OXFORD

INTERNATIONAL AQA EXAMINATIONS

Topic Test: OxfordAQA International GCSE Physics 9203

Space physics

Name: _____

Class: _____

Date: _____

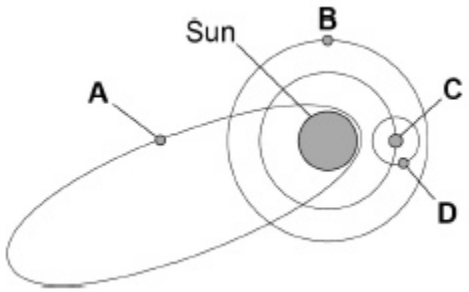
Time: **33 minutes**

Marks: **33 marks**

Comments:

1 **Figure 1** shows the orbits of some objects in the solar system.

Figure 1



(a) Which object is a comet?

Tick **one** box.

A		B		C		D	

(1)

(b) Which object is a moon?

Tick **one** box.

A		B		C		D	

(1)

(c) Complete the sentences.
Use words from the box.

galaxy	moon	planet	star

The Milky Way is a _____ .

The Sun is a _____ .

(2)

Saturn is a planet that has many moons in orbit around it.

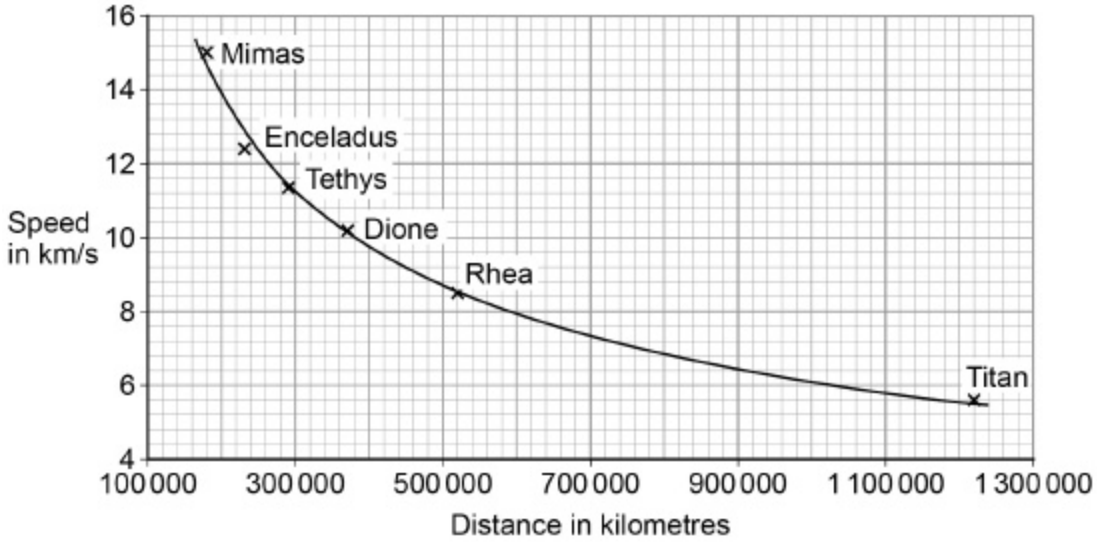
(d) What is the name of the force that causes a moon to orbit Saturn?

_____

(1)

Figure 2 shows how speed varies with distance from the centre of Saturn for Saturn's largest moons.

Figure 2



(e) Saturn has a smaller moon called Methone which is not shown on **Figure 2**.

The distance between Methone and the centre of Saturn is 200 000 km.

Determine the speed of Methone.

_____

_____

speed = _____ km/s

(1)

(f) Determine the difference in speed between Titan and Rhea.

_____

_____

Difference in speed = _____ km/s

(2)

(Total 8 marks)

2 Stars go through a life cycle. About 90 % of all stars are in the 'main sequence' period of the life cycle.

(a) Stars are stable during the 'main sequence' period of the life cycle.

Why?

_____

_____

(1)

(b) The table gives an estimated time for the number of years that three stars, **X**, **Y** and **Z**, will be in the 'main sequence' period of their life cycle.

Star	Relative mass of the star compared to the Sun	Estimated 'main sequence' period in millions of years
X	0.1	4 000 000
Y	1.0	9 000
Z	40.0	200

(i) This data suggests that there is a pattern linking the mass of a star and the number of years the star is in the 'main sequence' period of its life cycle.

What is the pattern suggested by the data?

_____

_____

(1)

(ii) Scientists cannot give the exact number of years a star will be in the 'main sequence' period.

Suggest why.

_____

_____

(1)

(iii) Nuclear fusion is the process by which energy is released in stars.

Which **one** of the following can be concluded from the data in the table?

Draw a ring around the correct answer in the box to complete the sentence.

The rate of nuclear fusion in a large star is

faster than
the same as
slower than

in a small star.

Explain the reason for your answer.

_____

_____

_____

_____

(3)

(c) *In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate*.

Describe what happens to a star **much bigger** than the Sun, once the star reaches the end of the 'main sequence' period of its life cycle.

Your answer should include the names of the stages the star passes through.

_____

_____

_____

_____

_____

_____

_____

_____

(6)

(Total 12 marks)

3 The 'Big Bang' theory is one theory of the origin of the Universe.

(a) (i) Explain what is meant by the 'Big Bang' theory.

_____

_____

_____

_____

(2)

(ii) The light arriving from distant galaxies provides scientists with evidence to support the 'Big Bang' theory.

Explain how.

_____

_____

_____

_____

(2)

(b) At a meeting held in 2005, a group of scientists claimed that new data had been collected that showed the 'Big Bang' theory to be wrong. Other scientists said that there was no reason to doubt the 'Big Bang' theory.

