KCET – 2015 TEST PAPER WITH ANSWER KEY
(HELD ON WEDNESDAY 13th MAY, 2015)

PHYSICS

1. In a Young's double slit experiment the slit separation is 0.5 m from the slits. For a monochromatic light of wavelength 500 nm, the distance of 3rd maxima from 2nd minima on the other side is

(1) 2.5 mm (2) 2.25mm

(3) 2.75mm (4) 22.5 mm

Ans: (Bonus)

Note: Data Insufficient

2. Calculate the focal length of a reading glass of a person if his distance of distinct vision is 75 cm.

(1) 37.5 cm (2) 100.4 cm

(3) 25.6 cm (4) 75.2 cm

Ans: (1)

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

(1) 30 cm (2) 20 cm

(3) 10 cm (4) 90 cm

Ans: (2)

4. If ε_0 and μ_0 are the permittivity and permeability of free space and ε and μ are the corresponding quantities for a medium, then refractive index of the medium is

(1) $\sqrt{\frac{\mu\varepsilon}{\mu_0\varepsilon_0}}$

(2) Insufficient information

(3) $\sqrt{\frac{\mu_0\varepsilon_0}{\mu\varepsilon}}$

(4) 1

Ans: (1)

5. The average power dissipated in a pure inductor is

(1) VI^2 (2) zero

(3) $\frac{1}{2}VI$ (4) $\frac{VI^2}{4}$

Ans: (2)

6. An α -particle of energy 5 MeV is scattered through 180^o by gold nucleus. The distance of closest approach is of the order of

(1) 10^{-12} cm (2) 10^{-16} cm

(3) 10^{-10} cm (4) 10^{-14} cm

Ans: (1)

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

(1) 102 pm (2) 124 pm

(3) 95 pm (4) 112 pm

Ans: (4)

8. Light of two different frequencies whose photons have energies 1 eV and 2.5 eV respectively, successively illuminate a metallic surface whose work function is 0.5 eV. Ratio of maximum speeds of emitted electrons will be

(1) 1 : 4 (2) 1 : 1

(3) 1 : 5 (4) 1 : 2

Ans: (4)

9. The polarizing angle of glass is 57°. A ray of light which is incident at this angle will have an angle of refraction as

(1) 33° (2) 38°

(3) 25° (4) 43°

Ans: (1)

10. To observe diffraction, the size of the obstacle

(1) should be $\lambda/2$, Wehre λ is the wavelength.
(2) should be of the order of wavelength.
(3) has no relation to wavelength.
(4) should be much larger than the wavelength.

Ans: (2)

11. A radioactive decay can form an isotope of the original nucleus with the emission of particles

(1) one α and two β (2) four α and once β

(3) one α and four β (4) one α and one β

Ans: (1)

12. The half life of a radioactive substance is 20 minutes. The time taken between 50% decay and 87.5% decay of the substance will be

(1) 40 minutes (2) 10 minutes

(3) 30 minutes (4) 25 minutes

Ans: (1)

13. A nucleus at rest splits into two nuclear parts having radii in the ratio 1 : 2 Their velocities are in the ratio

(1) 6 : 1 (2) 2 : 1

(3) 8 : 1 (4) 4 : 1

Ans: (3)

14. What is the wavelength of light for the least energetic photon emitted in the Lyman series of the hydrogen spectrum. (take hc = 1240 eV nm)

(1) 102 nm (2) 150 nm

(3) 82 nm (4) 122 nm

Ans: (4)

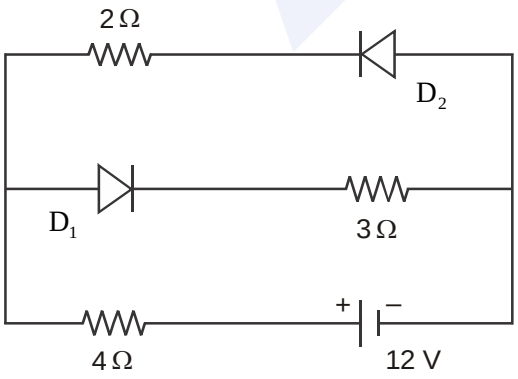
15. If an electron in hydrogen atom jumps from an orbit of level n = 3 to an orbit of level n = 2, the emitted radiation has a frequency (R = Rydberg constant, C = velocity of light)

(1) $\frac{RC}{25}$ (2) $\frac{5RC}{36}$

(3) $\frac{3RC}{27}$ (4) $\frac{8RC}{9}$

Ans: (2)

