ICSE Class 10 Physics Question Paper Solution 2019

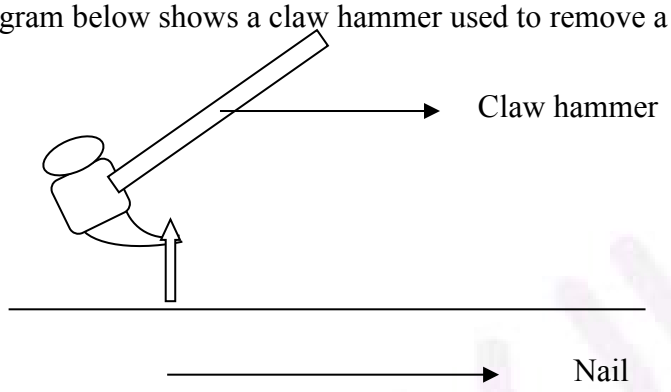
PHYSICS (PAPER-I)

SECTION I (40 Marks)

*Attempt **all** questions from this Section*

Question 1

(a) The diagram below shows a claw hammer used to remove a nail: [2]



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

(ii) Give one more example of the **same class** of lever mentioned by you in (i) for which the **mechanical advantage is greater than one**.

(b) Two bodies A and B have masses in the ratio 5:1 and their kinetic energies are in the ratio 125:9. Find the ratio of their velocities. [2]

(c) (i) Name the physical quantity which is measured in calories. [2]

(ii) How is calorie related to the S.I unit of that quantity?

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

(ii) State the S.I. unit of moment of couple.

(e) (i) Define critical angle. [2]

(ii) State one important factor which affects the critical angle of a given medium.

Comments of Examiners

(a) (i) Most of the candidates could identify the class of lever but some could not identify the position of fulcrum hence made a mistake.

(ii) Gave example of class two levers. Some gave example of class I lever, but its mechanical advantage was not greater than 1.

(b) Many candidates could not do substitution in the ratio form. Some candidates did not express the final answer in the ratio form with lowest term.

(c) (i) Most candidates named the physical quantity which is measured in calories correctly. But some wrote the physical quantity such as work or energy. Some of them even wrote as joule as they were confused between physical quantity and unit.

(ii) Most of the candidates wrote the relation between calorie and the S.I unit of that quantity correctly but some of them reversed it and wrote it as 1 J = 4.2/4.186 calorie.

Some even wrote

1 cal = 0.4 j/1J/41.8j/373K/336j

Suggestions for teachers

- Explain the types of levers with real life examples with respect to the positions of Fulcrum, Load and Effort, their mechanical advantage, velocity ratio etc.
- Give enough practice of ratio based numerical to the students.
- Clarify the difference between a unit and a physical quantity to the students.
- Train students to focus on key words in definitions. Explain them the meaning of a definition with key words or without key words.
- Differentiate between factors affecting total internal reflection and conditions of total internal reflection clearly with the help of a diagram or by using a media file.

(d) (i) In many answer scripts key words/terms such as two, equal, parallel, opposite, not acting along the same line etc. were missing which made the definition incomplete or meaningless. Some of them defined moment of couple or torque instead of couple.

(ii) Many candidates wrote the SI. unit of moment of couple correctly, but some candidates wrote joule in place of Nm or N or dyn or N/m or $N\ m^{-1}$

(e) (i) Many candidates defined critical angle correctly. But quite a number of candidates made following errors.

- key words such as rarer, denser were missing.
- did not make it clear that it is the angle of incidence.
- 90^0 was missing.

(ii) Many candidates wrote it correctly but quite a number of candidates wrote

- conditions of total internal reflection.
- factor as angle of incidence/frequency.
- additional point/s which were incorrect.

