



# ST. LAWRENCE HIGH SCHOOL

27, BALLYGUNGE CIRCULAR ROAD



**Class : 12**

**Subject : PHYSICS**

**Term : SECOND TERM**

**Max Marks : 80**

**Q 1 :** If  $E$  is the intensity of the electric field at a distance  $r$  ( $r > R$ ) due to a uniformly charged spherical shell, then it is proportional to  
 (1)  $\epsilon$  (2)  $1/r$  (3)  $r^2$  (4)  $1/r^2$

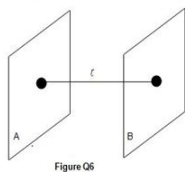
**Marks : 1**

- 1 . 1
- 2 . 2
- 3 . 3
- 4 . 4

( This Answer is Correct )

**Q 2 :** Figure Q6 shows two parallel equipotential surfaces A and B kept a small distance  $r$  apart from each other. A point charge of  $q$  coulomb is taken from the surface A to B. The amount of net work done is  
 (1)  $-q/(4\pi\epsilon_0 r)$  (2)  $q/(4\pi\epsilon_0 r^2)$  (3)  $-q/(4\pi\epsilon_0 r^2)$  (4) 0

**Marks : 1**



- 1 . 1
- 2 . 2
- 3 . 3
- 4 . 4

( This Answer is Correct )

**Q 3 :** Two capacitors  $C_1$  and  $C_2$  are charged to 120V and 200V respectively. It is found that by connecting them together the potential on each one can be made zero. Then  
 (1)  $5C_1=3C_2$  (2)  $3C_1=5C_2$  (3)  $3C_1+5C_2=0$  (4)  $9C_1=4C_2$

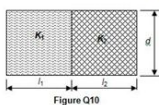
**Marks : 1**

- 1 . 1
- 2 . 2
- 3 . 3
- 4 . 4

( This Answer is Correct )

**Q 4 :** A parallel plate capacitor is filled with two dielectrics as shown in the Fig Q10. The ratio of capacitances without dielectric and with dielectric is  
 (1)  $K_1+K_2$  (2)  $(K_1+K_2)/2$  (3)  $K_1K_2/(K_1+K_2)$  (4)  $2(K_1+K_2)$

**Marks : 1**



- 1 . 1
- 2 . 2
- 3 . 3

( This Answer is Correct )

4 . 4

**Q 5 :** A  $800\mu\text{F}$  capacitor is charged at the steady rate of  $50\mu\text{Cs}^{-1}$ . How long will it take to raise its potential to  $10\text{V}$ ?

Marks : 1

- (1) 160s (2) 50s (3) 10s (4) 500s

1 . 1

 ( This Answer is Correct )

2 . 2

3 . 3

4 . 4

**Q 6 :** Expression for energy density of a parallel plate capacitor in vacuum is

Marks : 1

- (1)  $\epsilon_0 E^2/2$  (2)  $2\epsilon_0 E^2/2$  (3)  $\epsilon_0 E^2$  (4)  $\epsilon_0 E/2$

1 . 1

 ( This Answer is Correct )

2 . 2

3 . 3

4 . 4

**Q 7 :** Van de Graaff generator is used to

Marks : 1

- (1) store electrical energy  
 (2) build up high voltages of few million volts  
 (3) decelerate charged particle like electrons  
 (4) do both Options 1 and 2

1 . 1

 ( This Answer is Correct )

2 . 2

3 . 3

4 . 4

**Q 8 :** A wire is stretched so as to change its diameter by  $0.25\%$ . The percentage change in resistance is

Marks : 1

- (1) 4% (2) 2% (3) 1% (4) 0.5%

1 . 1

 ( This Answer is Correct )

2 . 2

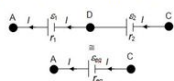
3 . 3

4 . 4

**Q 9 :** A parallel plate capacitor is filled with two dielectrics as shown in the Fig Q10. The ratio of capacitances without dielectric and with dielectric is

Marks : 1

- (1)  $K_1+K_2$  (2)  $(K_1+K_2)/2$  (3)  $K_1 K_2 / (K_1+K_2)$  (4)  $2(K_1+K_2)$



1 . 1

2 . 2

 ( This Answer is Correct )

3 . 3

4 . 4

**Q 10 :** Two electric cells each of emf 1.5V and internal resistance  $2\Omega$  are connected in parallel and this combination of cells is connected with an external resistance of  $2\Omega$ . What will be the current in the external circuit?  
 (1)  $(1/4)A$  (2)  $(1/3)A$  (3)  $(1/2)A$  (4)  $1A$