16. The circuit has two oppositely connected ideal diodes in parallel. What is the current flowing in the circuit?



(1) 2.0 A (2) 1.33 A

(3) 1.71 A (4) 2.31 A

Ans: (3)

17. Amplitude modulation has

(1) one carrier

(2) one carrier with high frequency

(3) one carrier with two side band frequencies

(4) one carrier with infinite frequencies

Ans: (3)

18. An LED is constructed from a pn junction based on a certain semi-conducting material whose energy gap is 1.9 eV. Then the wavelength of the emitted light is

(1) 1.6×10^{-8} m (2) 9.1×10^{-5} m

(3) 2.9×10^{-9} m (4) 6.5×10^{-7} m

Ans: (4)

19. The waves used for line-of-sight (LOS) communication is

(1) space waves (2) sky waves

(3) ground waves (4) sound waves

Ans: (1)

20. The given truth table is for

Input		Output
A	B	Y
0	0	1
0	1	1
1	0	1
1	1	0

(1) OR gate (2) NOR gate

(3) AND gate (4) NAND gate

Ans: (4)

21. The input characteristics of a transistor in CE mode is the graph obtained by plotting

(1) I_B against V_{CE} at constant V_{BE}

(2) I_B against I_C at constant V_{BE}

(3) I_B against V_{BE} at constant V_{CE}

(4) I_B against I_C at constant V_{CE}

Ans: (3)

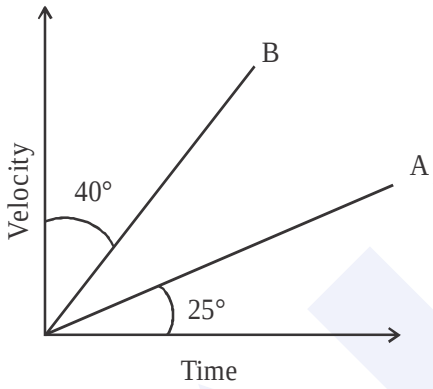
22. A particle is projected with a velocity v so that its horizontal range is twice the greatest height attained. The horizontal range is

(1) $\frac{2v^2}{3g}$ (2) $\frac{v^2}{2g}$

(3) $\frac{v^2}{g}$ (4) $\frac{4v^2}{5g}$

Ans: (4)

23. The velocity - time graph for two bodies A and B are shown. Then the acceleration of A and B are in the ratio



(1) $\tan 25°$ to $\tan 50°$ (2) $\cos 25°$ to $\cos 50°$

(3) $\tan 25°$ to $\tan 40°$ (4) $\sin 25°$ to $\sin 50°$

Ans: (1)

24. The ratio of the dimensions of Planck constant and that of moment of inertia has the dimensions of

(1) frequency (2) velocity

(3) time (4) angular momentum

Ans: (1)

25. Moment of Inertia of a thin uniform rod rotating about the perpendicular axis passing through its center is I. If the same rod is bent into a ring and its moment of inertia about its diameter is I', then the ratio $\frac{I}{I'}$ is

(1) $\frac{8}{3}\pi^2$ (2) $\frac{5}{3}\pi^2$

(3) $\frac{3}{2}\pi^2$ (4) $\frac{2}{3}\pi^2$

Ans: (4)

26. If the mas of a body is M on the surface of the earth, the mass of the same body on the surface of the moon is

(1) M (2) Zero

(3) M/6 (4) 6 M

Ans: (1)

27. The ratio of angular speed of a second-hand to the hour-hand of a watch is

(1) 60 : 1 (2) 72 : 1

(3) 720 : 1 (4) 3600 : 1

Ans: (3)

28. The kinetic energy of a body of mass 4 kg and momentum 6 Ns will be

(1) 3.5 J (2) 5.5 J

(3) 2.5 J (4) 4.5 J

Ans: (4)

29. A stone of mass 0.05 kg is thrown vertically upwards. What is the direction and magnitude of net force on the stone during its upward motion?

(1) 0.49 N vertically downwards

(2) 9.8 N vertically downwards

(3) 0.49 N vertically upwards

(4) 0.98 N vertically downwards

Ans: (1)

30. The ratio of kinetic energy to the potential energy of a particle executing SHM at a distance equal to half its amplitude, the distance being measured from its equilibrium position is

(1) 4 : 1 (2) 8 : 1

(3) 3 : 1 (4) 2 : 1

Ans: (3)

31. 1 gram of ice is mixed with 1 gram of steam. At thermal equilibrium, the temperature of the mixture is

(1) 100°C (2) 55°C

(3) 0°C (4) 50°C

Ans: (1)

32. Water is heated from 0°C to 10°C, then its volume

(1) increases

(2) first decreases and then increases

(3) decreases

(4) does not change

Ans: (2)

