KATHMANDU UNIVERSITY
End Semester Examination
February/March, 2019

Marks Scored:

Level : B.Sc.
Year : II
Course : PHYS 203
Semester : I

Exam Roll No. :
Time: 30 mins.
F.M. : 20

Registration No.:
Date : 05 MAR 2019

SECTION "A"
[20Q. × 1 =20 marks]

Encircle or provide the most appropriate answer.

1. If a nucleus emits α-particle followed by two β-particle, what should be the daughter nuclei with respect to parent nuclei?
[a] Isotone [b] Isobar [c] Isotope [d] Mirror nuclei

2. Planck's constant has the dimensions of
[a] Force [b] Energy
[c] Linear momentum [d] Angular momentum

3. In Balmer series of hydrogen atom, H_β line is formed when electrons jump from
[a] 3^{rd} orbit to 2^{nd} orbit [b] 5^{th} orbit to2^{nd} orbit
[c] 4^{th} orbit to2^{nd} orbit [d] 4^{th}orbit to3^{rd} orbit

4. The path of electron described by the equation, $\frac{1}{r} = \frac{1+\epsilon Cos(\psi\Phi)}{a(1-\epsilon^2)}$ is,
[a] circular [b] elliptical [c] rosette [d] spiral

5. Neutrino carry only the ..... interaction.
[a] Electromagnetic [b] Nuclear
[c] Weak [d] Gravitational

6. X-rays of wavelength 3Å are incident on a substance. The scattered X-rays observed at 45° have a different wavelength due to the Compton Effect. The scattered wavelength is
[a] 2.07 Å [b] 1.07 Å [c] 3.07 Å [d] 4.07 Å

7. In Zeeman effect, the frequency of a spectral line is found to be changed in a magnetic field. The change in frequency of spectral line is
[a] $\pm\frac{Be}{2m}$ [b] $\pm\frac{Be}{4\pi mc}$ [c] $\pm\frac{Be}{2mc}$ [d] $\pm\frac{Be}{4\pi m}$

8. Let's assume the radius of $_{92}U^{235}$ to be 8.12 m. The radius of $_2He^4$ is
[a] 1.5 m [b] 2.5 m [c] 3.5 m [d] 2.088 m

9. The end product of Neptunium series is
[a] $_{83}Bi^{209}$ [b] $_{82}Pb^{206}$ [c] $_{82}Pb^{207}$ [d] $_{82}Pb^{208}$

10. Becquerel is one of the units of radioactivity. Its value is
[a] 10^9disintegrations /sec [b] 10^{10}disintegrations/sec
[c] 1 disintegrations/sec [d] 10^6 disintegrations/sec

11. Which one of the following is most stable?
[a] $_2He^6$ [b] $_3Li^6$ [c] $_4Be^6$ [d] $_6B^{10}$

12. The activity of 2 gm. of Ra^{226} whose half-life is 1622 years is,
[a] 1 curie [b] 2 curie [c] 3 curie [d] 4 curie

13. If the mass defect of $_8O^{16}$ nucleus is 0.128 amu, then the binding energy per nucleon of oxygen is.
[a] 8.2 Mev [b] 7.45 Mev [c] 7.3 Mev [d] 7.1 Mev

14. The velocity of the electron in the first Bohr orbit in terms of velocity of light(c) is
[a] $\frac{1}{135}c$ [b] $\frac{1}{125}c$ [c] $\frac{1}{127}c$ [d] $\frac{1}{137}c$

15. A metal with work function of 0.6 eV is illuminated with a light of 2 eV. The stopping potential is
[a] 2.6 V [b] 2.36 V [c] 1.4 V [d] 0.8V

16. The critical potential for hydrogen is 13.05 V. The wavelength of the radiation that will be emitted by a hydrogen atom when bombarded by an electron of corresponding energy is.....

17. The potential difference applied to an X-ray tube is 15 KV and the current through it is 3.2 mA. Then the number of electrons striking the target per sec is.....

18. The wavenumber corresponding to the H_α-line of hydrogen is.....

19. A $_{92}U^{238}$ nuclei successively undergoes eight α-decays and six β-decays. The resulting isotope is.....

20. The isotope $_6C^{11}$ decays into $_5B^{11}$. The kind of particle emitted is.....

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F.M. : 55

SECTION "B"
[5Q. × 4 = 20 marks]

1. Describe Frank-Hertz experiment and write its conclusions.

OR

What is Pauli's exclusion principle? On the basis of this principle explain the configuration of electrons in atoms.

2. Explain how characteristic X-rays are produced. Discuss Moseley's law.

3. Write short notes on
(i) Larmor's Theorem.
(ii) Stark Effect

4. What is neutrino theory of beta decay? How does it explain continuous spectrum of beta decay?

OR

How would you explain the D_1 and D_2 doublet of sodium spectrum on the basis of vector model of atom?

5.
(i) Calculate the binding energy of an α-particle and express the result both in Mev and Joules.(Given: Mass of ${}_1H^1$=1.007276u Mass of ${}_0n^1$=1.008665u, Mass of ${}_2He^4$=4.001506u)
(ii) The maximum kinetic energy of the electrons emitted from a metallic surface is 1.6×10^{-19} J. When the frequency of radiation is 7.5×10^{14} *Hz*. Calculate the minimum frequency of radiation for which electrons will be emitted. Assume that h=6.62×10^{-34} Js.

SECTION "B"
[5Q. × 7 = 35 marks]

6.
(i) Explain the principle, construction and operation of a scintillation counter.
(ii) Describe the construction and working of linear accelerator.

