



Name :

University of Baghdad

College of Science

Astronomy and Space Department

Ph.D. Competition Exam

Date: 13/8/2015

Time:3 Hours

Notes:

- ***Answer All Questions***
- ***Answer in English***
- ***It is not allowed to consult any other information during the exam except for your own knowledge and what during the exam the assistants will explain.***

<i>Question Number</i>	<i>Mark(Numbering)</i>	<i>Mark(Written)</i>	<i>Signature.</i>
Q1			
Q2			
Q3			
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Q1) *Mark with circle the correct answer (60 Mark)*

- 1- The visible light spectrum of a typical star like our Sun shows
 - A. bright emission lines
 - B. shows all of the other answers depending on the season on Earth
 - C. no spectral lines at all
 - D. dark absorption lines

- 2- A device which would not work on the Moon is:
 - A. thermometer
 - B. siphon
 - C. spectrometer
 - D. spring balance

- 3- According to Kepler's first law, the Sun lies at the _____ of a planet's orbit.
 - A. Focus
 - B. center
 - C. end of the orbit

- 4- What is the collection of small rocky bodies, otherwise known as minor planets, 99.8 percent of whose orbits lie between the orbits of Mars and Jupiter?
 - A. meteorites
 - B. meteors
 - C. asteroids
 - D. none of these

- 5- Binary star systems
 - A. are extremely rare
 - B. are co-orbiting stars bound to each other by gravity
 - C. Contain a spectroscopic binary and an eclipsing binary
 - D. All of the above

- 6- Cassini's division is described by which of the following?
 - A. A break in the rings of Saturn
 - B. A break in the clouds of Jupiter
 - C. The distance between the first two moons of Jupiter
 - D. The distance between the Van Allen belts

- 7- Evidence that the Universe contains much unobserved dark matter is the
 - A. excessive amounts of gas found in spiral galaxies.
 - B. excessive amount of dark dust in spiral galaxies
 - C. flat rotation curves of spiral galaxies
 - D. powerful radio emission from the centers of spirals

8- What is a quasar?

- A. A large main sequence star
- B. Rotating neutron star
- C. An active galactic nucleus

9- One way to increase the resolving power of a telescope is to:

- A. Make its mirror bigger.
- B. Make its mirror smaller.
- C. Replace its mirror with a lens of the same diameter
- D. Use a mirror with made of gold

10- Why is the cosmic background radiation so cool?

- A. interstellar dust grains absorbs and cools it.
- B. it is emitted by cool stars.
- C. the expansion of the Universe has lengthened its wavelength.
- D. we are moving through it so fast it just looks cool

11- Galaxies are classified as

- A. Spiral
- B. Elliptical
- C. Irregular
- D. All of the Above

12- Main sequence stars obey a relation between

- A. mass and luminosity.
- B. composition and surface temperature.
- C. age and size.
- D. none of these

13- The geocentric model holds that _____ is at the center of the solar system.

- A. Moon
- B. Earth
- C. Sun

14- Which of the following types of electromagnetic radiation travels at the greatest speed in vacuum?

- A. Radio waves
- B. Visible light
- C. X rays
- D. All of these travel at the same speed



15- Spectral line splitting due to the influence of magnetic fields is called:

- A. Boltzmann Effect
- B. Zeeman Effect
- C. Planck Effect
- D. Zanstra's Effect

16- The angular position of the sun at solar noon with respect to the plane of the equator is the definition of:

- A. index of refraction
- B. solar azimuth angle
- C. latitude
- D. solar declination angle

17- Humans radiate in which region of the electromagnetic spectrum?

- A. Ultraviolet
- B. Visible
- C. Infrared
- D. Humans don't radiate, only stars can radiate

18- Which of the following statements is true about the steady-state cosmology?

- A. It explains the isotropic nature of the remnant radiation from a giant fireball.
- B. It appears to violate the law of conservation of matter in empty space
- C. It predicts a negative value for the Hubble Constant.
- D. It explains the galactic red shifts as gravitational effects

19- What is the Chandrasekhar limit?

