

National Testing Agency

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Stars And Stellar Systems

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Stars And Stellar Systems-1

Section Id :	603489175
Section Number :	1
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Number of Questions :	75
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Section Marks :	100
Enable Mark as Answered Mark for Review and Clear Response :	Yes
Sub-Section Number :	1
Sub-Section Id :	603489326
Question Shuffling Allowed :	Yes

Question Number : 1 Question Id : 6034898694 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No Correct Marks : 1 Wrong Marks : 0

For stars in the mass range, 0.5 – 40 solar masses, the luminosities lie in the range

1. $6.25 \times 10^{-2} - 4.05 \times 10^5$ solar luminosities
2. $6.25 \times 10^{-1} - 2.56 \times 10^6$ solar luminosities
3. $8.83 \times 10^{-2} - 2.56 \times 10^6$ solar luminosities
4. $8.83 \times 10^{-1} - 4.05 \times 10^5$ solar luminosities

Options :

- 60348932723. 1
- 60348932724. 2
- 60348932725. 3
- 60348932726. 4

Question Number : 2 Question Id : 6034898695 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No Correct Marks : 1 Wrong Marks : 0

Consider an isolated star whose mass and radius are 5 times that of the Sun. If the lower limit to the central pressure of Sun is 4.4×10^{13} Pa, then a lower limit to the central pressure of the star from the equation of hydrostatic equilibrium is

1. 2.4×10^{12} Pa
2. 4.4×10^{13} Pa
3. 1.8×10^{12} Pa
4. 2.4×10^{13} Pa

Options :

60348932727. 1

60348932728. 2

60348932729. 3

60348932730. 4

Question Number : 3 Question Id : 6034898696 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Estimate the angular size of the Sun at a distance of 10 parsecs. Choose the closest answer.

1. 8.75 milli-arcseconds
2. 6.45 milli-arcseconds
3. 9.93 milli-arcseconds
4. 0.93 milli-arcseconds

Options :

60348932731. 1

60348932732. 2

60348932733. 3

60348932734. 4

Question Number : 4 Question Id : 6034898697 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Which one of the following statements is false regarding the interior of the Sun?

1. Energy is transported by radiation till about $0.7 R_{\odot}$ after which convection takes over.
2. Nuclear reactions occur within about $0.3 R_{\odot}$. The zone of convection extends to $0.3 R_{\odot}$.
3. In the region where nuclear reactions take place, energy is transported by radiation.
4. The central temperature and density are about $1.6 \times 10^7 \text{ K}$ and $2.3 \times 10^{16} \text{ N m}^{-2}$, respectively.

Options :

60348932735. 1

60348932736. 2

60348932737. 3

60348932738. 4

Question Number : 5 Question Id : 6034898698 Question Type : MCQ Option Shuffling : No Is

Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Sirius is about two times more massive than the Sun but is about 25 times more luminous than the Sun. This is because

1. Sirius is burning H via the CNO cycle
2. Sirius is in a binary system and is accreting matter from its companion
3. Sirius is burning H via the pp cycle but far more efficiently
4. The dominant mode of energy production in Sirius is the triple-alpha process

Options :

60348932739. 1

60348932740. 2

60348932741. 3

60348932742. 4

Question Number : 6 Question Id : 6034898699 Question Type : MCQ Option Shuffling : No Is

Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Consider a stellar atmosphere that is of pure hydrogen with an average electron pressure of say 20 N m^{-2} . The fraction of atoms that are ionized at a temperature of about 9600 K estimated from Saha's ionization equation is approximately

1. 85 percent
2. 10 percent
3. 25 percent
4. 50 percent

Options :

60348932743. 1

60348932744. 2

60348932745. 3

60348932746. 4

Question Number : 7 Question Id : 6034898700 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

In the interior of a star, the mean free path of a particle is (choose the nearest answer)

1. About a thousand times smaller than that of a photon
2. About a million times smaller than that of a photon
3. About a hundred times smaller than that of a photon
4. Similar to that of a photon

Options :

60348932747. 1

60348932748. 2

60348932749. 3

60348932750. 4

Question Number : 8 Question Id : 6034898701 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Star X has a B magnitude of 3.15 and a V magnitude of 1.05; while star Y has a B magnitude of 5.00 and a V magnitude of 5.25. Which one of the following statements is correct?

1. Star X is hotter than star Y
2. Both stars are of similar temperature
3. Star X is cooler than star Y
4. Cannot determine which star is hotter

Options :

60348932751. 1

60348932752. 2

60348932753. 3

60348932754. 4

Question Number : 9 Question Id : 6034898702 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

The distance to a stellar system has been measured to be 147 parsecs using radio interferometry techniques. What is the value of parallax angle measured in arcseconds?

