

Name : .....

*University of Baghdad*

*College of Science*

*Astronomy and Space Department*

*M.Sc. 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			
<b>Total</b>			
<b>Out of</b>	100		



Q1) *Mark with circle the correct answer (60 Mark)*

- 1- The largest circular storm in our solar system is on the surface of which of the following planets?
- A. Jupiter
  - B. Venus
  - C. Uranus
  - D. Earth
- 2- Which of the following is a characteristic of an adiabatic process?
- A.  $\Delta U = 0$
  - B.  $W = 0$
  - C.  $Q = 0$
  - D.  $\Delta V = 0$
- 3- The best estimate of the Hubble constant is
- A. 700 m/s/Mpc
  - B. 0 km/s/Mpc
  - C. 70 km/s/Mpc
  - D. 500 Km/s/Mpc
- 4- Radio waves of wavelength 300 m have a frequency of:
- A.  $10^3$  kHz
  - B. 500 kHz
  - C. 1 MHz
  - D. 9 MHz
- 5- Which of these statements is TRUE about black holes?
- A. Only light can escape inside the event horizon
  - B. Does not emit any radiation
  - C. It is smaller than the Schwarzschild radius
- 6- Refracting telescopes always contain which one of the following?
- A. mirrors
  - B. lenses
  - C. television systems
  - D. film
- 7 - A comet's tail points in which direction
- A. toward the sun
  - B. toward the earth
  - C. behind the comet in its orbit
  - D. away from the sun



8- The second highest layer of Earth's atmosphere is:

- A. stratosphere
- B. mesosphere
- C. troposphere
- D. thermosphere

9- With which one of the following astronomical objects are meteor showers associated?

- A. Asteroids
- B. Comets
- C. Planets
- D. None of the above

10- Eclipses do not occur each month because:

- A. The moon's orbit is so elliptical.
- B. The earth's rotation axis is tilted
- C. The moon's orbit is tilted with respect to the earth's orbit around the sun.
- D. The moon takes 6 months to complete its orbit around the earth.

11- All weather phenomena take place in the:

- A. stratosphere
- B. mesosphere
- C. troposphere
- D. thermosphere

12- On the surface of the moon the

- A. mass and weight become less
- B. only the mass is less
- C. mass remain constant and only the weight is less
- D. mass and weight both remain unchanged

13- Light reaches the earth from sun in nearly

- A. 15 minutes
- B. 10 minutes
- C. 8 minutes
- D. 8 minutes and 30 seconds

14- The light-year is a unit of

- A. Time.
- B. Distance.
- C. Speed.
- D. Age.



15- Gamma rays have the same basic nature as:

- A. Alpha particles
- B. electrons
- C. positrons
- D. x-rays

16- If you were watching 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

17- Which of the following planets has been observed to have extensive Van Allen belts similar to those of Earth?

- A. Mercury
- B. Mars
- C. Jupiter
- D. Venus

18- Which of the following astronomical system is/are held together by gravity?

- A. The Sun.
- B. The Solar System.
- C. The Milky Way.
- D. All of them

19- A pulsar is actually a:

- A. black hole
- B. white dwarf
- C. red giant
- D. neutron star

20- The angular position of an object measured from a fixed point along the horizon is its:

- A. azimuth
- B. apogee
- C. zenith
- D. declination





- 21- The word Albedo refers to which of the following?
- A. The wobbling motion of a planet
  - B. The amount of light a planet reflects
  - C. The phase changes of a planet
  - D. The brightness of a star
- 22- Which one of the following planets has no moons?
- A. Mars
  - B. Neptune
  - C. Venus
  - D. Jupiter
- 23- Galaxies are classified as
- A. Spiral
  - B. Elliptical
  - C. Irregular
  - D. All of the Above
- 24- What shape is the Milky Way galaxy?
- A. A spiral galaxy
  - B. An elliptical galaxy
  - C. An irregular shape galaxy
- 25- Sun spots appear in the
- A. Photosphere
  - B. Chromosphere
  - C. Solar corona
- 26- A star's luminosity is
- A. dependent on the star's size and distance
  - B. expressed as its apparent visual magnitude.
  - C. calculated by measuring the star's parallax angle.
  - D. dependent on the star's temperature and amount of surface area.
- 27- The apparent magnitude of an object in the sky describes its
- A. size
  - B. magnification
  - C. brightness
  - D. distance



28- The study of the origin and evolution of the universe is known as:

