



Name : .....

*University of Baghdad*  
*College of Science*  
*Astronomy and Space Department*

*Ph.D. Competition Exam*

*Date: 18/7/2016*

*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			
Q4			
<b>Total</b>			
<b>Out of</b>	100		

Q1) Mark with circle the correct answer (12 Marks and each question One Mark)

- 1- A telescope resolving power measures its ability to see:
- A. Fainter source.
  - B. More distance source
  - C. Finer details in source.
  - D. Larger source
- 2- A device which would not work on the Moon is:
- A. thermometer
  - B. siphon
  - C. spectrometer
  - D. spring balance
- 3- What prevents a white dwarf from collapsing to a black hole?
- A. The highly compressed electrons exert degeneracy pressure.
  - B. Fission of complex elements releases heat.
  - C. Fusion of complex elements generates heat.
  - D. The highly compressed neutrons exert degeneracy pressure.
- 4- The most important advantage of a large telescope aperture is that it
- A. allows a large amount of radiation to be collected
  - B. gives a higher magnification of the objects observed
  - C. is less affected by the trembling of the Earth's atmosphere
  - D. produces a larger diffraction ring when distance its core.
- 5 - Hubble classified galaxies by their appearance. Which of the following types of galaxies do NOT fall on Hubble's tuning fork diagram?
- A. Peculiar galaxies.    B. Spiral galaxies.
  - C. Elliptical galaxies.    D. Barred spiral galaxies
- 6- Gravitational lensing
- A. Was not predicted by general relativity
  - B. May result in a galaxy image being stretched into a perfect ring, called an Einstein ring
  - C. May result in a complete obstruction of the light of a distant object by a more close object
  - D. All of the above
- 7 - 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

8- 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

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

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

10. The measurements of radial motions of astronomical objects using the Doppler effect have been instrumental in

- A. the discovery that our Universe is expanding.
- B. illustrating the need for dark matter in galaxies.
- C. discovering planets around other stars.
- D. All of these answers.

11- Which of the following is not a part of a comet?

- A. nucleus      B.coma      C.tail      D.stream

12- What is phase difference between two successive troughs in the transverse wave?

- A.  $\frac{\pi}{2}$       B. p      C.  $\frac{3\pi}{2}$       D. 2p

**Q2) Fill in the Blanks (8 Marks and each question two Marks)**

1- The focal ratio of a lens or mirror is the ratio of its ..... to .....

2- A star like object with a very large redshift is a .....

3- An individual piece (quantum) of light is called a.....

4- Radio waves of wavelength 300 m have a frequency of..... Hz

Q3) Mark with circle the correct answer (48 Marks and each question One mark)

1-  $\int_{-\infty}^{\infty} f(x)e^{-j2\pi x} dx$  represent:

- A. FT      B.DFT      C.CT

2- When light falls on the junction

- A.If the photon energy is small enough it produce free hole-electron pairs  
B.If the photon energy is large enough it produce free hole-electron pairs

3- Johnson noise is a type of detector noise generated by \_\_\_\_\_ fluctuations in conducting materials.

- A. thermal      B. nonthermal

4-  $h(x, y) \cong h_0 \exp\left(-jk \frac{x^2+y^2}{2d}\right)$  represent:

- A. Fresnel approximation for impulse response function  
B. Fraunhofer approximation for impulse response function  
C. Fourier transform for impulse response function

5-  $p(x, y) = \begin{cases} 1 & \text{inside the aperture} \\ 0 & \text{outside the aperture} \end{cases}$  called:

- A. Complex amplitude      B. Propagation function      C. Aperture function

6-The detector noise can be reduced by

- A.heating      B. Cooling

7- The total photomultiplier tube voltage

- A. May be from 500 to 3000 volts from anode to cathode.  
B. May be from 5 to 30 volts from anode to cathode.

8- Gamma rays wavelengths in order of .