1. 0.0039 arcseconds
2. 0.0068 arcseconds
3. 0.0089 arcseconds
4. 0.0023 arcseconds

Options :

60348932755. 1

60348932756. 2

60348932757. 3

60348932758. 4

Question Number : 10 Question Id : 6034898703 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

The spectral type A4III corresponds to

1. Giant stars with hydrogen absorption lines
2. White dwarfs with helium lines and no hydrogen lines
3. Sub-dwarfs with neutral metal absorption lines
4. Variable stars lying along horizontal branch having both hydrogen and helium lines

Options :

60348932759. 1

60348932760. 2

60348932761. 3

60348932762. 4

Question Number : 11 Question Id : 6034898704 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

The sidereal day (defined with respect to a distant astronomical source) compared to the solar day

1. Is longer by about 4 minutes
2. Is longer by about 6 minutes
3. Is shorter by about 4 minutes
4. Is shorter by about 6 minutes

Options :

60348932763. 1

60348932764. 2

60348932765. 3

60348932766. 4

Question Number : 12 Question Id : 6034898705 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

The azimuth and elevation of a source, as seen by a observer on the Earth

1. Do not change with time
2. Do not depend on observer location
3. Do change randomly
4. Do change systematically

Options :

60348932767. 1

60348932768. 2

60348932769. 3

60348932770. 4

Question Number : 13 Question Id : 6034898706 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Nuclear fusion in a main sequence star cannot progress beyond which one of the following elements?

1. Iron (Fe)
2. Calcium (Ca)
3. Silicon (Si)
4. Uranium (U)

Options :

60348932771. 1

60348932772. 2

60348932773. 3

60348932774. 4

Question Number : 14 Question Id : 6034898707 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Classical Cepheids can be used to determine distances up to a distance of the order of

1. 100 kpc
2. 10 Mpc
3. 1 Mpc
4. 100 Mpc

Options :

60348932775. 1

60348932776. 2

60348932777. 3

60348932778. 4

Question Number : 15 Question Id : 6034898708 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

[Fe/H] = 0 for a star indicates that

1. There are no metals in that star
2. There is no iron in that star
3. The metallicity of the star is the same as that of the Earth
4. The metallicity of the star is the same as that of the Sun

Options :

60348932779. 1

60348932780. 2

60348932781. 3

60348932782. 4

Question Number : 16 Question Id : 6034898709 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

What is the primary site that would have produced most of the carbon in the Sun?

1. Core collapse supernovae of massive stars
2. SNIa supernovae of a white dwarf
3. AGB stars
4. Neutron star mergers

Options :

60348932783. 1

60348932784. 2

60348932785. 3

60348932786. 4

Question Number : 17 Question Id : 6034898710 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

What is the main cooling agent of the primordial gas?

1. Molecular hydrogen
2. Atomic hydrogen
3. Fine structure cooling of C and O
4. Dust

Options :

60348932787. 1

60348932788. 2

60348932789. 3

60348932790. 4

Question Number : 18 Question Id : 6034898711 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Stellar archaeology involves:

1. Study of stellar remnants such as white dwarfs, neutron stars and black holes
2. Study of chemical elements ejected by stars in the ISM
3. Study of ratios of chemical abundances to find the chemical origin of stars
4. Study of coolest stars and faintest stars in the Galaxy

Options :

60348932791. 1

60348932792. 2

60348932793. 3

60348932794. 4

Question Number : 19 Question Id : 6034898712 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

The Initial Mass Function (IMF) of stars derived by Salpeter for stars in the solar neighbourhood shows that the normalized number of stars formed per unit solar mass varies with mass, as :

1. $M^{+0.15}$
2. $M^{-2.35}$
3. $M^{-3.95}$
4. $M^{+1.15}$

Options :

60348932795. 1

60348932796. 2

60348932797. 3

60348932798. 4

Question Number : 20 Question Id : 6034898713 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

The free-fall time of a gas cloud, assuming internal forces to be negligible, is:

1. Directly proportional to the density of the cloud
2. Inversely proportional to the density of the cloud
3. Inversely proportional to the cube root of the density of the cloud
4. Inversely proportional to the square root of the density of the cloud

Options :

60348932799. 1

60348932800. 2

60348932801. 3

60348932802. 4

Question Number : 21 Question Id : 6034898714 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Most protoplanetary disks dissipate on a time scale of

1. < 0.5 Million years
2. 3 – 5 Million years
3. 30 – 50 Million years
4. > 100 Million years

Options :

60348932803. 1

60348932804. 2

60348932805. 3

60348932806. 4

Question Number : 22 Question Id : 6034898715 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Which stellar population do we find in the spiral arms of our Galaxy and other similar galaxies?
Choose the most accurate answer.

