

## Mark schemes

### Q1.

- (a) nucleus 1
- neutron 1
- gamma rays 1
- in this order only*
- (b)  $\frac{25\,000\,000}{2\,400\,000}$  1
- 11
- an answer of 10.4 with no working scores 1 mark*
- an answer of 11 scores 2 marks*
- (c) any **two** from:
- waste is radioactive  
*allow nuclear waste*
  - waste has a long half-life  
*allow waste remains dangerous for a long time*
  - waste is toxic
  - waste needs to be buried  
*allow waste is difficult to dispose of*
  - risk of catastrophic accidents  
*allow named accident e.g. Fukushima, Chernobyl, Three Mile Island*
  - fuel is non-renewable
- 2
- (d) **similarity:**  
(carbon dioxide concentration and global temperature have) both increased  
*allow they both show a positive correlation*
- 1
- difference:**  
the carbon dioxide (concentration) continues to increase whereas temperature (increase) levels off  
*allow carbon dioxide (concentration) increases more quickly than temperature (increase)*
- 1

**Q2.**

(a) any **three** from:

- no carbon dioxide emitted (to produce electricity)  
*no greenhouse gases is insufficient*
- doesn't cause global warming  
*allow climate change or greenhouse effect for global warming*
- nuclear power doesn't cause earthquakes
- more energy released per kg of fuel (compared to shale gas)

3

(b) uranium  
**or**  
plutonium

*ignore any numbers given*

1

(c) a neutron is absorbed by a (large) nucleus

*a description in terms of only atoms negates first two marking points*

1

the nucleus splits into two (smaller) nuclei

1

releasing energy (and gamma rays)

1

and (two / three) neutrons

1

**[8]**

**Q3.**

(a) a uranium nucleus

1

absorbs a neutron

1

(uranium-236 nucleus) splits into two smaller nuclei

**or**

Kr and Ba nuclei

**or**

krypton and barium nuclei

1

and releases 3 neutrons and energy

1

(b) light nuclei

1

join to form a heavier nucleus

*allow hydrogen nuclei for light nuclei*

*allow helium nucleus for heavier nucleus*

1

(some of the) mass of the nuclei is converted to energy  
*allow particles for nuclei*

1

(c) any **two** from:

- easy to obtain / extract
  - available in (very) large amounts
  - releases more energy (per kg)
- do **not** accept figures **only***  
*naturally occurring is insufficient*  
*seawater is renewable is insufficient*  
*less cost is insufficient*  
*allow produces little / no radioactive waste*

2

[9]

**Q4.**

(a) neutrons

1

(b) generate electricity

*accept produce electricity*  
*accept heat water*  
*accept produce steam*  
*turns turbines is insufficient*

1

(c) (i) a neutron

1

(ii) two particles **X** released from the uranium-235

1

uranium-235 shown splitting into two fragments

**or**

each particle **X** shown colliding with a uranium-235 and producing 2 further particles **X**

*one uranium-235 shown splitting is sufficient, provided no contradiction shown*

1

[5]

**Q5.**

(a) (i) (enough) dust and gas (from space) is pulled together

*accept nebula for dust and gas*  
*accept hydrogen for gas*  
*accept gas on its own*  
*dust on its own is insufficient*  
*mention of air negates this mark*

1

by:  
gravitational attraction  
**or**  
gravitational forces  
**or**  
gravitaty

*ignore any (correct) stages beyond this*

1

(ii) joining of two (atomic) nuclei (to form a larger one)  
*do not accept atoms for nuclei*

1

(iii) more sensitive astronomical instruments / telescopes  
**or**  
infrared telescopes developed  
*accept better technology*  
*more knowledge is insufficient*

1

(b) (i) (other) planets / solar systems  
*do not accept galaxy*  
*moons is insufficient*

1

(ii) provided evidence to support theory  
*accept proves the theory*

1

(c) elements heavier than iron are formed only when a (massive) star explodes  
*accept materials for elements*  
*accept supernova for star explodes*  
*accept stars can only fuse elements up to (and including)*  
*iron*