Marks : 1

1 . 1

2 . 2

3 . 3

4 . 4

 ( This Answer is Correct )

**Q 11 :** Unit of electron mobility is  
 (1)  $m^2V^{-1}s^{-1}$  (2)  $m^2 V s$  (3)  $m^2V s$  (4)  $m^2V^{-1}s$

Marks : 1

1 . 1

2 . 2

3 . 3

4 . 4

 ( This Answer is Correct )

**Q 12 :** Potential at a distance  $r$  from the mid point of a dipole of length  $2l$  on the axis of it is  
 (1)  $V$  is doubled (2)  $l$  is doubled  
 (3) the diameter of the wire is doubled (4) the temperature of the wire is doubled

Marks : 1

1 . 1

2 . 2

3 . 3

4 . 4

 ( This Answer is Correct )

**Q 13 :** In the circuit of Figure Q25, the current  $I_2$  exceeds the current  $I_1$ , by a factor of  
 (1) 12 (2) 20 (3) 100 (4) 120

Marks : 1

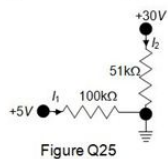


Figure Q25

1 . 1

2 . 2

3 . 3

4 . 4

 ( This Answer is Correct )

**Q 14 :** Resistance in the two gaps of a meter bridge are  $10\Omega$  and  $30\Omega$  respectively. If the resistances are interchanged the balance point shifts by  
 (1) 33.33cm (2) 66.67cm (3) 25cm (4) 50cm

Marks : 1

1 . 1

2. 2

3. 3

4. 4

 ( This Answer is Correct )

Q 15 :

A long wire carries a steady current. It is bent into a circle of one turn and the magnetic field at the centre of the coil is  $B$ . It is then bent into a circular loop of  $n$  turns. The magnetic field at the centre of the coil is

- (1)  $nB$       (2)  $n^2B$       (3)  $2nB$       (4)  $2n^2B$

Marks : 1

1. 1

2. 2

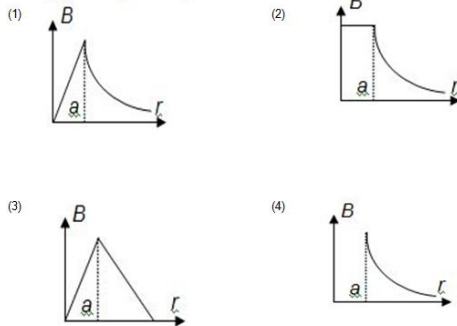
3. 3

4. 4

 ( This Answer is Correct )

Q 16 :

The magnetic field due to a straight conductor of uniform cross-section of radius  $a$  and carrying a steady current is represented by



Marks : 1

1. 1

2. 2

3. 3

4. 4

 ( This Answer is Correct )

Q 17 :

$n$   $\alpha$ -particle and a proton having same momentum enter into a region of uniform magnetic field and move in circular paths. The ratio of the radii of curvature of their circular paths  $r_\alpha/r_p$  in the field is

- (1) 1      (2)  $1/4$       (3)  $1/2$       (4) 4

Marks : 1

1. 1

2. 2

3. 3

4. 4

 ( This Answer is Correct )

Q 18 :

In an ammeter, 0.5% of the main current passes through the galvanometer. If the resistance of the galvanometer is  $G$ , the resistance of the ammeter is

- (1)  $G/200$       (2)  $G/199$       (3)  $200G$       (4)  $199 G$

Marks : 1

1. 1

2. 2

3. 3

4. 4

 ( This Answer is Correct )

**Q 19 :** In a moving coil galvanometer of coil of  $n$  turns and area of  $A$  have a spring of stiffness  $k$ . If the coil is deflected by some angle  $\phi$  due to flow of current  $I$  in uniform radial magnetic field  $B$ , then  $\phi$  is given by  
 (1)  $NAB/Ik$  (2)  $kI/(NAB)$  (3)  $kA/(NB)$  (4)  $NB/(kA)$

Marks : 1

- 1 . 1  
2 . 2  
3 . 3  
4 . 4

( This Answer is Correct )

**Q 20 :** Magnetic dipole moment is vector directed from  
 (1) south to north (2) north to south (3) east to west (4) west to east

Marks : 1

- 1 . 1  
2 . 2  
3 . 3  
4 . 4

( This Answer is Correct )