- A. The smallest mass a star can have and still burn hydrogen.
- B. The size of a black hole.
- C. The distance from the center of a galaxy at which Population I stars turn to Population II stars
- D. The maximum possible mass of a white dwarf.

20- When you observe the Sun in the sky with your eyes, you are looking at the

- A. corona.
- B. chromosphere.
- C. photosphere.



21- Where in the Universe are heavy elements currently being made?

- A. in the surface layers of low mass stars.
- B. in interstellar dust and gas clouds.
- C. no heavy elements are currently being formed. They all formed in the Big Bang at the beginning of the Universe.
- D. in the cores of massive stars.

22- Magnetic fields in a sunspot is,

- A. Is the same as the rest of the sun
- B. Weaker than the rest of the sun
- C. stronger than the rest the sun

23- Gas and dust between an observer and a star being observed causes _____ in the spectrum of the star.

- A. A redshift
- B. A blueshift
- C. Absorption lines
- D. Emission lines

24- What is meant by the cosmic background radiation?

- A. It is radiation from distant quasars.
- B. It is radiation from hot gas in intergalactic space
- C. It is radiation from the first star formed when the universe was young
- D. It is radiation created during the early days of the universe.

25- If a star is said to be in hydrostatic equilibrium, it is not contracting because

- A. the ratio of H to He is equal
- B. its temperature is too low
- C. its internal pressure balances its gravity
- D. it is too dense to contract further

26- Astronomers use interferometers to:

- A. Observe extremely dim source.
- B. Measure the speed of remote objects.
- C. Detect radiation that otherwise cannot pass through our atmosphere.
- D. Enhance the resolving power in source



27-What is the correct spectral class sequence in order from highest to lowest temperature?

- A. O B A F G K M
- B. O B F M A G K
- C. A B F G K K O
- D. M K G F A B O

28-A telescope resolving power measures its ability to see:

- A. Fainter source.
- B. More distance source
- C. Finer details in source.
- D. Larger source

29- The 2.7 Kelvin cosmic background radiation is concentrated in the:

- A. radio wavelengths
- B. infrared
- C. visible
- D. ultraviolet.

30-Which one of the following properties of light does not change with the nature of the medium?

- A. velocity
- B. wavelength
- C. amplitude
- D. Frequency

31- Astronomers know that interstellar matter exists because:

- A. They can see it in dark clouds and clouds that absorb light.
- B. The matter creates narrow absorption lines in the spectra of some stars.
- C. They can detect radio waves coming from atoms and molecules in the cold gas.
- D. All the above

32- What binary system is best seen when the orbital plane is perpendicular to the line of sight?

- A. Eclipsing binary system
- B. Spectroscopic binary system
- C. Visual binary system

33- Name the phase that the moon is in for each type of eclipse, lunar and solar:

- A. Full moon for both phases
- B. New moon for both phases
- C. Full moon for lunar and new moon for solar
- D. New moon for lunar and full moon for solar



34- Which planet has the highest average surface temperature and why?

- A. Mercury, because it is closest to the Sun
- B. Mercury, because of its dense carbon dioxide atmosphere
- C. Venus, because of its dense carbon dioxide atmosphere
- D. Mars, because of its red color

35- The space between stars is

- A. Inhomogeneous
- B. Homogeneous
- C. A vacuum

36- Which experiment shows that wavelength of light is smaller than that of sound

- A. Diffraction
- B. Polarization
- C. Interference
- D. Reflection

37- The weakest of the four fundamental forces of nature is

- A. Strong nuclear force
- B. Electromagnetism
- C. Weak nuclear force
- D. Gravity

38- The Hubble relation

- A. Expresses how recession velocity increases with distance from the observer
- B. is not a law of nature
- C. Can be expressed as $v = H_0 d$
- D. All of the above

39- We know that the universe is expanding because

- A. We observe the galaxies getting smaller and smaller every year.
- B. The proper motions of galaxies suggest they are moving away from a single point.
- C. Observe galaxies disappearing from view every year.
- D. Red shifts detected in the spectra of galaxies are due to the Doppler effect.

