PHYSICS QUESTION PAPER -2

1. X- rays, gamma rays and microwaves travelling in vacuum have

   a. Same wavelengths but different velocities
   b. Same frequency but different velocities
   c. Same velocity but different wavelengths
   d. Same velocity and same frequency

2. If 'n' is the orbit number of the electron in a hydrogen atom, the correct statement among the following is

   a. Electron energy increases as 'n' increases

   b. Hydrogen emits infrared rays for the electron transition from n= ∞ to n=1

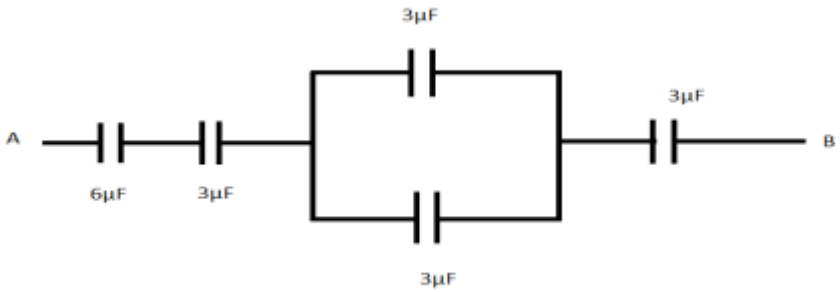
   c. Electron energy is zero for n=1

   d. Electron energy varies as n^2

3. A radioactive nucleus has specific binding energy 'E_1'. It emits an α- particle. The resulting nucleus has specific binding energy E_2then

   a. $E_2=E_1$ b. $E_2 < E_1$ c. $E_2>E_1$ d. $E_2=0$

4. In the diagram, the P.D between A & B is 60V. The P.D across 6μF capacitor is _____ V

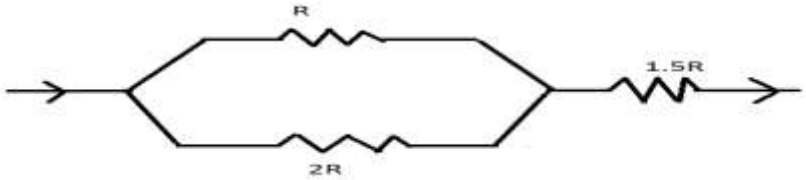


   a. 10 b. 5 c. 20 d.4

5. Acceleration of charged particle of charge `q' and mass `m' moving in a uniform electric field of strength `E' is

   a. $\frac{qE}{m}$ b. $\frac{m}{qE}$ c. mqE d. $\frac{q}{mE}$

6. In the circuit diagram heat produces in R, 2R and 1.5R are in the ratio of



a. 4:2:3 b. 8:4:27 c. 2:4:3 d. 27:8:24

7. Maximum velocity of the photoelectron emitted by a metal is $1.8X10^{6}$ ms^{-1}. Take the value of specific charge of the electron is $1.8X10^{11}$ CKg^{-1}. Then the stopping potential in volt is

a. 1 b. 3 c. 9 d. 6

8. A nucleus ${}_zX^A$ emits an α-particle with velocity v. The recoil speed of the daughter nucleus is

a. $\frac{A-4}{4v}$ b. $\frac{4\,v}{A-4}$ c. v d. $\frac{v}{4}$

9. In which of the following statements, the obtained impure semiconductor is of p- type?

a. Germanium is doped with bismuth b. Silicon is doped with antimony

c. Germanium doped with gallium d. Silicon is doped with phosphorus

10. A truck Accelerates from speed v to 2v. Work done in during this is

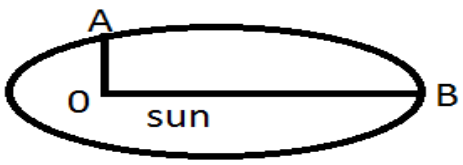
a. Three times as the work done in accelerating it from rest to v.

b. Same as the work done in accelerating it from rest to v.

c. Four times as the work done in accelerating it from rest to v.

d. Less than the work done in accelerating it from rest to v.