1

[7]

### Q6.

(a) (i) (atoms with the) same number of protons  
*allow same atomic number*  
**or** *same proton number*

1

(atoms with) different number of neutrons  
*allow different mass number*

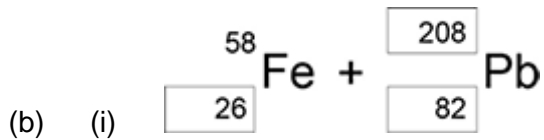
1

(ii) 82

1

(iii) 124

1



1 mark for each correct box

3

(ii) (a) neutron

1

(iii)  $4.0 \times 10^{-4}$  (s)

or

0.0004

$$3.00 \times 10^8 \times 0.1 = 12\,000 / t$$

*gains 1 mark*

2

(iv) particles need to travel a large distance

1

equipment would have to be very long

1

with circular paths long distances can be accommodated in a smaller space

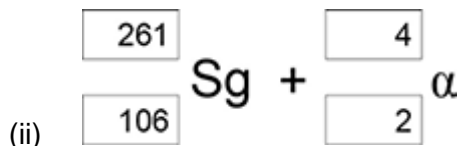
1

(c) (i) the average time for the number of nuclei to halve

1

the time for count rate to halve

1



1 mark if top boxes total = 265

**and** bottom boxes total = 108

1 mark for 4 and 2 for alpha

2

(d) (i) 3 plotted points

$\pm \frac{1}{2}$  small square

1

best line through points

1

- (ii) 190–205 (pm)  
*or correct from student's line*

1  
[20]

**Q7.**

- (a) inside the Sun  
  
(b) fusion  
  
(c) energy

1  
  
1  
  
1  
[3]

**Q8.**

- (a) (i) splitting of a(n atomic) nucleus  
*do not accept splitting an atom*  
  
(ii) Neutron  
  
(b) (i) nuclei have the same charge  
**or**  
nuclei are positive  
*accept protons have the same charge*  
  
(ii) (main sequence) star  
*accept Sun or any correctly named star*  
*accept red (super) giant*  
  
(c) (i) any **two** from:  
• easy to obtain / extract  
• available in (very) large amounts  
• releases more energy (per kg)  
*do not accept figures only*  
• produces little / no radioactive waste.  
*naturally occurring is insufficient*  
*seawater is renewable is insufficient*  
*less cost is insufficient*  
  
(ii) any **one** from:  
• makes another source of energy available  
• increases supply of electricity  
• able to meet global demand  
• less environmental damage  
• reduces amount of other fuels used.  
*accept any sensible suggestion*  
*accept a specific example*

1  
  
1  
  
  
  
1  
  
  
  
  
1  
  
2

*accept a specific example*

1

(d) 12

*allow 1 mark for obtaining 3 half-lives*

2

[9]

**Q9.**

(a) J

*reason only scores if J is chosen*

1

(only) stars (about) the same / smaller size / mass as the Sun become black dwarfs

*accept smaller than the Sun*

*accept it is the smallest*

*accept (only) small stars become black dwarfs*

1

(b) (i) become a supernova  
**or**  
it will explode

*ignore subsequent correct stages*

1

(ii) cannot take measurements needed  
**or**  
do not have the technology

*do **not** accept cannot measure mass*

1

(iii) advances in (measuring) techniques / technology / knowledge

1

(c) any **five** from:

*ignore any information up to the end of the main sequence*

*Apply the list rule if more than 5 points are made*

- star expands (to become)
- a red giant

*red supergiant is incorrect*

- heavier elements are formed (by fusion)

*elements heavier than iron are formed is incorrect*

- star shrinks (to become)
- a white dwarf

*supernova, neutron star, black hole are incorrect*

- star cools / fades
- star stops emitting energy / radiation

*star loses all energy is insufficient*

5

[10]

**Q10.**

(a) (same) number of protons  
*same atomic number is insufficient* 1

(b) (i) nuclei split  
*do **not** accept atom for nuclei / nucleus* 1

(ii) (nuclear) reactor 1

(c) beta 1

any **one** from:

