

ST. JOSEPH'S ACADEMY, DEHRADUN
1ST PRELIMINARY EXAMINATION 2022-23

SUBJECT: PHYSICS

CLASS: X

M.M.: 80 TIME: 2 HOURS

NAME OF THE STUDENT..

....CLASS/SECTION

ROLL NO...

ATTEMPT **ALL** QUESTIONS FROM SECTION A
AND **ANY FOUR** QUESTIONS FROM SECTION-B

SECTION-A [40 MARKS]

ATTEMPT **ALL** QUESTIONS FROM THIS SECTION

Q1. Choose the correct answers to the questions from the given options:

[15]

(i) Which of the following is not based on heating effect of current?

(a) electric iron

(b) electric heater

(c) microwave

(d) electric bulb

(ii) The moment of force of 4 N about a point is 60 Nm. The distance of the point of the force from this point is:

(a) 10 m

(b) 15 m

(c) 20 m

(d) 60 m

(iii) SI and CGS units of work are related as:

(a) $1 \text{ J} = 10^7 \text{ erg}$

(b) $1 \text{ J} = 10^9 \text{ erg}$

(c) $10^7 \text{ J} = 1 \text{ erg}$

(d) $1 \text{ J} = 10^5 \text{ erg}$

(iv) When in a machine, ratio of mechanical advantage to velocity ratio is equal to one, then

(a) Machine is practical

(b) Machine is ideal

(c) Machine has a large friction

(d) Machine is non-functional

(v) If $\sin 42^\circ = 2/3$ and refractive index of glass with respect to air is 1.5, then critical angle for the glass is:

(a) 49°

(b) 42°

(c) 48°

(d) 45°

(vi) Select the correct option from the following regarding the lens:

(a) Through a convex lens only virtual image is formed

(b) Through a convex lens virtual and inverted image is formed

(c) Through a concave lens real and inverted image is formed

(d) Through a concave lens virtual and smaller image is formed

(vii) Chemical solution used to detect ultraviolet radiation is:

(a) Silver bromide solution

(b) silver nitrate solution

(c) Silver chloride solution

(d) silver argentocyanide solution

(viii) A boy hears an echo of his own voice from a distant hill after 0.8 seconds. If the speed of sound in air is 320 m/sec, then the distance of the boy from hill is:

(a) 160 m

(b) 320 m

(c) 17 m

(d) 128 m

(ix) If the distance between the source of the sound and receiver is reduced to half then loudness of the sound received by listener will become:

(a) Four times

(b) one half

(c) double

(d) No change in loudness

(x) In three pin plug, the pins are splitted at the ends for the reason

(a) to avoid short circuit due to heavy current

(b) to avoid over heating of wires

(c) to provide a spring action for a proper connection

(d) all the above are correct

(xi) Rule to determine the direction of the force acting on a current carrying conductor placed in a magnetic field is:

- (a) Right hand thumb rule
- (b) Flemings right hand rule
- (c) Flemings left hand rule
- (d) Lenz law

(xii) An alpha particle consists of:

- (a) Two protons and two electrons
- (b) Two protons and two neutrons
- (c) Two neutrons and two electrons
- (d) Two protons and one electron

(xiii) Uranium nucleus with mass number 238 and atomic number 92 undergoes several disintegrations and ultimately decays to lead nucleus with mass number 206 and atomic number 82. The number of alpha and beta particles emitted are:

- (a) 6 alpha and 8 beta particles
- (b) 6 alpha and 6 beta particles
- (c) 8 alpha and 6 beta particles
- (d) 8 alpha and 8 beta particles

(xiv) If the handle of the door is connected to the middle of the door then:

- (a) More force will be needed to produce the turning effect required to open the door
- (b) Less force would be required to produce the greater turning effect
- (c) Same force would be applied to open the door
- (d) All the above options are correct

(xv) Number of times total internal reflection takes place in an isosceles right-angled prism to deviate the ray of light by 180° is:

- (a) five
- (b) one
- (c) three
- (d) two

Q2. (i) (a) What is the work done by the satellite that revolves around 36,000 km above the surface of the earth?

(b) What is the rest mass of an alpha particle?

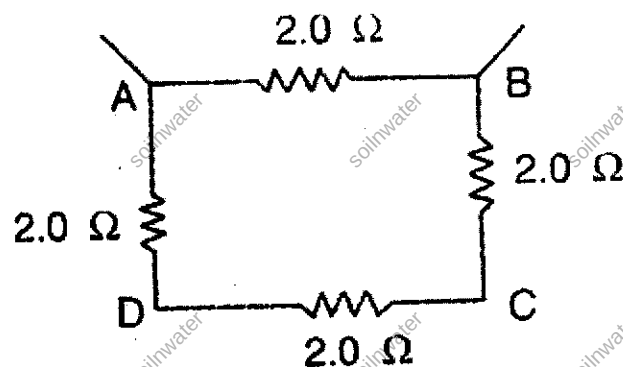
(c) How will the power of a lens change if its focal length is doubled?

(ii) The energy of an electron is 2×10^{-19} J, express it in eV and MeV.

(iii) State two conditions necessary for total internal reflection.