**Q 21 :** If a current  $I$  flows through a loop of area  $A$  and the strength of the pole thus generated is  $q_m$ , the magnetic moment of the loop is  
 (1)  $IA$  (2)  $IA^2$  (3)  $q_m A$  (4)  $q_m A^2$

Marks : 1

- 1 . 1  
2 . 2  
3 . 3  
4 . 4

( This Answer is Correct )

**Q 22 :** The ratio of the magnetic moment to the angular moment of an orbiting electron  
 (1)  $2mL/e$  (2)  $em/(2L)$  (3)  $mL/e$  (4)  $eL/(2m)$

Marks : 1

- 1 . 1  
2 . 2  
3 . 3  
4 . 4

( This Answer is Correct )

**Q 23 :** The minimum value of magnetic moment of an electron rotating in a circular orbit is  
 (1)  $eh/(2\pi m)$  (2)  $eh/(4\pi m)$  (3)  $eh/(\pi m)$  (4)  $4\pi m/(eh)$

Marks : 1

- 1 . 1  
2 . 2  
3 . 3  
4 . 4

( This Answer is Correct )

**Q 24 :** While entering a paramagnetic material from air, the spacing between the magnetic lines of force  
 (1) remains the same (2) decreases  
 (3) increases (4) first increases then decreases

Marks : 1

- 1 . 1  
2 . 2

( This Answer is Correct )

3 . 3

4 . 4

**Q 25 :** For a paramagnetic material, both  $\chi$  and  $\mu_r$  depend upon  
 (1) pressure (2) material (3) temperature (4) both material and temperature

Marks : 1

1 . 1

2 . 2

3 . 3

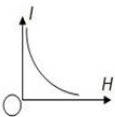
4 . 4

 ( This Answer is Correct )

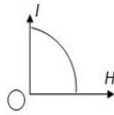
**Q 26 :** The  $I$ - $H$  curve for a paramagnetic material is represented by the figure

Marks : 1

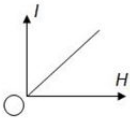
(1)



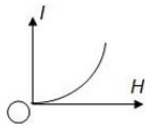
(2)



(3)



(4)



1 . 1

2 . 2

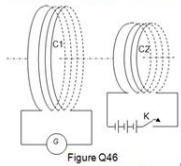
3 . 3

4 . 4

 ( This Answer is Correct )

**Q 27 :** When the key K in Figure Q46 is released, the current in C2 and the resulting magnetic field  
 (1) increases from zero to maximum value  
 (2) first increases, then decreases  
 (3) remains same  
 (4) decreases from the respective maximum to zero

Marks : 1



1 . 1

2 . 2

3 . 3

4 . 4

 ( This Answer is Correct )

**Q 28 :** A current passing through a coil of self inductance 2mH changes at a rate of 20mA<sup>s</sup><sup>-1</sup>. The emf induced in the coil is  
 (1) 10 $\mu$ V (2) 40 $\mu$ V (3) 10mV (4) 40mV

Marks : 1

1 . 1

2 . 2

3 . 3

4 . 4

 ( This Answer is Correct )

**Q 29 :** In 0.1s, the current in a coil increases from 1A to 1.5A. If inductance of coil is 60mH, then induced current in external resistance of 3Ω is  
 (1) 1A (2) 0.5A (3) 0.2A (4) 0.1A **Marks : 1**

1 . 1  
 2 . 2  
 3 . 3  
 4 . 4

( This Answer is Correct )

**Q 30 :** If an AC main supply is given to be 220V, what would be the average emf during a positive half-cycle?  
 (1) 198V (2) 386V (3) 256V (4) None of these **Marks : 1**

1 . 1  
 2 . 2  
 3 . 3  
 4 . 4

( This Answer is Correct )

**Q 31 :** The frequency of an alternating voltage of 120V amplitude is 50cycles/s. The rms value of the voltage is  
 (1) 101.3V (2) 84.8V (3) 70.7V (4) 56.5V **Marks : 1**

1 . 1  
 2 . 2  
 3 . 3  
 4 . 4

( This Answer is Correct )

**Q 32 :** In an AC circuit,  $i=100 \sin (200\pi t)$ . The time required for the current to reach its peak value is  
 (1) 0.01s (2) 0.005s (3) 0.0033s (4) 0.0025s **Marks : 1**

1 . 1  
 2 . 2  
 3 . 3  
 4 . 4

( This Answer is Correct )