MARKING SCHEME

Question 1

(a)	(i) Class I lever (ii) Crow bar / pliers / any other correct example/diagram with name (only scissors not accepted) , explanation to imply M A > 1.
(b)	$E_1/E_2 = 1/2\ m_1v_1^2 / 1/2m_2v_2^2 = (m_1/m_2) \times (v_1/v_2)^2$ $125/9 = (5/1) \times (v_1/v_2)^2$

	$(v_1/v_2)^2 = (125/9) \times (1/5) = 25/9$ $(v_1/v_2) = 5/3$
(c)	(i) Heat energy (ii) 1 calorie = 4.2 J / 4.186 J / 4.18 J
(d)	(i) Two equal and opposite parallel forces, not acting along the same line, form a couple. (ii) N m
(e)	(i) Critical angle is the angle of incidence in the denser medium for which the angle of refraction in the rarer medium is 90°. (ii) Colour / wavelength of light and temperature / refractive index/ optical density of the medium/material/nature of the medium/ pairing media /speed of light.

Question 2

(a) An electromagnetic radiation is used for photography in fog. [2]

(i) Identify the radiation.

(ii) Why is this radiation mentioned by you, ideal for this purpose?

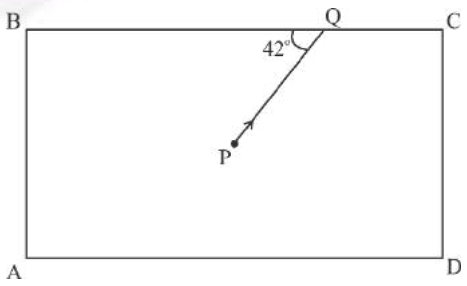
(b) (i) What is the relation between the refractive index of water with respect to air (${}_a\mu_w$) [2] and the refractive index of air with respect to water (${}_w\mu_a$).

(ii) If the refractive index of water with respect to air (${}_a\mu_w$) is $\frac{5}{3}$.
Calculate the refractive index of air with respect to water (${}_w\mu_a$).

(c) The specific heat capacity of a substance A is 3,800 $Jkg^{-1}K^{-1}$ and that of a substance B [2] is 400 $Jkg^{-1}K^{-1}$. Which of the two substances is a good conductor of heat? Give a reason for your answer.

(d) A man playing a flute is able to produce notes of different frequencies. If he closes the [2] holes near his mouth, will the pitch of the note produced, increase or decrease? Give a reason.

(e) The diagram below shows a light source P embedded in a rectangular glass block ABCD [2] of critical angle 42°. Complete the path of the ray PQ till it emerges out of the block. [Write necessary angles.]



Comments of Examiners

(a) (i) Most of the candidates wrote the name of the correct radiation but some candidates wrote incorrect name of the electromagnetic radiation used for photography in fog. Some wrote infar instead of infra.

(ii) In some scripts, the reasons for mentioned radiation were as follows:

- high penetrating power
- used generalized irrelevant words such as deviation, penetrate, dispersion etc.
- gave uses of infrared radiations.

(b) (i) Many candidates wrote separate expression or definition for each ${}_a\mu_w$ and ${}_w\mu_a$ but did not give the relation between the two.

(ii) In spite of writing an incorrect answer in the first part, most of the candidates were able to give a correct answer in the second part.
Some candidates wrote the equation of refractive index in terms of speed of light, substituted values and then obtained the answer through long calculations. Some of the candidates also wrote answer as 1.

(c) A large number of candidates did not name the good conductor of heat out of the two given substances. Also, many were unable to write the reason for naming one of the given substances as a good conductor of heat on the basis of their specific heat capacities.

(d) Very few candidates answered it correctly. Many candidates could not write the reason about the holes present on the flute and its relation with the frequency (pitch) of the sound produced. Some of them even related it to the loudness. Some of them answered first part of the question correctly but failed to give the explanation.

