# ICSE Class 10 Physics Question Paper Solution 2018

## PHYSICS (PAPER-1)

## SECTION I (40 Marks)

*Attempt all questions from this Section*

### Question 1

(a) (i) State and define the S.I. unit of power. [2]

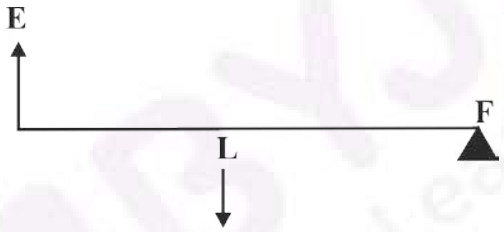
(ii) How is the unit horse power related to the S.I. unit of power?

(b) State the energy changes in the following cases while in use: [2]

(i) An electric iron.

(ii) A ceiling fan.

(c) The diagram below shows a lever in use: [2]




(i) To which class of levers does it belong?

(ii) Without changing the dimensions of the lever, if the load is shifted towards the fulcrum what happens to the mechanical advantage of the lever?

(d) (i) Why is the ratio of the velocities of light of wavelengths 4000Å and 8000Å in vacuum 1:1? [2]

(ii) Which of the above wavelengths has a higher frequency?

(e) (i) Why is the motion of a body moving with a constant speed around a circular path said to be accelerated? [2]

(ii) Name the unit of physical quantity obtained by the formula $\frac{2K}{V^2}$.

Where K: kinetic energy, V: Linear velocity.

## Comments of Examiners

(a)(i) Majority of the candidates were able to answer this question. However, some candidates either did not define the unit or defined an incorrect unit. A few candidates made spelling errors while stating and defining the unit *watt*.

(ii) Most candidates answered this sub-part correctly. Some candidates, however, wrote either 1 H.P. = 0.746 watt or 1 watt = 746 H.P. Some candidates were unsure about the exact value of H.P. in watt. A few candidates did not write the unit.

(b)(i) Some candidates stated the energy change in case of an electric iron electrical to mechanical or vice versa. A few candidates gave irrelevant answers.

(ii) Majority of the candidates answered this sub-part correctly. However, some candidates stated the energy change in case of a ceiling fan, *mechanical to wind energy* instead of *electrical to kinetic energy.*

(c)(i) Most of the candidates wrote second class lever but a few candidates did write Class I or Class III lever.

(ii) Majority of the candidates were unable to answer *what happens to the mechanical advantage of the lever if the load is shifted towards the fulcrum without changing the dimensions of the lever!* They just mentioned mechanical advantage is greater than one without realizing that the mechanical advantage of lever is already > 1 which increases further.

(d)(i) Most of the candidates were able to answer this question. A few candidates however, arrived at the correct

answer or an incorrect answer after long calculations.

(ii) Most of the candidates answered it correctly as $4000\overset{0}{A}$ but some candidates wrote $8000\overset{0}{A}$. A few candidates did huge calculations to arrive at the answer.

(e)(i) Several candidates explained the centripetal and centrifugal forces. Some candidates diagrammatically showed that motion is tangential to the curved path but were unable to make it clear that the *motion of a body moving with a constant speed around a circular path, would be accelerated.*

(ii) Most of the candidates could name the unit of physical quantity obtained by the given formula correctly, however, a few candidates were unable to name the unit.

## Suggestions for teachers

- Teach units with their definitions and conversions. Emphasise on their correct spellings.
- Explain energy conversion giving common day to day examples to the students. Lay stress on important energy changes that occur, with the proper names of energies.
- Illustrate change in the mechanical advantage of a lever giving daily life examples.
- Clarify to the students the difference between electromagnetic waves and mechanical waves.
- Lay stress on the concept that frequency of a wave is inversely proportional to its wavelength i.e., $f \propto \frac{1}{\lambda}$.
- Interpret the concept of the motion of a body moving with a constant speed around a circular path thoroughly.
- Train the students to read the questions and answer as per their requirements.

| MARKING SCHEME | |
|---|---|
| **Question 1** | |
| (a) | (i) watt – If 1joule of work is done in 1 second then the power spent/developed / expended is 1watt.<br>(ii) 1H.P. = 746 W /750 W |
| (b) | (i) Electrical energy to heat energy<br>(ii) Electrical energy to kinetic/mechanical energy. |
| (c) | (i) Second order (or class) lever.<br>(ii) Mechanical advantage of the lever increases. |
| (d) | (i) In vacuum their speed/velocity is the same.<br>(ii) 4000 Å has higher frequency. |
| (e) | (i) Because on a circular path the direction of motion changes continuously which changes the velocity of the body continuously.<br>(ii) kg or kilogram/g/ any unit of mass can be accepted. |

# Question 2

(a) The power of a lens is –5D. [2]

(i) Find its focal length.

(ii) Name the type of lens.

(b) State the position of the object in front of a converging lens if: [2]

(i) It produces a real and same size image of the object.

(ii) It is used as a magnifying lens.

(c) (i) State the relation between the critical angle and the absolute refractive index of a medium. [2]

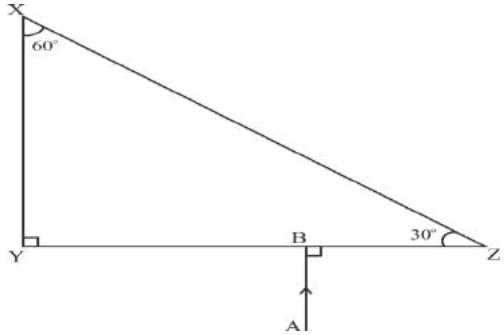
(ii) Which colour of light has a higher critical angle? Red light or Green light.

