Version No.			
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
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9	9	9	9

ROLL NUMBER						
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1	1	1	1	1	1	1
2	2	2	2	2	2	2
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4	4	4	4	4	4	4
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6	6	6	6	6	6	6
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Answer Sheet No.____________

Sign. of Candidate___________

Sign. of Invigilator___________

PHYSICS SSC–II (2nd Set Solution)

SECTION – A (Marks 12)

Time allowed: 15 Minutes

Section – A is compulsory. All parts of this section are to be answered on this page and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. **Do not use lead pencil.**

Q.1 Fill the relevant bubble for each part. All parts carry one mark.

1. A plastic rod is rubbed with a dry cloth. The rod becomes positively charged because it has:

A.	gained electrons	◯	B.	gained neutrons	◯
C.	lost electrons	●	D.	lost neutrons	◯

2. The part of oscilloscope which controls the number of electrons is:

A.	Electron gun	◯	B.	Grid	●
C.	Deflecting plates	◯	D.	Fluorescent screen	◯

(3) The instrument which stores charges is:

A.	Electroscope	◯	B.	Capacitor	●
C.	Resistor	◯	D.	Inductor	◯

(4) The count rate falls to a very low reading by placing a paper between radioactive source and detector. Which type of radiation is emitted by the source?

A.	α- Ray	●	B.	β-Ray	◯
C.	ϒ-Ray	◯	D.	X-rays	◯

(5) If a radioactive element has half life of 1 day. What fraction of the substance will be left at the end of 2nd day?

A.	1/2	◯	B.	1/4	●
C.	1/6	◯	D.	1/8	◯

(6) If an object is placed between ‘F’ and ‘2F’ in front of convex lens then image formed is:

A.	real, inverted and diminished	◯
B.	virtual, inverted and diminished	◯
C.	virtual, inverted and magnified	●
D	real, inverted and magnified	◯

(7) Velocity of sound waves in vacuum is:

A. 332ms $^{-1}$ ○ B. 228ms $^{-1}$ ○
C. 140ms $^{-1}$ ○ D. Zero ms^{-1} ●

(8) The frequency of microwaves used in microwave oven is 2400MHz.The wave length of these waves will be:

A. 0.125m ● B. 8.0m ○
C. 125m ○ D. 7200m ○

(9) The part of the DC motor which reverses the direction of current through coil after every half cycle:

A. Armature ○ B. Commutator ●
C. Carbon brushes ○ D. Slip rings ○

(10) A ball is dropped from a certain height onto the floor, and keeps bouncing. Its motion will be:

A. Rectilinear ● B. Random ○
C. Simple harmonic ○ D. Rotatory ○

(11) 2Ω and 3 Ω are connected in parallel, its equivalent resistance will be:

A. 4 Ω ○ B. 1.2 Ω ●
C. 2.5 Ω ○ D. 5 Ω ○

(12) Electric Generator works on the principle of:

A. Ohm's law ○ B. Lenz's law ○
C. Coulomb's law ○ D. Faraday's law ●

Federal Board SSC-II Examination
Physics Model Question Paper
(Curriculum 2006)

Time allowed: 2.45 hours | Total Marks: 53

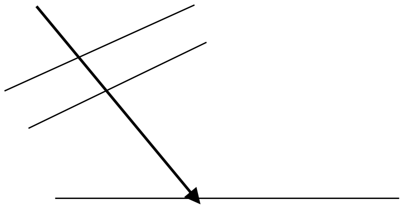
Note: Answer any eleven parts from Section 'B' and attempt any two questions from Section 'C' on the separately provided answer book. Write your answers neatly and legibly.

SECTION – B (Marks 33)

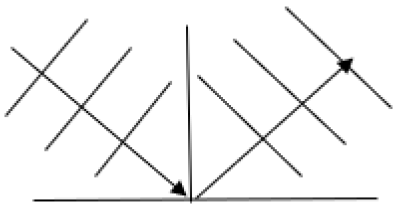
Q.2 Attempt any **ELEVEN** parts from the following. All parts carry equal marks. **(11×3=33)**

i. Figure shows water waves approaching barrier of ripple tank. Draw reflected water waves. If wave has wavelength of 36cm and speed of $1.2ms^{-1}$, calculate the frequency of waves.

Direction of wave



Ans.



Wavelength $=\lambda$ =36 cm=0.36 m
Speed= 1.2 m/s
Frequency=?
Solution:
$V=f\lambda$
f = 3.33 Hz

ii. Differentiate between transverse and longitudinal waves. (Any two)

Ans. **<u>Longitudinal waves:</u>**

In longitudinal waves the particles of the medium move back and forth along the direction of propagation of wave.