11. Earth is moving around the sun in elliptical orbit as shown. The ratio of OB & OA is R. Then ratio of earth at `A' &`B' is



a. R^{-1} b. $\sqrt{R}$ c. R d. $R^{2/3}$

12. The distance between an object and its real image produced by a converging lens is 0.72m. The magnification is 2. What will be the magnification when the object is moved by 0.04m towards the lens?

a. 2 b. 4 c. 3 d. 6

13. White light reflected from a soap film (Reflective index = 1.5) has a maxima at 600nm and a minima at 450nm with no minimum is between. Then the thickness of the film is _____ $X10^{-7}$ m.

a. 1 b. 2 c. 3 d. 4

14. A solenoid of inductance 2H carries a current of 1A. What is the magnetic energy stored in a solenoid?

a. 4J b. 2J c. 5J d. 1J

15. Two capacitors of 10 PF and 20 PF are connected to 200V and 100V sources respectively. If they are connected by the wire, what is the common potential of the capacitors?

a. 300 volt b. 133.3 volt c. 400 volt d. 150 volt

16. What is the period of revolution of earth satellite? Ignore the height of the satellite above the surface of earth. Given

1. The value of gravitational acceleration g= $10ms^{-2}$.

2. Radius of earth R_E = 6400Km. Take $\pi = 3.14$

a. 83.73 minutes b. 85 minutes c. 90 minutes d. 156 minutes

17. A body having a moment of inertia about its axis of rotation equal to 3 Kgm^2 is rotating with angular velocity of 3rad s^{-1}. Kinetic energy of this rotating body is same as that of a body of mass 27Kg moving with velocity v. The value of `v' is

a. 2m s^{-1} b. 1m s^{-1} c. 1.5m s^{-1} d. 0.5m s^{-1}

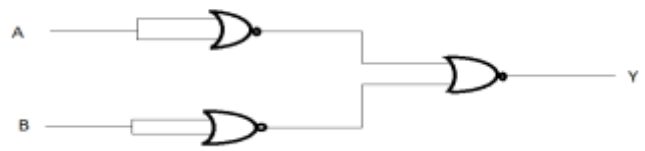
18. An object is placed at 20 cm in front of a concave mirror produces three times magnified real image. What is focal length of the concave mirror?

a. 10cm b. 15cm c. 7.5cm d. 6.6cm

19. What is the de Broglie wavelength of the electron accelerated through a potential difference of 100 volt?

a. 0.1227A^0 b. 12.27 A^0 c. 0.001227 A^0 d. 10227 A^0

20. For the given digital circuit, write the truth table and identify the logic gate it represents



a. NAND gate b. OR gate c. AND gate d. NOR gate

21. A tuned amplifier circuit is used to generate a carrier frequency of 2 MHz for the amplitude modulation. The value of $\sqrt{LC}$ is

a. $\frac{1}{3\pi X10^6}$ b. $\frac{1}{2\pi X10^6}$ c. $\frac{1}{4\pi X10^6}$ d. $\frac{1}{2X10^6}$

22. Two resistors of resistance 2Ω and 6Ω are connected in parallel, this combination is then connected to a battery of emf 2 V and internal resistance 0.5Ω. What is the current flowing through the battery?

a. 4/17 A b. 4 A c. 1 A d. 4/3 A

23. A cyclotron is used to accelerate

a. Only positively charged particles

b. Both positively and negatively charged particles

c. Neutron

d. Only negatively charged particles

24. An aircraft with a wingspan of 40m flies with a speed of 1080km/hr in the eastward direction at a constant altitude in the northern hemisphere where the vertical component of the earth's magnetic field is $1.75x10^{-5}$ T. Then the emf developed between the tips of the wings is

a. 0.34V b. 2.1V c. 0.5V d. 0.21V

25. A person wants a real image of his own 3 times enlarged. Where should he stand in front of a concave mirror of radius of curvature 30cm?

a. 30cm b. 20cm c. 10cm d. 90cm

26. Find the de- Broglie wavelength of an electron with kinetic energy of 120 eV.

a 102 pm b. 124 pm c. 95 pm d. 112 pm

27. If an electron in Hydrogen atom jumps from an orbit of level n= 3 to an orbit of level n=2, the emitted radiation has a frequency(R =Rydberg constant, C = velocity of light)

a. RC/25 b. 5RC/36 c. 3RC/27 d .8RC/9

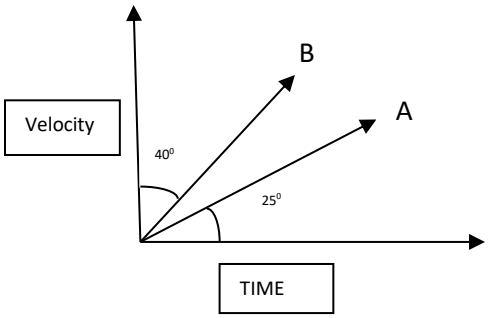
28. The velocity – time graph for the bodies A and B are shown. Then the acceleration of A & B are in the ratio