(d) (i) Define scattering. [2]

(ii) The smoke from a fire looks white.
Which of the following statements is true?

1. Molecules of the smoke are bigger than the wavelength of light.
2. Molecules of the smoke are smaller than the wavelength of light.

(e) The following diagram shows a 60º, 30º, 90º glass prism of critical angle 42º. Copy the diagram and complete the path of incident ray AB emerging out of the prism marking the angle of incidence on each surface. [2]




## Comments of Examiners

(a)(i) Most of the candidates answer this sub-part correctly. However, some candidates calculated the focal length of the given lens incorrectly or expressed the focal length in incorrect unit.

(ii) Most candidates named the type of lens correctly. Some candidates, however, were unaware that the focal length of a lens with negative sign is for a concave lens.

(b)(i) Many candidates gave the incorrect position of the object. Some candidates even drew an incorrect diagram. A few candidates got confused due to the labelling seen in question 6 (b).

(ii) Majority of the candidates made the same error as in Q6(b).

(c)(i) Only a few candidates wrote the correct mathematical relation between the critical angle and the absolute refractive index of a medium. Many candidates simply mentioned increases and decreases.

(ii) Most of the candidates wrote correct colour of light which has a higher critical angle. However, some candidates mentioned the colour as green which was incorrect.

(d) (i) Majority of the candidates stated the definition of dispersion which was incorrect. Some candidates did not state absorption and reemission without the change in the wavelength. Some candidates even changed the order and wrote reemission and absorptio

(ii) Almost all candidates identified the correct statement except a few who chose statement 2 as the correct option.

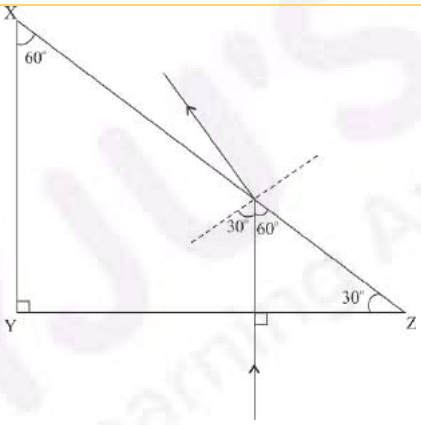
(e) Majority of the candidates showed total internal reflection Some candidates showed the ray bending towards normal. The diagram drawn by a few candidates was ambiguous.

### Suggestions for teachers

- Explain clearly the sign convention for the nature of lens, relating it to the spectacle numbers of the students being negative for most of them.
- Emphasise the unit while writing a physical quantity or an answer.
- Teach different cases of image formation by lenses, giving relevant examples from daily life.
- Train students to write mathematically correct statement rather than the generalised mathematical statement in terms of increases and decreases.
- Explain the difference between scattering and dispersion Also give a practical demonstration.
- Train the students to complete the path of the ray of light by calculating the angle of incidence at every new surface when the ray hits the surface.
- Give adequate practice to the students in drawing the ray diagrams.
- Instruct students to focus on the requirement of the question and to draw diagrams only when asked for.

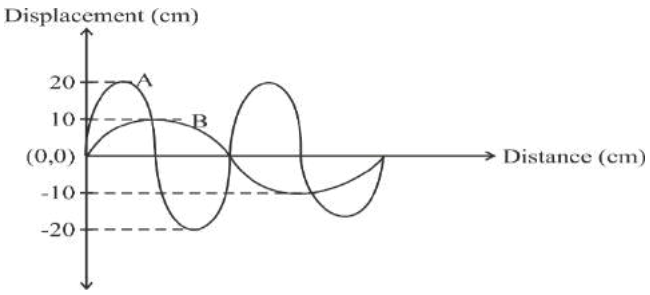
## MARKING SCHEME

## Question 2

| | |
|---|---|
| (a) | (i) $f = \frac{1}{P} = \frac{1}{5} = 0.2\ m\ or\ 20cm$(substitution expressed with negative sign is also acceptable)<br>(ii) Concave/diverging lens |
| (b) | (i) at 2F<br>(ii) Between the optical centre and principal focus. |
| (c) | (i) $\mu = \frac{1}{\sin c}$<br>(ii) Red |
| (d) | Bending away at surface XZ<br>Angle of incidence = $30^o$   |
| (e) | (i) Scattering is the absorption and then reemission of light without the change in the wavelength.<br>(ii) Statement 1 |

# Question 3

(a) Displacement distance graph of two sound waves A and B, travelling in a medium, are as shown in the diagram below. [2]




Study the two sound waves and compare their:

(i) Amplitudes

(ii) Wavelengths

(b) You have three resistors of values 2Ω, 3Ω and 5Ω. How will you join them so that the total resistance is more than 7Ω? [2]

(i) Draw a diagram for the arrangement.

(ii) Calculate the equivalent resistance.

(c) (i) What do you understand by the term nuclear fusion? [2]

(ii) Nuclear power plants use **nuclear fission** reaction to produce electricity. What is the advantage of producing electricity by **fusion** reaction?

(d) (i) What do you understand by free vibrations of a body? [2]

(ii) Why does the amplitude of a vibrating body continuously decrease during damped vibrations?

(e) (i) How is the e.m.f. across primary and secondary coils of a transformer related with the number of turns of coil in them? [2]

(ii) On which type of current do transformers work?

## Comments of Examiners

(a) A number of candidates were unable to comprehend the diagram. Many candidates, instead of calculating proper ratios of amplitudes and wave lengths, just compared them by stating more or less. Some candidates left the answer in the fractional form without bringing it to the lowest form. A few candidates stated the values of the quantities for the two waves.