**Q 33 :** In an L-R circuit, the phase angle between the alternating voltage and current is 45°. The value of the inductive reactance is  
 (1) R/4 (2) R/2 (3) R (4) data insufficient **Marks : 1**

1 . 1  
 2 . 2  
 3 . 3  
 4 . 4

( This Answer is Correct )

**Q 34 :** In an L-C-R series AC circuit, the voltage across each of the components, L, C and R is 50 V. The voltage across the L-C combination is  
 (1) 50V (2) 50√2V (3) 100V (4) 0V **Marks : 1**

1 . 1  
 2 . 2

3 . 3

4 . 4

 ( This Answer is Correct )

Q 35 :

It is desired to photograph the image of an object placed at a distance of 3m from a plane mirror. The camera which is at a distance of 4.5m from the mirror should be focussed for a distance of

(1) 3m (2) 4m (3) 6m (4) 7.5m

Marks : 1

1 . 1

2 . 2

3 . 3

4 . 4

 ( This Answer is Correct )

Q 36 :

What is the distance of a needle from a concave mirror of focal length 10cm for which a virtual image of twice its height is formed?

(1) 2.5cm (2) 5cm (3) 8cm (4) 9.1cm

Marks : 1

1 . 1

2 . 2

3 . 3

4 . 4

 ( This Answer is Correct )

Q 37 :

A beaker of depth  $a$  is half filled with olive oil of refractive index  $\mu_1$  and the other half is filled with water of refractive index  $\mu_2$ . The apparent depth of the beaker when viewed from above is

(1)  $\frac{a(\mu_1 + \mu_2)}{(2\mu_1\mu_2)^{-1}}$  (2)  $0.5a\mu_1\mu_2(\mu_1 + \mu_2)^{-1}$   
 (3)  $\frac{a\mu_1\mu_2}{(\mu_1 + \mu_2)^{-1}}$  (4)  $2a\mu_1\mu_2(\mu_1 + \mu_2)^{-1}$

Marks : 1

1 . 1

2 . 2

3 . 3

4 . 4

 ( This Answer is Correct )

Q 38 :

A ray of light strikes an air-glass interface such that a part of it is reflected back to air and the rest enters the glass as shown in Figure Q66. If the angle of refraction and the refractive index of glass with respect to air are  $r$  and  $\mu$  respectively, then the value of  $\alpha$  is

(1)  $r$  (2)  $\mu \sin(r)$  (3)  $\sin^{-1}(\mu \sin(r))$  (4)  $\sin^{-1}[\sin(r/\mu)]$

Marks : 1

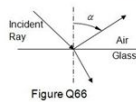


Figure Q66

1 . 1

2 . 2

3 . 3

4 . 4

 ( This Answer is Correct )

Q 39 :

In an optical fibre shown in Figure Q68, the correct relation between the indices of core cladding is

(1)  $n_1 = n_2$  (2)  $n_1 > n_2$  (3)  $n_1 < n_2$  (4)  $n_1 + n_2 = 2$

Marks : 1

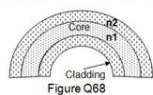


Figure Q68

1 . 1



2 . 2

 ( This Answer is Correct )

3 . 3

4 . 4

Q 40 :

The angle of incidence for a ray of light at a refracting surface of a prism is  $45^\circ$ . The angle of prism is  $60^\circ$ . If the ray suffers minimum deviation through the prism, the angle of minimum deviation and refractive index of the material of the prism are given respectively by

- (1)  $30^\circ; \sqrt{2}$  (2)  $45^\circ; \sqrt{2}$  (3)  $30^\circ; 1/\sqrt{2}$  (4)  $45^\circ; 1/\sqrt{2}$

Marks : 1

1 . 1

 ( This Answer is Correct )

2 . 2

3 . 3

4 . 4

Q 41 :

Two thin lenses of focal lengths  $f_1$  and  $f_2$  are kept in contact coaxially. The power of the combination is given by

- (1)  $1/(f_1 f_2)$  (2)  $1/(f_2 f_1)$  (3)  $(f_1 + f_2)/2$  (4)  $(f_1 + f_2)/(f_1 f_2)$

Marks : 1

1 . 1

2 . 2

3 . 3

4 . 4

 ( This Answer is Correct )

Q 42 :

A parallel beam of light is incident on a solid transparent sphere. If a point image is produced at the back of the sphere, the refractive index of the material of the sphere is

- (1) 2.5 (2) 1.5 (3) 1.25 (4) 2

Marks : 1

1 . 1

2 . 2

3 . 3

4 . 4

 ( This Answer is Correct )

Q 43 :

Which option is correct for rays coming from an object at infinity incident on the lens as shown in Figure Q75?

