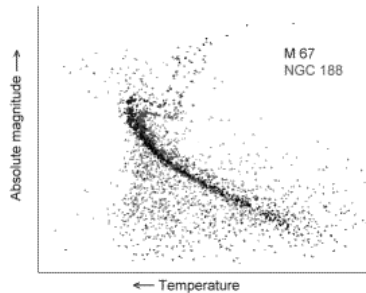


Let's Take Care Of This Turkey! (150,000 points) Multiple-Guess-Fill-In-The-Bubbles

The following use the H-R diagram for the two open clusters M67 and NGC188:

- 1.) Though it doesn't reproduce well in black & white, the M67 main sequence goes further up and to the left. This means that _____ is the older cluster.
 A - M67 B - NGC188 C - Neither, they are the same.

- 2.) The Main Sequence Turnoff occurs because...
A - higher mass stars have shorter lifetimes.
B - all the stars in a cluster are about the same age.
C - higher mass stars have already left the main sequence.
 D - All of the above. E - None of the above.

Select the Best Answer from the choices given:

- 3.) A stellar nursery is obscured in visible light by a gas cloud. If you wanted to try and observe hot young stars inside, you might try looking in the _____ part of the E-M spectrum.

A - X-ray.
B - UV (ultraviolet).
 C - IR (infrared).
 D - 21cm microwave.
 E - None of the above

- 4.) We talk about the high gravity of a white dwarf because of its...

A - massive size.
 B - strong "sucking" influence on matter.
 C - high luminosity.
D - small radius.
 E - None of the above

- 5.) Jupiter cannot become a star because...

A - it doesn't have enough mass.
 B - it doesn't contain any hydrogen.
 C - helium and methane in its atmosphere cannot fuse.
 D - All of the above.
 E - None of the above

- 6.) Wolf-Rayet (WR) stars are...

A - isolated "lone wolf" stars.
 B - red dwarf stars like nearby Wolf-359.
C - some of the largest, most massive unstable and/or variable stars.
 D - made out of a concentration of brown dwarfs.
 E - None of the above

- 7.) When plotting stars on an H-R diagram, we don't plot Luminosity Class because...

A - LC appears in the bands of stars which are plotted.

B - LC appears only in the mass of the star.
 C - it can't be measured.
 D - it doesn't matter.
 E - None of the above

- 8.) The difference between deuterium and tritium is the number of...

A - protons. B - neutrons.
 C - electrons. D - croutons.
 E - None of the above

- 9.) Hans Bethe won the Nobel Prize for proposing the carbon cycle for fusion in the core of the Sun. Except...

A - the carbon cycle works in hotter stars.
B - the Sun uses a proton-proton chain fusion.
C - he told a young Dr. Phil that he wasn't giving the Nobel Prize back just because the Sun doesn't use the carbon cycle.
D - All of the above.
 E - None of the above

- 10.) Our Sun is likely destined to end its life as a...

A - red giant.
 B - red dwarf.
C - white dwarf.
 D - protostar.
 E - None of the above

- 11.) VY Canis Major is a red star of Luminosity Class 0. That makes it _____ than the Sun.

A - hotter. B - larger.
 C - smaller. D - dimmer.
 E - None of the above

- 12.) Carbon-12 is assigned a mass of exactly 12.00000 in atomic mass units. That means that the mass of a single proton by itself...

A - is slightly bigger than 1.00000 amu.
 B - is slightly smaller than 1.00000 amu.
 C - is exactly 1.000000 amu.
 D - cannot be determined.
 E - None of the above

- 13.) All G2 main sequence stars ...

A - are the same.
 B - vary due to composition.
C - vary due to age.
D - both B and C.
 E - None of the above

- 14.) A possible large carbon diamond in the core of Jupiter makes it the same as the inert carbon core of a white dwarf star.

A - True. B - False.

- 15.) Globular cluster M4 turns off the main sequence on the H-R diagram near G2 stars like our Sun, meaning that its age is about...

A - no more than 100 million years.
 B - 5.5 billion years.
C - 10-13 billion years.
 D - 25 billion years.
 E - None of the above

- 16.) Mass determines...

A - what happens when a star collapses.
 B - where a star is located.
 C - whether a star has a companion star.
 D - All of the above.
 E - None of the above

- 17.) Brown dwarfs do not collapse because...