- atomic / proton number increases (by 1)  
*accept atomic / proton number changes by 1*
- number of neutrons decreases / changes by 1
- mass number does not change  
*(total) number of protons and neutrons does not change*
- a neutron becomes a proton

1

(d) (average) time taken for number of nuclei to halve  
**or**  
(average) time taken for count-rate / activity to halve 1

(e) (i) 6.2 (days)  
*Accept 6.2 to 6.3 inclusive*  
*allow 1 mark for correctly calculating number remaining as 20 000*  
**or**  
*allow 1 mark for number of 80 000 plus correct use of the graph (gives an answer of 0.8 days)* 2

(ii) radiation causes ionisation  
*allow radiation can be ionising* 1

that may then harm / kill healthy cells  
*accept specific examples of harm, eg alter DNA / cause cancer* 1

(iii) benefit (of diagnosis / treatment) greater than risk (of radiation)  
*accept may be the only procedure available* 1

[11]

### Q11.

(a) (i) nuclear reactor 1



star

1

- (ii) nuclei are joined (not split)  
*accept converse in reference to nuclear fission*  
*do **not** accept atoms are joined*

1

- (b) (i) any **four** from:

- neutron
- (neutron) absorbed by U (nucleus)  
*ignore atom*  
*do **not** accept reacts*  
*do **not** accept added to*
- forms a larger nucleus
- (this larger nucleus is) unstable
- (larger nucleus) splits into two (smaller) nuclei / into Ba and Kr
- releasing three neutrons and energy  
*accept fast-moving for energy*

4

- (ii) 56 (Ba)

1

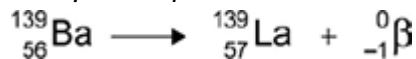
57 (La)

*if proton number of Ba is incorrect allow 1 mark if that of La is 1 greater*

1



*accept e for  $\beta$*



*scores 3 marks*

1

[10]

## Q12.

- (a) uranium-235

*accept any correct indication*

1

- (b) splits / breaks (into two smaller parts)

*nucleus is separated is insufficient*

*do **not** accept atom splits – on its own*

1

and (two / three) neutrons

1

- (c) steam

*correct order only*

1

turbine

1

generator

1

[6]

**Q13.**

(a) (i) plutonium (239)

*accept Pu / Thorium / MOX (mixed oxide)*  
*do **not** accept uranium-238 **or** hydrogen*

1

(ii) (energy) used to heat water and

1

produce (high pressure) steam

1

the steam drives a turbine (which turns a generator)

1

(b) Neutron(s) shown 'hitting' other U-235 nuclei

*one uranium nucleus is sufficient*

1

U-235 nuclei (splitting) producing 2 or more neutrons

1

(c) any **two** from:

- neutrons are absorbed (by boron / control rods)
- there are fewer neutrons
- chain reaction slows down / stops  
*accept fewer reactions occur*

2

[8]

**Q14.**

(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]

**Q15.**

(a) fusion

*do **not** credit any response which looks like 'fission'*

1

of hydrogen / H (atoms)

*credit only if 1<sup>st</sup> mark point scores*

1

(b) fusion of other / lighter atoms / elements

*reference to big bang nullifies both marks*

1

during supernova / explosion of star(s)

1

(c) the (available) evidence: supports this idea

**or**

does not contradict this idea

**or**

can be extrapolated to this idea

**or**

(electromagnetic) spectrum from other stars is similar to sun

**Q16.**

- (a)
- answers must be in terms of nuclear fuels*

concentrated source of energy

*idea of a small mass of fuel able to generate a lot of electricity*

1

that is able to generate continuously

*accept it is reliable**or can control / increase / decrease electricity generation**idea of available all of the time / not dependent on the weather**ignore reference to pollutant gases*

1

the energy from (nuclear) fission

1

is used to heat water to steam to turn turbine linked to a generator

1

- (b)
- carbon dioxide
- is not released (into the atmosphere)