- (1) Two images are formed  
(2) Continuous image is formed between focal points of the two lenses  
(3) One image is formed  
(4) None of Options 1 to 3

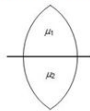


Figure Q75

Marks : 1

1 . 1

 ( This Answer is Correct )

2 . 2

3 . 3

4 . 4

Q 44 :

A ray incident at  $15^\circ$  on one refracting face of a prism of angle  $60^\circ$  suffers a deviation of  $55^\circ$ . What is the angle of emergence?

- (1)  $95^\circ$  (2)  $45^\circ$  (3)  $30^\circ$  (4) None of Options 1 to 3

Marks : 1

1 . 1

2 . 2

3 . 3

4 . 4

 ( This Answer is Correct )

Q 45 :

The spectral lines appear on the lower frequency side of the unmodified spectral line are known as

(1) Stokes line (2) anti-Stokes line  
(3) Raman line (4) None of Options 1 to 4

Marks : 1

1 . 1

 ( This Answer is Correct )

2 . 2

3 . 3

4 . 4

Q 46 :

The scattering of light by molecules, without change of frequency on wavelength is known as

(1) Rayleigh scattering (2) non-Rayleigh scattering  
(3) scattering (4) Raman scattering

Marks : 1

1 . 1

 ( This Answer is Correct )

2 . 2

3 . 3

4 . 4

Q 47 :

What is the angle between the electric dipole moment and the electric field due to it on the axial line?

(1) 0° (2) 90° (3) 45° (4) 180°

Marks : 1

1 . 1

 ( This Answer is Correct )

2 . 2

3 . 3

4 . 4

Q 48 :

The dimensional formula of electric intensity is

(1)  $[MLT^{-2} A^{-1}]$  (2)  $[MLT^{-2} A^{-1}]$  (3)  $[ML^2T^{-2} A^{-1}]$  (4)  $[ML^2T^{-2} A^{-2}]$

Marks : 1

1 . 1

 ( This Answer is Correct )

2 . 2

3 . 3

4 . 4

Q 49 :

If the medium between two shells in Fig Q13 is filled up with a dielectric constant  $K$ , then its capacitance is

(1)  $4\pi\epsilon_0 K a^2/(b-a)$  (2)  $4\pi\epsilon_0 b^2/[K(b-a)]^{-1}$   
(3)  $4\pi\epsilon_0 K/(b-a)$  (4)  $Kab/(4\pi\epsilon_0)$

Marks : 1

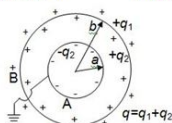


Figure Q13

1 . 1

 ( This Answer is Correct )

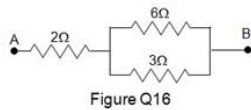
2 . 2

3 . 3

4 . 4

**Q 50 :**

The equivalent resistance between the points A and B is in Figure Q16 is  
 (1)  $3\Omega$  (2)  $4\Omega$  (3)  $6\Omega$  (4)  $11\Omega$

**Marks : 1**

1 . 1

2 . 2

3 . 3

4 . 4

 ( This Answer is Correct )
**Q 51 :**

Potentiometer measures the potential difference more accurately than a voltmeter because  
 (1) it has a wire of high resistance  
 (2) it has a wire of low resistance  
 (3) it does not draw current from external circuit  
 (4) it draws a heavy current from external circuit

**Marks : 1**

1 . 1

2 . 2

3 . 3

4 . 4

 ( This Answer is Correct )
**Q 52 :**

Name the material for which magnetic susceptibility is high and positive.  
 (1) Ferromagnetic (2) Paramagnetic (3) Diamagnetic (4) Non-magnetic

**Marks : 1**

1 . 1

2 . 2

3 . 3

4 . 4

 ( This Answer is Correct )
**Q 53 :**

The net magnetic flux through any closed surface, kept in a magnetic field is  
 (1) zero (2)  $\mu_0(4\pi)$  (3)  $4\pi\mu_0$  (4)  $4\mu_0\pi$

**Marks : 1**

1 . 1

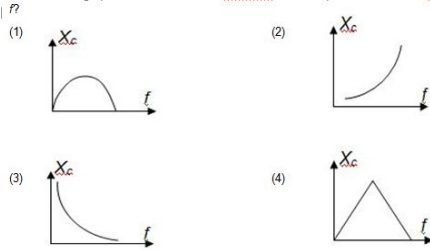
2 . 2

3 . 3

4 . 4

 ( This Answer is Correct )
**Q 54 :** 1

Which of the graphs shows the correct variation of the capacitive reactance  $X_c$  with frequency  $f$ ?