- A.Centimeters      B. nanometers      C. meters

- 9- Assume the atom to be sphere with diameter ( $2 \times 10^{-8}$  cm), the mean free path in the ionosphere, if there are ( $3 \times 10^{19}$  atoms/cm<sup>3</sup>) is approximately  
 A.  $3 \times 10^{-5}$  cm      B.  $50 \times 10^{-5}$  m      C.  $3 \times 10^{-8}$  cm      D.  $63 \times 10^{-7}$  cm
- 10- The Earth's magnetosphere formed from:  
 A. X-ray and EUV      B. Solar wind and Earth magnetic field  
 C. Cosmic ray and solar wind      D. Solar wind and ionosphere
- 11- The device photomultiplier tube is type of \_\_\_\_\_ detector.  
 A. photoconductor      B. photovoltaic      C. Photoemissive
- 12- A supernova explosion occurs when  
 A. neutron star becomes a Cepheid.  
 B. the core of a massive star begins to burn iron into uranium.  
 C. tidal forces from one star in a binary tear the other apart.  
 D. the core of a massive star collapses in an attempt to ignite iron
- 13- The kinetic temperature of the plasma in the solar corona can reach million Kelvin, so that the speed of the electron in such plasma is  
 A.  $9.74 \times 10^6$  m/sec      B.  $6.74 \times 10^6$  m/sec      C.  $6.74 \times 10^3$  m/sec      D.  $9.74 \times 10^5$  m/sec
- 14- Modern cosmology supposes that the Universe came from a "big bang" event about 13 billion years ago. Evidence for this is  
 A. the uniformity of the abundance of hydrogen and helium.  
 B. the cosmic background radiation.  
 C. the Hubble expansion.  
 D. all of these answers
- 15- What is a gas's temperature in Celsius when it has a volume of (25 L), concentration (203 mol), and pressure (143.5 atm)?  
 A. 50.3 °C      B. 60 °C      C. -80.2 °C      D. -57.4 °C
- 16- In the base of exosphere the scale height multiplied by concentration equal to  
 a) E      b) Zt      c) N      d)  $\sigma$

- 17- High-frequency waves are
- A. absorbed by the F2 layer
  - B. reflected by the D layer
  - C. capable of use for long-distance communications on the moon
  - D. affected by the solar cycle

18- The First layer in Atmosphere is

- A. Troposphere
- B. stratosphere
- C. Mesosphere
- D. Ionosphere

19- 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.

20- The ionosphere is a region of ionized gas in the upper atmosphere. The ionosphere is responsible for

- A.. The blue color of the sky
- B. Rainbows.
- C. Long distance radio communication
- D. The ability of satellites to orbit the earth

21- The kernel of the discrete Fourier transform is:

A.  $W_m^{ux} = \exp(-2\pi(\frac{ux}{m}))$

B.  $W_m^{ux} = \exp(-2\sqrt{-1}(\frac{ux}{m}))$

C.  $W_m^{ux} = \exp(-2\pi\sqrt{-1}(\frac{ux}{m}))$

22- The most dense of all ionized layer of the ionosphere

- A. E
- B. F1
- C. F2
- D. D

23- 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

- 24- We always see the same face of the moon because -
- A. it is smaller than the earth
  - B. it revolves on its axis in a direction opposite that of the earth
  - C. it takes equal time for revolution around the earth and rotation in its axis
  - D. it rotates at the same speed as the earth around the sun
- 25- Which of the following is not a type of space?
- A. flat space
  - B. spherical space
  - C. conical space
  - D. hyperbolic space
- 26- If an alien astronomer in a distant galaxy looks at the galaxies it can see, it will observe that
- A. half of the galaxies are moving away and half of them are moving toward it.
  - B. other galaxies are stationary.
  - C. other galaxies are moving away from it.
  - D. other galaxies are moving toward it.
- 27- The visual aurora consists of luminous arcs, rays or bands in the night sky, usually confined to high latitudes and located in the:
- A. troposphere
  - B. stratosphere
  - C. ozonosphere
  - D. ionosphere
- 28- In the ladder of distance indicators used by astronomers, which of the following techniques is used on the most nearby objects?
- A. Parallax
  - B. Radar
  - C. Supernovae
  - D. RR Lyrae variables
- 29- Cepheid variables and RR Lyrae are good distance indicators because
- A. They have very large radial velocities
  - B. They maintain a constant apparent brightness regardless of their distance
  - C. They have well-established period-luminosity relationships
  - D. Cepheid variables and RR Lyrae are not good distance indicators
- 30- The search for dark matter is fueled by the drive to discover
- A. The source of energy for quasars.
  - B. What causes galaxy to rotate.
  - C. How long the Sun is expected to live.
  - D. Whether the universe is open or closed.
- 31- Which of these things can the small angle equation not be used to measure:
- A. distance to an object
  - B. speed of an object
  - C. diameter of an object
- 32 - If the force of gravity doubles, your mass
- A. is half as much, is one quarter as much
  - B. remains the same
  - C. doubles
  - D. quadruples