40- In a typical H-R diagram, stars are graphed by these two characteristics

- A. Temperature and luminosity
- B. Luminosity and distance
- C. Distance and temperature
- D. Size and distance



41-When the sun is nearest to the earth, the earth is said to be in -

- A. Aphelion
- B. Perihelion
- C. Apogee
- D. Perigee

42-The escape velocity is

- A. the speed of a comet on a hyperbolic trajectory.
- B. the terminal velocity acquired in the rocket trick experiment.
- C. the speed at which a satellite will orbit in a circle.
- D. the speed required to completely escape the gravitational pull of an object.

43- How can astronomers determine whether the unseen companion in an X-ray emitting binary star system is a black hole or a neutron star?

- A. Black holes show up as a black dot and neutron stars show up as a pulsar.
- B. Any binary system having an unseen companion must contain a black hole.
- C. If the mass of the unseen companion exceeds three solar masses, it must be a black hole.
- D. Only neutron stars can emit X-rays; black holes emit nothing.

44- The light travel time of a galaxy which is 3 Mpc away is about

- A. 3 years
- B. 3000 years
- C. 3 million years
- D. 9 million years

45-What causes the radio pulses of a pulsar?

- A. The star vibrates.
- B. As the star spins, beams of radio radiation from it sweep through space. If one of these beams points toward the earth, we observe a pulse.
- C. The star undergoes nuclear explosions that generate radio emission.
- D. The stars dark orbiting companion periodically eclipses the radio waves emitted by the main star.

46- Which of the following statements best describes the distribution of galaxies in the universe?

- A. the galaxies lie on sheets and chains surrounding empty regions
- B. the galaxies are distributed uniformly in space
- C. there are a few large clusters of galaxies with nothing in between
- D. there are many clusters near us in space, but nothing beyond



47- If at a given time of year the night is 24 hours long at the North Pole. How many hours long is the night at the South Pole?

- A. 24 hours.
- B. 12 hours.
- C. 36 hours.
- D. There is no night then

48- How do we know what the core of the Earth is made of?

- A. Deep bore holes allow us to sample all but the inner 10% of the Earth.
- B. By proper use of Kepler's Laws, we can deduce the composition of the core.
- C. Earthquake waves give information about the kind of material through which they pass.
- D. Volcanoes bring up material directly from the core

49- The two electrons present in an orbital are distinguished by

- A. Principal quantum number
- B. Magnetic quantum number
- C. Spin quantum number
- D. Azimuthal quantum number

50- Which of these can only be seen with a radio telescope?

- A. Cool hydrogen clouds
- B. Asteroids
- C. Globular star clusters

51- Which of the following statement is correct?

- A. The kinetic energy of a body before impact is more than the kinetic energy of a body after impact.
- B. The kinetic energy of a body before impact is equal to the kinetic energy of a body after impact
- C. The kinetic energy of a body during impact remains constant
- D. The kinetic energy of a body before impact is less than the kinetic energy of a body after

52- When the tide producing forces of the sun and moon act in a straight line complementing each other, it produces -

- A. tidal bores
- B. neap tides
- C. spring tides
- D. normal tides

- 53- Planets are spherical while asteroids are irregularly shaped because
- gravity dominates over material strength in asteroids.
 - gravity dominates over material strength in planets.
 - asteroids cannot be irregular in shape.
 - material strength dominates over gravity in planets.
- 54- Radio telescope's dish reflector need not be as smooth as a mirror (used in an optical telescope) because,
- Radio waves are stronger than light waves
 - Radio waves have a higher frequency than light waves
 - Radio waves have a longer wave length than light waves
- 55- Which of the following is not a part of a comet?
- nucleus
 - coma
 - tail
 - stream
- 56- The focal ratio of a lens or mirror is the ratio of its
- focal length to diameter
 - diameter to thickness
 - magnification to diameter
 - focal length to thickness
- 57- Which part of the Milky Way galaxy contains the most of the stars?
- Galactic halo
 - Galactic
 - Nuclear bulge
- 58- In this type of universe, the universe reaches a maximum size and then collapses
- Flat
 - Closed
 - Open
 - Empty
- 59- Kepler's laws were based on _____'s observations
- Galileo
 - Copernicun
 - Aristot
- 60- How many years does it take for our solar system to complete an orbit around the Milky Way?
- 50 million years
 - 240 million years
 - 130 million years