33. The efficiency of a Carnot engine which operates between the two temperatures $T_1 = 500$ K and $T_2 = 300$ K is

(1) 25% (2) 40%
(3) 50% (4) 75%

Ans: (2)

34. The ratio of hydraulic stress to the corresponding strain is known as

(1) Bulk modulus (2) Rigidity modulus
(3) Compressibility (4) Young's modulus

Ans: (1)

35. The angle between the dipole moment and electric field at any point on the equatorial plane is

(1) 90° (2) 45°
(3) 0° (4) 180°

Ans: (4)

36. Pick out the statement which is incorrect.

(1) The electric field lines forms closed loop
(2) Field lines never intersect.
(3) The tangent drawn to a line of force represents the direction of electric field.
(4) A negative test charge experiences a force opposite to the direction of the field.

Ans: (1)

37. Two spheres carrying charges $+6\mu C$ and $+9\mu C$, separated by a distance d, experiences a force of repulsion F. When a charge of $-3\mu C$ is given to both the sphere and kept at the same distance as before, the new force of repulsion is

(1) 3F (2) F/9
(3) F (4) F/3

Ans: (4)

38. A stretched string is vibrating in the second overtone, then the number of nodes and antinodes between the ends of the string are respectively

(1) 3 and 2 (2) 2 and 3
(3) 4 and 3 (4) 3 and 4

Ans: (2)

Note: Total Number of nodes and antinodes will be 4 and 3 but between the ends it is 2 and 3.

39. When two tuning forks A and 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

(1) 388 Hz (2) 389 Hz
(3) 380 Hz (4) 379 Hz

Ans: (1)

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

(1) 6 : 4 : 3 (2) 4 : 3 : 2
(3) 6 : 3 : 2 (4) 5 : 4 : 3

Ans: (1)

41. Four identical cells of emf E and internal resistance r are to be connected in series. Suppose if one of the cell is connected wrongly, the equivalent emf and effective internal resistance of the combination is

(1) 4E and 2r (2) 2E and 2r
(3) 4E and 4r (4) 2E and 4r

Ans: (4)

42. A parallel plate capacitor is charged and then isolated. The effect of increasing the plate separation on charge, potential and capacitance respecticely are

(1) increases, decreases, decreases
(2) constant, increases, decreases
(3) constant, decreases, decreases
(4) constant, decreases, increases

Ans: (2)

43. A spherical shell of radius 10 cm is carrying a charge q. If the electric potential at distances 5 cm, 10 cm and 15 cm from the centre of the spherical shell is V_1, V_2 and V_3 respectively, then

(1) $V_1 < V_2 < V_3$ (2) $V_1 = V_2 < V_3$
(3) $V_1 > V_2 > V_3$ (4) $V_1 = V_2 > V_3$

Ans: (4)

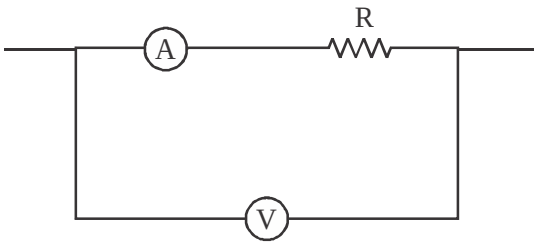
44. Three point charges 3nC, 6nC and 9nC are placed at the corners of an equilateral triangle of side 0.1 m. The potential energy of the system is

(1) 89100 J (2) 99100 J
(3) 8910 J (4) 9910 J

Ans: (Bonus)

Note: Answer should be 8910×10^{-9}

45. In the circuit shown below, the ammeter and the voltmeter readings are 3 A and 6 V respectively. Then the value of the resistance R is

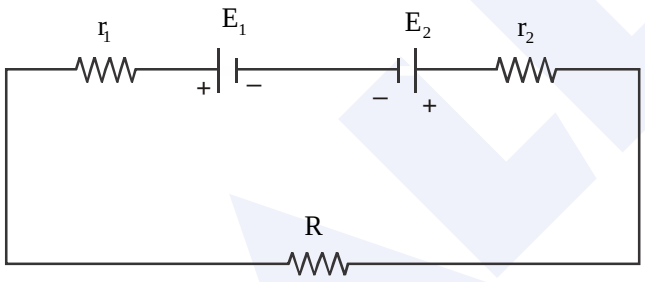


(1) $> 2\Omega$ (2) $\geq 2\Omega$

(3) 2Ω (4) $< 2\Omega$

Ans: (4)