A - electron degeneracy prevents further collapse.
 B - fusion heat in the core keeps it inflated.
 C - fission heat in the core keeps it inflated.
 D - All of the above.
 E - None of the above

- 18.) M7 is an open star cluster of about 100 stars. The brightest star is a G8 yellow giant, the hottest main sequence star is of spectral type B6. This is consistent with an age estimated at 220 million years, because...

A - a G2 star like our Sun might become a G8 yellow giant.
 B - any hot O stars will not yet have stabilized.
C - any hot O stars would have moved off the main sequence.
 D - All of the above.

E - None of the above

- 19.) As bright supergiants age they...
 A - flare once, then settle back down into a long old age.
B - zig-zag along the H-R diagram as new elements begin to fuse.

C - maintain their color only.
 D - maintain their temperature only.
 E - None of the above

- 20.) We know fusion is still going on in the core of our Sun because ...

A - we can detect solar neutrinos.
 B - it's shining during the day.
 C - sunlight casts shadows.
 D - sunlight feels warm.
 E - None of the above

- 21.) Neutron stars do not collapse because...

A - electron degeneracy prevents further collapse.
 B - fusion heat in the core keeps it inflated.
 C - fission heat in the core keeps it inflated.
 D - All of the above.
E - None of the above

- 22.) Ancients viewed the Sun as powered by...

A - thermonuclear fusion.
 B - friction between the Sun and the Æther.
 C - hydrolysis of water.
D - burning coal or wood.
 E - None of the above

- 23.) 19th century astronomers thought that very slow gravitational contraction could keep the Sun shining for 25 million years. The problem with this was that rock and fossil research showed the Earth was _____ than 25 MY.

A - far older. B - just older.
 C - just younger. D - much younger.
 E - None of the above

- 24.) Two Helium-4 nuclei can fuse into a Beryllium-8 nucleus, but Beryllium-8 is an uncommon isotope because...

A - this nuclear reaction actually cannot occur.
B - Beryllium-8 can readily absorb another Helium-4 nucleus and become Carbon-12.
 C - Beryllium-8 is beyond the Iron Minimum.
 D - Beryllium-8 readily fissions into a Lithium-6 and a Hydrogen-2.
 E - None of the above

- 25.) A white dwarf star can steal matter from a close binary companion, because...

A - it's white.

B – it's so luminous.

C – its mass and size result in very large gravity.

D – it's mass and size result in much lower gravity.

E – None of the above

26.) A protostar of about 25 solar masses will take about _____ to ignite and become a stable hydrogen burning star.

A – 100,000 years. B – 1,000,000 years.

C – 10,000,000 years. D – 100,000,000 years.

E – None of the above

27.) Two stars have the same spectral type and luminosity class, K8 V. Star A is 1000 LY away, while Star B is 100 LY away. Therefore...

A – Star A appears 10 times brighter than Star B.

B – Star A appears 100 times brighter than Star B.

C – Star A appears $1/10^{\text{th}}$ as bright as Star B.

D – Star A appears $1/100^{\text{th}}$ as bright as Star B.

E – None of the above

28.) In a large nebula, like the Tarantula Nebula, which contains a lot of large mass stars of 50-60 Solar masses, it is not surprising to observe a...

A – brown dwarf. B – white dwarf.

C – large moon. D – supernova.

E – None of the above

29.) The use of the Einstein relation $E = mc^2$ in stars is about...

A – chemical reactions.

B – angular momentum in rotating systems.

C – the conversion of mass to energy.

D – All of the above.

E – None of the above

30.) In a main sequence star of around 1 Solar masses, the energy from fusion in the core comes from the fact that...

A – the sum of the masses of 4 protons is *less* than the mass of the helium nucleus formed.

B – the sum of the masses of 3 helium nuclei is *less* than the mass of the carbon nucleus formed.

C – the sum of the masses of 4 protons is *more* than the mass of the helium nucleus formed.

D – the sum of the masses of 3 helium nuclei is *more* than the mass of the carbon nucleus formed.

E – None of the above

31.) Open star clusters are...

A – located in the main plane of the galaxy.

B – made up of a few thousand stars.

C – loosely held together by gravity.

D – All of the above.

E – None of the above

32.) A white dwarf star contains about as much matter as our Sun, packed into a sphere whose size is approximately that of...

