IGCSE (EDEXCEL) Physics : Stars 2 answers

Q1. (a)(i) arrow originating at object A and directed towards the star by eye;
arrow labelled gravitational (force);

(ii) D - (a planet);

(iii) A - (a comet)

(b) Gravity

(c) spectral class B to have any temperature higher than 5600 K;
spectral class M to have any temperature lower than 5600 K;

(d) star becomes a red (super) giant; (then) a supernova;
(leaving) a neutron star / black hole;

Q2. a description including any six from:

MP1. nebula collapses / forms protostar;

MP2. temperature / brightness of nebula / protostar increases;

MP3. (when temperature becomes hot enough) fusion starts and star becomes main sequence;

MP4. brightness / temperature of main sequence star depends on its mass;

MP5. (when hydrogen runs out) main sequence star becomes red giant;

MP6. red giants are brighter (than main sequence);

MP7. red giants (surfaces) are cooler (than most main sequence stars);

MP8. red giant becomes white dwarf;

MP9. white dwarfs are less bright (than red giant / main sequence stars);

MP10. white dwarfs are hotter (than red giant / most main sequence stars);

Q3. (a) Cosmic Microwave Background Radiation (CMBR)
(Cosmological) Red shift of galaxies

(b) CMBR. MAX TWO from

MP1 CMBR appears to be the same in all directions/is everywhere;

MP2 Which implies all parts of the Universe were in contact a long time ago;

MP3 Wavelength has increased as the universe has expanded;

MP4 universe was (significantly) hotter long ago;

Red Shift of Galaxies MAX TWO from

MP5 The further the galaxy is from Earth, the greater the red-shift;

MP6 The greater the red-shift, the faster the galaxy is moving away;

MP7 Speed of galaxies increases (is directly proportional to) with increased distance;

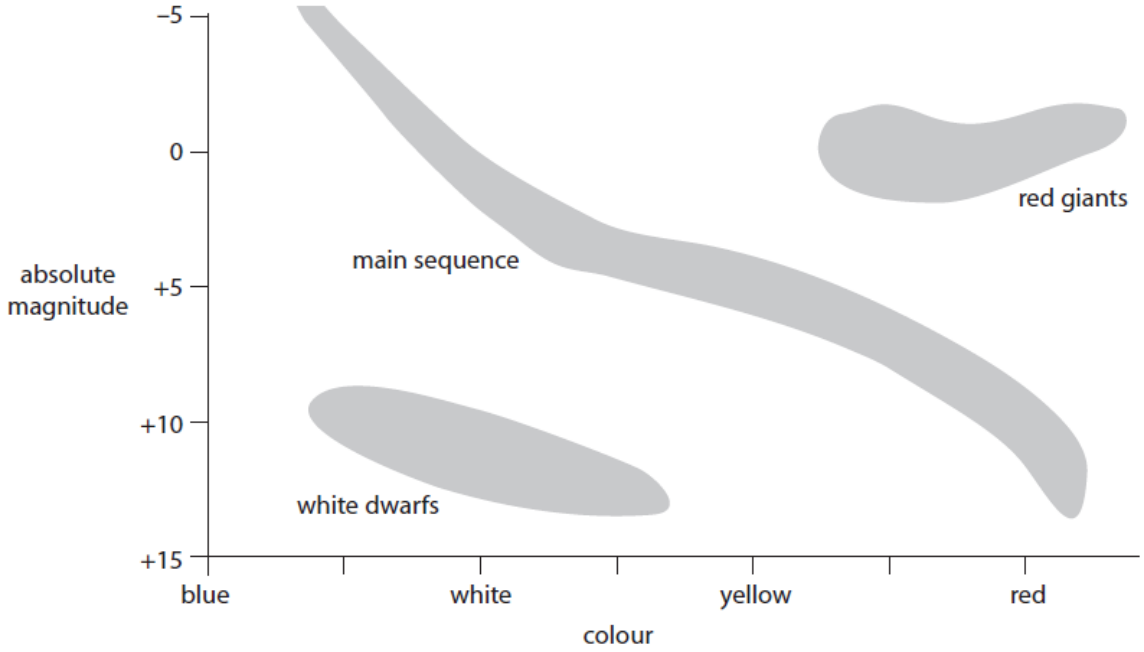
MP8 Relationship between speed and distance implies expansion from a single point or since the Big Bang;

(c) Universe began as hot / dense point;
Universe has expanded since the Big Bang;
Universe has cooled since the Big Bang;

Q4. arrow pointing from the comet to the star;
force labelled 'gravitational';

Q5.(a) M1 (a measurement of) the brightness (of a star);
M2 at a standard distance;

(b) correct absolute magnitude scale;
x-axis labelled 'colour';
main sequence top-left to bottom-right with clear flatter region in the middle;
white dwarf region in bottom-left corner with part of it in line with 'white' label on x-axis;
red giant region in top-right corner with part of it in line with 'red' label on x-axis;



Q6. B (decreases, increases);

Q7. (i) 10 (nm);
(ii) idea the speed of Q is double the speed of P;
(iii) 20 (nm);
(iv) any four from:
MP1. further / faster galaxy (Q) shows greater red shift;
MP2. further galaxy (Q) is travelling faster;
MP3. (which suggests) universe is expanding;
MP4. idea that at an earlier point in time;
MP5. the universe was a single point;

Q8. MP1 nebula/gas cloud;
MP2 protostar;
MP3 main sequence (then red supergiant);
MP4 supernova;
MP5 neutron star/ black hole;

Q9. (i) C (ii) D (iii) C (iv) A

Q10.(a) Universe; galaxy (milky way): Solar System;
(b) A
(c) 1 day = The time for the Earth to rotate once
1 year = The time for the earth to orbit the sun

Q11. (a) A (blue-white)

(b) any two from:
gas collapses / gas particles attract each other;
temperature (of the gas) increases;
fusion starts/eq;

(c) two (small) nuclei;
join together (to produce a large nucleus);
releasing energy;

(d) (i) C mass

(ii) any three from:
MP1. Rigel will become a red supergiant;
MP2. then contracts rapidly;
MP3. (explodes as a supernova) leaving a neutron star;
MP4. (or) black hole;

Q12.(a) any four correctly linked stages in star's evolution:
MP1. nebula to protostar;
MP2. protostar to main sequence;
MP3. main sequence to red giant;
MP4. red giant to white dwarf;
MP5. white dwarf to black dwarf;

(b) stars use fusion, reactor uses fission;
fusion detail e.g.;
(fusion is the) joining of nuclei
involves light nuclei e.g. hydrogen
fission detail e.g.;
(fission is the) splitting of nuclei
involves heavy nuclei e.g. uranium/plutonium

Q13.

Observation	Supports the Big Bang theory
Black holes are formed from extremely massive stars	
Cosmic microwave background radiation is seen in all directions	✓
Cosmic rays from space are detected at the Earth's surface	
Each galaxy contains billions of stars	
Most galaxies show a red-shift in the light detected from them	✓

1 mark for each correct tick;
-1 for each additional tick if more than two ticks seen 5 ticks scores zero

Q14.(a) W marked between +10 and +15 absolute magnitude and between blue and white/yellow colour marks;

(b) X marked between 0 and -5 absolute magnitude and between yellow/red and end of colour scale;

(c) Y marked above and to the left of the Sun;

(d) Z marked vertically in line with and below the Sun;

(e) Any one from:
MP1. idea that the Moon does not emit its own light;
MP2. Idea that the Moon is not a star
MP3. idea that the (surface) temperature of the Moon is too low / does not fit on the scale;