

Candidate Forename		Candidate Surname	
---------------------------	--	--------------------------	--

Centre Number						Candidate Number				
----------------------	--	--	--	--	--	-------------------------	--	--	--	--

**OXFORD CAMBRIDGE AND RSA EXAMINATIONS
GENERAL CERTIFICATE OF SECONDARY EDUCATION**

A331/02

**TWENTY FIRST CENTURY SCIENCE
PHYSICS A**

Unit 1: Modules P1 P2 P3 (Higher Tier)

THURSDAY 24 JUNE 2010: Afternoon

DURATION: 40 minutes

SUITABLE FOR VISUALLY IMPAIRED CANDIDATES

**Candidates answer on the Question Paper
A calculator may be used for this paper**

OCR SUPPLIED MATERIALS:

None

OTHER MATERIALS REQUIRED:

Pencil

Ruler (cm/mm)

READ INSTRUCTIONS OVERLEAF

INSTRUCTIONS TO CANDIDATES

- **Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes on the first page.**
- **Use black ink. Pencil may be used for graphs and diagrams only.**
- **Read each question carefully and make sure that you know what you have to do before starting your answer.**
- **Answer ALL the questions.**
- **Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your Candidate Number, Centre Number and question number(s).**

INFORMATION FOR CANDIDATES

- **The number of marks is given in brackets [] at the end of each question or part question.**
- **The total number of marks for this paper is 42.**

BLANK PAGE

Answer ALL the questions.

1 The following statements are all true.

- A All elements except hydrogen are made in stars.**
- B Hydrogen, helium and lithium were formed in the big bang.**
- C When a star dies most of it is blown into space.**
- D Hydrogen and helium are the lightest elements.**
- E The solar system formed from gas clouds in space.**
- F Most stars are older than the Sun.**

A scientist says, “We are all made from elements like carbon and oxygen, so we are all made from stardust.”

(a) Which THREE statements, A, B, C, D, E or F, provide an explanation for what the scientist says?

statements _____ , _____ and _____ [3]