Such a wave consists of regions called **compressions**, where the loops of the spring are close together, alternating with regions called **rarefactions** (expansions), where the loops are spaced apart.

Sound Waves and spring waves are examples of longitudinal waves.

<u>Transverse waves:</u>

In transverse waves, the vibratory motion of particles of the medium is perpendicular to the direction of propagation of waves.

The crests are the highest points while the troughs are the lowest points of the particles of the medium from the mean position.
Waves on the surface of water and light waves are examples of transverse waves.

iii. β-particles ionize the air they pass through less strongly than the same number of α-particles. Suggest why this is so. Why ionization power of β-particles is less than α-particles?

Ans. Alpha particles are helium nuclei, they have the greater power of ionization as compared to beta particles and gamma rays. It is due to their large energy. Beta particles have less energy then α-particles so they ionize gas less than alpha particles.

iv. Sound produced on sun is not heard on earth, why?

Ans. Sound waves are mechanical waves, require some material medium for their propagation. Vacuum exists between sun and earth, which does not provide medium for sound waves to propagate, hence we cannot hear sound produced on sun.

v. An electric kettle is rated as 2.5 kW, 230 V. Determine a suitable current rating of the fuse to put in the three-pin plug. Choose from 1A, 5 A, 13 A, 30 A and briefly explain.

Ans. Power = 2.5 Kw
Voltage = 230 V
Current = I=?
SOLUTION:
P = VI
$I = 2.5 \times 10^3 = 230\ I$
We get
I = 10.8 A
So fuse of 13 A will be suitable for this device.

vi. If pitch of sound is decreased in air. What is the effect on wavelength and wave velocity?

Ans. Pitch depends upon the frequency. When pitch is reduced, frequency will be reduced.
According to relation $v = f\lambda$
By decreasing frequency, wavelength will be increased to keep speed of sound constant.

vii. Differentiate between 'AND' gate and 'OR' gate. (Any three)

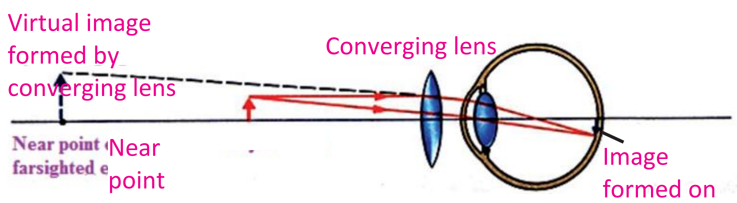
Ans. **AND GATE**
Symbol for AND operation is dot (.). Its Boolean expression is: X = A . B and is read as "X equals A AND B".
AND operation may be represented by switches connected in series, with each switch representing an input.
Output of AND gate will be '1' only when all of its inputs are at logic '1',
OR GATE
OR operation is represented by the symbol of plus (+). Boolean expression for OR operation is : X = A + B and is read as " X" equals A OR B.
An OR operation may be represented by switches connected in parallel.
The value of output of OR gate will be '1' when anyone of its inputs is at '1'.

viii. An object of size 3 cm is placed at a distance of 15 cm from a convex lens. Focal length of lens is 10 cm. Find the position, nature and size of image.

Ans. TYPE : Convex lens
Size of object = O = 3 cm
Distance of object = p= 15 cm
Focal length= 10 cm
Distance of image = q =?
Size of image = I =?
Nature of image=?
Solution:
1/f = 1/p + 1/q
Rearranging and substituting values of f and p, we get
q = 30 cm
using magnification formula q/p = I/O
I = 6 cm
As object is between f and 2f so Real, inverted and large size image will be formed.

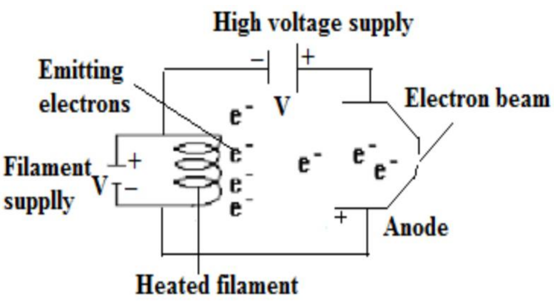
ix. What spectacles will be used by a person suffering from farsightedness? Draw diagram to show correction of this problem.

Ans. The disability of the eye to form distinct images of nearby objects on its retina is known as farsightedness.
This defect can be corrected with the aid of a suitable converging lens. The lens refracts the light rays which converges and form image on the retina.



x. How fine electron beam will be obtained by electron gun?