a. $\tan 25^o$ to $\tan 50^o$

b. $\cos 25^o$ to $\cos 50^o$

c. $\tan 25^o$ to $\tan 40^o$

d. $\sin 25^o$ to $\sin 50^o$



29. When two tuning forks A & B are sounded together, 4 beats per second are heard. The frequency of the fork B is 384 Hz. When one of the prongs of the fork A is filed and sounded with B, the beat frequency increases, then the frequency of the fork A is

a. 388 Hz b. 389 Hz c. 380 Hz d. 379 Hz

30. Three resistance 2Ω, 3Ω and 4Ω are connected in parallel. The ratio of currents passing through them when a potential difference is applied across its ends will be

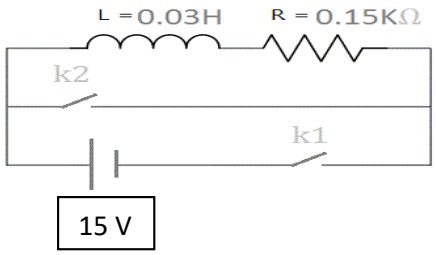
a. 6:4:3 b. 4:3:2 c. 6:3:2 d. 5:4:3

31. When 5V potential difference is applied across a wire of length 0.1m, the drift speed of electrons is $2.5X10^{-4}$ ms^{-1}. If the electron density in the wire is $8X10^{28}m^{-3}$, the resistivity of the material is done the

a. $1.6X10^{-6}\Omega m$ b. $1.6X10^{-5}\Omega m$

c. $1.6X10^{-8}\Omega m$ d. $1.6X10^{-7}\Omega m$

32. An inductor (L=0.03H) and a resistor (R=0.15K Ω) are connected in series to a battery of 1.5 V EMF in a circuit shown below. The key K_1 has been kept closed for a long time. Then at t=0, K_1 is opened and key K_2 is closed simultaneously. At t=1ms, the current in the circuit will be ($e^5 \leq 150$)



a. 6.7mA b. 0.67mA c. 100mA d. 67mA

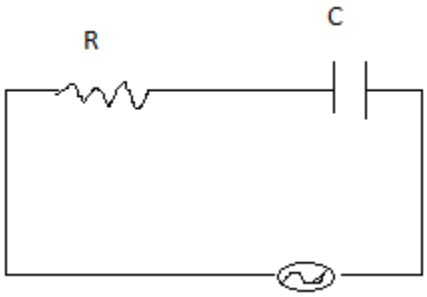
33. The period of oscillation of a simple pendulum is T= $2\pi\sqrt{\frac{L}{g}}$. Measured value of L is 20.0cm known to 1mm accuracy and time for 100 oscillations of the pendulum in sound to be 90s using a unit watch of 1s revolution. The accuracy in the determination of g is

a. 1% b. 5% c. 2% d. 3%

34. A tuning fork produces 4 beats per second when sound with a sonometer wire of vibrating length 48cm. It produces 4 beats per second also when the vibrating length in 50cm. What is the frequency of the tuning fork?

a. 196Hz b. 284Hz c. 375Hz d. 460Hz

35. A 50Hz AC source of 20V is connected across R & C as shown in the figure. The voltage across R is 12V. The voltage across C is



a. 8V b. 16V

c. 10V d. Not possible to determine unless value of R &C are given.

36. A body is projected at an angle of 30^0 with the horizontal with momentum P. At its highest point, the momentum is

a. P b. $\frac{P}{2}$ c. $\frac{\sqrt{3}}{2}P$ d. $\frac{2}{\sqrt{3}}$P

37. Among which, the magnet susceptibility does not depend on the temperature?

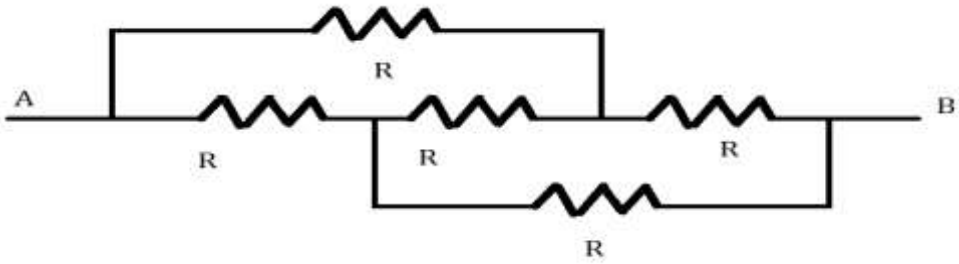
a. Diamagnetism b. Paramagnetism c. Ferromagnetism d. Ferrite