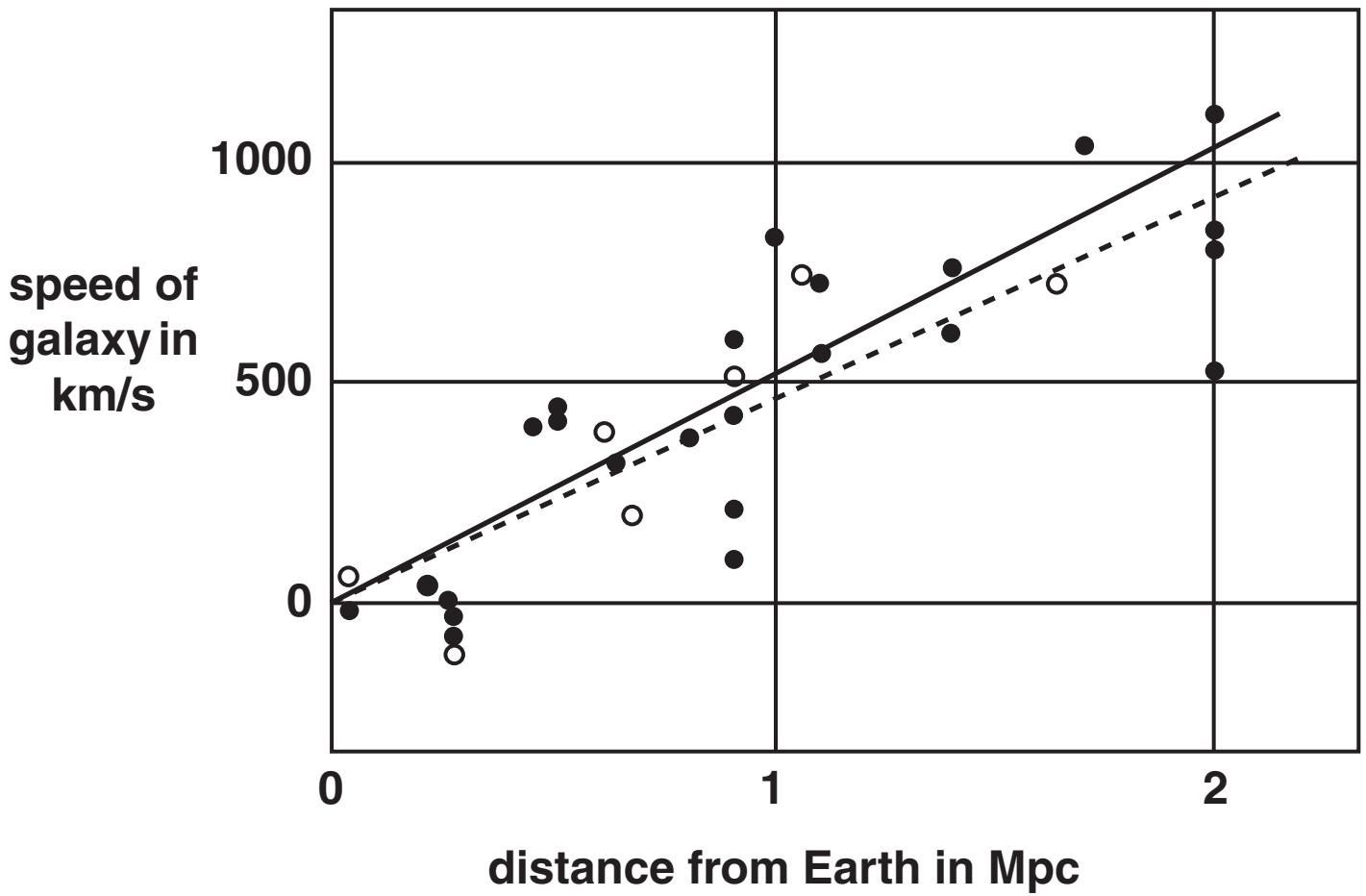
(b) Another scientist says, “All elements heavier than helium were only made in stars.”

Which statement, A, B, C, D, E or F, disagrees with what this scientist says?

statement _____ [1]

[Total: 4]

2 This graph shows the results of Edwin Hubble's research into galaxies, published in 1929.



(a) Which statements correctly describe what the graph shows?

Put a tick (✓) in the boxes next to the correct answers.

As distance from Earth increases the speed of galaxies increases.

As distance from Earth decreases the speed of galaxies increases.

Speed of galaxies and distance from Earth are inversely related.

Galaxies are moving.

As distance from Earth increases the speed of galaxies decreases.

[2]

(b) Which statement best EXPLAINS the results in the graph?

Put a tick (✓) in the box next to the best answer.

Gravity is acting on the galaxies.

Space is expanding.

Hubble discovered the relationship.

There are too many galaxies in the universe.

[1]

(c) The data in the graph provides one piece of evidence for which of the following explanations?

Put a tick (✓) in the box next to the best answer.

Life must exist on other planets.

Galaxies are made up of stars.

The universe is orbiting our galaxy.

Stars have a life cycle.

The universe started with a 'big bang'.

[1]

(d) Approximately how many years old is the universe?

Put a **ring** around the correct answer.

14 MILLION

14 HUNDRED MILLION

14 THOUSAND MILLION

14 HUNDRED BILLION

[1]

[Total: 5]

3 Wegener's theory of continental drift was not really accepted until plate tectonics explained how the continents could move.

(a) Wegener's theory of continental drift was based on comparisons between different continents.

Which of the following comparisons did Wegener use as evidence for his theory?

Put a ring around the correct answers.

CLIMATE

FOSSILS

RECORDS ON STONE TABLETS

RIVERS

ROCK TYPES

[2]

(b) Which of the following are correct statements about Wegener's theory of continental drift?

Put ticks (✓) in the boxes next to each correct answer.

The theory linked things previously thought unrelated.

Mountains formed as the Earth cooled.