1. Population II stars which include old red giants, dwarf stars and stars of globular clusters
2. Population I stars which include the Sun and low-metallicity stars of the globular clusters
3. Population II which include old red giants and newly formed stars in the molecular clouds and HII regions
4. Population I stars which include the Sun and the class O and B stars

Options :

60348932807. 1

60348932808. 2

60348932809. 3

60348932810. 4

Question Number : 23 Question Id : 6034898716 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

A diffuse nebular region of emission in our Galaxy appears bluish in colour. This is likely to be due to :

1. The cloud approaching us at relativistic speeds so that the emission is blue-shifted
2. The cloud consists of millions of extremely hot stars emitting in the bluish part of the spectrum
3. The gas cloud is reflecting light from a nearby hot star
4. The cloud is a copious emitter of Ly-alpha emission which is redshifted to the blue region as the cloud is receding from us

Options :

60348932811. 1

60348932812. 2

60348932813. 3

60348932814. 4

Question Number : 24 Question Id : 6034898717 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Dust grains are an important constituent of molecular clouds in determining their chemistry and physics. Approximately, what percentage of the mass of a molecular cloud is made up by the dust grains?

1. 1 percent
2. 50 percent
3. 25 percent
4. 10 percent

Options :

60348932815. 1

60348932816. 2

60348932817. 3

60348932818. 4

Question Number : 25 Question Id : 6034898718 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Although there are suggestions of a few stars more massive than about $200 M_{\odot}$, such stars are extremely rare and stars, significantly more massive than that are unlikely to exist. This is because (choose the most appropriate answer)

1. There must be very massive giant molecular clouds to form such massive stars and such molecular clouds do not exist
2. Such massive stars forming from giant molecular clouds, which would have a certain angular momentum, would be spinning very rapidly as they collapse that centrifugal forces will throw out all the outer layers
3. The intense energy production in the centre will lead to a large outflow of radiation which will drive off the star's outer layers
4. Such massive stars will complete their life cycles in seconds making it difficult to detect these stars

Options :

60348932819. 1

60348932820. 2

60348932821. 3

60348932822. 4

Question Number : 26 Question Id : 6034898719 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No Correct Marks : 1 Wrong Marks : 0

Which of the following is accounted for deriving the original Chandrasekhar mass limit of white dwarfs?

1. Effect of general relativity
2. Effect of Coulomb interactions
3. Effect of magnetic field
4. None of the above

Options :

60348932823. 1

60348932824. 2

60348932825. 3

60348932826. 4

Question Number : 27 Question Id : 6034898720 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No Correct Marks : 1 Wrong Marks : 0

Approximately, what percentage of the energy released in a core-collapse supernova is in the form of electromagnetic radiation?

1. 0.01%
2. 1%
3. 90%
4. 99%

Options :

60348932827. 1

60348932828. 2

60348932829. 3

60348932830. 4

Question Number : 28 Question Id : 6034898721 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

The number of white dwarfs in our galaxy are expected to exceed the number of neutron stars by a factor of about:

1. 1000
2. 10
3. 2
4. 200

Options :

60348932831. 1

60348932832. 2

60348932833. 3

60348932834. 4

Question Number : 29 Question Id : 6034898722 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Which of the following is NOT a source of radiation from compact objects (white dwarfs, neutron stars, and black holes)?

1. Nuclear fusion in the core
2. Cooling
3. Accretion
4. Magnetospheric emission

Options :

60348932835. 1

60348932836. 2

60348932837. 3

60348932838. 4

Question Number : 30 Question Id : 6034898723 Question Type : MCQ Option Shuffling : No Is

Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Approximately, what fraction of the neutron star mass is in the crust?

1. 5%
2. 0.01%
3. 0.1%
4. 1%

Options :

60348932839. 1

60348932840. 2

60348932841. 3

60348932842. 4

Question Number : 31 Question Id : 6034898724 Question Type : MCQ Option Shuffling : No Is

Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

The rotating vector model for pulsars is used to explain:

1. The overall magnetic field structure of the magnetosphere
2. The observed pattern of linear polarization position angle in the radio
3. The shape of the radio pulse profile
4. The shape of the pulse profile at all wavelengths

Options :

60348932843. 1

60348932844. 2

60348932845. 3

60348932846. 4

Question Number : 32 Question Id : 6034898725 Question Type : MCQ Option Shuffling : No Is

Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

The dispersion measure of a pulsar depends on which of the following pairs of parameters?

