THIS IS A LEGACY SPECIFICATION

OCR
RECOGNISING ACHIEVEMENT

H

Wednesday 30 May 2012 – Afternoon

GCSE TWENTY FIRST CENTURY SCIENCE PHYSICS A

A333/02 Unit 3: Ideas in Context plus P7 (Higher Tier)

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

OCR supplied materials:
- Insert (inserted)

Other materials required:
- Pencil
- Ruler (cm/mm)

Duration: 60 minutes

A314330612

A 3 3 3 0 2

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- The Insert will be found in the centre of this document.
- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- 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).
- Do **not** write in the bar codes.

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 **55**.
- A list of physics equations is printed on page **2**.
- Where you see this icon you will be awarded a mark for the quality of written communication in your answer.
- This document consists of **16** pages. Any blank pages are indicated.

TWENTY FIRST CENTURY SCIENCE EQUATIONS

Useful Relationships

Explaining Motion

$$\text{speed} = \frac{\text{distance travelled}}{\text{time taken}}$$

$$\text{momentum} = \text{mass} \times \text{velocity}$$

$$\text{change of momentum} = \text{resultant force} \times \text{time for which it acts}$$

$$\text{work done by a force} = \text{force} \times \text{distance moved in the direction of the force}$$

$$\text{change in energy} = \text{work done}$$

$$\text{change in GPE} = \text{weight} \times \text{vertical height difference}$$

$$\text{kinetic energy} = \frac{1}{2} \times \text{mass} \times [\text{velocity}]^2$$

Electric Circuits

$$\text{resistance} = \frac{\text{voltage}}{\text{current}}$$

$$\frac{\text{voltage across primary coil}}{\text{voltage across secondary coil}} = \frac{\text{number of turns in primary coil}}{\text{number of turns in secondary coil}}$$

$$\text{energy transferred} = \text{power} \times \text{time}$$

$$\text{power} = \text{potential difference} \times \text{current}$$

$$\text{efficiency} = \frac{\text{energy usefully transferred}}{\text{total energy supplied}} \times 100\%$$

The Wave Model of Radiation

$$\text{wave speed} = \text{frequency} \times \text{wavelength}$$

Further Physics, Observing the Universe

$$\text{lens power} = \frac{1}{\text{focal length}}$$

$$\text{magnification} = \frac{\text{focal length of objective lens}}{\text{focal length of eyepiece lens}}$$

$$\text{speed of recession} = \text{Hubble constant} \times \text{distance}$$

Answer **all** the questions.

1 This question is based on the article **'Scientists review evidence for the extinction of the dinosaurs'.**

(a) (i) The article was published in the scientific journal *Science*.

Articles in this journal are peer reviewed.

What is meant by peer reviewed?

One mark is for a clear and well-ordered answer.

.....

.....

..... **[3]**

(ii) This article is a summary review that is quite common in scientific journals.

It is not reporting **new** experimental data.

Suggest the purpose of this summary review article and explain why it is important.

.....

.....

.....

..... **[2]**

(b) What is an asteroid and where are they found?

.....

.....

..... **[2]**

(c) Explain how an asteroid impact could have resulted in the extinction of the dinosaurs.

.....

.....

.....

..... **[3]**

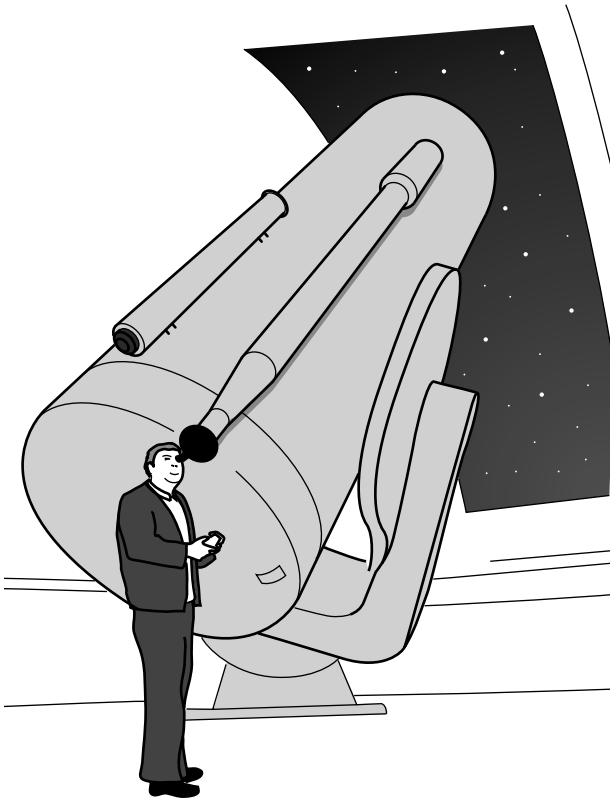
(d) Use data from the graph in the article to answer the following question.