His observations could not be replicated by other scientists.

The evidence did not prove his theory correct.

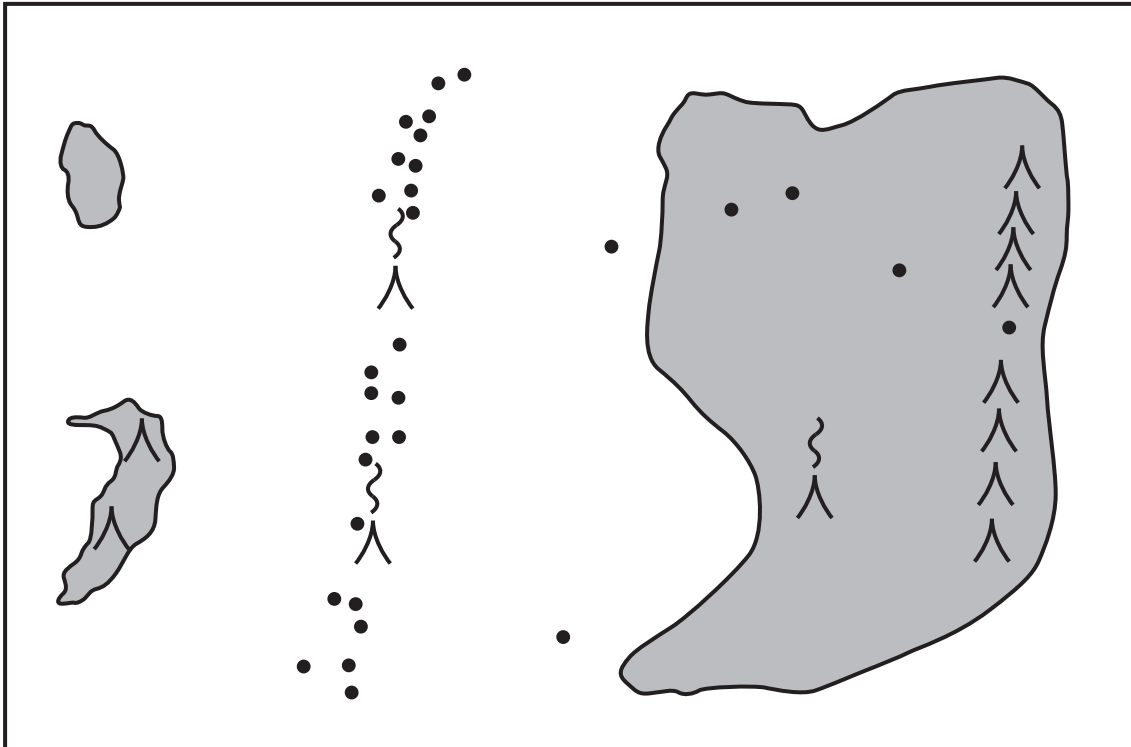
He predicted a symmetrical pattern of sea floor magnetism.

[2]

(c) Look at the map of part of an ocean and the key.

key:

- earthquakes
- ⋈ volcanoes
- ⋈ mountains
- land



(i) On the map draw lines to show the most likely position of plate boundaries. [2]

(ii) On the map draw an arrow to show the direction of movement of one plate. [1]

[Total: 7]

4 The properties of microwaves mean that they are used for many purposes.

(a) Which of the following statements about microwaves are true?

Put ticks (✓) in the boxes next to each CORRECT statement.

Microwaves heat by causing particles to vibrate.

Microwaves are ionising radiation.

The screen on a microwave oven lets light through but blocks microwaves.

Mobile phones produce microwaves.

Microwaves are blocked by the ozone layer.

The higher the intensity of microwaves in a microwave oven the less the food is heated.

[3]

(b) Susie sunbathes on the beach.

Her mum tells her to put on sun cream.

Put a tick (✓) in the box next to the correct explanation for using sun cream.

Sun cream will keep her skin from getting hot.