What should scientists do when a theory does **not** appear to be supported by new data?

_____

_____

_____

_____

(2)

(c) Scientists can answer many questions about the Universe, but not the question:

Why was the Universe created?

Suggest a reason why this question **cannot** be answered by scientists.

_____

_____

(1)

(Total 7 marks)

4 (a) Explain how stars produce energy.

_____

_____

_____

_____

(2)

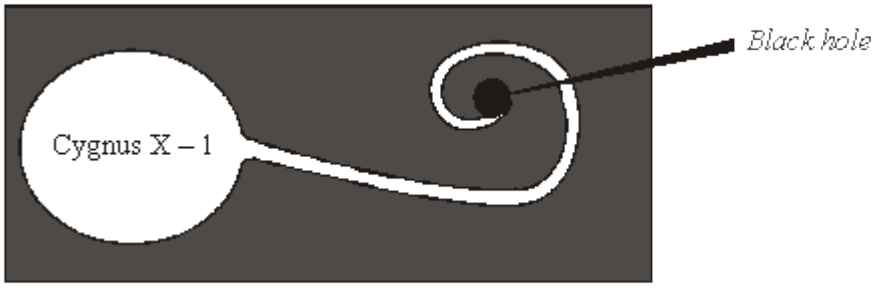
(b) What evidence is there to suggest that the Sun was formed from the material produced when an earlier star exploded?

_____

_____

(1)

(c) It is thought that gases from the massive star Cygnus X-1 are spiralling into a black hole.



(i) Explain what is meant by the term *black hole*.

_____

_____

(2)

(ii) What is produced as the gases from a star spiral into a black hole?

_____

(1)

(Total 6 marks)

1

(a) A

1

(b) D

1

(c) galaxy

1

star

1

(d) gravitational force

allow gravity

1

(e) 13.8 (km/s)

allow 13.6−14.0

1

(f) 5.6 **and** 8.6

allow ± half a small square on each reading

1

8.6 − 5.6 = 3.0 (km/s)

allow correct subtraction of their values

1

[8]

2

(a) forces (within the star) are balanced

if specific forces are mentioned they must be appropriate

1

(b) (i) bigger the mass (of the star) the shorter the 'main sequence' period

accept bigger the star the shorter the time

1

(ii) any **one** from:

- insufficient evidence
- do not know (exact) amount of hydrogen in star

  accept do not know (exact) mass of star
- time too long (to measure directly)
- may be other factors (not yet known) that determine length of 'main sequence' period
- values are based on theory / calculation

1

(iii) faster than

1

larger stars have a shorter ‘main sequence’ period so they must have the faster (rate of) nuclear fusion

there must be a link between shorter ‘main sequence’ and nuclear fusion, this may be implied from the first marking point

1

the end of ‘main sequence’ happens as the hydrogen in (the core of) a star is used up

or

(since) they use up hydrogen at a faster (rate)

accept more massive stars (are brighter so) release energy faster

1

(c) Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information in the Marking guidance, and apply a 'best-fit' approach to the marking.

0 marks
No relevant content.

Level 1 (1-2 marks)
There is a basic description of what happens to a star much larger than the Sun after the 'main sequence' period.
OR
Two stages are correctly named and are in the correct sequence.

Level 2 (3-4 marks)
There is a clear description of what happens to a star much larger than the Sun after the 'main sequence' period.
AND
At least two stages are correctly named and are in the correct sequence.

Level 3 (5-6 marks)
There is a detailed description of what happens to a star much larger than the Sun after the 'main sequence' period.
AND
At least three stages are named, in the correct sequence. There are no additional incorrect stages given.

Examples of the points made in the response:

extra information

- (the core of the) star runs out of hydrogen
- (the star) expands (to form)
- (the star) cools (to form)
    - *the core shrinks*
    - *helium starts to fuse to form other elements*
- a red supergiant

  accept super red giant
  *do **not** accept red giant*

    - (outer layers) explode
        - *fusion of lighter elements to form heavier elements (up to iron)*
- as a supernova
    - elements heavier than iron are formed

      accept heaviest elements are formed

    - core shrinks
- becoming a neutron star

- if mass large enough (core collapses)

- (to form) a black hole

if a correct description and sequence for a star the same size as the Sun and much bigger than the Sun given without clearly indicating which is which is limited to Level 2

6

[12]

3 (a) (i) Universe began at a (very) small (initial) point

'it' refers to Universe

1

'explosion' sent matter outwards
or
'explosion' causing Universe to expand

accept gas / dust for matter

accept rapid expansion for explosion

1

(ii) light shows a red shift

owtte

the term red shift on its own does not score a mark

1

galaxies moving away (from the Earth)

'it' refers to light

'they' refers to galaxies

accept star for galaxy

*do **not** accept planet for galaxy*

1

(b) check reliability / validity of data

accept check data

accept collect more data

1

amend theory
or
discount the data

accept replace old theory with new theory

1

(c) answer involves (religious) belief
or
no / insufficient evidence

accept it cannot be tested

1

[7]

4 (a) any **two** from:

- nuclei / atoms of light elements fuse

  accept hydrogen or helium for light elements
  accept join for fuse
  *accept for **1** mark, by nuclear fusion*
  answers about fission negates a mark

- each (fusion) reaction releases energy / heat / light

- lots of reactions occur

2

(b) presence of nuclei of the heaviest / heavy / heavier elements

accept atom for nuclei

1

(c) (i) (matter / mass) with such a high density / strong gravitational (field)

1

electromagnetic radiation / light is pulled in

accept nothing can escape
*do **not** accept answers in terms of an empty void*

1

(ii) X-rays

accept e-m radiation / e-m waves

1

[6]