- 33- Which of the following is true of the Roche Limit?
- A. Moons are located inside it, rings are located outside
  - B. Rings are located inside it, moons are located outside
  - C. Only applies to the gas giant planets.
  - D. Defines the distance at which asteroids transition from stony and metal-rich to black and carbon-rich
- 34- 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
- 35- In general, the primary function of a telescope is
- A. to measure the wavelengths of the incoming types of radiation.
  - B. separate out one type of radiation from another.
  - C. act as a "light bucket" to catch photons.
  - D. measure the amount of radiation produced inside of an object
- 36- If you were watching a star collapsing to form a black hole, the light would disappear because it:
- A. is strongly redshifted
  - B. is strongly blueshifted
  - C. its color suddenly becomes black
  - D. none of the above
- 37- In which spectral region is it possible for astronomers to observe through clouds?
- A. visual
  - B. radio
  - C. ultraviolet
  - D. x-ray
- 38- Present evidence suggests that most of the mass of the universe is in the form of
- A. dark matter
  - B. luminous matter
  - C. cosmic rays
  - D. black holes
- 39- 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. dark absorption lines
  - D. no spectral lines at all
- 40- The Magellanic Clouds are visible from \_\_\_\_?
- A. Northern hemisphere
  - B. Southern Hemisphere
  - C. Both Northern and Southern Hemisphere
  - D. Neither Northern nor Southern Hemisphere



41- Radiation from the early history of the universe was doppler-shifted by the expansion of the universe until today it is in the form of.

- A. x-rays      B . infrared waves      C. ultraviolet waves      D. radio waves

42-The speed of rotation of the earth is the highest

- A .along the Equator      B .at the North-Pole  
C .along the Tropic of Cancer      D .along the Arctic Circle

43- Most stars are cooler than the sun. These stars, the planets, interstellar clouds and star-forming regions emit most of their radiant energy in the

- A. visible      B. x-ray region      C. ultraviolet      D. infrared

44-The gravitational force due to which all the planets and other heavily bodies rotates around the sun is called?

- A. Centrifugal force      B. Centripetal force      C. Cosmic force      D. Surface tension

45- Most common type of galaxies yet found in universe are

- A.spiral galaxies      B.elliptical galaxies      C.peculiar galaxies      D.lenticular galaxies

46- The scientists have discovered that Milky Way is having two components, the disc and spherical. What may be the central object of Milky Way?

- A.A Black Hole      B.A Neuron Star      C,Vacuum      D.A Large Magellanic Cloud

47-Cosmic rays

- A. circulate freely through space  
B. are trapped in our galaxy by electric fields  
C. are trapped in our galaxy by magnetic fields  
D. are trapped in our galaxy by gravitational fields

48- Smaller heavenly bodies that rotates around sun are called?

- A. Planets      B. Asteroids      C. Comets      D. All of above

**Q4) Fill in the Blanks (32 Marks and each question Four Marks)**

1. The layer of the ionosphere which farthest from the sun is ..... layer
- 2-Kepler's laws were based on ..... observations
- 3 -Primary cosmic rays are composed largely of very fast .....
- 4- The Earth's magnetosphere formed from .....and .....
- 5-The fitting of the coordinate system of one image to that of a second image of the same area is called  
... ..
- 7- Rayleigh criteria is .....
- 8- Electromagnetic waves that are directed above the horizon level is called .....

***Good Luck***