Centre No.						Paper Reference							Surname	Initial(s)
Candidate No.						5	6	4	8	/	6	P	Signature	

Paper Reference(s)

5648/6P

Edexcel GCSE

Physics B (1549)

(Modules 17 and 18)

Paper 6P

Higher Tier

Friday 15 June 2007 – Morning

Time: 30 minutes

Examiner's use only

Team Leader's use only

Question Number	Leave Blank
1	
2	
3	
4	
5	
Total	

Materials required for examination
Nil

Items included with question papers
Nil

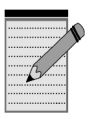
Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initial(s) and signature.
Check that you have the correct question paper.
Answer ALL the questions. Write your answers in the spaces provided in this question paper.
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 individual questions and the parts of questions are shown in round brackets: e.g. **(2)**.
There are 5 questions in this question paper. The total mark for this paper is 30.
There are 12 pages in this question paper. Any blank pages are indicated.

Advice to Candidates



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

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FORMULAE

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

$$\text{force} = \frac{\text{mass} \times (\text{orbital speed})^2}{\text{radius}} \qquad F = \frac{m \times v^2}{r}$$

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

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

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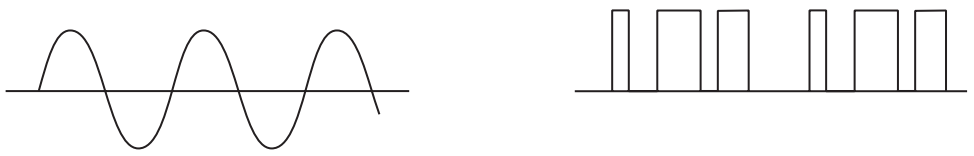
Answer ALL the questions. Write your answers in the spaces provided.

1. (a) The diagram below shows two types of signal.



Signals can be attenuated or affected by noise.
Draw over the diagrams below to show what happens when each of the signals is:

(i) attenuated

(2)

(ii) affected by noise

(2)

(b) Rifi wants to buy a new radio.
He has a choice of AM, FM or DAB (**digital** audio broadcast).

(i) Explain what is meant by AM and FM.
You may choose to draw a diagram to help your explanation.

.....

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.....

(3)

Leave blank

(ii) Rifi found this in a leaflet about the new radios:

- FM and DAB both use VHF radio waves.
- AM radios use medium and long waves.

Put **one** tick in each row of the table below to show which radio signal matches the stated property.

property	AM	FM	DAB
greatest range			
most susceptible to noise			
can be regenerated			
most information in signal			

(2) **Q1**

(Total 9 marks)

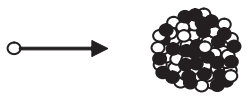
Leave blank

2. In a nuclear reactor, neutrons hit uranium-235 nuclei.

key

○ neutron

● proton



(a) Sometimes a nucleus absorbs a neutron.

(i) Describe what happens to the uranium-235 nucleus after the neutron is absorbed.
You may choose to add to the diagram if this helps your answer.

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(3)

(ii) Reactors are designed so that a chain reaction occurs.
Explain what a chain reaction is.

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(1)

Leave blank

(b) The government is worried about global warming and atmospheric pollution.
There is also concern that some ways of producing energy can use up fuel reserves.
Some people think that nuclear reactors produce ‘clean’ or ‘ecologically friendly’ energy.
Other people think that nuclear reactors produce ‘dirty’ energy.

(i) Suggest a reason why nuclear reactors can be considered to be ‘ecologically friendly’.

.....

.....

(1)

(ii) Suggest a reason why nuclear reactors can be considered to be ‘dirty’.

.....

.....

(1)

Q2

(Total 6 marks)

Leave blank

3. A scuba diver breathes gas from a cylinder.

Source: www.en.wikipedia.org/wiki

Each cylinder is filled with a gas at a pressure of 30 MPa and a temperature of 0 °C.
If the cylinders are accidentally heated, the pressure rises.
A safety valve will open when the pressure is 45 MPa.

Do a calculation to show that the safety valve will open when the temperature is approximately 140 °C.

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Q3

(Total 3 marks)

Leave blank

4. The Mars Reconnaissance Orbiter (MRO) was launched in August 2005.

The MRO is designed to :

- travel to Mars
- go into an elliptical polar orbit around Mars
- move to a lower orbit
- photograph details on the surface of Mars.

Source: www.nssdc.gsfc.nasa.gov

(a) Suggest what is meant by an 'elliptical polar orbit'.

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(2)

(b) From the lower orbit, the MRO can collect images of the whole surface of Mars. Explain why Mars must rotate for this to be possible.

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(2)

(c) These are the details of the lower orbit that the MRO uses:

- period = 7380 s
- velocity = 3.142 km/s
- radius = 3690 km
- mass of MRO = 1031 kg

Calculate the gravitational force acting on the MRO.
Give your answer correct to 4 significant figures. Include the unit.

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(2) **Q4**

(Total 6 marks)

Leave blank

5. Two isotopes of actinium $^{224}_{90}Ac$ and $^{226}_{90}Ac$ can decay in more than one way.

$^{224}_{90}Ac$ can decay

- by β^+ emission to radium
- by α emission to francium.

$^{226}_{90}Ac$ can decay

- by β^- emission to thorium
- by β^+ emission to radium.

In all these decays, γ radiation is also produced.

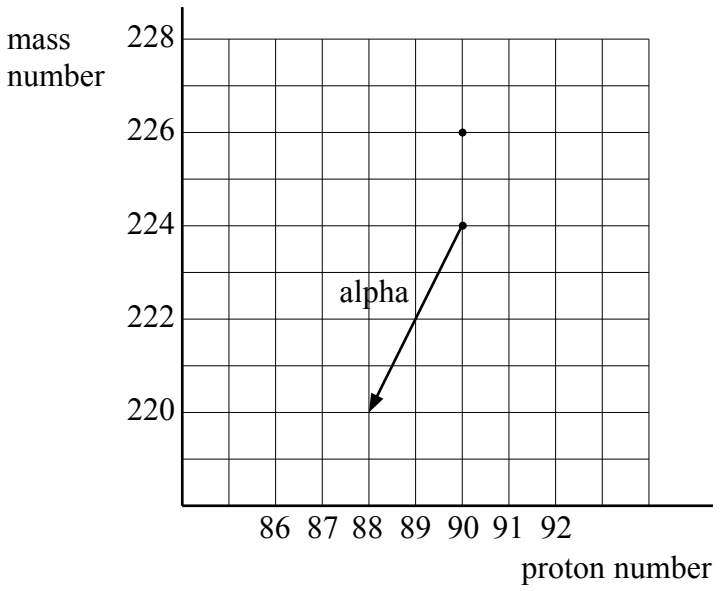
(a) Complete the table to show how the mass number and proton number of the parent nuclide change for β^+ emission and for β^- emission.

type of decay	mass number	proton number
α	decreases by 4	decreases by 2
β^+		
β^-		

(2)

Leave blank

(b) Decays can be represented on a grid.



The alpha decay from the $^{224}_{90}Ac$ has already been shown on the graph.
Draw arrows on the graph to show the β^+ decay and the β^- decay from $^{226}_{90}Ac$.
Label the arrows.

(2)

(c) Explain what happens to the nucleus during γ decay.

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(1)

(d) β^+ decay is associated with a quark change in a proton.
What is this change?

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(1) **Q5**

(Total 6 marks)

TOTAL FOR PAPER: 30 MARKS

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