What is the probability of a 3 km asteroid impact happening in the next 100 years?

probability = ... **[3]**

[Total: 13]

2 Edwin Hubble did much of his research using a large telescope at Mount Wilson in America.



(a) The large telescope is a reflecting telescope with a curved mirror.

(i) Draw a diagram to show how a mirror can bring light to a focus.

[2]

(ii) Explain why astronomical telescopes need to be so large.

.....

.....

..... **[2]**

(b) The large telescope has a much smaller telescope attached to its side.

This sighting telescope does not magnify as much, but can see more of the sky.

It is used to point the large telescope in the right direction.

The sighting telescope uses glass lenses.

(i) Which of the following statements about the sighting telescope are correct?

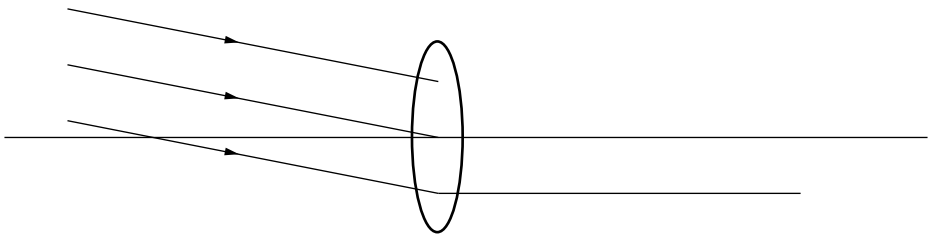
Put ticks (✓) in the boxes next to the **two** correct statements.

Each lens has a different power.	☐
The objective lens is more powerful than the eyepiece lens.	☐
The most powerful lens has the longest focal length.	☐
There must be a minimum of 3 lenses.	☐
The eyepiece lens has the most curved surface.	☐

[2]

(ii) Complete the diagram to show how the objective lens will bring the light from a star to a focus.

Label the point where the image of the star is formed.



[3]

(iii) Modern day large telescopes rarely have sighting telescopes.

Suggest reasons why.

.....

.....

..... **[2]**

[Total: 11]

3 **(a)** The Sun, the Moon and the stars follow a similar pattern of apparent movement across the sky in a day.

(i) Sketch a diagram to show this movement across the sky.

east ——————————————————————————— west

horizon

[2]

(ii) The apparent speed at which the Sun, the Moon and the stars move across the sky is different for all three.

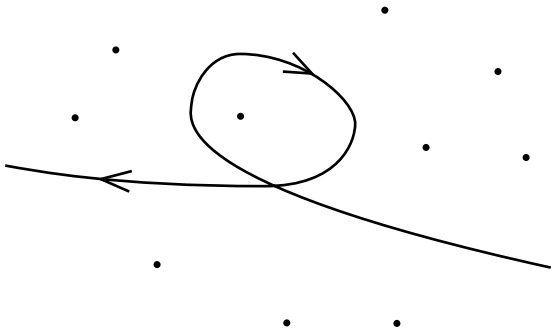
Put the three in order of apparent speed.

slowest | | | | fastest

[1]

(b) Some planets show retrograde motion, for example Mars.

This is an apparent change in direction of the motion of the planet against the background stars.



Explain how this apparent motion comes about.

You may use a diagram to help your explanation.

.....

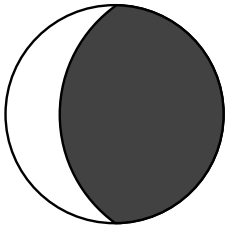
.....

.....

..... **[3]**

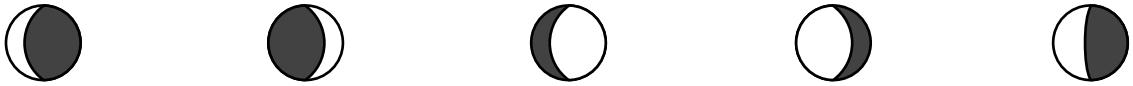
(c) The Moon orbits the Earth once every 28 days.

A student sketches a picture of the Moon when it has just risen above the horizon.



(i) How would the Moon look about 12 hours later, just before it sets below the horizon?

Put a (ring) around the correct view of the Moon.



[1]

(ii) Draw how the Moon would look 14 days later.

[2]

(iii) A solar eclipse occurs when the Moon comes between the Sun and the Earth and casts a shadow on the Earth. The Moon orbits around the Earth once every 28 days.