(iv) How is loudness related to amplitude of the sound wave? How is amplitude of a sound related to pitch?

(v) Four resistors each of $2\ \Omega$ are joined end to end to form a square ABCD, Calculate the equivalent resistance of the combination across two adjacent corners.



(vi) State two ways to increase the strength of the electromagnet.

(vii) State two safety precautions required while handling radioactive substances.

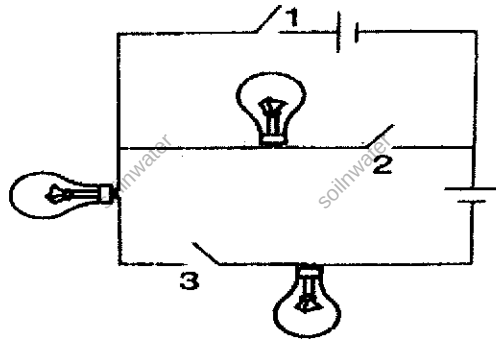
Q3. (i) (a) State Lenz's law.

(b) How does the law show the conservation of energy in the phenomenon of electromagnetic induction?

(ii) A light mass (m) and a heavy mass (M) have equal momentum. Find by calculation the ratio of their kinetic energies.

(iii) An object is placed at a distance of 24 cm in front of a convex lens of focal length 8 cm. Find the position of the image.

- (iv) The diagram below shows three lamps and three switches 1, 2 and 3 connected with two cells. [2]

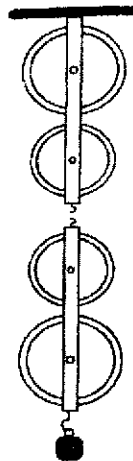


- (a) Name the switch/switches to be closed so as to light all three lamps.
(b) How are the lamps connected: in series or in parallel?
- (v) An iron door of a building is 3 m broad. It can be opened by applying a force of 150 N normally at the middle of the door. Calculate (a) the torque needed to open the door. (b) the least force required to open the door. [2]

SECTION-B [40 MARKS]

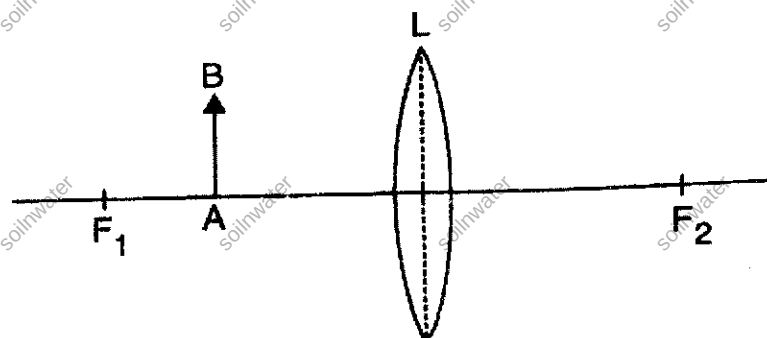
ATTEMPT ANY FOUR QUESTIONS FROM THIS SECTION

- Q4. (i) The diagram below shows a block and tackle system of four pulleys. [3]



- (a) Copy and redraw the diagram showing the string around the pulleys, direction of forces to obtain maximum VR in a convenient direction.
(b) Calculate MA of this pulley system if its efficiency is 75%
- (ii) (a) Define echo.
(b) A man standing in front of vertical cliffs fires a gun. He hears the echo after 3 seconds. On moving closer to the cliff by 82.5 m, he fires the gun again and hears the echo after 2.5 seconds. Find (a) distance of the cliff from initial position of the man.
(b) velocity of the sound in air [3]

- (iii) The diagram shows the object AB and a converging lens L with foci F_1 and F_2 . [4]

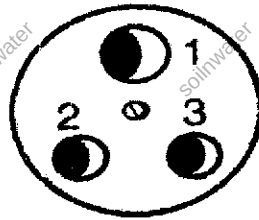


- (a) Draw two rays from the object to complete the diagram to locate the position of the image as CD.
(b) State three characteristics of the image in relation to the object.

Q5. (i) A ray of light falls normally on a glass slab.

- Draw the diagram to show the path of the ray till it emerges out of the glass slab.
- What is the angle of incidence and angle of refraction at each surface of the glass slab?

(ii) The diagram shows a three-pin socket marked as 1, 2 and 3.



- Identify and write live, neutral and earth pin against correct number.
- To which wire is the metallic case of the electric appliance connected?
- To which wire joined to 2 or 3 is the fuse connected?

(iii) (a) State Ohm's law. What are the limitations of the law?

- Two copper wires of same length have the ratio of their cross-section areas as 1 : 2. Find the ratio of their resistances.

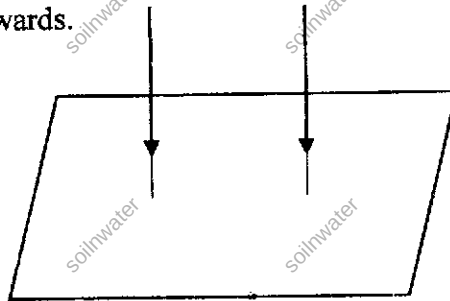
Q6. (i) (a) In what way does the temperature of water at the bottom of the waterfall differ from the temperature at the top? Explain your answer.