1

but is (caught and) stored (in huge natural containers)

1

[6]

**Q17.**

- (a) (i) (nuclear) fission is the splitting of a (large atomic) nucleus

*do not accept particle/atom for nucleus*

1

(nuclear) fusion is the joining of (two atomic) nuclei (to form a larger one)

*do not accept particles/atoms for nuclei*

1

- (ii) energy

*accept heat/radiation/nuclear energy**accept gamma (radiation)**do not accept neutrons/neutrinos*

1

- (b) (i) uranium (-235)

*accept U (-235)**ignore any numbers given with uranium**accept thorium**accept MOX (mixed oxide)**do not accept hydrogen*

- (ii) (same) number of protons  
*accept (same) atomic number*  
*accept (same) positive charge*  
*ignore reference to number of electrons*

1

[5]

**Q18.**

- (a) (i) protostar  
*correct order only* 1
- red giant 1
- black dwarf 1
- (ii) Alpha Centauri A  
*accept any correct indication, eg alpha, centauri, A*  
*reason only scores if Alpha Centauri A is chosen* 1
- stars (about) same size as Sun form white / black dwarfs  
**or**  
 very large stars form red super giants / supernova/black hole  
*it is the same size as the Sun is insufficient*  
*same life cycle as the Sun is insufficient* 1
- (b) Atomic nuclei inside the star join together 1

[6]

**Q19.**

- (a) a protostar is at a lower temperature  
**or**  
 a protostar does not emit radiation /energy 1
- as (nuclear) fusion reactions have not started  
*accept heat or light for energy* 1
- (b) by (nuclear) fusion  
*accept nuclei fuse (together)*  
*nuclear fusion and fission negates this mark* 1
- of hydrogen to helium 1

elements heavier than iron are formed in a supernova

*accept a specific example e.g. heavier elements such as gold are formed in a supernova*

*accept heavier elements (up to iron) formed in red giant/red super giant*

*reference to burning (hydrogen) negates the first 2 marks*

1

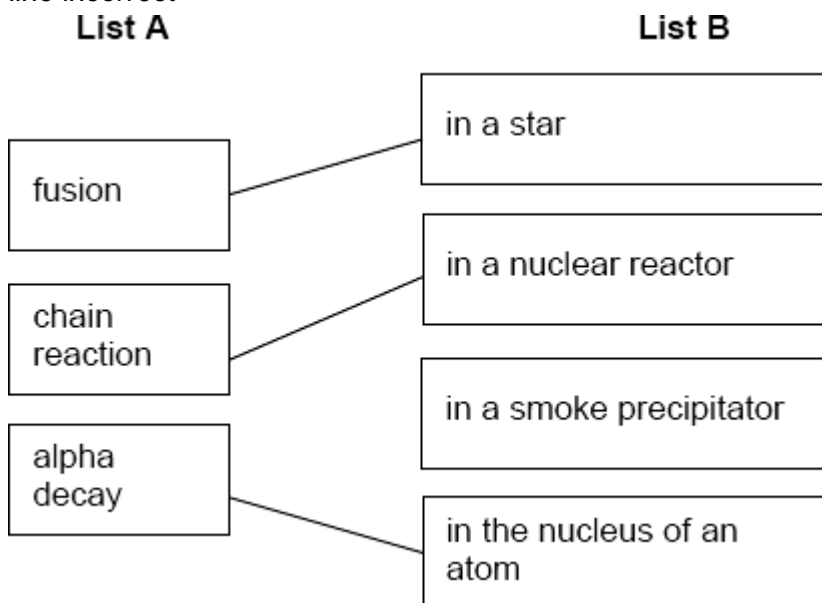
[5]

### Q20.

three lines correct

*allow 1 mark for each correct line*

*if more than 1 line is drawn from a box in **List A**, mark each line incorrect*



[3]