Q2) Fill in the Blanks (20 Marks)

- 1-Rayleigh criteria is
- 2-If the Hubble's constant taken to be equals 75km/s. Mpc^{-1} , then the age of the universe is nearly equals to..... years
- 3- What is the name of the star that is the brightest in the sky?
- 4- Remote sensing imaging instruments are often characterized by 1-.....; 2-..... and 3-..... Resolution
- 5- The rapidly moving stream of charged particles that is being driven away from the sun is known as what?.....
- 6- Which planet can never be seen on the meridian at midnight?.....
- 7-The basic difference between ultraviolet, visible, and infrared radiation is.....
- 8- Most of the mass in the solar system is in theMost of the angular momentum in the solar system is in the
- 9- A galaxy's spectrum has a redshift of 30000 kilometers per second. If the Hubble constant is 75 km per second per Mpc, How far away from earth is the galaxy?..... Mpc.
- 10- Telescope A's mirror has three times the diameter of telescope B's. how much greater A's light-gathering power?.....Times
- 11-An individual piece (quantum) of light is called a.....
- 12- The total motion possessed by a body, is called
- 13- Radio waves of wavelength 300 m have a frequency of..... Hz
- 14- The approximate height of the atmosphere is km.
- 15- The important parameters that define an optical astronomical observation are 1-, 2-.....and 3-.....
- 16- What happens to a collapsed star that is too massive to be supported by neutron pressure?
it forms



17- if the distance between the components of the binary stars is $1.38''$ arc second. What should the diameter of a telescope be to resolve the binary stars if the wavelength value is equal to 550nm ?

.....cm

18-What is the frequency of a wave that has a speed of 0.4 m/s and a wavelength of 0.020 meter ?

.....Hz

19- As two or more waves pass simultaneously through the same region, can occur.

20- The orbital plane of the moon is how many degrees inclined from the ecliptic?..... degrees

Q3) Answer with either True or False (20 Marks)

1- The solar day is longer than the sidereal day.

2- The surface temperature of a star radiates most strongly at 400 nanometers is $75000?$

3- The 21 cm absorption line in HI-region can be observed using Radio astronomy.

4- The solar system is defined as all matter and energy in existence anywhere, observable or not.

5- The Magellanic Cloud is Made up of small galaxies moving in orbits around the Milky Way.

6- Aristotle was first to propose that all planets revolve around the Sun?

7- Sunspots are dark because They are hot relative to the gas around them.

8 - The point, through which the whole weight of the body acts, irrespective of its position, is known as centre of gravity .

9- the orbital velocity of the earth is equal to 29 km/s .

10- The corona is the Hottest region of the sun.

11-The comet known as Halley's Comet has an average period of 86 years .

12- To determine the transverse velocity of a star, both its Distance and proper motion must be known..

13 - The EMW with wavelength $0.6\ \mu\text{m}$ and frequency $0.5 \times 10^{15}\text{Hz}$ is $3.3 \times 10^{-20}\text{ J}$.

14- The point directly over your head is called the zenith .

- 15- A star of apparent magnitude five looks brighter than one of apparent Magnitude two?
- 16- The apparent rising and setting of the Sun, as viewed from Earth, is caused by the Sun's rotation.
- 17- Interstellar dust between Earth and a star causes the star's light to appear dimmer and redder.
- 18- Gravitational lensing of the most distant objects is usually caused by Galaxies.
- 19- When neutron degeneracy fails in a high-mass star, it becomes a white dwarf.
- 20 - Differences among stellar spectra are mainly due to differences in star Composition?

Good Luck

