1. As a result of radioactive decay a $_{92}U^{238}$ nucleus is changed to a $_{91}Pa^{234}$ nucleus. During this decay the particles emitted are
   a) One proton and two neutrons
   b) One α-particle and one β-particle
   c) Two β-particles and one neutron
   d) Two β-particles and one proton

2. Which one of the following logic gates does the truth table represent

A	B	Y
0	0	0
1	0	0
0	1	0
1	1	1

   a) NOT b) NOR
   c) OR d) AND

3. For a transistor the value of $\alpha = 0.9$, the value of β is
   a) 1 b) 9
   c) 0. 99 d) 0. 9

4. An n-type semiconductor is
   a) Negatively charged
   b) Positively charged
   c) Neutral
   d) May be negatively or positively charged depending on the amount of charge

5. What are the major parts of a communication system
   a) Transmitter and communication channel
   b) Communication channel and receiver
   c) Transmitter and receiver
   d) Transmitter, receiver and communication channel

6. The dimensional formula for permittivity ε_o is
   a) $[M^{-1}L^{-3}T^4A^2]$
   b) $[M^{-1}L^{-3}T^2A^2]$
   c) $[ML^3T^{-4}A^{-3}]$
   d) $[M^{-1}L^{-3}T^{-4}A^2]$

7. The position vector of a moving particle at time t is $\vec{r} = 3\vec{\imath} + 4t^2\vec{j} - t^3\vec{k}$. Its displacement during the time interval t = 1s to t = 3s is
   a) $\vec{j} - \vec{k}$ b) $3\vec{\imath} + 4\vec{j} - \vec{k}$
   c) $9\vec{\imath} + 36\vec{j} - 27\vec{k}$ d) $32\vec{j} - 26\vec{k}$

8. The displacement of a particle is given by $\sqrt{x} = 2t + 5$. What is the nature of motion of the particle
   a) Accelerated b) With uniform motion
   c) Retarded d) At rest

9. If the range of the projectile be R, then its kinetic energy is maximum after covering a distance equal to
   a) $\frac{R}{4}$ b) $\frac{R}{2}$
   c) $\frac{3R}{4}$ d) R

10. A ship of mass 3×10^7 kg initially at rest is pulled by a force 5×10^4 N through a distance of 3m. Assume that the resistance due to water is negligible, then speed of ship is
    a) 1. 5 m/s b) 60 m/s
    c) 0.1 m/s d) 5 m/s

11. The second law of thermodynamics implies
    a) Whole of the heat can be converted into mechanical energy
    b) No heat engine can be 100% efficient
    c) Every heat engine has an efficiency of 100%
    d) Refrigerator can reduce the temperature to absolute zero

12. A Carnot engine whose sink is at a temperature of 300K has an efficiency of 40%. By how much should the temperature of source be increased so to increase the efficiency to 60%
    a) 380 K b) 325 K
    c) 250 K d) 275 K

13. At a given temperature which of the following gases possesses maximum r.m.s. velocity
    a) Hydrogen b) Oxygen
    c) Nitrogen d) Carbon dioxide

14. At what temperature will the r.m.s. velocity of hydrogen be double of its value at N. T. P., pressure remaining constant
    a) 200 K b) 1092 K
    c) 1492 K d) 819 K

15. A whistle sends out 256 waves in one second. If the whistle approaches the stationary observer with velocity $\frac{1}{3}$ of the velocity of sound in air, the number of waves will be received by the observer, is
    a) 384 b) 192
    c) 300 d) 200

16. A string of length 2m fixed between two supports vibrates in two loops. The distance between node and antinode is
    a) 50cm b) 10cm
    c) 100cm d) 200cm

17. A hole is bored along the diameter of the earth and a stone is dropped into the hole
    a) The stone reaches the centre of the earth and stops there
    b) The stone reaches the other side of the earth and stops there
    c) The stone executes simple harmonic motion about the centre of earth
    d) The stone reaches the other side of the earth and escapes into space

18. The total energy of the particle executing S. H. M. is E. Then the kinetic energy when the displacement is half of the amplitude is
    a) E/2 b) E/4
    c) 3E/4 d) $\sqrt{3}$E/4

19. Beats are the result of
    a) Diffraction
    b) Destructive interference
    c) Constructive and destructive interference
    d) Superposition of two waves of nearly equal frequency

20. At what temperature the speed of sound in air will become double of its value at 27 °C
    a) 927 °C b) 327 °C
    c) 627 °C d) 54 °C

21. A charge q_1 exerts a force on a second charge q_2. If a third charge q_3 is brought near, the force of q_1 exerted on q_2
    a) Decreases
    b) Increases
    c) Remains unchanged
    d) Increases if q_3 is of same sign as q_1 and decreases if q_3 is of opposite sign.

22. Work done in carrying 2C charge in a circular path of 3m around a charge of 10C is
    a) Zero b) 6. 66 J
    c) 15 J d) 60 J

23. To obtain 3 μF capacity from three capacitors of 2 μF each, they will be arranged
    a) All the three in series
    b) All the three in parallel
    c) Two capacitors in series and third in parallel with the combination of first two
    d) Two capacitors in parallel and third in series with the combination of first two

24. A piece of aluminum and germanium are cooled from T_1 K to T_2 K, the resistance of
    a) Each of them increases
    b) Each of them decreases
    c) Aluminum decreases and that of germanium decreases
    d) Aluminum decreases and that of germanium increases

25. Five equal resistors each of resistance five (5) ohm are connected so as to form a pentagon. What is the resistance between any two corners
    a) 25 ohm b) 10 ohm
    c) 8 ohm d) 4 ohm