38. The mass of a photoelectron is

a. $9.1X10^{-27}Kg$ b. $9.1X10^{-29}Kg$

c. $9.1X10^{-31}Kg$ d. $9.1X10^{-34}Kg$

39. The equivalent resistance between A & B is



a. 4R b. 2R c. R d. 3R

40. The resistance of an ammeter is 13Ω and its scale is graduated for a current up to 100A. After an additional shunt has been connected to this ammeter it becomes possible the measure current up to 750A by this meter. The value of shunt resistance is

a. 2Ω b. 0.2 Ω c. 2 kΩ d. 20 Ω

41. A vessel contains a mixture of one mole of oxygen and two mole of nitrogen at 300K. The ratio of the average kinetic energy per O_2 molecule to per N_2 molecule is

a. 1:1 b. 1:2

c. 2:1 d. depends on the moment of inertia of the two molecules

42. Let 'I' be the moment of inertia of uniform square plate about an axis AB of that passes through its Centre and is parallel to two of its sides. CD is a line in the plane of the plate that passes through the Centre of the plate and makes an angle 'Ɵ' with AB. The moment of inertia of the plate about the axis CD is then equal to

a. 1 b. $I \sin^2\theta$

c. $I \cos^2\theta$ d. $I \cos^2(\theta/2)$

43. The work function of a substance in 4.0eV. The longest wavelength of light that can cause photoelectron emission from this substance is approximately.

a. 540nm b. 400nm c. 310 nm d. 220nm

44. A particle of mass m is executing oscillations about the origin on the x – axis. Its potential Energy is U(x) = K|x|^3 where K is a positive constant. If the amplitude of oscillation is a, then its time period T is

a. Proportional to $\frac{1}{\sqrt{a}}$ b. Independent of a

c. proportional to $\sqrt{a}$ d. Proportional to $a^{\frac{3}{2}}$

45. The ratio of the speed of sound in nitrogen gas to that in helium gas at 300K is

a. $\sqrt{\frac{2}{7}}$ b. $\sqrt{\frac{1}{7}}$ c. $\frac{\sqrt{3}}{5}$ d. $\frac{\sqrt{6}}{5}$

46. A spring of force constant K is cut into the pieces such that one piece is double the length of the other. Then the long piece will have a force constant of

a. $\frac{2}{3}K$ b. $\frac{3}{2}K$ c. 3K d. 6K

47. Yellow light is used in a single slit diffraction experiment with slit width of 0.6mm. If yellow light is replaced by X- rays, then the observed pattern will reveal

a. That the central maximum is narrower

b. More number of fringes

c. Less number of fringes

d. No diffraction pattern

48. A gas mixture consists of 2 moles of oxygen and 4 moles of argon at temperature T. neglecting all vibrational modes, the total internal energy of the system is

a. 4RT b. 15RT c. 9RT d. 11RT

49. The half-life period of a radioactive element Y. Initially both of them have the same number of atom, then

a. X & Y have the same decay rate initially

b. X & Y decay at the same rate always

c. Y will decay at a greater rate than X

d. X will decay at a greater rate than Y

50. When a potential difference is applied across, the current passing through

a. An insulator at 0K is zero b. A semiconductor at 0K is zero

c. A metal at 0K is finite d. A p-n diode at 300K is finite if it is reverse biased

51. Standing waves can be produced

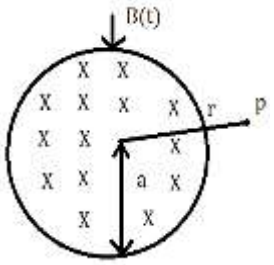
a. On a string clamped at both ends

b. On a string clamped as one end free at the other

c. When incident wave gets reflected from a wall

d. When two identical waves with a phase difference of π are moving in the same direction

52. A uniform but time varying magnetic field B (t) exists in a circular region of radius and is directed into the plane of the paper as shown. The magnitude of the included electric field at point 'P'at a distance 'r' from the centre of the circular region.