(b) (i) Many candidates showed a straight line instead of a wavy line to depict the resistor in the diagram. Some candidates showed various combinations of series and parallel resistors. A few candidates considered 7Ω as one of the resistors in the circuit

(ii) Many candidates showed series combination but used the formula of parallel combination and *vice versa*. Several candidates tried out different combinations as they overlooked the word *more than* 7 Ω and tried to get it *equal* to 7 Ω. Some candidates did not write the unit in the final answer.

### ***Suggestions for teachers***

- Explain to the students that if the numerical figures are given in the question then *compare* means *ratio*.
- Train students to interpret the information of waves from graph.
- rill students for expressing the final answer as per the requirement of the question.
- Encourage students to learn the definitions with proper understanding keeping in mind the importance of keywords like *periodic force, constant frequency and amplitude* in the definition of free vibrations.
- Ensure that the students understand the difference between external force and external resistive force

(c) (i) Many candidates, instead of writing lighter and heavier nuclei, wrote smaller and bigger atoms/nuclei. Some candidates wrote the definition of nuclear fission.

(ii) Majority of the candidates were unable to answer this question correctly. A few candidates expressed that only nuclear fission can be used to produce electricity. Some candidates gave advantages of fission reaction.

(d)(i) Many candidates did not write the key words such as *without influence of external periodic force, constant frequency and constant amplitude* in the definition.

(ii) Most candidates did not write that external force is resistive in nature or that it causes loss of energy. Some candidates wrote the definition of damped vibrations. A few candidates wrote that damped vibrations are due to the removal of external force.

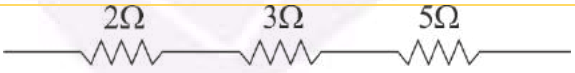
- Point out clearly the distinction
- among free, forced and damped vibrations with a variety of examples.
- Adequate practice should be given to students for comprehension of various terms and related aspects in transformers correctly.
- Give adequate practice to the students in solving numerical problems based on combination(series/parallel/mixed) of resistors.
- Clarify the terms Nuclear *fusion* and *fission* in detail giving relevant examples for comprehension

(e)(i) Several candidates were unable to answer this question. Most of them wrote how voltage or current increases or decreases in step-up and step-down transformer. A large number of candidates wrote $E = \frac{N_s}{N_p}$. Several candidates wrote only primary or only secondary coil without giving clear relation between number of turns and e.m.f.

(ii) Majority of the candidates wrote d.c or induced current or high voltage current or eddy currents.

## MARKING SCHEME

## Question 3

| | |
|---|---|
| (a) | (i) Amplitudes of A and B are in the ratio 2:1.<br>(ii) Wavelengths of A and B are in the ratio 1:2. |
| (b) | (i)  <br>(ii) $R = 2 + 3 + 5 = 10\ \Omega$<br>(Only 10 Ω can be accepted if the diagram is shown else substitution is a must.) |
| (c) | (i) Nuclear fusion – The process in which two lighter nuclei of lighter atoms combine to form a heavy and more stable nucleus with the liberation of large amount of heat.<br>(ii) The product formed is not radioactive hence less harmful to human/ energy produced per nucleon (for same mass of nuclear material) is more than fission. |
| (d) | (i) Vibrations of a body in absence of any external periodic force with constant frequency and amplitude.<br>(ii) The energy is lost to the surrounding due to the friction of the surrounding medium. |

| | | |
|---|---|---|
| (e) | (i) | e.m.f. and the number of turns of the coil are directly proportional. |
| | (ii) | A.C. or alternating current. |

# Question 4

(a) (i) How can a temperature in degree Celsius be converted into S.I. unit of temperature? [2]

(ii) A liquid **X** has the maximum specific heat capacity and is used as a coolant in Car radiators. Name the liquid **X**.

(b) A solid metal weighing 150 g melts at its melting point of 800 $^{o}$C by providing heat at the rate of 100 W. The time taken for it to completely melt at the same temperature is 4 min. What is the specific latent heat of fusion of the metal? [2]

(c) Identify the following wires used in a household circuit: [2]

(i) The wire is also called as the phase wire.

(ii) The wire is connected to the top terminal of a three-pin socket.

(d) (i) What are isobars? [2]

(ii) Give one example of isobars.

(e) State any two advantages of electromagnets over permanent magnets. [2]

## Comments of Examiners

(a)(i) Majority of the candidates could not express a temperature in degree Celsius in S.I. unit of temperature. Several candidates wrote $1^0$C = 273 K. Some candidates wrote $t^0$C-273 or T = 273 – $t^0$C or t = 273+K, $1^0$C=1 K.

(ii) Most of the candidates named the liquid X correctly. However, some candidates wrote hydrogen or kerosene, or petrol or diesel can be used as a coolant in car radiators.

(b) Majority of the candidates used melting point 800 $^0$C in their calculation. Most candidates substituted $150 \times 800 \times l$ on one side of the equation. Some candidates solved the specific latent heat of fusion of the metal equation using incorrect expressions $Q = mc\Delta t$ only or $Q = ml$ only or using $Q = ml + mc\Delta t$. A few candidates wrote the incorrect unit.

(c)(i) Most of the candidates were unaware of the word *phase*. Some candidates wrote the answer in terms of colours of wire. A few candidates wrote options such as hot wire or live/earth or neutral/earth.

(ii) This question was attempted well by most of the candidates. However, some candidates wrote live wire or live/neutral. Some candidates wrote the answer in terms of colours of wire.

(d) Many candidates answered sub-parts (i) and (ii) correctly. However, some common errors made by a few candidates were as follows:
confused between isotopes and isobars.
wrote examples with incorrect mass number and atomic number.wrote the elements without atomic number and mass numbers. gave examples of isotopes.