Ans. An electron gun is used to investigate the properties of electron beam. The electrons are produced by thermionic emission from a tungsten filament heated by 6 V supply. A high positive potential (several thousands) is applied to a cylindrical anode (+). The electrons are accelerated to a high speed and pass through the hole of the anode in the form of a fine beam of electrons.



xi. Which one is more reliable to store data: floppy disc or hard disc? Briefly explain.

Ans. **<u>Hard disc</u>**
Storage medium is the aluminium plates coated with particular material. These aluminium plates are not flexible.
Its capacity is very large, reliable and compact storage media.
It is installed inside the system unit.

Floppy Disc
It is a flexible plastic coated with a ferromagnetic material that stores data.
The storage medium is flexible
It can store data up to 1.44MB, it is not reliable medium and data can be lost.
It is removable storage device.

xii. Describe one situation from everyday life in which static electricity is dangerous and precautions taken to ensure that charges are discharged safely.

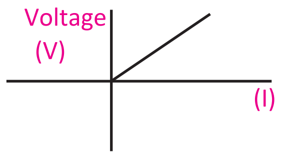
Ans. The phenomenon of lightning occurs due to a large quantity of electric charge which builds up in the heavy thunderclouds. The thunderclouds are charged by friction between the water molecules in the thunderclouds and the air molecules. When the charge on the thunderclouds is sufficiently high, it induces opposite charge on the objects present on the ground giving rise to a strong electric field between the cloud and the ground. Suddenly, the charge in cloud jumps to the ground with a violent spark and explosion. This is called lightning.
To prevent lightning from damaging tall buildings, lightning conductors are used. The purpose of the lightning conductor is to provide a steady discharge path for the large amount of negative charge in the air to flow from the top of the building to the Earth. In this way, the chances of lightning damage due to sudden discharge can be minimized.

xiii. State Joule's Law. Write its formula.

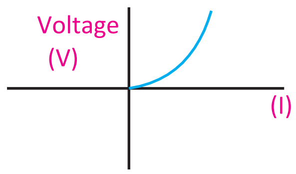
Ans. The amount of heat generated in a resistance due to flow of charges is equal to the product of square of current I, resistance R and the time duration t.
Formula:
$W = I^2 Rt = V^2 t/R$

xiv. Sketch V-I characteristics graphs for
- a. A metallic conductor
- b. A filament lamp
- c. A thermistor

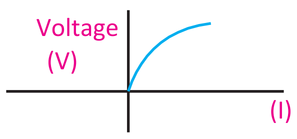
Ans. Metallic conductor



A filament lamp



A thermister



xv. Why force is experienced by a current carrying conductor placed in a magnetic field?

Ans. Electric current produces a magnetic field similar to that of a permanent magnet. When a current carrying conductor is placed in magnetic field, its magnetic field exerts force on a permanent magnet, it implies that current carrying wire should also experience a force when placed in a magnetic field.

SECTION – C(Marks 20)

Note: Attempt any **TWO** questions. All questions carry equal marks. (2 × 10 = 20)

Q.3 a. Explain nuclear fission reaction in detail. **(6)**

Ans. Nuclear fission takes place when a heavy nucleus, such as U^{235}, splits into two smaller nuclei by absorbing a slow moving (low-energy) neutron as represented by the equation (1)

$\mathbf{n^1} + U^{235} \longrightarrow {}^{236}U^* \longrightarrow \mathbf{X + Y + neutron}$ (1)

where U^*-236 is an intermediate state that lasts only for a fraction of second before splitting into nuclei X and Y, called fission fragments.

The process also resulted in the production of typically two or three neutrons per fission event. On the average, 2.47 neutrons are released per event. (1)

Energy description (1)

In nuclear fission, the total mass of the products is less than the original mass of the heavy nucleus. Measurements showed that about 200 MeV of energy is released in each fission event of U^{235}. This is a large amount of energy relative to the amount released in chemical processes.

Fission chain reaction (1)

We have seen that neutrons are emitted when U^{235} undergoes fission. These neutrons can in turn trigger other nuclei to undergo fission with the possibility of a chain reaction. Calculations show that if the chain reaction is not controlled, it will proceed too rapidly and possibly results in the sudden release of an enormous amount of energy (an explosion).