1 . 1

2 . 2

3 . 3

4 . 4

Marks :

 ( This Answer is Correct )

Q 55 :

Resonant circuits are used in

- (1) tuning mechanism of radios  
 (2) TV sets  
 (3) both for TV set and tuning mechanism of radios  
 (4) neither for TV sets nor for tuning mechanism of radios

Marks : 1

1 . 1

2 . 2

3 . 3

4 . 4

 ( This Answer is Correct )

Q 56 :

The refracting angle of a prism is  $A$ , and refractive index of the material of the prism is  $\cot(A/2)$ .  
 The angle of minimum deviation is

- (1)  $180^\circ - 3A$       (2)  $180^\circ - 2A$       (3)  $90^\circ - A$       (4)  $180^\circ + 2A$

Marks : 1

1 . 1

2 . 2

3 . 3

4 . 4

 ( This Answer is Correct )

Q 57 :

If red light is used instead of blue light in order to determine the focal length a lens, then the focal length

- (1) increases      (2) decreases      (3) remains same      (4) cannot be determined

Marks : 1

1 . 1

2 . 2

3 . 3

4 . 4

 ( This Answer is Correct )

Q 58 :

A monochromatic light is incident on one face of a prism at an angle of incidence  $i=60^\circ$ . Which of given statement is correct?

(1) Dispersion takes place  
 (2) Deviation takes place  
 (3) Both dispersion and deviation take place  
 (4) Neither dispersion nor deviation takes place

Marks : 1

1 . 1

2 . 2

3 . 3

 ( This Answer is Correct )

4 . 4

Q 59 :

A sphere of radius 10cm has an unknown charge. If the electric field 20cm from the centre of the sphere is  $2 \times 10^4 \text{ N/C}$  and points radially inward. What is the net charge on the sphere?

- (1) 88.9nC (2) -88.9nC (3) 0 (4) 90nC

Marks : 1

1 . 1

2 . 2

3 . 3

4 . 4

 ( This Answer is Correct )

Q 60 :

Potential at a distance  $r$  from the mid point of a dipole of length  $2l$  on the axis of it is

- (1) 0 (2)  $\frac{1}{4\pi\epsilon_0} \left\{ \frac{p}{(r^2-l^2)} \right\}$   
 (3)  $\frac{1}{4\pi\epsilon_0} \left\{ \frac{2p}{(r^2-l^2)} \right\}$  (4)  $p/(r^2-l^2)$

Marks : 1

1 . 1

2 . 2

3 . 3

4 . 4

 ( This Answer is Correct )

Q 61 :

A thin spherical conducting shell of radius  $R$  has a charge  $q$ . Another charge  $Q$  is placed at the centre of the shell. The electrostatic potential at a point  $P$  at a distance  $R/2$  from the centre of the shell is

- (1)  $\frac{2Q}{4\pi\epsilon_0 R}$  (2)  $\frac{2(Q+q)}{4\pi\epsilon_0 R^2}$   
 (3)  $\frac{2(Q+q)}{4\pi\epsilon_0 R^2}$  (4)  $\frac{2(Q+q)}{4\pi\epsilon_0 R}$

Marks : 1

1 . 1

2 . 2

3 . 3

4 . 4

 ( This Answer is Correct )

Q 62 :

If the potential difference between the plates of a capacitor is increased by 20%, the energy stored in the capacitor increases by exactly

- (1) 20% (2) 22% (3) 40% (4) 44%

Marks : 1

1 . 1

2 . 2

3 . 3

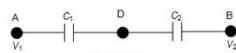
4 . 4

 ( This Answer is Correct )

Q 63 :

Two condensers  $C_1$  and  $C_2$  in a circuit are joined as shown in the Fig Q11. The potential of point A is  $V_1$  and that of B is  $V_2$ . The potential of point D is