Sun cream will reflect or absorb ionising radiation from the Sun.

Sun cream will transmit ionising radiation from the Sun.

Sun cream will stop her skin from getting cold.

[1]

[Total: 4]

5 People often confuse the greenhouse effect with holes in the ozone layer.

(a) Put one tick (✓) in each row to show whether each phrase relates to the GREENHOUSE EFFECT, HOLES IN THE OZONE LAYER or BOTH.

	GREENHOUSE EFFECT	HOLES IN THE OZONE LAYER	BOTH
skin cancers			
electromagnetic radiation			
reversible chemical changes in the atmosphere			

[3]

(b) Which two processes in living organisms have the most effect on carbon dioxide in the atmosphere?

_____ and _____ [2]

[Total: 5]

6 Scientists often discover correlations between factors and outcomes.

Sometimes they think that a change in one factor causes a change in an outcome.

Give an example of a correlation that does NOT have a causal link.

Your example should relate either to health risks and radiation or to global warming.

Use this example to explain the difference between a correlation and a cause.

[4]

[Total: 4]

- 7 (a) The government is planning to build a new power station.
The table gives some information about three different types of power station.

TYPE OF POWER STATION	EFFICIENCY	COST PER kWh IN PENCE	ENVIRONMENTAL FACTORS
coal	38%	2 to 3	produces carbon dioxide
nuclear	34%	2 to 2.5	produces radioactive waste
wind	35%	4 to 5.5	may damage local wildlife e.g. birds

Which type of power station would you recommend building?

Explain your choice.

Use information from the table to decide.

[3]

(b) Explain why electricity is described as a SECONDARY energy source.

[1]

[Total: 4]

8 Read the article about a new drug.

NEW DRUG CAN PROTECT HEALTHY CELLS FROM RADIATION

Scientists have found a drug which can protect healthy cells from radiation. The discovery could improve the effectiveness of radiation therapy in treating cancer. Radiotherapy is an important tool in the fight against cancer.

The radiation causes damage to healthy cells. Damaged cells kill themselves through a process known as apoptosis. The body uses this process to stop damaged cells from multiplying; cancer cells survive by turning off the apoptosis mechanism. One risk of preventing cell death is that defective cells may be allowed to survive which could then turn cancerous.

However, the researchers found no sign of this happening in laboratory tests on rats.

Protecting healthy cells against the effects of radiation may allow cancer patients to receive higher doses of radiotherapy, or longer courses of treatment.

(a) Explain how radiation therapy damages cells.

[2]

(b) Use information in the article to explain what is meant by apoptosis.

[1]

(c) Who will decide when the drug is ready to be used on human patients?

Put a **ring** around the correct answer.

DOCTORS

GOVERNMENT OFFICIALS

PATIENTS

PHYSICISTS

[1]

[Total: 4]

9 Uranium is used in nuclear power stations.

Uranium-238 has 92 protons and 146 neutrons in its nucleus.

Uranium emits alpha particles.

An alpha particle is made up of 2 protons and 2 neutrons.

(a) In 13.38 billion years the activity of uranium-238 drops to one eighth of the original amount.

(i) How many half-lives does this take?

Put a ring around the correct answer.

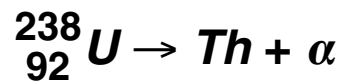
1/4 7/8 3 7 8

[1]

(ii) What is the half-life of uranium-238?

half-life = _____ [1]

(b) When a uranium-238 atom emits an alpha particle it changes into a thorium atom.



How many protons, neutrons and electrons are IN THE NUCLEUS of the thorium atom?

protons _____

neutrons _____

electrons _____

[3]

[Total: 5]

END OF QUESTION PAPER

BLANK PAGE

BLANK PAGE



Copyright Information

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations, is given to all schools that receive assessment material and is freely available to download from our public website (www.ocr.org.uk) after the live examination series.

If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity.

For queries or further information please contact the Copyright Team, First Floor, 9 Hills Road, Cambridge CB2 1GE.

OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.