26. The resistance of a wire of length L and diameter D is R ohm. The wire is stretched to reduce its diameter one-third. The ratio of final resistance of wire to original resistance would be
    a) 3 : 1 b) 81 : 1
    c) 1 : 81 d) 9 : 1
27. A charged particle is moving through a uniform magnetic field. Then, magnetic field
    a) Always exerts a force on the particle
    b) Never exerts a force on the particle
    c) Exerts a force, if the particle is moving at right angle to the field
    d) Exerts a force, if the particle is moving along the field
28. A beam of ions is moving with a velocity of 2×10^5 m/s in a field of 4×10^{-2} tesla. If specific charge of the ion is 5×10^7 C/Kg, the radius of circular path described will be
    a) 0. 10 m b) 0. 16 m
    c) 0. 20 m d) 0. 25 m
29. The resistance of a galvanometer is 90 ohm. If only 10% of the main current flow may flow through the galvanometer, in which way and in what way a resistor is used
    a) 10 ohm in series
    b) 10 ohm in parallel
    c) 810 ohm in series
    d) 810 ohm in parallel
30. A coil of wire of radius r has 600 turns and a self inductance of 108 mH. The self inductance of a similar coil of 500 turns will be
    a) 75 mh b) 108 mH
    c) 90 mH d) 21 mH
31. While dusting a carpet we give a sudden jerk or beat it with a stick because:
    a) Inertia of rest keeps the dust in its position and the dirt is removed by movement of carpet away
    b) Inertia of motion removes the dirt
    c) No inertia is involved in the process, it is simply due to practical experience
    d) Jerk compensates for the force of adhesion between dust and carpet and the dust is removed.
32. The kinetic energy of a body of mass 1 kg and momentum 2 N-s is
    a) 1J b) 2 J
    c) 4 J d) 0.5 J
33. At a certain instant a body of mass 0. 4 kg has a velocity of $(8\vec{i} + 6\vec{j})$ m/s. The kinetic energy of the body is
    a) 10J b) 40 J
    c) 20 J d) None of these
34. Which of the following has centre of mass not situated in the material body
    a) A rod bent in the form of a circle
    b) Football
    c) Hand ring
    d) All of these
35. If earth shrinks to half of its present size (radius) without any change in its mass, the duration of day and night will be
    a) 12 hours b) 6 hours
    c) 13 hours d) 18 hours
36. A satellite is moving round the earth. In order to escape it, its velocity must be increased by
    a) 100% b) 41. 4%
    c) 1. 41% d) 50%
37. Fours wires of same material are stretched by the same load. The dimensions are given below. Which of them will elongate the most
    a) Length 1. 0 m, diameter 1 mm
    b) Length 2. 0 m, diameter 2 mm
    c) Length3. 0 m, diameter 3 mm
    d) Length 4. 0 m, diameter 0. 5 mm
38. Water rises in a capillary tube through a height h. If the tube is inclined to the liquid surface at 45°, the liquid will rise in the tube upto to its length equal to
    a) $\frac{h}{\sqrt{2}}$ b) h
    c) $\sqrt{2}$ h d) 2 h
39. The viscous drag on a liquid layer does not depend upon
    a) Area b) Velocity
    c) Velocity gradient d) Nature of liquid

40. Newton's law of cooling holds true provided the temperature difference between body and surroundings is
a) Large b) Small
c) Very large d) Both (a) and (b)

41. Electric power is transmitted over long distance through conduction wires at high voltages because
a) It reduces the possibility of theft of wire
b) This entails less power loses
c) AC generators produce electric power at very high voltages
d) AC signal of high voltage travels fasters

42. The number of turns in the primary and the secondary coils of a transformer are 1000 and 3000 respectively. If 80 volts ac is applied to the primary coil of a transformer, then the potential difference per turn of the secondary coil will be
a) 240 volt b) 2400 volt
c) 0.24 volt d) 0.08 volt

43. In an electromagnetic wave
a) Power is transmitted along the magnetic field
b) Power is transmitted along the electric field
c) Power is equally transferred along the electric and magnetic fields
d) Power is transmitted in a direction perpendicular to both the fields

44. The magnifying power of an astronomical telescope can be increased if we
a) Increase the focal length of the objective
b) Increase the focal length of the eye lens
c) Decrease the focal length of the objective
d) Decrease the focal length of the objective and at the same time increase the focal length of eye lens

45. When a beam of white light passes through a prism, it splits up into different colours. Violet colour is bent most because
a) Refractive index of glass for violet rays is larger than for other rays
b) Refractive index of glass for violet rays is smaller than for other rays
c) Refractive indices are all equal but violet rays have smaller wavelength
d) Refractive indices are all equal but red rays have longer wavelength

46. Two coherent sources whose intensity ratio is 81 : 1 produce interference fringes. The ratio of maximum to minimum intensity in the fringe system is
a) 10 : 1 b) 82 : 80
c) 25 : 16 d) 10 : 8

47. If a convex lens of focal 80 cm and a concave lens of focal length 50 cm are combined together what will be their resulting power
a) + 6. 5 D b) – 6. 5 D
c) + 7. 5 D d) – 0. 75 D

48. A diffraction pattern is obtained using a beam of red light. Now red light is replaced by blue light, then
a) Bands will disappear
b) Diffraction bands will become broader and farther apart
c) Diffraction bands will become narrower and crowded together
d) There will be no change

49. If the momentum of the particle is increased to four times, the de-Broglie wavelength will
a) Become twice b)Become four times
c) Become half d) Become one forth

50. When an electron in hydrogen atom jumps from some outer orbit to the inner most orbit (I^{st} orbit), the series obtained is
a) Balmer series b) Lyman series
c) Paschen series d) P fund series