuit a meter which would measure the current in the resistor.

(2)

(b) The current in the resistor is 0.4 A and the resistance is 20 Ω.

(i) Write down an equation which could be used to calculate the voltage across the resistor.

.....

(1)

(ii) Calculate the voltage across the resistor.

.....

.....

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(2)

Leave blank

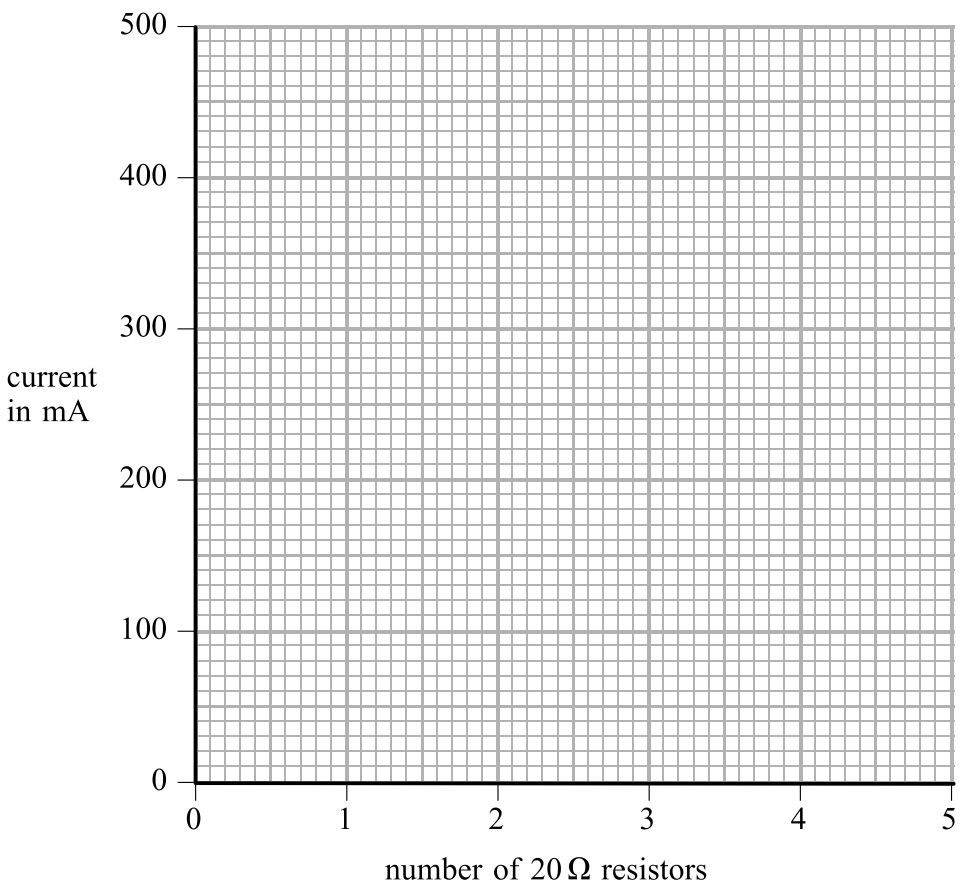
(c) The student has four more 20 Ω resistors. She adds these to the circuit one at a time in series with the first resistor. After she adds each resistor, she records the current.

Her results are shown in the table.

number of 20 Ω resistors	current (mA)
1	400
2	200
3	130
4	100
5	80

(i) Use the grid to draw the graph of current against number of resistors.

(3)



(ii) The student repeats the experiment but this time she uses five 40 Ω resistors.

Use the grid to sketch the curve you would expect her results to produce this time.

(1)

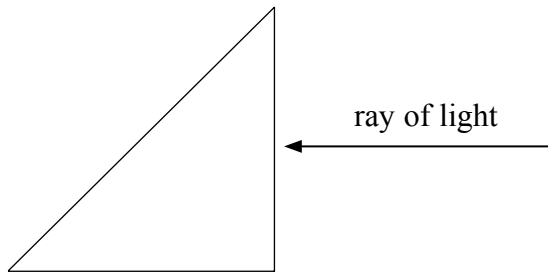
Q2

(Total 9 marks)

Leave blank

3. (a) The diagram shows a ray of light approaching a glass prism.

Complete the diagram to show the path of the ray as it travels inside the prism and out again.



(2)

(b) Light is an electromagnetic wave.

Which colour has the longest wavelength?

.....

(1)

(c) The diagram shows the electromagnetic spectrum. Two of the electromagnetic waves are not named.

B	microwaves	**A**	light	ultraviolet	X-rays	gamma

(i) Name the wave in box **A**.

.....

(1)

(ii) Name the wave in box **B**.

.....

(1)

Leave blank

(d) The table shows some statements about electromagnetic waves.