### Q21.

(a) gravitational attraction

*accept 'gravity'*

*accept (nuclear) fusion*

1

(b) radiation 'pressure' and gravity / gravitational attraction

*must be in correct context*

1

are balanced / in equilibrium

*accept are equal and opposite*

*do **not** accept 'equal'*

**or**

there is sufficient / a lot of hydrogen / fuel

*do **not** accept constant supply of hydrogen*

to last a very long time / for (nuclear) fusion

*this mark only scores if linked to the supply of hydrogen / fuel  
reference to burning negates both marks*

1

- (c) (i) (conversion of) hydrogen to helium  
*accept (conversion of) lighter elements to heavier elements*

1

by (nuclear) fusion  
*note do **not** credit spelling of 'fusion' which could be 'fission'  
reference to burning negates both marks*

1

- (ii) massive supply / lots of hydrogen

1

- (d) distributed throughout the Universe / space  
*do **not** accept Solar System for Universe*

1

[7]

## Q22.

beta

*reason may score even if alpha or gamma given*

1

any **two** from:

- mass number does not change  
**or**  
total number of protons and neutrons does not change
- atomic / proton number increases by 1  
**or**  
number of protons increases by 1
- number of neutrons goes down by 1  
*allow for **2** marks a neutron splits / changes into a proton and  
electron / beta  
candidates that answer correctly in terms of why alpha **and**  
gamma are not possible, gain both marks*

2

[3]

## Q23.

- (a) (forces due to) gravity and radiation pressure

1

correct direction of forces

1

(forces) are balanced / equilibrium / equal  
*accept for **3** marks an answer in terms of  
sufficient hydrogen (1)*



*to keep fusion reaction (1)*  
*reference to burn / burning negates this mark*  
*going at a continuous /steady rate (1)*  
*if fuel is used instead of hydrogen maximum of 2 marks*

1

- (b) the Sun will remain stable (for several billion years)

1

based on evidence

*accept a specific example of evidence*  
*eg that the Sun has remained stable during the life of our planet / for 4.5 billion years*

**or**

*still contains more than 50 % hydrogen*

**or**

*by comparison with the lifecycle of (similar) stars*

*allow a refutation*

*eg not based on prejudice / whim / hearsay / folk law / historical or religious authority*

1

[5]

#### Q24.

- (a) (i) (two) nuclei (of light elements) join  
*accept hydrogen atoms for nuclei*

1

forming a larger / heavier nucleus / one

*accept comparative term equivalent to larger*

*accept forms a helium (nucleus / atom) this mark only scores if fusion is in terms of hydrogen atoms*

1

- (ii) stars

*accept a named star*

*e.g. the Sun*

*accept nebula*

*mention of planets negates answer*

1

- (b) (i) any **one** from:

- (currently) only experimental
- reaction does not last long enough
- use more energy than they produce  
*allow difficult to control*  
*do **not** allow inefficient on its own*

1

- (ii) any **one** from:

- will give another source of energy
- unlimited fuel supplies / energy  
*accept unlimited hydrogen*
- would not produce any radioactive waste  
*accept less radioactive waste*  
*accept nuclear for radioactive*  
*do **not** accept toxic waste*
- want to show that it can be done  
*accept any sensible suggestion*  
*do **not** accept answers only in terms of fossil fuels or carbon dioxide*

1

[5]

**Q25.**

- (a) gravitational force(s) (1)  
*accept 'gravity'*

balanced by (force(s) due to) radiation pressure (1)  
*accept equal*

2

- (b) by (nuclear) fusion (1)

of hydrogen to helium (other light elements) (1)  
*allow 'low density' for light*  
*accept hydrogen nuclei / atoms form helium*  
*response must clearly link one element(s) producing others*  
*fusion to produce helium (2)*

heavy element / elements heavier than iron are only produced (by fusion) in a supernova (1)

*allow dense for heavy*  
*ignore any reference to elements undergoing radioactive decay (to form other elements)*

3

[5]

**Q26.**

- (a) isotopes

1

- (b)  ${}_{90}^{231}\text{Th}$

1

*correct order only*

1

- (c) (i) (nuclear) fission

*accept fision*

*do **not** accept any spelling that may be confused with fusion*

1

(ii) neutron / neutrons

1

(d) plutonium (239)