- A. tomography
- B. cystoscopy
- C. cryology
- D. cosmology

29- An emission line which has been shifted to a longer wavelength is said to be

- A. Retrograde
- B. Red shifted
- C. Blue shifted
- D. Emission lines cannot be shifted

30- The sun is

- A. a star
- B. 1 AU from Earth
- C. more than 100 times the diameter of Earth
- D. all of the above

31- The charge on an electron is known to be  $1.6 \times 10^{-19}$  coulomb. In a circuit the current flowing is

1 A. How many electrons will be flowing through the circuit in a second?

- A.  $1.6 \times 10^{19}$
- B.  $1.6 \times 10^{-19}$
- C.  $0.625 \times 10^{19}$
- D.  $0.625 \times 10^{12}$ .

32- Under what condition does the Winner filter become an inverse filter

- A.  $\text{SNR}=0$
- B.  $\text{SNR}=\infty$
- C.  $\text{SNR}=1$

33- Which one of the following cannot be polarized?

- A. radio waves
- B. ultraviolet rays
- C. X-rays
- D. sound waves

34- The resolving power of a telescope depends on the:

- A. focal ratio
- B. diameter of the objective
- C. magnification
- D. focal length



35- X-ray are

- A. of unknown nature
- B. high energy electrons
- C. high energy photons
- D. radio isotopes

36- Which of the following is a scalar quantity?

- A. Acceleration
- B. Force
- C. Speed
- D. Velocity

37- The unit of angular velocity is

- A. m/min
- B. rad/s
- C. revolutions/min
- D. both B and C

38- If (H) is the Hamiltonian operator in three dimensions and ( $P_x$ ) is the momentum in x-direction the  $[H, p_x] = \dots\dots$

- A.  $i\hbar P_x$
- B.  $i\hbar H$
- C.  $i\hbar(\partial V/\partial x)$
- D.  $-i\hbar(\partial V/\partial x)$

39- The energy that heats the sun has its origin in

- A. The production of helium from hydrogen
- B. nuclear fission
- C. radioactive
- D. The production of hydrogen from helium

40- Planck's constant has the same units as

- A. angular momentum
- B. the Hamiltonian
- C. frequency
- D. quantum number



- 41- The radius of  $^{208}\text{Pb}$  is
- A.  $7.11 \times 10^{-15} \text{ m}$
  - B.  $7.11 \times 10^{-10} \text{ m}$
  - C.  $7.11 \times 10^{-13} \text{ m}$

42- The bands of the electromagnetic spectrum, in order of increasing photon energy (decreasing wavelength), are

- A. radio, microwave, infrared, optical, ultraviolet, X-ray, gamma-ray
- B. gamma-ray, X-ray, ultraviolet, optical, infrared, microwave, radio
- C. radio, microwave, ultraviolet, optical, infrared, X-ray, gamma-ray
- D. gamma-ray, X-ray, infrared, optical, ultraviolet, radio, microwave

43- If two light waves are coherent:

- A. their amplitudes are the same
- B. their frequencies are the same
- C. their wavelengths are the same
- D. their phase difference is constant

44- Fermi function equal one at.....with Temperature  $0\text{K}^0$

- A.  $\epsilon < \epsilon_f$
- B.  $\epsilon = \epsilon_f$
- C.  $\epsilon > \epsilon_f$

45- Neutron stars

- A. Composed entirely of neutrons
- B. Are well below the Chandrasekhar limit
- C. Have slow rotational speeds

46- What is an example of a longitudinal wave

- A. sound wave
- B. X-ray
- C. Gamma ray
- D. water wave

47- 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



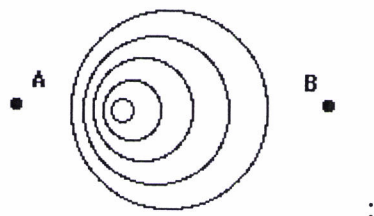


48- Atomic spectra is an example of

- A. line spectra
- B. continuous spectra
- C. band spectra
- D. both a and b

49--Consider the diagram below of several circular waves created at various times and locations.

The diagram illustrates .



- A. interference
- B. diffraction
- C. the Doppler effect
- D. polarization

50-In double slit experiment we observe

- A. interference fringes only
- B. diffraction fringes only
- C. polarized fringes
- D. both interference and diffraction fringes

51- Which of these is NOT a component of a radio telescope?