(e) Some candidates, instead of writing the advantages of *electromagnets* over *permanent magnets*, wrote the differences between the two. Some candidates wrote only one advantage. Some candidates repeated the points. A few candidates wrote incorrect advantages.

### ***Suggestions for teachers***

- Teach the basic physical quantities and their corresponding conversions. While doing calorimetry numerical, ask the students to express the temperature in K or vice versa. Clearly explain the properties of water and the advantages of its high specific heat capacity.
- Tell the students that every piece of information given in the sum need not be used in the calculations involving change of state. Give adequate practice on the heat numerical.
- Make the students aware of the colloquial terms. Practically show the students the connections to the three-pin socket.
- Clearly explain the difference between isotopes and isobars. Ensure that the students are clear that the reactant and product during *beta emission* are always isobars. Teach the topic by giving sufficient examples.
- Encourage the students to think over the statement and check its validity in different situations. Clearly explain the advantages of electromagnets as compared to the permanent magnets.

## MARKING SCHEME

### Question 4

| | |
|---|---|
| (a) | (i) $^{o}C + 273 = K$<br>(ii) Water |
| (b) | $P \times t = mL \Rightarrow 100 \times 4 \times 60 = 150 \times L$ (both side correct substitutions.)<br>$L = 160$ J $g^{-1}$ (answer is accepted in any unit.) |
| (c) | (i) Live wire<br>(ii) Earth wire |
| (d) | (i) Elements of same mass number but different atomic numbers are called isobars.<br>(ii) $^{14}_{6}C, ^{14}_{7}N$ , $^{23}_{12}Mg, ^{23}_{11}Na$ *(Any one correct example)* |

(e)

| Permanent Magnet | Electromagnet |
|---|---|
| Magnetic Strength cannot be easily altered | Magnetic strength can be easily altered. |
| Polarity cannot be reversed easily | Polarity can be reversed easily. |

# SECTION I (40 Marks)

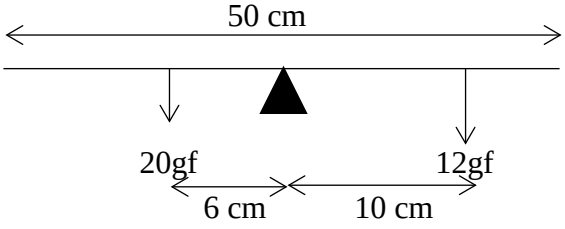
*Attempt any **four** questions from this Section*

## Question 5

(a) (i) Derive a relationship between S.I. and C.G.S. unit of work. [3]

(ii) A force acts on a body and displaces it by a distance S in a direction at an angle θ with the direction of force. What should be the value of θ to get the maximum positive work?

(b) A half metre rod is pivoted at the centre with two weights of 20 gf and 12 gf suspended at a perpendicular distance of 6 cm and 10 cm from the pivot respectively as shown below. [3]



(i) Which of the two forces acting on the rigid rod causes clockwise moment?

(ii) Is the rod in equilibrium?

(iii) The direction of 20 kgf force is reversed. What is the magnitude of the resultant moment of the forces on the rod?

(c) (i) Draw a diagram to show a block and tackle pulley system having a velocity ratio of 3 marking the direction of load(L), effort(E) and tension(T). [4]

(ii) The pulley system drawn lifts a load of 150 N when an effort of 60 N is applied. Find its mechanical advantage.

(iii) Is the above pulley system an ideal machine or not?

## Comments of Examiners

(a)(i) Some candidates, instead of deriving the relation between S.I. and C.G.S. unit of work wrote the relation. Some candidates showed the derivation between newton and dyne. The derivations done by a few candidates were the substitution on R.H.S of equation making it meaningless.

(ii) Several candidates wrote $\theta = 90^0\ or 180^0$ or $cos90^0 = 1$. Some candidates identified the angle correctly but made contradictory statements like $cos0 = 0$.

(b)(i) Majority of the candidates were able to answer this question. However, some candidates were confused and wrote both 20 gf and 12 gf.

(ii) This part of the question was attempted well by most candidates. However, some candidates arrived at the conclusion after long, elaborate and unnecessary calculations. A few candidates guessed the answer to be either a yes or no.

(iii) This question was performed well by most candidates.

(c)(i) The common anomalies in most of the answer scripts were:

- Direction of load and tension were missing.
- There were no proper number of pulleys in the fixed and movable block.
- No distinction between fixed and movable block.
- No support was shown.
- The strands of the tackle were shown loose.

### Suggestions for teachers

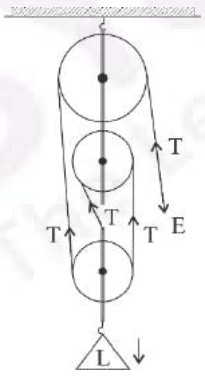
- Lay stress on the derivations for conversions with key steps.
- Clearly explain the work done for $\theta = 0^0, 90^0, 180^0$. Ensure that the basic concept of trigonometry is clear to the students.
- Drill students on the concept of clockwise and anticlockwise moment. Give adequate practice on numerical of moments.
- Train students to answer the questions as per the requirement of the question.
- Ensure that the students are given regular practice of drawing pulley diagrams. Clearly explain the difference between ideal and practical pulley. Tell the students that if the mechanical advantage is less than the number of strands supporting the load, then it is not an ideal pulley system.

(ii) Majority of the candidates were able to get the calculations correct but left the answer in fraction form. Some candidates added the units. The calculations done by a few candidates were vague.

(iii) Majority of the candidates were able to answer this question. Some candidates, however, wrote it is an ideal pulley system.