- (1)  $V_1 + V_2 / 2$  (2)  $(C_1 V_2 + C_2 V_1) / (C_1 + C_2)^{-1}$   
 (3)  $C_1 V_1 + C_2 V_2 / (C_1 + C_2)^{-1}$  (4)  $(C_2 V_1 - C_1 V_2) / (C_1 + C_2)^{-1}$



Marks : 1

1 . 1

2 . 2

3 . 3

4 . 4

 ( This Answer is Correct )

- Q 64 :** A set of  $n$  identical resistors, each of resistance  $R$  ohm when connected in series, has effective resistance  $X$  ohm and when connected in parallel the effective resistance is  $Y$  ohm. Then the resistance  $R$  is given by

Marks : 1

- (1)  $\frac{X^2}{Y}$  (2)  $Y \cdot X$  (3)  $X \cdot Y$  (4)  $X^2 Y^2$

- 1 . 1  
2 . 2  
3 . 3  
4 . 4

( This Answer is Correct )

- Q 65 :** A galvanometer of resistance  $R$  is connected to an electric circuit. The main current in the circuit is  $k$  times the maximum current that the galvanometer can withstand. The maximum value of the shunt resistance that should be used across the galvanometer is

Marks : 1

- (1)  $\frac{R}{k}$  (2)  $(k-1)R$  (3)  $R/k$  (4)  $R/(k-1)$

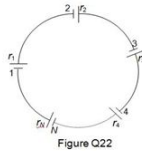
- 1 . 1  
2 . 2  
3 . 3  
4 . 4

( This Answer is Correct )

- Q 66 :** A group of  $N$  cells whose emf varies directly with the internal resistance as per the equation  $E_n = 1.5r_n$  are connected as shown in Figure Q22. The current  $i$  in the circuit is

Marks : 1

- (1) 0.51A (2) 5.1A (3) 0.15A (4) 1.5A



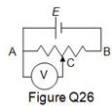
- 1 . 1  
2 . 2  
3 . 3  
4 . 4

( This Answer is Correct )

- Q 67 :** In the circuit of Figure Q26, the source of emf  $E$  has negligible internal resistance.  $C$  is the midpoint of the potentiometer wire  $AB$ . The resistance of the voltmeter  $V$  is not very high compared to that of the potentiometer wire. Then the voltmeter reading is

Marks : 1

- (1)  $E$  (2)  $E/2$  (3) greater than  $E/2$  (4) less than  $E/2$



- 1 . 1  
2 . 2  
3 . 3  
4 . 4

( This Answer is Correct )

- Q 68 :** A potentiometer wire is 100cm long and a constant potential difference is maintained across it. Two cells are connected in series first to support one another and then in opposite direction. The balance points are obtained at 50cm and 10cm from the positive end of the wire in two cases. The ratio of emf is

Marks : 1

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

- 1 . 1

2 . 2

3 . 3

4 . 4

 ( This Answer is Correct )

Q 69 :

Resistances P and Q are connected in the gaps of metre-bridge. The balancing point is obtained at  $(1/3)l$  from the zero end. If a  $6\Omega$  resistance is connected in series with P, the balance point shifts to  $(2/3)l$  from the same end. P and Q

(1) are  $4\Omega, 2\Omega$  (2) are  $2\Omega, 4\Omega$  (3) could be both Options 1 and 2  
(4) are neither of Options 1 and 2

Marks : 1

1 . 1

2 . 2

3 . 3

4 . 4

 ( This Answer is Correct )

Q 70 :

A uniform electric field and a uniform magnetic field are acting along the same direction in a certain region. If an electron is projected in the region such that its velocity is pointed along the direction of fields, then the electron

(1) turns towards right of direction of motion  
(2) speed decreases  
(3) speed increases  
(4) turns towards left of direction of motion

Marks : 1

1 . 1

2 . 2

3 . 3

4 . 4

 ( This Answer is Correct )

Q 71 :

In Figure Q35, X and Y are two long straight parallel conductors each carrying current of 2A. The force on each conductor is  $F$  newtons. When the current in each changed to 1A and reversed in direction, the force on each is now

(1)  $F/4$  and unchanged in direction (2)  $F/2$  and reversed in direction  
(3)  $F/2$  and unchanged in direction (4)  $F/4$  and reversed in direction

Marks : 1

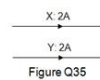


Figure Q35

1 . 1

2 . 2

3 . 3

4 . 4

 ( This Answer is Correct )

Q 72 :

A helicopter rises vertically with a speed 100m/s. If the helicopter is 10m long and the horizontal component of earth's magnetic field is  $5 \times 10^{-5} \text{Wb/sq.m}$ , then the induced emf between the tip of the nose to the tail of the helicopter is