1. Radiation frequency and distance to the pulsar
2. Electron density along the line of sight and radiation frequency
3. Electron density along the line of sight and distance to the pulsar
4. Magnetic field and the line of sight direction

Options :

60348932847. 1

60348932848. 2

60348932849. 3

60348932850. 4

Question Number : 33 Question Id : 6034898726 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

As the pulsar spins down over time, the radius of its light cylinder

1. Decreases
2. Remains same
3. Result depends on strength of magnetic field
4. Increases

Options :

60348932851. 1

60348932852. 2

60348932853. 3

60348932854. 4

Question Number : 34 Question Id : 6034898727 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Which of the following phenomena may be one of the likely causes of pulsar glitches?

1. Magnetic reconnection
2. Crust cracking due to magnetic stress
3. Magnetic braking
4. Mode changes in the plasma

Options :

60348932855. 1

60348932856. 2

60348932857. 3

60348932858. 4

Question Number : 35 Question Id : 6034898728 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

The minimum spin period a pulsar can sustain without disintegration depends on the star's:

1. Mass only
2. Radius only
3. Density
4. Conductivity in the crust

Options :

60348932859. 1

60348932860. 2

60348932861. 3

60348932862. 4

Question Number : 36 Question Id : 6034898729 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

The ratio of moment of inertia (I) of a neutron star of mass M to that of a white dwarf of mass $M/2$, is:

1. Much less than unity
2. Much higher than unity
3. Equal to unity
4. Equal to the mass ratio ($1/2$)

Options :

60348932863. 1

60348932864. 2

60348932865. 3

60348932866. 4

Question Number : 37 Question Id : 6034898730 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

The primary goal of pulsar timing arrays are the detection of :

1. Gravitational waves
2. Neutrinos
3. Cosmic rays
4. Dark matter

Options :

60348932867. 1

60348932868. 2

60348932869. 3

60348932870. 4

Question Number : 38 Question Id : 6034898731 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Progenitor of type-Ia supernova can be :

1. An isolated massive star
2. An isolated neutron star
3. A white dwarf in a binary system, with a white dwarf companion
4. A neutron star in a binary system, with a pulsar companion

Options :

60348932871. 1

60348932872. 2

60348932873. 3

60348932874. 4

Question Number : 39 Question Id : 6034898732 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

The radial temperature profile of an accretion disk is expected to have:

1. One minimum
2. One maximum
3. Two minima
4. Two maxima

Options :

60348932875. 1

60348932876. 2

60348932877. 3

60348932878. 4

Question Number : 40 Question Id : 6034898733 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

X is typically (or, on average) greater for a neutron star LMXB than for a neutron star HMXB. X is

1. Neutron star magnetic field
2. Secondary star mass
3. Binary orbital period
4. Neutron star spin frequency

Options :

60348932879. 1

60348932880. 2

60348932881. 3

60348932882. 4

Question Number : 41 Question Id : 6034898734 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

The wind mass capture rate by the compact object in a high-mass X-ray binary increases as

1. The binary separation increases
2. The radius of accretion cylinder increases
3. The mass loss rate from the secondary star via wind decreases
4. The solid angle indicating the stellar wind distribution from the companion star in the orbit increases

Options :

60348932883. 1

60348932884. 2

60348932885. 3

60348932886. 4

Question Number : 42 Question Id : 6034898735 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

How many payloads are there on the Aditya-L1 mission?

1. 2
2. 3
3. 7
4. 11

Options :

60348932887. 1

60348932888. 2

60348932889. 3

60348932890. 4

Question Number : 43 Question Id : 6034898736 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Sunspots are :

1. Dark regions on the Sun in visible wavelength and have stronger magnetic fields than the quiet Sun
2. Bright regions on the Sun in visible wavelength and have weaker magnetic fields than the quiet Sun
3. Bright regions on the Sun and have stronger magnetic fields than the quiet Sun
4. Dark regions with weaker magnetic fields than the quiet Sun

Options :

60348932891. 1

60348932892. 2

60348932893. 3

60348932894. 4

Question Number : 44 Question Id : 6034898737 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

What is the Solar Ultraviolet Imaging Telescope (SUIT)?