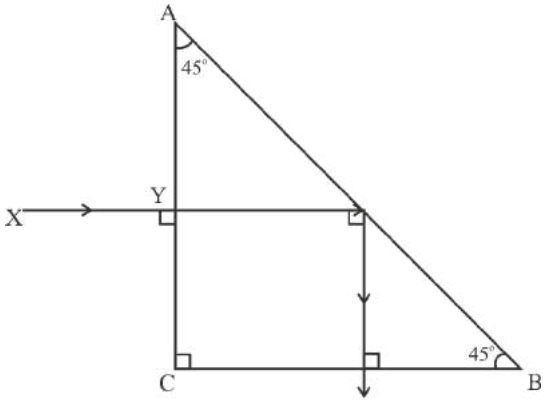
## MARKING SCHEME

## Question 5

| | |
|---|---|
| (a) | (i) 1 J = 1 N x 1 m<br>1 J = $10^5$ dyn x 100 cm<br>1 J = $10^7$ ergs<br>(ii) 0° |
| (b) | (i) 12 kg f<br>(ii) Yes<br>(iii) On reversing the direction of 20 kg f, the magnitude of the resultant forces on the rod = $20 \times 6 + 12 \times 10 = 240$ |
| (c) | (i)  <br>Two pulleys in block and one pulley(movable) in tackle, their proper connection, marking directions of load(L) and effort(E) and at least one tension and the support. Strands should be stretched.<br>(ii) $M.A. = \frac{L}{E} = \frac{150}{60} = 2.5$<br>(iii) No, it is not an ideal system. |

# Question 6

(a) A ray of light XY passes through a right angled isosceles prism as shown below. [3]

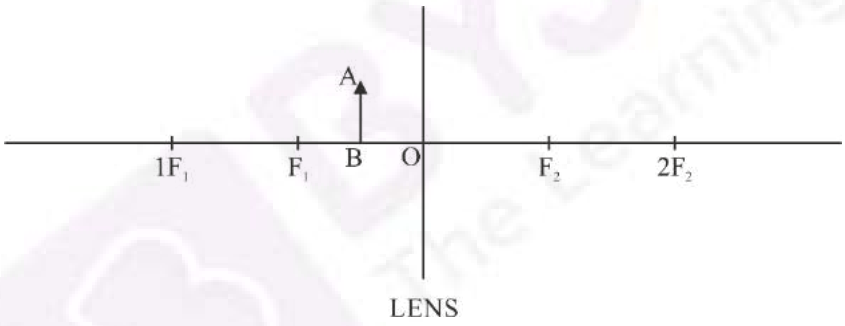



(i) What is the angle through which the incident ray deviates and emerges out of the prism?

(ii) Name the instrument where this action of prism is put into use.

(iii) Which prism surface will behave as a mirror?

(b) An object AB is placed between O and $F_1$ on the principal axis of a converging lens as shown in the diagram. [3]




Copy the diagram and by using three standard rays starting from point A, obtain an image of the object AB.

(c) An object is placed at a distance of 12 cm from a convex lens of focal length 8 cm. [4]
Find:

(i) the position of the image

(ii) nature of the image

## Comments of Examiners

(a) Majority of the candidates answered sub-parts (i),(ii) and (iii) of this question well. However, some common miscues made by candidates were:
- Reported the angle through which the incident ray deviates and emerges out of the prism as $0^0$ or $45^0$
- named binoculars as the instrument.
- the prism surface BC and AC will behave as a mirror.
- all the three surfaces will behave as a mirror.

(b) Many candidates were unsure of the answer due to the third standard ray which was asked.

The common anomalies in most of the answer scripts were:

- Ray after refraction did not pass through F.
- Virtual intersection or the image was not shown by dotted lines.
- Arrows were missing on either incident or refracted rays.
- Two rays were drawn but the image was not drawn.
- Arrows were drawn on the dotted lines to show the path of the ray.

(c)(i) Majority of the candidates were unable to answer this question. The common flaws observed in most of the answer scripts were:

- use of incorrect lens formula
- incorrect use of sign convention.
- incorrect substitutions.
- incorrect characteristics of the images.
- incorrect answer with correct unit or correct answer with incorrect unit or without unit.

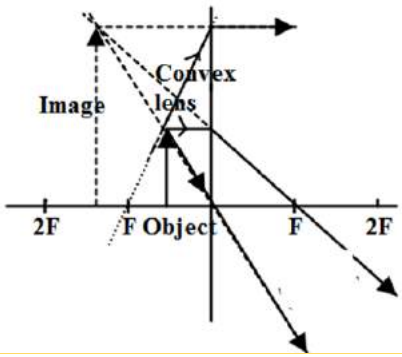
### *Suggestions for teachers*

- Teach the students the angle of deviation with respect to any phenomenon of light and not only with respect to refraction through prism.
- Discuss with the students, the total internal reflection through the right angled isosceles prism in detail.
- Illustrate lenses including characteristics of the images formed, location of images using ray diagrams, sign convention lens formula thoroughly. Ensure that the students understand the sign convention clearly.
- Give sufficient practice to the students to draw ray diagrams using three standard rays even if the object is lying between the optical centre and the focus.
- Insist on the arrows on the rays before and after the refraction. Guide students that apparent intersection and virtual image has to be shown by dotted lines.
- Give sufficient practice to the students to solve the numerical problems.