*accept MOX (mixed oxide)*

*accept Pu*

*do **not** accept uranium 238 / hydrogen*

1

[6]

**Q27.**

(a) (enough) dust and gas (from space)

*accept nebula for dust and gas*

*accept hydrogen for gas*

*mention of air negates this mark*

1

pulled together by:

- gravitational attraction
- **or**
- gravitational forces
- **or**
- gravity

1

(b) forces (in the star) are balanced

*accept equal and opposite for balanced*

*accept in equilibrium for balanced*

1

forces identified as gravity and radiation pressure

*both forces are required*

*gravitational forces inwards balance / equal radiation pressure outwards for **2** marks*

*accept for **2** marks an answer in terms of sufficient hydrogen to keep the fusion reactions going*

*accept for **1** mark an answer in terms of sufficient fuel to keep the fusion reactions going*

1

(c) (explodes as) a supernova

1

any **one** from:

- outer layer(s) thrown into space  
*do **not** accept just 'thrown into space'*
- scatters dust and gas into space (for the formation of new stars)

do **not** accept just 'dust and gas'

- elements distributed throughout space  
do **not** accept just 'distributed'
- matter left behind / core may form a neutron star  
do **not** accept just 'neutron star'
- a black hole will form if the gravitational forces are enormous / sufficient mass is left behind  
do **not** accept just 'black hole'  
do **not** accept any references to 'dark bodies' or 'black dwarfs'  
black hole forms if star is large enough is insufficient

1

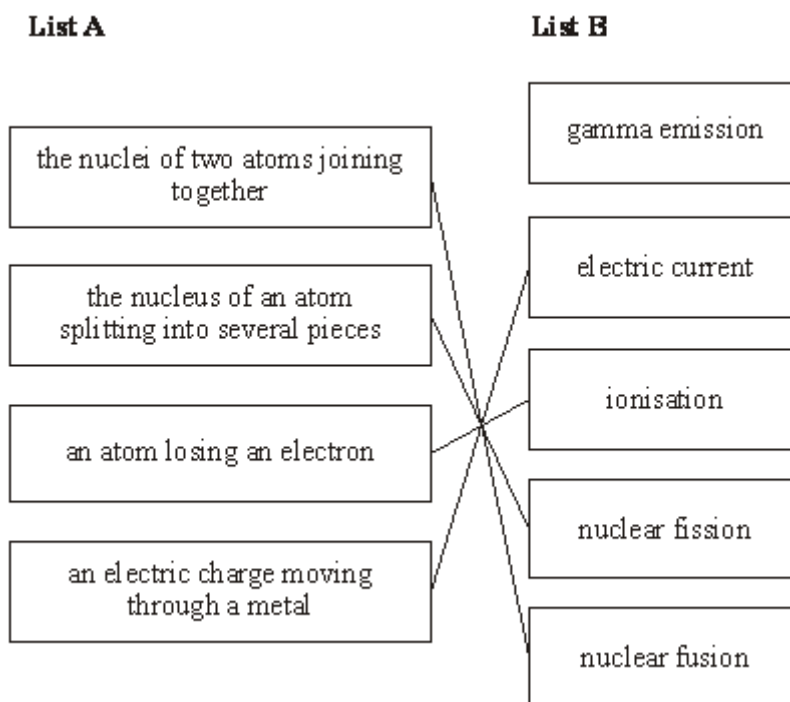
[6]

### Q28.

four lines correct

allow 1 mark for each correct line

if more than 1 line is drawn from a box in List A, mark each line incorrect



[4]

### Q29.

(a) fusion (1)

of hydrogen/H (atoms)(1)

do **not** credit any response which looks like 'fission' or the 'word' 'fussion'

credit only if a nuclear reaction

- (b) fusion of other/lighter atoms/elements (1)  
*reference to big bang nullifies both marks*

during super nova/explosion of star(s) (1)