Controlled Fission chain reaction (1)

This fission chain reaction is controlled in nuclear reactors by using cadmium rods. In this sort of self sustained reaction, extra neutrons liberated in fission reactions are absorbed to slowdown the chain reaction.

b. The force of repulsion between two identical positive charges is 80 N, when charges are 0.5 m apart. Find the value of each charge. **(4)**

Ans. $F = 80N$

$q_1 = q_2 = q = ?$

$r = 0.5m$

$k = 9 \times 10^9\ Nm^2/C^2$

Solution:

$F = K\ q_1\ q_2 / r^2$ (1)

$F = K\ q^2 / r^2$

Substituting the values of F, K and r, we get (2)

$q = 4.7 \times 10^{-5}$ C (1)

Q.4 a. Define intensity of sound waves. Derive formula to find intensity level of unknown sound. **(1+5)**

Ans. Sound energy passing per second through a unit area held perpendicular to the direction of propagation of sound waves is called intensity of sound. (1)

Intensity is a physical quantity and can be measured accurately. The unit of intensity of sound is watt per square metre.

Sound Intensity Level

The loudness (L) of a sound is directly proportional to the logarithm of intensity i.e.,

$L \propto \log I$

$L = K \log I$ (1)

where K is a constant of proportionality.

Let L_o be the loudness of the faintest audible sound of intensity I_o and L be the loudness of an unknown sound of intensity I,

then, we can write

$L_o = K \log I_o$ (2)

Subtracting Eq. (2) from Eq. (1), we get

$L - L_o = K (\log I - \log I_o) = K \log I/I_o$ (1)

This difference, $(L - L_o)$, between the loudness L of an unknown sound and the loudness L is called the intensity level of the unknown sound. Therefore, the intensity level of an unknown sound is given by

Intensity level = $K \log I/I_o$ (3) (1)

UNIT

If K =1, then unit of Intensity level is bel,

If K =10, then intensity level is measured in decibel, dB.

b. Find the length of second's pendulum and its frequency. **(4)**

Ans. T=2s

L=?

f =?

Solution:

$T = 2\pi\sqrt{L/g}$ (1)

Squaring and rearranging

$L = T^2 g / 4\pi^2$

Substitute T =2s

$g = 10\ m/s^2$

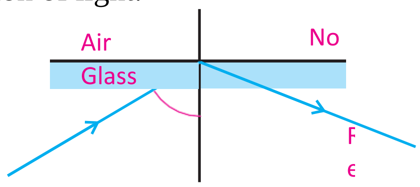
we get L = 1.02 m (2)

f = 1/T = 1/2 = 0.5 Hz (1)

Q.5 a. What is total internal reflection? Describe the use of this phenomenon in optical fibers and endoscopy. **(2+5)**

Ans. **Total internal reflection**

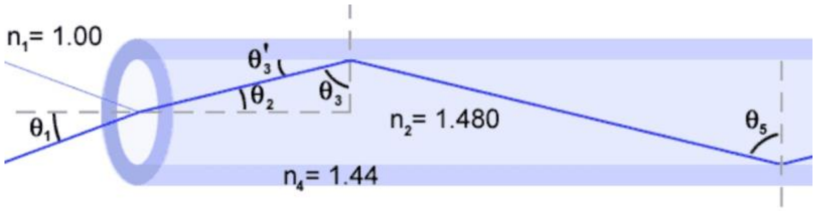
When a ray of light travelling in denser medium enters into a rarer medium, it bends away from the normal. When the angle of incidence becomes larger than the critical angle, no refraction occurs. The entire light is reflected back into the denser medium. This is known as total internal reflection of light.



(1)

Fibre optics

Fibre optics consists of hair size threads of glass or plastic through which light can be travelled. The inner part of the fibre optics is called core that carries the light and an outer concentric shell is called cladding. The core is made from glass or plastic of relatively high index of refraction. The cladding is made of glass or plastic, but of relatively low refractive index. Light entering from one end of the core strikes the core-cladding boundary at an angle of incidence greater than critical angle and is reflected back into the core. In this way light travels many kilometres with small loss of energy.



(3)

Endoscope

An endoscope is used to explore the interior organs of the body. Due to its small size, it can be inserted through the mouth and thus eliminates the invasive surgery. The light shines on the organ of patient to be examined by entering through one of the fibre tubes of the endoscope. Then light is transmitted back to the physician's viewing lens through the other fibre tube by total internal reflection. Flexible endoscopes have a tiny camera attached to the end. Doctor can see the view recorded by the camera on a computer screen. (3)

b. A transformer is used to produce an output of 6V from 220V main supply. Primary coil of the transformer has 2000 turns. Calculate the number of turns in the secondary coil. **(3)**

Ans. Secondary voltage=V_S =6V

Primary voltage = V_P = 220V

N_P = 2000

N_S =?

Solution:

$N_S / N_P = V_S / V_P$ (1)

$N_S /2000 = 6/ 220$ (1)

N_S = 54approx (1)

* * * * *