1. It is a payload on board Aditya -L1 mission that will image the Sun in X-rays
2. It is a payload on board a NASA mission that will image the Sun between 2000 Å to 4000 Å
3. It is a payload that will perform spectroscopic observations of the Sun between 2000 Å to 4000 Å using a slit and grating
4. It is a payload on board Aditya -L1 mission that will image the Sun between 2000 Å to 4000 Å

Options :

60348932895. 1

60348932896. 2

60348932897. 3

60348932898. 4

Question Number : 45 Question Id : 6034898738 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

During solar maximum, the Sun becomes quite active and the number of sunspots can be a factor of about 10 more than at the solar minimum during a solar cycle. The flux density of the slowly varying component of solar radio emission at say 10.7 GHz,

1. Shows a high correlation with the sunspot number
2. Shows periodicity in its variability but is not related to the sunspot number
3. Varies randomly and shows no correlation with the sunspot number
4. Varies slowly without any evidence of periodicity

Options :

60348932899. 1

60348932900. 2

60348932901. 3

60348932902. 4

Question Number : 46 Question Id : 6034898739 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

In the radiation zone of the Sun, energy is transported because of:

1. High internal temperature
2. High internal density
3. High internal pressure
4. Internal temperature gradient

Options :

60348932903. 1

60348932904. 2

60348932905. 3

60348932906. 4

Question Number : 47 Question Id : 6034898740 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Since our Sun started its life on the main sequence about 4.5 billion years ago, its radius has :

1. Remained the same
2. Decreased by 10 percent
3. Increased by 15 percent
4. Increased by 50 percent

Options :

60348932907. 1

60348932908. 2

60348932909. 3

60348932910. 4

Question Number : 48 Question Id : 6034898741 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Compared to the current luminosity, at the beginning of the main-sequence life our Sun was about:

1. 33% cooler
2. 15% cooler
3. 67% hotter
4. 25% hotter

Options :

60348932911. 1

60348932912. 2

60348932913. 3

60348932914. 4

Question Number : 49 Question Id : 6034898742 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

In Helioseismology, normal-mode frequencies are sensitive to:

1. 3D structure in the solar interior
2. Only 1D structure in the solar interior
3. Only axisymmetric features
4. Only magnetic fields

Options :

60348932915. 1

60348932916. 2

60348932917. 3

60348932918. 4

Question Number : 50 Question Id : 6034898743 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 1 Wrong Marks : 0

Radial velocity method of planet detection is most sensitive to

1. High mass planets with small orbits
2. Low mass planets with large orbits
3. High mass planets with large orbits
4. Low mass planets with small orbits

Options :

60348932919. 1

60348932920. 2

60348932921. 3

60348932922. 4

Sub-Section Number : 2

Sub-Section Id : 603489327

Question Shuffling Allowed : Yes

Question Number : 51 Question Id : 6034898744 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

A star A has a surface temperature of 20,000 K, a radius which is 1.8 times the solar radius, and the absolute bolometric magnitude is 1.5; the radius of its companion, B, is 0.01 solar radius and the absolute bolometric magnitude is 11.5. The effective temperatures of B is :

1. 26833 K
2. 5487 K
3. 10986 K
4. 6785 K

Options :

60348932923. 1

60348932924. 2

60348932925. 3

60348932926. 4

Question Number : 52 Question Id : 6034898745 Question Type : MCQ Option Shuffling : No Is

Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

In a stellar photosphere, where the density is approximately $2.1 \times 10^{-4} \text{ kg/m}^3$, the mass-absorption coefficient at 500 nm is $0.03 \text{ m}^2/\text{kg}$. The characteristic distance travelled by a photon before being absorbed/scattered from the beam of photons at this level in the photosphere is:

1. 6.3 microns
2. 160 km
3. 7.0 mm
4. 142 m

Options :

60348932927. 1

60348932928. 2

60348932929. 3

60348932930. 4

Question Number : 53 Question Id : 6034898746 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Which of the following products cannot form in the nuclear reaction $^{16}_8\text{O} + ^{16}_8\text{O} ?$

1. $^{32}_{16}\text{S} + \gamma$
2. $^{31}_{15}\text{P} + \text{p}^+$
3. $^{28}_{14}\text{Si} + ^3_2\text{He}$
4. $^{31}_{16}\text{S} + \text{n}$

Options :

60348932931. 1

60348932932. 2

60348932933. 3

60348932934. 4

Question Number : 54 Question Id : 6034898747 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

The velocity distribution of particles in the interior of a star as well as molecules in our atmosphere can be described by the Maxwell-Boltzmann distribution. Estimate the most probable velocity of nitrogen molecules in our atmosphere at a room temperature of 300 K. Choose the nearest answer.