## MARKING SCHEME

### Question 6

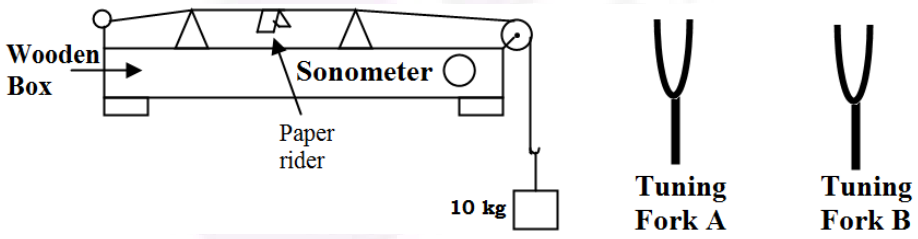
| | |
|---|---|
| (a) | (i) $90^0$<br>(ii) refracting periscope.<br>(iii) Surface AB |

| | |
|---|---|
| (b) | Image of the object AB, using three standard rays starting from point A<br>  <br> |
| (c) | (i) $\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$<br>$\frac{1}{v} - \frac{1}{-12} = \frac{1}{8}$<br>$\frac{1}{v} = \frac{1}{8} - \frac{1}{12} = \frac{3-2}{24} = \frac{1}{12}$ ; image distance $v$ = +24cm<br>(ii) Real or inverted<br>(iii) Image is bigger than object. |

# Question 7

(a) Draw the diagram of a right angled isosceles prism which is used to make an inverted image erect. [3]

(b) [3]




The diagram above shows a wire stretched over a sonometer. Stems of two vibrating tuning forks A and B are touched to the wooden box of the sonometer. It is observed that the paper rider (a small piece of paper folded at the centre) present on the wire flies off when the stem of vibrating tuning fork B is touched to the wooden box but the paper just vibrates when the stem of vibrating tuning fork A is touched to the wooden box.

(i) Name the phenomenon when the paper rider just vibrates.

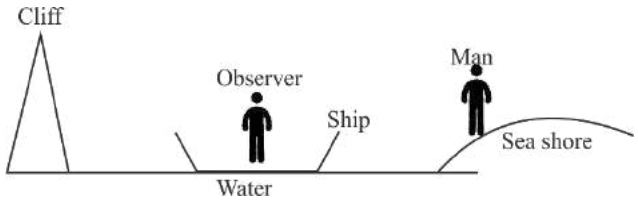
(ii) Name the phenomenon when the paper rider flies off.

(iii) Why does the paper rider fly off when the stem of tuning fork B is touched to the box?

(c) A person is standing at the sea shore. An observer on the ship which is anchored in between a vertical cliff and the person on the shore fires a gun. The person on the shore hears two sounds, 2 seconds and 3 seconds after seeing the smoke of the fired gun. If the speed of sound in the air is 320 $ms^{-1}$ then calculate: [4]

(i) the distance between the observer on the ship and the person on the shore.

(ii) the distance between the cliff and the observer on the ship.




## Comments of Examiner

(a) Many candidates performed well barring a few exceptions who could not show:
- $90^0$ Deviation
- Inversion of image.
- Arrows on incident, refracted, reflected and emergent rays.

(b) Most candidates answered sub-parts (i), (ii) and (iii) correctly, however a few candidates wrote:

(i) damped and forced or resonant vibrations.

(ii) forced vibrations.

(iii) that the frequency of the tuning fork B becomes more than the natural frequency of the stretched wire and vibrates with greater amplitude or vice versa or the explanation of increased amplitude was missing.

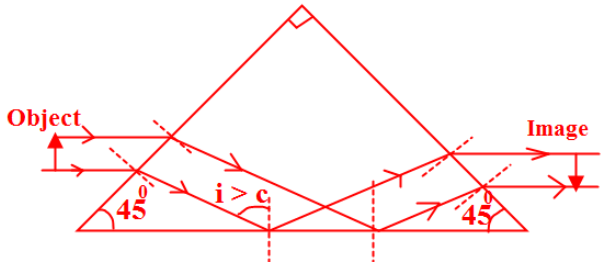
(c) Most of the candidates attempted this part well, however, some candidates made mistakes in calculations.

### ***Suggestions for teachers***

- Drill students in drawing correct ray diagrams. Insist on necessary labelling and specifications of the diagrams. Explain to the students, the reason for total internal reflection taking place at the lower surface and not at the side surfaces.
- Illustrate free vibrations, forced vibrations and resonance with relevant examples.
- Train students to read and analyse the question gingerly and then take logical steps towards solving it.
- Instruct students to refrain themselves from simply substituting the data in the formula.

## MARKING SCHEME

### Question 7

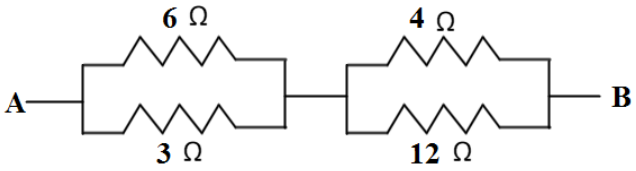
| | |
|---|---|
| (a) |  <br>*(Any other correct ray diagram)* |
| (b) | (i) Forced vibrations<br>(ii) Resonance.<br>(iii) Frequency of the tuning fork B matches the natural frequency of the stretched wire and vibrates with greater amplitude. |
| (c) | (i) $d = v \times t = 320 \times 2$<br>$d = 640$ m<br>(ii) $d = \frac{v \times t}{2} = \frac{320 \times 1}{2}$<br>$d = 160$ m |

# Question 8

(a) (i) A fuse is rated 8A. Can it be used with an electrical appliance rated 5 KW, 200 V? Give a reason. [3]

(ii) Name two safety devices which are connected to the live wire of a household electric circuit.

(b) (i) Find the equivalent resistance between A and B. [3]




(ii) State whether the resistivity of a wire changes with the change in the thickness of the wire.

(c) An electric iron is rated 220V, 2kW. [4]

(i) If the iron is used for 2h daily find the cost of running it for one week if it costs ` 4.25 per kWh.