(1) 50V (2) 0.5V (3) 5V (4) 25V

Marks : 1

1 . 1

2 . 2

3 . 3

4 . 4

 ( This Answer is Correct )

Q 73 :

The expression for the magnetic energy stored in a solenoid in terms of magnetic field  $B$ , area  $A$  and length  $l$  of the solenoid, is

(1)  $BA^2l/2\mu_0$  (2)  $B^2Al/2\mu_0$  (3)  $B^2Al/\mu_0$  (4)  $BA^2l/\mu_0$

Marks : 1

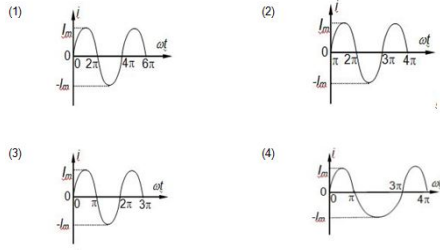
( This Answer is Correct )

- 1 . 1
- 2 . 2
- 3 . 3
- 4 . 4

**Q 74 :**

What is the angle between the electric dipole moment and the electric field due to it on the axial line?

**Marks : 1**



- 1 . 1
- 2 . 2
- 3 . 3
- 4 . 4

( This Answer is Correct )

**Q 75 :**

A resistance of  $300\Omega$  and inductance of  $(1/m)\text{henry}$  is connected in series to an AC voltage of  $20\text{V}$  and frequency  $200\text{Hz}$ . The phase angle between the voltage and current is  
 (1)  $\tan^{-1}(4/3)$  (2)  $\tan^{-1}(3/4)$  (3)  $\tan^{-1}(3/2)$  (4)  $\tan^{-1}(2/5)$

**Marks : 1**

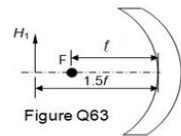
- 1 . 1
- 2 . 2
- 3 . 3
- 4 . 4

( This Answer is Correct )

**Q 76 :**

In Figure Q63, the height  $H_1$  of the object is  $+2.5\text{cm}$ . The height  $H_2$  of the image is  
 (1)  $-5\text{cm}$  (2)  $+5\text{cm}$  (3)  $+7.5\text{cm}$  (4)  $-7.5\text{cm}$

**Marks : 1**



- 1 . 1
- 2 . 2
- 3 . 3
- 4 . 4

( This Answer is Correct )

**Q 77 :**

An object is approaching a convex mirror. The ratio of the velocities of the object and its image, which is magnified by  $m$  times, is  
 (1)  $-1/m^2$  (2)  $m^2$  (3)  $-m$  (4)  $1/m$

**Marks : 1**

- 1 . 1
- 2 . 2
- 3 . 3

( This Answer is Correct )



4 . 4

Q 78 :

A ray of light is incident at a parallel slab of glass-water interface at an angle  $\theta$ . The ray emerges in air parallel to the surface of water as shown in Figure Q67. The value of refractive index of glass is

- (1)  $(4/3)\sin\theta$       (2)  $1/\sin\theta$       (3)  $4/3$       (4) 1

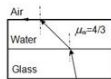


Figure Q67

Marks : 1

1 . 1

2 . 2

3 . 3

4 . 4

 ( This Answer is Correct )

Q 79 :

A plano-convex lens fits exactly into a plano-concave lens. Their plane surfaces are parallel to each other. If lenses are made of different materials of refractive indices  $\mu_1$  and  $\mu_2$  and  $R$  is the radius of curvature of the curved surface of the lenses, then the focal length of the combination is

- (1)  $0.5R/(\mu_1 + \mu_2)$       (2)  $0.5R/(\mu_1 - \mu_2)$       (3)  $1.25R/(\mu_1 - \mu_2)$       (4)  $2R/(\mu_2 - \mu_1)$

1 . 1

2 . 2

3 . 3

4 . 4

Marks : 1

 ( This Answer is Correct )

Q 80 :

The ratio of powers of a thin convex and thin concave lenses is  $3/2$ . When they are in contact, the equivalent focal length is 30cm. Their individual focal lengths are

- (1) 75cm, -50cm      (2) 10cm, -15cm      (3) 15cm, -10cm      (4) 50cm, -75cm

1 . 1

2 . 2

3 . 3

4 . 4

Marks : 1

 ( This Answer is Correct )