1. 10 m/s
2. 140 m/s
3. 260 m/s
4. 420 m/s

Options :

60348932935. 1

60348932936. 2

60348932937. 3

60348932938. 4

Question Number : 55 Question Id : 6034898748 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Consider a gas of neutral H atoms. From a simple application of the Boltzmann equation, at what temperature will there be an equal number of electrons in the ground state ($n=1$) and the first excited state ($n=2$) ? Choose the nearest answer.

1. 8.5×10^4 K
2. 2.3×10^3 K
3. 7.9×10^3 K
4. 9.8×10^5 K

Options :

60348932939. 1

60348932940. 2

60348932941. 3

60348932942. 4

Question Number : 56 Question Id : 6034898749 Question Type : MCQ Option Shuffling : No Is

Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

In a 20 solar mass star, H burning lasts for about 8 million years and He burning for about 1.2 million years. How long does the Ne burning stage last (choose the nearest answer)?

1. 1000 years
2. 100 years
3. 0.6 year
4. 60 years

Options :

60348932943. 1

60348932944. 2

60348932945. 3

60348932946. 4

Question Number : 57 Question Id : 6034898750 Question Type : MCQ Option Shuffling : No Is

Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

From the simple 'pulsation period - mean stellar density' relation applicable to Cepheids, we can deduce that a factor of 3 increase in mean density implies a factor of

1. $\sqrt{3}$ decrease in pulsation period
2. 3 increase in pulsation period
3. 3 decrease in pulsation period
4. $\sqrt{3}$ increase in pulsation period

Options :

60348932947. 1

60348932948. 2

60348932949. 3

60348932950. 4

Question Number : 58 Question Id : 6034898751 Question Type : MCQ Option Shuffling : No Is

Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

For a double-lined eclipsing spectroscopic binary the maximum Doppler shift $\Delta\lambda$ of Balmer line H α (656.282 nm) is $\Delta\lambda_s = 0.075$ nm for the smaller star, and $\Delta\lambda_l = 0.0069$ nm for the larger star. Estimate the ratio of masses of the two stars and their maximum radial velocities.

1. 5.5, 16.2 km/s, 0.45 km/s
2. 10.9, 34.3 km/s, 3.15 km/s
3. 43.4, 57.6 km/s, 8.89 km/s
4. 10.9, 48.8 km/s, 9.76 km/s

Options :

60348932951. 1

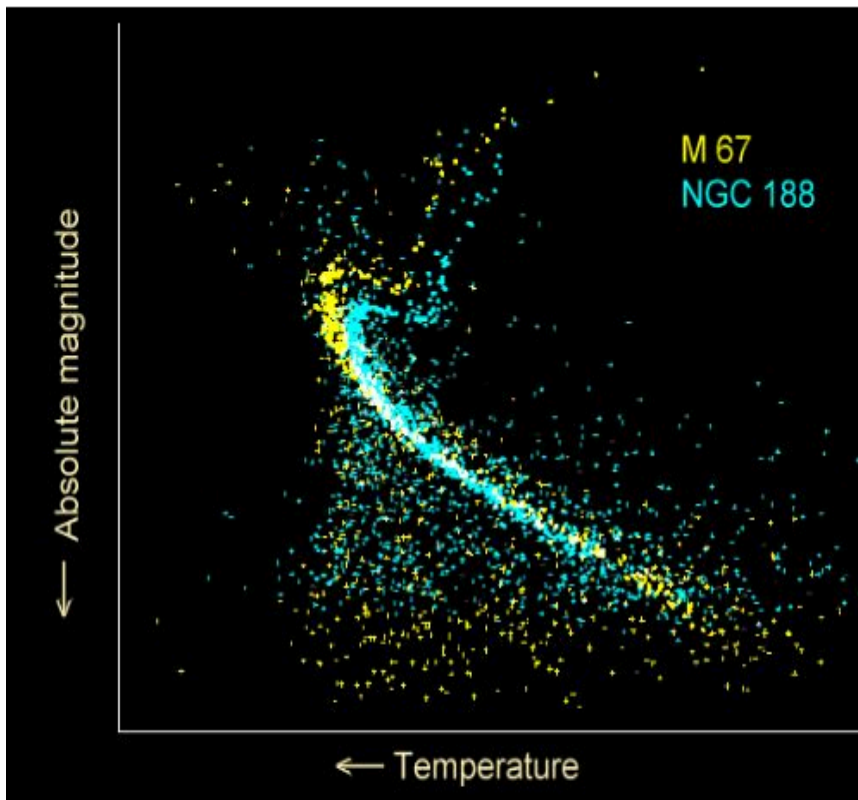
60348932952. 2

60348932953. 3

60348932954. 4

Question Number : 59 Question Id : 6034898752 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0



The figure shows the Hertzsprung-Russell (HR) diagram for two star clusters. Which of the two clusters are older?