(ii) Why is the fuse absolutely necessary in a power circuit?

## Comments of Examiners

(a) Sub-parts (i) and (ii) were correctly attempted by most of the candidates except for some who:

(i) answered the question without calculating current. calculated the current but made calculation errors. were unable to comprehend the meaning of the term *fuse rating* and hence could not write a proper reason. simply wrote *No* as the answer.

(ii) wrote the names of the appliances. wrote earthing /earth wire without realising that the safety devices connected to the live wire had been asked.

(b) (i) This sub-part was correctly attempted by most candidates. The common anomalies in most of the answer scripts were:

- Series resistor formula was used.
- L.H.S of the parallel resistor formula was written R in place of $\frac{1}{R}$ which resulted in incorrect mathematical step.
- Unit was missing in the answer.

(ii) Majority of the candidates wrote that the resistivity changes as they were unsure about the factors affecting it.

(c) (i) The common lapses observed in some of the answer scripts were:

- calculation errors.
- time (one week) was not taken into consideration.
- kW was converted into watt.

(ii) Many candidates could not write about the absolute necessity of the *fuse* in power circuits correctly.

### Suggestions for teachers

- Explain the concepts on electrical power and energy, fuse and its rating and its use in power circuits in detail.
- Ask students to show the calculations in the numerical problems.
- Ensure that the students are clear about the safety devices and their functions.
- Illustrate the concept of resistors in combination (series, parallel and mixed) with adequate number of numerical problems. Guide students about the possible errors also.
- Point out the difference between resistance and resistivity.
- Give regular practice to the students in solving the numerical problems based on different topics in Electricity.

## MARKING SCHEME

### Question 8

| | |
|---|---|
| (a) | (i) $I = \frac{P}{V} = \frac{5000}{200} = 25\ A$ No, it cannot be used.<br>Maximum current drawn by the appliance is greater than the fuse rating.<br>(ii) M.C.B. Fuse, switch, ELCB |

| | |
|---|---|
| (b) | (i) $R_1 = \frac{6\times3}{6+3} = 2\ \Omega$ Or $R_2 = \frac{4\times12}{4+12} = 3\ \Omega$<br>$R = 2 + 3 = 5\ \Omega$<br>(ii) No, it does not change. |
| (c) | (i) E = P x t = 2 x 2 =4 kW h [Correct substitution]<br>Cost for running it for a week = 4 x 7 x 4.25 = ` 119/-<br>(ii) Power circuits draw large amount of current/<br>Electric shock in this circuit is very fatal hence to avoid it fuse is necessary in the power circuit/ to safeguard. |

# Question 9

(a) (i) Heat supplied to a solid change it into liquid. What is this change in phase called? [3]

(ii) During the phase change does the average kinetic energy of the molecules of the substance increase?

(iii) What is the energy absorbed during the phase change called?

(b) (i) State two differences between "Heat Capacity" and "Specific Heat Capacity". [3]

(ii) Give a mathematical relation between Heat Capacity and Specific Heat Capacity.

(c) The temperature of 170g of water at 50°C is lowered to 5°C by adding certain amount of ice to it. Find the mass of ice added. [4]

Given: Specific heat capacity of water = 4200 J $kg^{-1}$ $^0C^{-1}$ and Specific latent heat of ice = 336000 J $kg^{-1}$

## Comments of Examiners

(a)(i) Majority of the candidates were able to answer this question. However, some candidates wrote melting point, boiling point, boiling, liquification, and vaporization A few candidates explained about specific heat capacity.

(ii) Most of the candidates wrote *yes* for this part, missing out on the word *average* in the question.

(iii) Majority of the candidates wrote specific heat or specific latent heat or heat energy or kinetic energy or potential energy or specific latent heat capacity.

(b)(i) Many candidates made errors in the definitions of Heat Capacity and Specific Heat Capacity. Several candidates stated incorrect units. Some candidates did not write corresponding points of difference.

(ii) Many candidates were confused in the use of symbols such as C, C' and H. Several candidates deviated from the usual symbols but did not explain them.

(c) The common inaccuracies observed in most of the answer scripts were:

- Required conversions were not done.
- Proper equation was not formed.
- Heat absorbed by melted ice was not considered.
- Unit was incorrect or not mentioned in the final answer.

### *Suggestions for teacher*

- Familiarize students with conceptual questions through oral questioning and regular written tests.
- With the help of the heating curve, discuss the various processes of phase change and the difference between them. Explain phase change on the basis of the kinetic theory.
- Explain the differences between Heat Capacity and Specific Heat Capacity. Tell the students that the formula is nothing but the mathematical statement of definition and so is not a point of difference.
- Train students to explain the symbols in an answer given in the form of a formula/mathematical equation.
- Give adequate practice to students in solving a variety of questions based on calorimetry. Also, ask them to use only the values given in the question.
- Give adequate practice in constructing the equation involving change of state and principle of mixtures as well as substitution in the equation.
- Use the Heating curve to construct an equation.

