AQA GCSE PHYSICS (HIGHER) · 8463

PHYSICS



MARK SCHEME

4.8.1 SOLAR SYSTEM, STABILITY OF ORBITAL MOTIONS AND SATELLITES (PACK 2)

SCORE	PERCENTAGE
/39	%

STEMUP

These questions belong to AQA, not to us.

The examination questions, mark schemes and examiner comments in this pack were written and published by AQA. They are past assessment materials, reproduced here so that students can revise from them.

What we do not own

STEMUP is not affiliated with AQA and does not own, and makes no claim to own, any of the question, mark scheme or examiner report material in this pack. AQA has not endorsed, approved or been involved in the production of it. AQA and the qualification titles used here belong to their respective owners and appear for identification only.

Where to find the originals

AQA publishes its past papers, mark schemes and examiner reports. Always check the current specification at aqa.org.uk before you revise, because content and wording can change between series.

If you hold the rights to any material in this pack and would like it amended or removed, contact admin@stemup.co.uk and we will act on it.

Q1.

(a) (i) any **two** from

(matter from) exploded star / supernova

matter so dense / gravity so strong

that electromagnetic radiation / light cannot escape from it

2

(ii) X-rays emitted

1

when gases or matter released from nearby stars spiral into it

1

(b) fusion (of nuclei)

1

of lighter elements / hydrogen helium

1

[6]

Q2.

Quality of written communication: One mark for using correct scientific sequence : gravity → fusion → balance

1

any **four** from

- (dust and gas) pulled together by gravity
- (star formed when) it is hot enough
  accept (as mass is pulled together) it gets very hot
- hydrogen (and helium) nuclei fuse
- (these nuclear fusion reactions) release the energy / heat / light (which is radiated by stars)
- energy causes expansion
- gravitational pull is balanced by the expansion (force)

4

[5]

Q3.

(a) materials produced when earlier stars exploded

accept the Sun is a second generation star

accept formed from nebulae

1

STEMUP.CO.UK

(b) **Quality of written communication:**
1 mark for correct sequencing balanced forces → expansion → contraction / explosion

1

any **five** from

gravity pulling matter together

accept idea that a star is very massive so its force of gravity is very strong

high temperatures that create expansion forces

nuclear fusion releases energy that causes the very high temperatures

these forces balance

star expands greatly

since expansion is greater than gravity

accept fuel runs out

forms a red giant

give no further marks if red giant → white dwarf, red dwarf etc

collapses inwards and explodes outwards

called a supernova

neutron star may form

leaves a small, dense object (a black hole)

accept nothing can escape from it

5

[7]

Q4.

any **one** of

* between (stage) 2 and (stage) 3
* (in) the main sequence
* (in) the main stable period
* (it is a) yellow dwarf

[1]

Q5.

(a) *evidence of conclusion* 4 × 1.007825 **or** 4.0313

each gain 1 mark

based on use of data that there is a (very small) loss of mass
or 0.0276 **but** a loss of mass of 0.0276 **for every helium atom or** 0.69%/0.7%

gains 3 marks

3

STEMUP.CO.UK

(b) *idea that* loss of mass results in release of energy
gains 1 mark

but small loss of mass results in huge energy release
gains 2 marks

2

[5]

Q6.

(a) it use $E = mc^2$

mass in kg i.e. $0.001 \times \frac{0.7}{100}$

each gains 1 mark

but 000007
gains 2 marks

2.1×10^3
gains 3 marks

evidence of 0.000007

mass in kg (i.e. 0.0007 **or** 0.7/100000)
each gains 1 mark

squaring the speed of light
but 6.3×10^{11} *(credit alternative ways of stating this)*
gains 3 marks

units J/joule
for 1 further mark

(N.B credit kJ, MJ, GJ but check power of 10 for full credit)

4

(b) (i) *idea that* the bigger the mass the shorter the life
gains 1 mark

but *idea that* decrease in life is much more than proportional to increase in mass
or more than proportional to $mass^2$
gains 2 marks

2

(ii) *ideas that*:
greater mass means greater **core** temperature/pressure
greater core temperature/pressure means greater rate of fusion
increase in mass produces a proportionally much greater increase in the rate of fusion
each for 1 mark

3

STEMUP.CO.UK

[9]

Q7.

ideas that

- formed from dust/gases
- pulled together by gravity
- massive so very large gravitational forces (pulling inwards)
- hydrogen → helium / fusion releases energy [<u>not</u> fission or just 'nuclear']
- high temperature creates high pressure (pushing outwards)
- long period when forces balance
- then expands → red giant / red star
- then contracts to (dense) white dwarf / white star

[<u>credit</u> if massive enough / more massive than sun, red giant → supernova → (very dense) neutron star but do not accept w.r.t. Sun itself]
[The whole of the (non bracketed part of) each idea <u>must</u> be present in some appropriate for in of words for each mark to be credited. To gain more than a single mark ideas must also be in correct sequence and/or appropriately related.]

any six 1 mark each

[6]

STEMUP.CO.UK