- A. Antenna
- B. Amplifier
- C. Eye piece

52- The value of (x) which solves the inequality  $(2x-1) < (x+3)$  is

- A.  $x=4$
- B.  $x \geq 4$
- C.  $x < 4$
- D.  $x \leq 4$

53- Bohr's atomic model is based upon

- A. Einstein's relativistic theory
- B. classical theory
- C. planks quantum theory
- D. both B and C



54- 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

55- In hydrogen spectrum which one of the following series lies in the ultraviolet region?

- A. Balmer series
- B. Pfund series
- C. Bracket series
- D. Lyman series

56- Which one of following postulate is in accordance with the Rutherford's model?

- A. continuous spectra for atoms
- B. discrete spectra for atoms
- C. either continuous nor discrete
- D. no spectrum

57- The material between stars is

- A. A nebula
- B. Dark matter
- C. The interstellar medium
- D. A vacuum

58- The names of the planets in order of their distance from the Sun are

- A. Mercury, Venus, Earth, Jupiter, Mars, Neptune, Uranus, Saturn
- B. Mercury, Venus, Earth, Mars, Saturn, Jupiter, Neptune, Uranus
- C. Venus, Mercury, Earth, Mars, Jupiter, Saturn, Uranus, Neptune
- D. Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune

59- H-R diagram classifies stars according to

- A. Visual magnitude and Spectral class
- B. Absolute magnitude and Stellar mass
- C. Stellar luminosity and Spectra class

60- What is the name of the following statement: "When two systems are in thermal equilibrium with a third system, then they are in thermal equilibrium with each other"

- A. First Law of Thermodynamics
- B. Second Law of Thermodynamics
- C. Mechanical equivalent of heat
- D. Zeroth Law of Thermodynamics



**Q2) Fill in the Blanks (20 Marks)**

- 1- The sunspot cycle is .....
- 2- The potential at a point is 20 V. The work done to bring a charge of 0.5 C from infinity to this point will be .....
- 3-The moon declination change as .....
- 4- The age of the Universe in billions of years is approximately.....
- 5- Solar system is located within one of the .....of Milky way Galaxy
- 6- Which is the smallest planet in our solar system?.....
- 7- A star like object with a very large redshift is a.....
- 8-The blue color of the sky is due to .....
- 9-The mean energy for one dimensions Harmonic Oscillator in classical system is.....KT
- 10- Total weight of configuration for a sheet with three electrons in four states.....
- 11- The velocity of sound in vacuum is..... m/s
- 12- The Moon orbit inclined by .....degree with ecliptic orbit
- 13-The synchronous satellite have angle .....with.....
- 14-The period from one full moon to the next is .....days
- 15-The work done in moving a unit positive charge across two points in an electric circuit is a measure of .....
- 16- The average molecular kinetic energy of a gas depends on.....
- 17- One Astronomical unit is approximately ..... km
- 18- The star has a parallax of 0.04 arc second. its distance. ....parsecs
- 19- Julian day for 2/3/2015.....
- 20-Our Sun is a star of spectral type. ....



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

- 1- The parallax of an object is directly proportional to its distance from the observer .
- 2- Energy is transferred from the Sun to Earth mainly by electromagnetic waves.
- 3- Most elliptical Galaxies contain only old stars?
- 4- Elliptical galaxies may be classified as either barred or unbarred.
- 5- Hydrogen burning is a star's source of energy during its main-sequence phase.
- 6- Uncertainty principle is  $\Delta x \Delta p \leq h$  .
- 7- Stars begin their life composed mostly of oxygen.
- 8- As two or more waves pass simultaneously through the same region, interference can occur.
- 9- The most important line in radio astronomy is the 21-cm emission line of Hydrogen.
- 10- Kepler's laws were based on Galileo's observations.
- 11- Hydrogen atom does not emit X-rays because it has a single electron.
- 12- As a wave travels into a medium in which its speed increases, its wavelength decrease.
- 13- In the lowest level of the photosphere of the Sun, the temperature is  $6000 \text{ K}^0$ .
- 14- Binary systems help astronomers to determine the mass of the stars.
- 15- A telescope that uses a mirror to collect light is called a reflector .
- 16- Jupiter has only one large storm system?
- 17- The derivative of the function  $[f(x) = x^3 - 4x^2 + 10x]$  is  $(3x^2 - 8x)$ .
- 18- The name of the galaxy which is one of the closest galaxies near Milky Way galaxy is Heliocentric Galaxy.
- 19- When a star, the size of our sun dies, it will become, A white dwarf.
- 20- According to Kepler's Laws, all orbits of the planets are parabolas .

***Good Luck***