2

- (c) explosion of star(s)/super nova (1)  
*reference to big bang nullifies both marks reference to the star running out of energy/material nullifies both marks*

at the end of the 'life' of star(s) / when they 'die' (1)

2

[6]

### Q30.

(a)

Particle	Relative Mass	Relative charge
Proton	1	
Neutron		0

*accept one, accept +1  
do **not** accept -1*

1

*accept zero  
do **not** accept no charge/ nothing/neutral unless given with 0*

1

- (b) equal numbers/amounts of protons and electrons

1

protons and electrons have equal but opposite charge

*accept protons charge +1 and electron charge -1*

*accept (charge) on proton*

*cancels/balances (charge) on electron*

*accept positive (charges) cancel out the negative(charges)*

*neutrons have no charge is neutral*

*do **not** accept total charge of protons, electrons (and neutrons) is 0 unless qualified*

1

- (c) (i) (3) fewer neutrons

*accept lower/ smaller mass number*

*do **not** accept different numbers of neutrons*

*any mention of fewer/more protons/electrons negates mark*

*accept answers in terms of U-238 providing U-238 is*

*specifically stated i.e. U-238 has (3) more neutrons*

1

(ii) neutron

1

(iii) (nuclear) fission

*accept fision*

*do **not** accept any spelling that may be taken as fusion*

1

[7]

**Q31.**

(a) gravitational

*accept gravity*

*do **not** accept weight*

1

(b) (i) planet(s)

*accept comet(s)*

*accept asteroid(s)*

*do **not** accept moon(s)*

1

(ii) balanced

*accept equal / the same / are in equilibrium*

1

(iii) Milky Way

*accept milky way*

1

[4]

**Q32.**

(a) (i) the bigger the masses (of the dust and gases then) the bigger the force / gravity (between them)

*accept the converse*

1

(ii) the greater the distance (between the dust and gases then) the smaller the force / gravity (between them)

*accept the converse*

1

(b) radiation 'pressure' and gravity / gravitational attraction these are balanced / in equilibrium

1

*must be in correct context*

*do **not** accept are equal*

**or** there is sufficient / a lot of hydrogen / fuel to last a very long time

*second mark consequent on first*

1

- (c) any **two** from:
- hydrogen runs out / is used up
  - nuclei larger than helium nuclei formed  
*accept bigger atoms are formed however do **not** accept any specific mention of an atom with a mass greater than that of iron*
  - (star expands to) / become(s) a red giant

2

[6]

**Q33.**

- (a) (i) (nuclear) fission  
*accept fision providing clearly **not** fusion*
- 1
- (ii) (released) neutrons are absorbed by further (uranium) nuclei  
*accept hit nuclei for absorbed / hit  
do **not** accept atom for nuclei*
- 1
- more neutrons are released (when new nuclei split)  
*accept for **both** marks a correctly drawn diagram*
- 1
- (iii) increases by 1  
**or** goes up to 236
- 1

- (b) any **two** from:
- (more) neutrons are absorbed  
*accept there are fewer neutrons*
  - (chain) reaction slows down / stops  
*accept keeping the (chain) reaction controlled*
  - less energy released  
*accept heat for energy  
accept gases (from reactor) are not as hot*
- 2

[6]

**Q34.**

- (a) (a) supernova (explosion)
- 1
- (b) solar system contains heavy elements / elements heavier than hydrogen and helium (1)
- these (heavy) elements are / were formed by (nuclear) fusion (1)

*accept minor misspellings for 'fusion'  
but **not** anything which could also be 'fission'*

(at the very high temperature(s)) in a super nova / when stars explode (1)

3

[4]

**Q35.**

(a) dust

*accept 'solid (s)'*

1

space

*accept 'from supernova / supernovum / supernovas'*

1

(b) By atoms joining together

*only one ticked or otherwise unambiguously identified*

1

(c) Milky Way (galaxy)

1

(d) The answer depends on beliefs and opinions, not scientific evidence.

*only one ticked or otherwise unambiguously identified*

1

[5]