1. It is not possible to determine the ages of star clusters from the HR diagram
2. They are of the same age
3. M67
4. NGC188

Options :

60348932955. 1

60348932956. 2

60348932957. 3

60348932958. 4

Question Number : 60 Question Id : 6034898753 Question Type : MCQ Option Shuffling : No Is

Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Three stars X, Y and Z are characterised by (i) singly ionized and neutral metals with weak H lines; (ii) weak He lines, strong H lines and lines of singly ionized metals; (iii) strong lines of ionized He, weak H and multiply ionized metals. Select the spectral classes of these stars that are closest to the above description and in the order given.

1. O-type, B-type, and F-type
2. B-type, K-type, and M-type
3. G-type, A-type, and O-type
4. M-type, K-type, and G-type

Options :

60348932959. 1

60348932960. 2

60348932961. 3

60348932962. 4

Question Number : 61 Question Id : 6034898754 Question Type : MCQ Option Shuffling : No Is

Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

If the Jeans mass for a cloud with a temperature of 10 K and molecular hydrogen number density of 10^4 cm^{-3} is approximately 7 solar masses, what would be the approximate Jeans mass if the temperature is 100 K?

1. $150 M_{\odot}$
2. $90 M_{\odot}$
3. $5 M_{\odot}$
4. $220 M_{\odot}$

Options :

60348932963. 1

60348932964. 2

60348932965. 3

60348932966. 4

Question Number : 62 Question Id : 6034898755 Question Type : MCQ Option Shuffling : No Is

Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Planetary systems are the natural by-products of star formation starting with the collapse in a molecular cloud, formation of a protostar, leading to the formation of a young star with a protoplanetary disk and then a star with a planetary system. Choose the nearest correct time scales for the different processes.

1. 3 – 5 Myr; 5 – 20 Myr; 20 – 500 Myr; >500 Myr
2. <0.1 Myr; 0.1 – 1 Myr; 1 – 10 Myr; >10 Myr
3. 8 – 10 Myr; 10 – 500 Myr; 500 – 1000 Myr; >1000 Myr
4. <0.1 Myr; 0.1 – 500 Myr; 500 – 2000 Myr; >2000 Myr

Options :

60348932967. 1

60348932968. 2

60348932969. 3

60348932970. 4

Question Number : 63 Question Id : 6034898756 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

A one solar mass star goes through several stages in its life cycle. Choose the correct sequence from the following from an early to a later stage.

1. T Tauri star → main sequence → red giant branch → helium flash → asymptotic giant branch → planetary nebula
2. Main sequence → helium flash → red giant branch → T Tauri star → planetary nebula → asymptotic giant branch
3. Main sequence → T Tauri star → planetary nebula → asymptotic giant branch → helium flash → red giant branch
4. T Tauri star → main sequence → helium flash → red giant branch → planetary nebula → asymptotic giant branch

Options :

60348932971. 1

60348932972. 2

60348932973. 3

60348932974. 4

Question Number : 64 Question Id : 6034898757 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Under which one of the following conditions do the Tolman-Oppenheimer-Volkoff equation of hydrostatic equilibrium simplify to the Newtonian hydrostatic equilibrium condition? [Choose the most accurate option]

1. Low pressure-to-mass ratio
2. Low mass-to-pressure ratio
3. Low mass-to-radius ratio
4. Low radius-to-pressure ratio

Options :

60348932975. 1

60348932976. 2

60348932977. 3

60348932978. 4

Question Number : 65 Question Id : 6034898758 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Estimate the Schwarzschild factor (f_{Sch}) for a 1 solar mass and 1000 km radius white dwarf and determine whether the Newtonian hydrostatic equilibrium condition is sufficient to model its equilibrium structure. (Below, TOV stands for Tolman-Oppenheimer-Volkoff)

1. $f_{\text{Sch}} = 0.997$ and yes, Newtonian condition is sufficient
2. $f_{\text{Sch}} = 0.997$ and no, general relativistic TOV equations needed
3. $f_{\text{Sch}} = 0.003$ and yes, Newtonian condition is sufficient
4. $f_{\text{Sch}} = 0.003$ and no, general relativistic TOV equations needed

Options :

60348932979. 1

60348932980. 2

60348932981. 3

60348932982. 4

Question Number : 66 Question Id : 6034898759 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Choose the correct order (from interior to exterior) of the various components of the neutron star structure