7. Discuss the general characteristics of Sommerfeld's elliptical orbits and show that the total energy of an electron moving in Sommerfeld's orbits of the same total quantum number is the same and is identical with that of corresponding Bohr orbits.

OR

Describe Rutherford's model of an atom and the evidence that led to it and hence obtain the expression for Rutherford's scattering formula.

8. How is the age of earth determined from radioactive decay? What do you mean by radioactive equilibrium? Obtain the condition for secular and transient equilibrium.

9. What do you understand by Zeeman Effect? Discuss Normal Zeeman Effect. How will you determine the value of e/m? Why does Normal Zeeman Effect occur only in atoms with an even number of electrons?

OR

State different processes involved in interaction of Gamma rays with matter. Explain in detail the Compton Effect for X-rays and find the expression for Compton shift.

10.

(i) A piece of an ancient wooden boat shows an activity of C^{14} of 3.9 dis/minute per gm. of carbon. Estimate the age of boat if the half-life of C^{14} is 5568 years. Assume that the activity of fresh C^{14} is 15.6 dis/minute per gram.

(ii) Evaluate the Lande's g factor for $^3p_1$ level and use the result to predict the splitting (in *eV*) of the energy level when the atom is in external magnetic field of 0.1 Tesla. Given Bohr magnetron=9.3×10-24 Am^2

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Course : GEOM 202
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Exam Roll No. :
Time: 30 mins
F. M. : 10

Registration No. :
Date 05 MAR 2019

SECTION "A"
[20 Q. × 0.5 = 10 marks]

Choose the best alternative from the given choices.

1. What is the radius of longitudinal curvature of bubble tube on which the divisions are 2 mm long if the angular value of one division is 30 seconds?
   a. Zero b. 13.075 m c. 13.75 m d. 13.057 m

2. The real image of an object formed by the objective must be _____.
   a. at the center of the objective b. at the optical center of the objective
   c. in the plane of the cross wire d. on the staff

3. Graduation error in staff can be removed by:
   a. Even number of set-ups
   b. Placing same staff in first backsight and last foresight
   c. Placing instrument at equal distance from two staff
   d. Such error cannot be removed

4. In reciprocal levelling, how many set up is required for determining the elevation difference between two intervisible points?
   a. 1 b. 2 c. 3 d. 4

5. Apart from arithmetic, levelling is the best checked by _____.
   a. height of instrument method b. closed loop check
   c. rise and fall method d. open loop check

6. Combined correction value of curvature and refraction for a distance of 1000 m is :
   a. 0.06735 km b. 0.06735 m c. 0.06735 cm d. 0.06735 mm

7. In Barometric levelling if the error in pressure reading is 0.1 mm of Hg, error in elevation will be _____.
   a. 1 m b. 3 m c. 2 m d. 4 m

8. If RL of BM is 300.00 m, back sight is 1.525 m and foresight is 3.285 m, RL of the forward station will be _____.
   a. 299.240 m b. 298.475 m c. 296.715 m d. 298.240 m

9. While measuring zenithal angles by T2 and T16 theodolites if the closing error is not exactly 400 grade, the difference is known as :
   a. The collimation error b. The index error
   c. The Zenithal error d. The Swing error

10. Line of collimation is defined as the _____.
    a. line joining the center of eyepiece and optical center of objective
    b. line joining the intersection of cross-hair, optical center of objective and its continuation when the bubble is central
    c. line tangential to the longitudinal curve of the bubble tube at its mid-point
    d. inclined line of sight

11. If departure and latitude of a line are -78.0 m and +135.1 m respectively, the quadrantal bearing of the line is _____.
    a. S 30° W b. S 30° E c. N 30° E d. N 30° W

12. To observe the included angle accurately, _____ is method preferred.
    a. repetition b. reiteration c. deflection angles d. double precision

13. In a traverse survey, closing error means _____.
    a. the error in closing of the traversing operation
    b. the actual distance by which traverse fails to close
    c. the distance between the starting and end point of an open traverse
    d. the bearings observed are unaffected by local attraction

14. The coordinates of A are 100 m (Northing) and 200 m (Easting), whereas that of B are 100 m (Southing) and 200 m (Easting). The length of AB is _____.
    a. 200 m b. 282.84 m c. 244.94 m d. 400 m

15. Choose the incorrect statement:
    a. Three sets of theodolite and tangent screws are provided on a theodolite.
    b. Theodolite are equipped with an internal focusing telescope to facilitate transiting.
    c. The least count of a vernier theodolite is 20".
    d. The telescope normal position means that the vertical circle of the theodolite is to the right of the observer.

16. In triangulation, horizontal misclosure for 4^{th} grade triangulation should be within the range of _____.
    a. 5 ccg b. 10 ccg c. 30 ccg d. 20 ccg

17. The number of stations for a triangulation framework can be reduced, yet maintaining the required accuracy by using a chain of _____.
    a. triangles b. parallelograms c. pentagons d. polygons

18. Nine sets of angular observation is done in triangulation of _____.
    a. basic first order b. first order c. third order d. second order

19. Geodimeter is based on _____.
    a. propagation of infrared radiation
    b. propagation of modulated light waves
    c. the visible light as carrier waves with frequency of the order of 5×10^{14}
    d. high frequency radio waves

20. Modern EDM instruments work on the principle of measuring _____.
    a. the reflected energy generated by the target
    b. total time taken by electromagnetic wave in travelling the distance
    c. the change in frequency of the electromagnetic waves
    d. the phase difference between the transmitted and the reflected electromagnetic waves