Introduction to Astrophysics

Concept Tests

CONCEPT TEST

To see the greatest number of stars possible throughout the period of one year, a person should be located at latitude

a) 90 degrees
b) 45 degrees
c) 0 degrees
d) Anywhere, since latitude makes no difference

CONCEPT TEST

The angle between Polaris and the zenith

a) Is always 90^o
b) Is always 0^o
c) Is always 23.5^o
d) Varies through the night
e) Depends upon your latitude

CONCEPT TEST

An astronomer wants to make observations of a star at RA=0^{o}. This is best done at

a) The spring equinox

b) The autumn equinox

c) The summer solstice

d) The winter solstice

CONCEPT TEST

A sidereal day is about 4 minutes shorter than a mean solar day. If the Earth spun in the opposite direction, then a sidereal day would

a) Still be shorter than a solar day

b) Be longer than a solar day

c) Be the same as a solar day

d) Have no meaning

CONCEPT TEST

A sundial measures

a) Universal time
b) Local sidereal time
c) Mean solar time
d) Apparent solar time

CONCEPT TEST

A star lies at a distance of 10 pc. During the year, the total angular distance it appears to move on the sky, due to the Earth's motion around the sun, is

a) 0.1″
b) 10″
c) 0.2″
d) Depends on the observer's latitude
e) Depends on the star's declination

CONCEPT TEST

A small star cluster consists of 10 stars, each of which has apparent magnitude 14.8. The apparent magnitude of the whole cluster is

a) 148

b) 1.48

c) 4.8

d) 24.8

e) 12.3

CONCEPT TEST

The James Webb Space Telescope (planned successor to HST) will operate in the IR band, compared to a similar sized telescope operating in the optical its angular resolution will be

a) Better

b) Worse

c) The same

CONCEPT TEST

A star with U-B=-0.4 will be

a) Hotter than Vega
b) Cooler than Vega
c) Brighter than Vega
d) Dimmer than Vega

CONCEPT TEST

In the Sun, the transition from level 4 to level 2 of hydrogen produces photons with a wavelength of 486.1 nm. In a star twice as hot as the Sun, this transition would produce photons with

a) Half this wavelength

b) The same wavelength

c) Double this wavelength

d) Four times this wavelength

CONCEPT TEST

Since we see galaxies moving away from us in the same way in all directions, it follows that

a) We are at the centre of an expanding Universe
b) The Universe is infinite in size
c) The Universe is expanding in the same way everywhere

DISCUSSION

If the Universe is following this path of accelerating expansion, what will the distant future be like? E.g.

- Will our Sun be alone in space?
- Will our Galaxy be alone?
- Will all the stars eventually burn out?
- Does life have a long term future?

THINK!

The Virial Theorem tells us that a star cannot cool. However, the Earth was hot when it was first formed, and it has been able to cool.

Why is there this difference between a planet and a star?

CONCEPT TEST

A dusty gas cloud lies lies fairly close to us in the Galaxy. If we look in the direction of this cloud then we will notice:

a) A pink glow
b) A blue glow
c) A patch in which stars are dimmer
d) A patch in which stars are redder
e) A patch in which stars are dimmer *and* redder

THINK!

Which of the two star clusters pictured below is the youngest, and why?

(a)

(b)

THINK!

The argument on the previous page was that

"The mean internal temperature is approximately constant, since the nuclear reactions are very temperature sensitive"

and therefore as as μ rises, *R* must also increase - i.e. the star expands.

But <u>why</u> should <*T*> remain constant, just because the reactions are very temperature sensitive?

$$<T>= \frac{\eta G M \mu}{3kR}$$

CONCEPT TEST

Which of the following stars is probably oldest?

a) A 1 solar mass MS star
b) A 1 solar mass white dwarf
c) A 10 solar mass MS star
d) A 5 solar mass red giant

CONCEPT TEST

Fusion in a stable star cannot proceed beyond iron because

a) It would require temperatures higher than is possible within stars
b) The fusion of iron nuclei is impossible
c) Fusion of iron does not generate any energy
d) Stars become unstable to pulsation and eject most of their mass before the iron fusion stage is reached

CONCEPT TEST

Write three column headings:

Nuclear Gravitational Rotation

and enter the following into whichever column corresponds to the main power source for their radiation:

SNIa, SNII, pulsar, X-ray binary, nova

CONCEPT TEST

Given that the mass within radius r is related to the circular velocity at r by $M=rv^2/G$,
Which of the following distribution of mass density, ρ, would give a flat rotation curve?

a) $\rho(r)$=constant

b) $\rho(r)=Ar$

c) $\rho(r)=Ar^{-1}$

d) $\rho(r)= Ar^{-2}$

THINK!

Can you suggest why heavier elements (C,N,O etc.) are not formed in the Big Bang?