Crust, Inner core, Envelope, Outer core, Atmosphere

1. Inner core, Envelope, Outer core, Atmosphere, Crust
2. Inner core, Outer core, Envelope, Crust, Atmosphere
3. Inner core, Outer core, Crust, Atmosphere, Envelope
4. Inner core, Outer core, Crust, Envelope, Atmosphere

Options :

60348932983. 1

60348932984. 2

60348932985. 3

60348932986. 4

Question Number : 67 Question Id : 6034898760 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

For a pulsar with a spin period P and a period derivative $\dot{P}$, the estimated magnetic field B is

1. $B \propto P \dot{P}$
2. $B \propto (P \dot{P})^{1/2}$
3. $B \propto P/\dot{P}$
4. $B \propto 1/(P \dot{P})$

Options :

60348932987. 1

60348932988. 2

60348932989. 3

60348932990. 4

Question Number : 68 Question Id : 6034898761 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

The value of a neutron star's magnetic field estimated from the accretion rate refers to

1. Dipolar field at the star surface
2. Total field strength at light cylinder
3. Dipolar field at Alfvén radius
4. Higher multipoles at the surface

Options :

60348932991. 1

60348932992. 2

60348932993. 3

60348932994. 4

Question Number : 69 Question Id : 6034898762 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

For the following bodies arrange the values of P^2/a_3 from the smallest to the largest values:

- (i) Comet Halley orbiting the Sun;
- (ii) Moon orbiting the Earth; and
- (iii) Ganymede orbiting Jupiter.

Here (P) is the orbital period in years and (a) is the semi-major axis in AU.

1. They all have similar values
2. (i), (iii), (ii)
3. (ii), (iii), (i)
4. (iii), (ii), (i)

Options :

60348932995. 1

60348932996. 2

60348932997. 3

60348932998. 4

Question Number : 70 Question Id : 6034898763 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

An outburst of accretion via disk can occur

1. When a thermal instability is followed by a viscous instability
2. When a viscous instability is followed by a thermal instability
3. As soon as only a thermal instability occurs
4. When a viscous instability does not occur

Options :

60348932999. 1

60348933000. 2

60348933001. 3

60348933002. 4

Question Number : 71 Question Id : 6034898764 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

As one goes from lower to greater heights above the solar 'surface' the dominant physical processes for the observed emission changes as follows:

1. Plasma emission, gyro-synchrotron and gyro-resonance, bremsstrahlung
2. Gyro-synchrotron and gyro-resonance, plasma emission, bremsstrahlung
3. Gyro-synchrotron and gyro-resonance, bremsstrahlung and plasma emission
4. Bremsstrahlung, plasma emission and gyro-synchrotron and gyro-resonance

Options :

60348933003. 1

60348933004. 2

60348933005. 3

60348933006. 4

Question Number : 72 Question Id : 6034898765 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

Which of the following statements is not true for Type III solar radio bursts?

1. The Type III burst emission drifts from higher to lower frequencies with time
2. They are most commonly observed only above 300 MHz
3. The Type III burst emission is at the fundamental and the harmonic of the local plasma frequency
4. They are believed to arise due to beams of electrons travelling through the corona at very high speeds

Options :

60348933007. 1

60348933008. 2

60348933009. 3

60348933010. 4

Question Number : 73 Question Id : 6034898766 Question Type : MCQ Option Shuffling : No Is Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

At wavelengths of a few metres the radio emission from the active Sun could be larger than that of the quiet Sun by a factor of

1. About a factor of two
2. At least about three orders of magnitude
3. About two orders of magnitude
4. About one order of magnitude

Options :

60348933011. 1

60348933012. 2

60348933013. 3

60348933014. 4

Question Number : 74 Question Id : 6034898767 Question Type : MCQ Option Shuffling : No Is

Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

What is the highest mode harmonic degree that is typically observed in stars and why?

1. 20: because we can observe and resolve parts of the stellar disk
2. 15: because despite integrating over the stellar disk, we can still observe up to $ell = 15$
3. 10: because this is the highest ell that you can resolve on the stellar disk
4. 3: because the stellar disk cannot be resolved and only the largest-scale modes are observed

Options :

60348933015. 1

60348933016. 2

60348933017. 3

60348933018. 4

Question Number : 75 Question Id : 6034898768 Question Type : MCQ Option Shuffling : No Is

Question Mandatory : No

Correct Marks : 2 Wrong Marks : 0

If a star has two transiting planets with orbital periods 30 days and 70 days, the pattern of the transits in the star's lightcurve will repeat itself nearly every

1. 350 days
2. 70 days
3. 210 days
4. 365 days

Options :

60348933019. 1

60348933020. 2

60348933021. 3

60348933022. 4