A – our Sun. B – the planet Jupiter.

C – the planet Earth. D – Kalamazoo County.

E – None of the above

33.) If a star cluster has a population of O and B stars, you can conclude that the cluster is...

A – very old. B – very young.

C – very near. D – very far away.

E – None of the above

34.) Multiple burning shells occur in high mass stars later in their life off the main sequence because...

A – the inert carbon core can serve multiple reactions.

B – higher core temperatures create multiple layers of higher mass fusion reactions.

C – iron catalyses the silicon fusion reaction.

D – one fusion reaction always results in another fusion reaction.

E – None of the above

35.) Stars like our Sun eventually eject their envelopes in ...

A – gentle planetary nebulae. B – novae.

C – violent supernovae. D – carbon fusion detonations.

E – None of the above

36.) A red dwarf star doesn't steal matter from a close binary companion because...

A – it's red.

B – it's so luminous.

C – its mass and size result in very large gravity.

D – it's mass and size result in much lower gravity.

E – None of the above

37.) Protostar A will become a 20 solar mass main sequence star, while Protostar B formed at the same time will become a 0.35 solar mass main sequence star, so...

A – A and B will become stars simultaneously.

B – A will become a star first.

C – B will become a star first.

D – mass has no effect on the time scale.

E – None of the above

38.) A neutron star...

A – has at least 1.4 times the mass of our Sun.

B – is a supernova remnant.

C – is made of degenerate matter where gravity has crushed everything into neutrons.

D – All of the above.

E – None of the above

39.) A small star with less than 0.08 Solar mass and a temperature of 1300 K would be a...

A – red dwarf. B – white dwarf.

C – brown dwarf. D – neutron star.

E – None of the above

40.) If it weren't for _____, you would be unable to get two or more protons in a nucleus and the only element in the universe would be hydrogen.

A – gravity

B – the weak nuclear force

C – the strong nuclear force

D – electromagnetic repulsion

E – None of the above

41.) Stars with 40 Solar masses eventually eject their envelopes in...

A – gentle planetary nebulae.

B – novae.

C – violent supernovae.

D – carbon fusion detonations.

E – None of the above

42.) The luminosity of high mass main sequence stars is much greater than lower mass main sequence stars, because in high mass stars...

A – lower density means much more surface area.

B – lower density means much less surface area.

C – higher density means much more surface area.

D – higher density means much less surface area.

E – None of the above

43.) In a helium-burning supergiant...

A – carbon builds up in the core.

B – the core expands.

C – the hydrogen-burning shell shrinks.

D – All of the above.

E – None of the above

44.) A star can leave behind a black hole remnant if...
A – its mass is low enough and undergoes a supernova explosion.

B – its mass is high enough and undergoes a supernova explosion.

C – its mass is low enough and undergoes a planetary nebula ejection.

D – its mass is high enough and undergoes a planetary nebula ejection.

E – None of the above

45.) Helium ignition requires a core temperature of...

A – 60,000 K. B – 1,000,000 K.

C – 10,000,000 K. D – 100,000,000 K.

E – None of the above

46.) The size of a main sequence star in equilibrium is determined by the balance of the gravitational collapse and...

A – pressure generated from the fusion in the core.

B – cannot be balanced, the gravitational collapse cannot be stopped.

C – matter generated from the fusion in the core.

D – degenerate neutron matter in the core.

E – None of the above

47.) When our Sun is about 10 billion years old, about twice its current age, it is likely to expand to a...

A – red subgiant. B – red giant.

C – red supergiant. D – white dwarf.

E – None of the above

48.) Stars of less than 8% (0.08) times the mass of our Sun fail to become main sequence stars because...

A – lower mass objects never form in nature.

B – lower mass objects contract to become white dwarfs instead.

C – the core temperature of lower mass objects never reaches 10 million K.

D – all such lower mass objects are called planets.

E – None of the above

49.) It takes a supernova explosion to drive fusion past the Iron Minimum because Iron-56...

A – cannot undergo fusion into any higher elements.

B – cannot undergo fusion into any higher elements and release energy.

C – cannot exist in any great quantity inside a star.

D – All of the above.

E – None of the above

50.) A star's _____ is the *most* crucial quantity in determining a star's appearance and evolution from its formation to its death?

A – overall elemental composition.

B – luminosity.

C – mass.

D – size.

E – None of the above