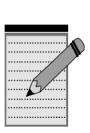
Tick the boxes next to the **three** correct statements.

they are all transverse	
they are all longitudinal	
they all have the same frequency	
they all travel at the same speed in a vacuum	
they can all travel through concrete	
they can all transmit energy	

(3)

(e) All electromagnetic waves can be diffracted.

The diffraction of microwaves can be observed using a 3 cm gap.
Suggest why the same size gap could not be used to show the diffraction of X-rays.



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(3)

Q3

(Total 11 marks)

TURN OVER FOR QUESTION 4

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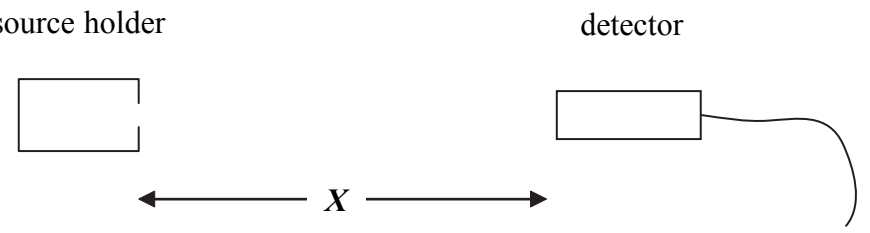
4. The diagram shows the apparatus used to measure the activity of different radioactive sources. A radioactive source is placed in the holder and its activity is measured using the detector. The distance ***X*** can be changed.



(a) Name a suitable detector.

.....

(1)

(b) The activity of three sources is measured at three distances ***X***.
Each source emits only one type of ionising radiation.

The results are shown in the table.

	activity (Bq)		
	X = 1 cm	***X*** = 7 cm	***X*** = 100 cm
no source	3	2	4
source 1	230	4	3
source 2	230	200	5
source 3	230	233	228

(i) Why does the detector still record some activity when there is no source in the source holder?

.....

.....

(1)

Leave blank

(ii) Use the results to help you to complete the following table about the three sources.

	type of ionising radiation	charge
source 1		
source 2		negative
source 3	gamma	

(4)

(c) Source 1 is americium–241. The symbol for a nucleus of americium–241 is

$$^{241}_{95}\mathrm{Am}$$

(i) How many protons are there in a nucleus of americium–241?

.....

(1)

(ii) How many neutrons are there in a nucleus of americium–241?

.....

(1)

(iii) Americium–241 is used in home smoke detectors.
Suggest why it is used instead of source 2 or source 3.

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(2)

Q4

(Total 10 marks)

TURN OVER FOR QUESTION 5

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5. The chart shows the shortest stopping distances for a car travelling at different speeds.

15 m/s	Thinking distance 9 m; Braking distance 19 m Overall stopping distance 28 m
25 m/s	Thinking distance 15 m; Braking distance 52 m Overall stopping distance 67 m
35 m/s	Thinking distance 21 m; Braking distance 102 m Overall stopping distance 123 m

(a) (i) What is meant by the thinking distance?

.....

.....

.....

(2)

(ii) Use the figures in the chart to show that the thinking time is 0.6 s for each of the speeds shown.

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.....

(3)

(iii) State **two** factors that could affect the thinking time.

1 .....

2 .....

(2)

Leave blank

(b) (i) What is meant by the braking distance?

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.....

(1)

(ii) Explain why the braking distance increases as the speed of the car increases.

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.....

.....

(2)

Q5

(Total 10 marks)

TURN OVER FOR QUESTION 6

Leave blank

6. The modern world uses large amounts of electrical energy. Most of this electrical energy is produced by burning fossil fuels.

(a) It is important that we reduce the amount of fossil fuels burnt for two main reasons. One reason is to do with the supply of fossil fuels, the other is to do with the environmental effects of burning fossil fuels.

(i) Explain the reason to do with the supply of fossil fuels.

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(1)

(ii) Describe **two** of the environmental effects of burning of fossil fuels.

1 .....

.....

2 .....

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(2)

Leave blank

(b) Two alternatives to burning fossil fuels are HEP (hydroelectric power) and wind farms.

Suggest **two** disadvantages for each of these alternatives.

(i) HEP

1 .....

.....

2 .....

.....

(2)

(ii) wind farms

1 .....

.....

2 .....

.....

(2)

(c) A wind generator produces electricity by electromagnetic induction.

Explain how the generator uses electromagnetic induction to produce electricity.