Why do we not see a solar eclipse every 28 days?

You may use a diagram to help your explanation.

.....

.....

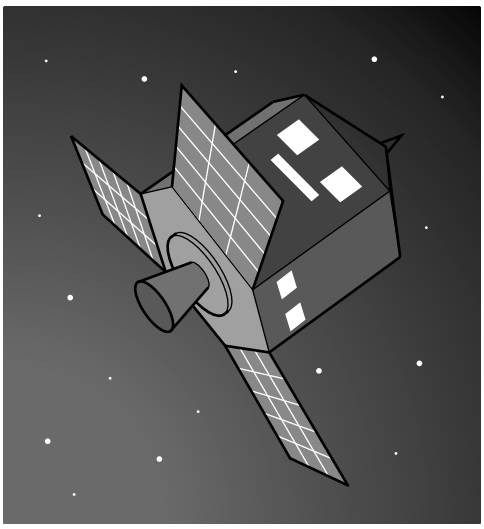
.....

..... **[2]**

[Total: 11]

4 The Hipparcos space satellite was a scientific mission of the European Space Agency.

Hipparcos is short for "**Hi**gh **p**recision **par**allax **co**llecting **s**atellite".



The telescope on the Hipparcos satellite measured the position and distance of stars very accurately.

(a) The Hipparcos satellite made much more accurate measurements of the parallax than it would if its telescope had been on Earth.

Suggest reasons why.

.....

.....

.....

..... **[2]**

(b) The mission was organised by the European Space Agency.

Why was it **not** organised by a single European country?

.....

.....

.....

..... **[2]**

(c) (i) The Hipparcos satellite used the parallax method to measure the distance to stars.

To do this it had to measure the position of the stars very accurately.

Explain how the position of a star is used to measure the parallax angle.

.....

.....

.....

..... **[2]**

(ii) Hipparcos measured the parallax angle to a white dwarf, Stein 2051B, as 0.181 seconds of arc.

Calculate the distance to the white dwarf star.

distance = ... parsecs **[2]**

(d) The distance to any nearby star can also be found using its apparent brightness.

Which additional information would allow the distance to the star to be found?

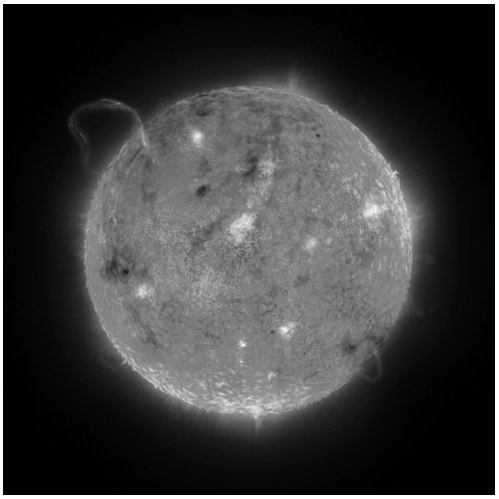
Put ticks (✓) in the boxes next to the **two** correct answers.

the speed of the star	☐
the temperature of the star	☐
the Hubble constant	☐
the period of variation of brightness	☐
the size of the star	☐

[2]

[Total: 10]

5 **(a)** The Sun shines very brightly.



Energy in the Sun is produced in the core.

Give a brief description of how the energy travels from the core through each region of the Sun and then into space.

Your answer should include

- the different regions of the Sun
- how the energy is transferred in each region.

.....

.....

.....

.....

.....

..... **[4]**

(b) Here are some events that can happen in the core of a star.

A Hydrogen in the core is used up.

B Helium fusion happens in the core.

C Helium fusion stops in the core.

D Fusion of larger nuclei than helium happens in the core.

E Fusion stops when the core is nearly all iron.

Which core events from **A**, **B**, **C**, **D**, and **E** are linked to each of the following?

Each letter may be used once, more than once or not at all.

(i) formation of a red giant event

..... and .....**[1]**

(ii) formation of a white dwarf event

..... **[1]**

(iii) starting a supernova event

..... **[1]**

(iv) produces carbon, nitrogen and oxygen event

..... **[1]**

(c) In which of the following types of star is there no fusion?

Put ticks (✓) in the boxes next to the **two** correct answers.

red giant ☐

neutron star ☐

white dwarf ☐

supergiant ☐

red supergiants ☐

[2]

[Total: 10]

END OF QUESTION PAPER

BLANK PAGE

PLEASE DO NOT WRITE ON THIS PAGE

BLANK PAGE

PLEASE DO NOT WRITE ON THIS PAGE

PLEASE DO NOT WRITE ON THIS PAGE