46. Two cells of emf E_1 and E_2 are joined in opposition (such that $E_1 > E_2$). If r_1 and r_2 be the internal resistance and R be the external resistance, then the terminal potential difference is



(1) $\frac{E_1 + E_2}{r_1 + r_2 + R} \times R$ (2) $\frac{E_1 - E_2}{r_1 + r_2 + R} \times R$

(3) $\frac{E_1 + E_2}{r_1 + r_2} \times R$ (4) $\frac{E_1 - E_2}{r_1 + r_2} \times R$

Ans: (2)

47. A proton beam enters a magnetic field of 10^{-4} Wb m^{-2} normally. If the specific charge of the proton is 10^{11} C Kg^{-1} and its velocity is 10^{9} ms^{-1}, then the radius of the circle described will be

(1) 10 m (2) 1 m

(3) 0.1 m (4) 100 m

Ans: (4)

48. Two concentric coils each of radius equal to 2π cm are placed right angles to each other. If 3A and 4A are the currents flowing through the two coils respectively. The magnetic induction (in Wb m^{-2}) at the centre of the coils will be

(1) 10^{-5} (2) 7×10^{-5}

(3) 12×10^{-5} (4) 5×10^{-5}

Ans: (4)

49. The resistance of the bulb filament is 100Ω at a temperature of 100°C. If its temperature co-efficient of resistance be 0.005 per °C, its resistance will become 200Ω at a temperature

(1) 400°C (2) 200°C

(3) 300°C (4) 500°

Ans: (1)

50. In Wheatstones network $P = 2\Omega$, $Q = 2\Omega$, $R = 2\Omega$ and $S = 3\Omega$. The resistance with which S is to shunted in order that the bridge may be balanced is

(1) 2Ω (2) 6Ω

(3) 1Ω (4) 4Ω

Ans: (2)

51. Core of electromagnets are made of ferromagnetic material which has

(1) high permeability and high retentivity

(2) low permeability and low retentivity

(3) high permeability and low retentivity

(4) low permeability and high retentivity

Ans: (3)

52. If there is no torsion in the suspension thread, then the time period of a magnet executing SHM is

(1) $T = \frac{1}{2\pi}\sqrt{\frac{I}{MB}}$ (2) $T = 2\pi\sqrt{\frac{MB}{I}}$

(3) $T = \frac{1}{2\pi}\sqrt{\frac{MB}{I}}$ (4) $T = 2\pi\sqrt{\frac{I}{MB}}$

Ans: (4)

53. Two parallel wires 1 m apart carry currents of 1 A and 3 A respectively in opposite directions.The force per unit length acting between these two wires is

(1) 6×10^{-7} Nm^{-1} attractive

(2) 6×10^{-5} Nm^{-1} attractive

(3) 6×10^{-7} Nm^{-1} repulsive

(4) 6×10^{-5} Nm^{-1} repulsive

Ans: (3)

54. A galvanometer of resistance 50Ω gives a full scale deflection for a current 5×10^{-4} A.The resistance that should be connected in series with the galvanometer to read 3 V is

(1) 5050Ω (2) 5950Ω

(3) 595Ω (4) 5059Ω

Ans: (2)

55. A cyclotron is used to accelerate

(1) only positively charged particles

(2) both positively and negatively charged particles

(3) neutron

(4) only negatively charged particles

Ans: (1)

56. A tranformer is used to light 100 W - 110 lamp from 220 V mains. If the main current is 0.5 A, the efficiency of the transformer is

(1) 95 % (2) 99 %

(3) 90 % (4) 96 %

Ans: (3)

57. In an LCR circuit, at resonance

(1) the impedance is maximum

(2) the current leads the voltage by $\pi/2$

(3) the current and voltage are in phase

(4) the current is minimum

Ans: (3)

58. An aircraft with a wingspan of 40 m flies with a speed of 1080 km/hr in the eastward direction at a constant altitude in the northern hemisphere, where the vertical component of the earth's magnetic field 1.75×10^{-5} T. Then the emf developed between the tips of the wings is

(1) 0.34 V (2) 2.1 V

(3) 0.5 V (4) 0.21 V

Ans: (4)

59. Two coils have a mutual inductance 0.005 H.The current changes in the first coil according to the equation $i = i_m \sin\omega t$ where i_m =10 A and ω =100 π rad s^{-1}. The maximum value of the emf induced in the second coil is

(1) 5π (2) 4π

(3) 2π (4) π

Ans: (1)

60. The magnetic susceptibility of a paramagnetic material at –73° C is 0.0075 and its value at –173° C will be

(1) 0.0030

(2) 0.0075

(3) 0.0045

(4) 0.015

Ans: (4)