- How much work is needed to be done on a ball of mass 50 gm to give it a momentum of 5 kg m s^{-1} ?

(ii) A uniform meter rule balances horizontally on a knife edge placed at 60 cm mark when a weight of 25 gf is suspended from one of the ends.

- Draw diagram of the arrangement.
- What is the weight of the meter rule?

(iii) Two straight current carrying conductors carries equal currents in a direction normal to the plane of paper inwards.

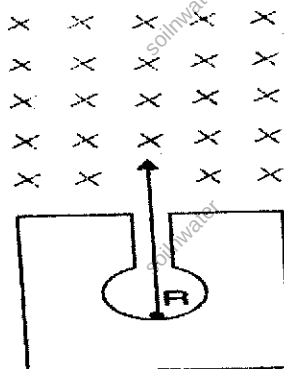


- Sketch separately the magnetic field lines produced by each current.
- What will be the magnetic field at a point which lies exactly at the centre of two conductors.
- How will the magnetic compass rest if it is placed at the point mentioned in part (b).

Q7. (i) A wave has a wavelength of 50 Å.

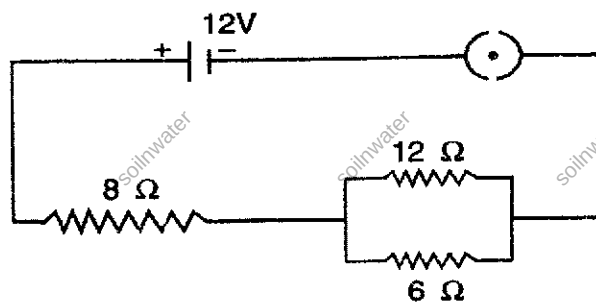
- Name the wave.
- State its speed in vacuum.
- State its one use.

(ii) The diagram shows a radioactive substance R kept in a thick lead walled container. The radiations pass through a magnetic field in a direction perpendicular to the plane of the paper as shown by x.



- Show in the diagram how the radiations get affected?
- Name the law used in part (a) above.

- (iii) Three resistors $8\ \Omega$, $12\ \Omega$ and $6\ \Omega$ are connected to a 12 V battery as shown in the figure



Find:

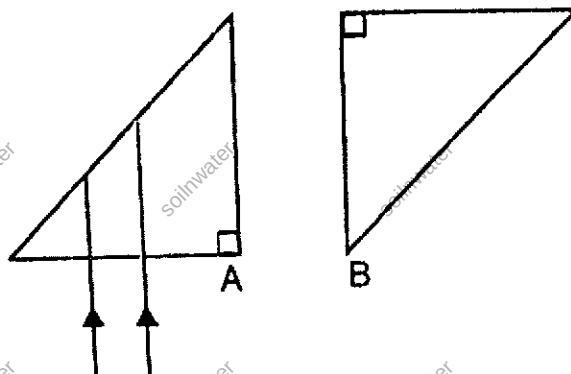
- Total resistance of the circuit.
- Current through $8\ \Omega$ resistor.
- Potential difference across the parallel combination of $6\ \Omega$ and $12\ \Omega$ resistor.
- Current through $6\ \Omega$ resistor.

[4]

- Q8. (i) A family uses 4 tube lights of 40 W each, 2 fans of 100 W each for an average 10 hours a day. Calculate: (a) the energy consumption for a period of month in kWh and Joules.
(b) the electricity bill to be paid for the month if the cost of one unit is Rs. 6.50.

[3]

- (ii) (a) The diagram below shows two isosceles right-angled prisms A and B of refractive index 1.5 each and the light rays incident on the prism A. Complete the diagram to show the rays emerging out of the prism B.

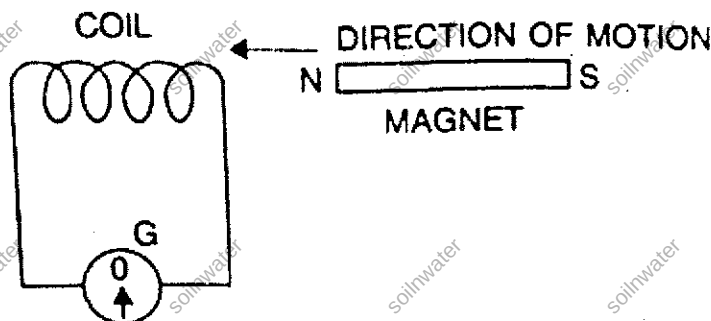


- (b) State the principle used for completing the ray diagram in part (a) above.

[3]

- (iii) The diagram shows a fixed coil of several turns connected to a centre zero galvanometer G and the magnet NS which can move as shown in the diagram.

[4]



- Describe the observation in the galvanometer if the magnet is:
 - moved rapidly towards the coil.
 - the magnet is kept stationary after it has moved into the coil.
 - the magnet is rapidly pulled out of the coil.
- How will the observation in (i) of part (a) change if a more powerful magnet is used?