## MARKING SCHEME

### Question 9

| | | |
|---|---|---|
| (a) | (i) | Melting |
| | (ii) | No. |
| | (iii) | Latent heat of melting/fusion. |

(b) (i)

| Heat capacity | Specific heat capacity |
|---|---|
| Heat absorbed by the mass of a body to raise its temperature by $1^{o}$ C. | Heat absorbed by unit mass of a body to raise its temperature by $1^{o}$ C. |
| S.I. Unit is J $K^{-1}$ | S.I. unit is J $kg^{-1}$ $K^{-1}$ |
| Depends on mass and (specific Heat capacity/material) | Does not depend on mass (but depends on material) |

*(Any two points)*

(ii) Heat capacity(C') = mass of the body(m) x specific heat capacity (c)

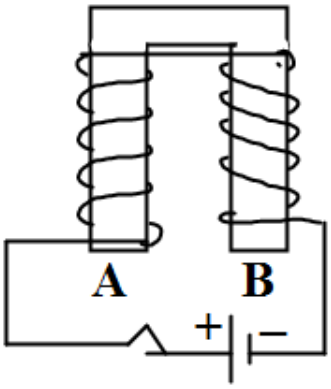
(c) $m_w\ c_w\ \theta_w = m_i\ L + m_i\ c_w\ \theta_w$

$170 \times 4.2 \times 45 = m_i\ [\ 336 + 4.2 \times 5\ ]$

$m_i = 90$ g

# Question 10

(a) [3]




The diagram shows a coil wound around a U shape soft iron bar AB.

(i) What is the polarity induced at the ends A and B when the switch is pressed?

(ii) Suggest one way to strengthen the magnetic field in the electromagnet.

(iii) What will be the polarities at A & B if the direction of current is reversed in the circuit?

(b) The ore of Uranium found in nature contains $_{92}U^{238}$ and $_{92}U^{235}$. Although both the isotopes are fissionable, it is found out experimentally that one of the two isotopes is more easily fissionable. [3]

(i) Name the isotope of Uranium which is easily fissionable.

(ii) Give a reason for your answer.

(iii) Write a nuclear reaction when Uranium 238 emits an alpha particle to form a Thorium (Th) nucleus.

## Comments of Examiners

(a)(i) Majority of the candidates were unable to write the correct polarity induced at the ends A and B of the coil wound around a U shape soft iron bar AB on pressing the switch. Some candidates wrote that the answer is not possible.

(ii) Most of the candidates answered this sub-part correctly.

(iii) Majority of the candidates who were unable to answer sub-part (i) of this question correctly, could not answer this sub-part correctly.

(b)(i) Many candidates named the easily fissionable isotope of Uranium, $^{238}U$. Some candidates wrote $^{238}$ U or $^{235}$ U or $^{92}$ U.

(ii) Majority of the candidates were unable to answer this question.

(iii) Many candidates wrote the nuclear equation but were unable to balance it. Several candidates wrote $\alpha$ above the arrow in the equation.

### *Suggestions for teacher*

- Explain to the students the correct method of determining the polarity induced at any end of a coil wound around a magnetic substance, on passing the current through the coil.
- Discuss the isotopes of Uranium and fission of uranium thoroughly to the students.
- Train students to write balanced nuclear equations.
- Discuss radioactivity and changes in the nucleus, comparative properties of $\alpha, \beta$ and $\gamma$ along with the reasons. Explain in detail the important uses of nuclear radiations

(c)(i) Most candidates were able to answer this question. However, some candidates wrote $\alpha$ or $\beta$ which was incorrect.

(ii) Majority of the candidates, instead of relating it to the negligible mass of $\beta$ , related it to its speed or negative charge.

(iii) Majority of the candidates wrote either beta or gamma. Candidates seemed to be confused by the word *externally*.

(iv) Majority of the candidates either did not attempt this question or wrote incorrect answer.

## MARKING SCHEME

## Question 10

| | | |
|---|---|---|
| (a) | (i) | South and south. |
| | (ii) | Increasing the strength of current through the coil. |
| | (iii) | The polarities at the two ends become North. |
| (b) | (i) | $_{92}U^{235}$ |
| | (ii) | Fission of $_{92}U^{238}$ is possible only by fast neutrons while the fission of $_{92}U^{235}$ can be even possible by the slow neutrons. |

| | |
|---|---|
| | (iii) $^{238}_{92}U \rightarrow {}^{234}_{90}Th + {}^{4}_{2}He$ |
| (c) | (i) B (gamma)<br>(ii) C has less mass compared to A<br>(iii) A<br>(iv) C |

**Note: For questions having more than one correct answer/solution, alternate correct answers/solutions, apart from those given in the marking scheme, have also been accepted.**

# GENERAL COMMENTS

**Topics found difficult/ confusing by candidates**

- Change in mechanical advantage when the load is shifted towards fulcrum in class II lever.
- Speed of light for all wavelengths in vacuum is the same.
- Problems on calorimetry.
- Conversion of units.
- Heat capacity and specific heat capacity.
- Ray diagrams of lenses.
- Numerical problem on lens formula.
- Total internal reflection through right angled isosceles prism.
- Specific resistance and its unit.
- Differentiation between resistance and specific resistance.
- Difference between the use of a fuse in a normal circuit and a power circuit.
- Numerical on reflection of sound.
- Confusion between the use of $V = \frac{d}{t}$ and $V = \frac{2d}{t}$.
- Beta emission during carbon dating.
- Nuclear fusion.
- Concept of isobar.
- Identification of magnetic poles in electromagnets.
- Substitution in a numerical which required some conversion.

**Suggestions for candidates**

- Avoid selective study.
- Learn tables and squares up to 30.
- Read the questions heedfully and write answer in brief and to the point.
- Express the answer only in SI units unless otherwise asked.
- Learn the principles, laws and definitions accurately.
- Focus more on conceptual learning rather than the rote learning.
- Make observations and try to relate your learning with it.
- State the meaning of the symbols if the answer is given in terms of any formula/mathematical equation.
- Use abbreviations/symbols which are standard/acceptable.
- Solve at least the last five years' I.C.S.E. question papers.
- Write in a neat and legible handwriting.
- Avoid changing the order of sequence of questions and numbering system while attempting the paper.
- Express final answer with proper unit as per the requirement of the question.