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(3)

Q6

(Total 10 marks)

TURN OVER FOR QUESTION 7

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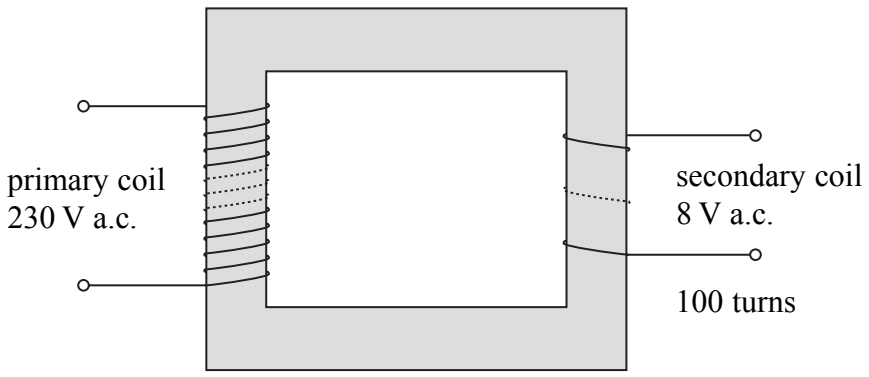
7. The diagram shows a transformer which is used to step down the 230 V mains voltage to 8 V.



(a) There are 100 turns in the secondary coil.

(i) Write down the equation which could be used to calculate the number of turns in the primary coil.

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.....

(1)

(ii) Calculate the number of turns in the primary coil.

.....

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(2)

Leave blank

(b) This transformer is part of a circuit for the battery charger for a mobile phone. The current in the primary and secondary coils of the transformer is a.c.

(i) What do the letters a.c. stand for?

.....

(1)

(ii) The current used to charge the battery must be d.c.

In addition to the transformer, what other component is needed in the battery charger circuit?

.....

(1)

(c) When the 8 V d.c. battery charger is used to recharge a battery, 150 J of energy is transferred in 300 s.

(i) Calculate the average value of the charging current.

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(3)

(ii) Suggest why this is only the **average** value of the charging current.

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(2)

Q7

(Total 10 marks)

TURN OVER FOR QUESTION 8

Leave blank

8. There have been many theories about the origin of the Universe. One theory is that the Universe started at one point in time and space and has been expanding ever since.

(a) What is this theory called?

.....

(1)

(b) Evidence that the Universe is expanding comes from studying the light from distant galaxies.

The light from distant galaxies appears to have shifted towards the red end of the spectrum.

(i) What does this indicate about the movement of the galaxies?

.....

(1)

(ii) The shift in wavelength is measured for a galaxy.

Suggest what could be calculated from this measurement.

.....

(1)

(c) What other evidence is there to support this theory?

.....

(1)

(d) How could the cooling of the Universe over time support the theory that it is expanding?

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(1)

Leave blank

(e) Our Sun is a star in a galaxy.

(i) State the name of this galaxy.

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(1)

(ii) Our Sun formed from a very large cloud of hydrogen, helium and dust.

Explain the main steps in the formation of the Sun.

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(4)

Q8

(Total 10 marks)

TURN OVER FOR QUESTION 9

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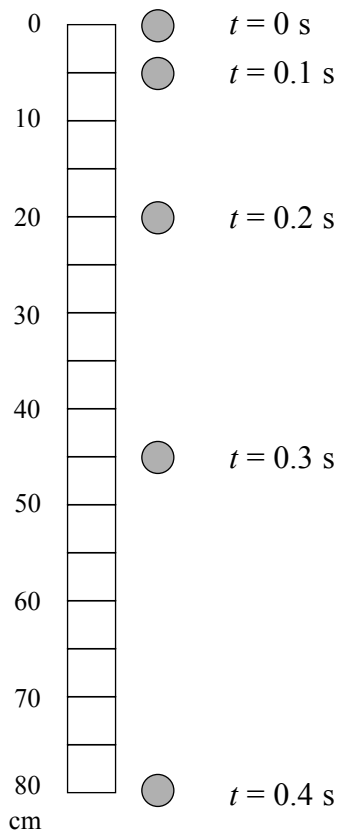
9. (a) The diagram shows the positions of a ping-pong ball at different times during its fall from rest.



(i) How can you tell from the diagram that the ping-pong ball is accelerating?

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(2)

Leave blank

(ii) Calculate the average speed of the ping-pong ball between $t = 0$ s and $t = 0.1$ s.

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(2)

(iii) Calculate the average speed of the ping-pong ball between $t = 0.3$ s and $t = 0.4$ s.

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.....

(1)

(iv) Use the change in the average speeds between (iii) and (ii) to calculate the acceleration of the ping-pong ball.

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(3)

(b) The ping-pong ball reaches zero acceleration when it falls far enough through the air.

Explain why.

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(3)

Q9

(Total 11 marks)

TURN OVER FOR QUESTION 10

Leave blank

10. (a) A car of mass 1000 kg is travelling along a flat road at 25 m/s.

Calculate the kinetic energy of the car.

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(3)

(b) The car brakes and comes to a halt. Its kinetic energy is reduced to zero. Where has the kinetic energy gone?

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.....

(1) **Q10**

(Total 4 marks)

TOTAL FOR PAPER: 90 MARKS

END