a. is zero b. Decreases as 1/r c. Increases as r c. Decreases as $1/r^2$

53. A large open tank has two holes in wall. One is a square hole of side L at a depth Y from the top and the other is a circular hole of radius R at a depth AY from the top. When the tank is completely filled with water, the quantities of water flowing out per second from both holes are the same. Then, R is equal to

a. $\frac{L}{\sqrt{2\pi}}$ b. 2πL c. L d. $\frac{1}{2\pi}$

54. A train moves towards a stationary observer with speed 34 m/s. The train sounds a whistle and its frequency registered by the observer is f_1. If the train's speed in reduced to the 17 m/s, the frequency registered is f_2. If the speed of sound is 340 m/s then the ratio f_1/f_2 is

a. 18/19 b. 1/2 c. 2 d. 19/18

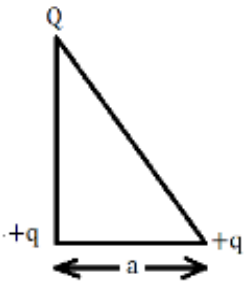
55. Three charges Q, +q & +q are placed at the vertices of a right angle triangle (isosceles triangle) as shown. The net electrostatic energy of the configuration is zero if Q is equal to

a. $\frac{-q}{1+\sqrt{2}}$

b. $\frac{-2q}{2+\sqrt{2}}$

c. -2q

d. +q



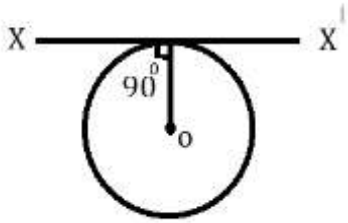
56. A thin wire of length L and uniform linear mass density 'ρ' is bent into a circular loop with Centre at 'O' as shown. The moment of inertia of the loop about the XX′ axis

a. $\rho L^3/8\pi^2$

b. $\rho L^3/16\pi^2$

c. $5\rho L^3/16\pi^2$

d. $3\rho L^3/8\pi^2$

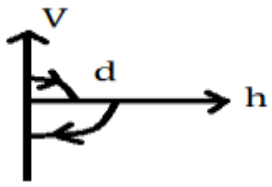


57. A wind powered generator converts wind energy into electrical energy. Assume that the generator converts a fixed fraction of the wind energy integrated by into blades in the electrical energy. For wind speed v, the electrical power output will be proportional to

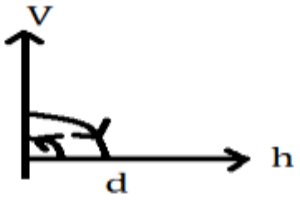
a. v b. v^2 c. v^3 d. v^4

58. A ball is dropped vertically from a height 'd' above the ground. It hits the ground and bounces up vertically to a height a/2. Neglecting subsequent motion and air resistance, its velocity 'v' varies with height 'h' above the ground as

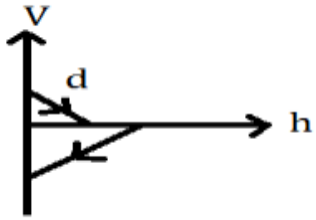
a.



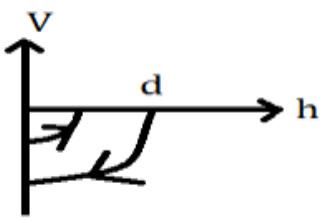
b.



c.



d.



59. Two vibrating strings of the same material but lengths ‘L’ and ‘2L’ have radius ‘2r’ and ‘r’ respectively. They are stretched under the same tension. Both the strings vibrate in their fundamental modes, the one of the length ‘L‘ with frequency f_1 are the other with frequency f_2. The ratio f_1/ f_2 is given by

a. 2 b. 4 c. 8 d. 1

60. The transition from the state n=4 to n=3 in a hydrogen like atom resultants ultraviolet radiation. Infrared radiation will be obtained in the transition

a. 2 → 1 b. 3 → 2 c. 4 → 2 d.5 → 4

Answers Blue

1	c	16	a	31	b	46	b
2	a	17	b	32	b	47	d
3	c	18	b	33	d	48	d
4	a	19	d	34	a	49	c
5	a	20	c	35	b	50	a.b.d
6	b	21	c	36	c	51	a.b.c
7	c	22	c	37	a	52	b
8	b	23	b	38	c	53	a
9	c	24	d	39	c	54	d
10	a	25	b	40	a	55	b
11	c	26	d	41	a	56	d
12	b	27	b	42	a	57	c
13	c	28	a	43	c	58	a
14	d	29	a	44	a	59	d
15	b	30	a	45	c	60	d