(e) Many candidates could complete the path of first reflected ray correctly but made a mistake in completing the path of the second ray after total internal reflection.
Following lapses were observed in the diagram:

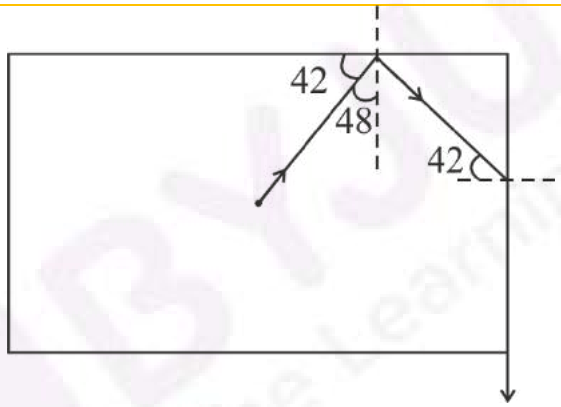
- Assuming 42^0 as the angle of incidence some candidates showed the first refracted ray along the surface.
- Many candidates did not calculate the angle of incidence at the new surface they showed incorrect path (refracting out or going along the normal) of the second ray.
- Angle of incidence was not marked and written.
- Arrows were missing on the rays.

Suggestions for teachers

- Explain the phenomena scattering, reflection, refraction dispersion etc. exhaustively to the students.
- Teach electromagnetic radiations, their properties, uses and the methods of detection intensively to the students and frequently revise the topic.
- Clarify principle of reversibility involved in the relation ${}_a\mu_b = \frac{1}{{}_b\mu_a}$ to the students. Insist on expressing the final answer in decimal.
- Train students to interpret the natural phenomena involving specific heat capacities of the substances and consequences of high specific heat capacity. Use the given table of specific heat capacities of different substances.
- Teach students to apply the relation $f \propto \frac{1}{l}$ in case of different musical instruments involving air columns. Demonstrate experimentally this by using tuning fork of different frequencies and resonating them with different lengths of the air column.
- Drill students in completing the path of the ray through different optical media. Also, train them to calculate the angle of incidence when the ray strikes at every new surface and then complete the path of the ray.
- Instruct students to mark arrow in all ray diagrams.
- Spell out the concept of total internal reflection to the students intensely.

MARKING SCHEME

Question 2

(a)	(i)	Infra-Red
	(ii)	They have long wavelength hence less scattered and can travel through the fog.
(b)	(i)	They are inversely propotional. Or $_a\mu_w = \frac{1}{_w\mu_a}$
	(ii)	$_w\mu_a = \frac{1}{_a\mu_w} = \frac{3}{5} = 0.6$
(c)	Substance B is a good conductor of heat Because specific heat capacity of B is less than that of A and specific heat capacity is the heat energy required to raise the temperature of 1 kg of a substance by 1°C, so substance B gets heated faster.	
(d)	Decrease Frequency is inversely proportional to the length of the air column.	
(e)		

Question 3

(a) (i) If the lens is placed in water instead of air, how does its focal length change? [2]

(ii) Which lens, thick or thin has greater focal length?

(b) Two waves of the same pitch have amplitudes in the ratio 1:3. [2]

What will be the ratio of their:

(i) intensities and

(ii) frequencies?

(c) How does an increase in the temperature affect the specific resistance of a: [2]

(i) Metal and

(ii) Semiconductor?

(d) (i) Define resonant vibrations. [2]

(ii) Which characteristic of sound, makes it possible to recognize a person by his voice without seeing him?

(e) Is it possible for a hydrogen ($^{1}_{1}H$) nucleus to emit an alpha particle? [2]
Give a reason for your answer.

Comments of Examiners

(a) (i) Many candidates could not comprehend the question correctly. Some candidates answered that focal length changes, but they could not give the correct reason. Several candidates could not write about the effect on the focal length of the lens due to change in the refractive index of the outside medium.

(ii) While many candidates answered it correctly, quite a few could not comprehend it. They wrote convex lens as a thicker lens and concave lens as a thinner lens. Some candidates wrote thicker lens has greater focal length.

(b) Most of the candidates answered it correctly but some of the candidates made following errors in both the sub parts (i) and (ii).

- expressed the same ratio.
- expressed the answer in the fractional form.
- wrote reverse ratio.

(c) (i) Most of the candidates wrote the effect of an increase in the temperature on the specific resistance of a metal, increases which was a correct answer. But following answers were also observed that is the specific resistance of a metal does not change or decreases.

(ii) Most of the candidates answered it correctly but some candidates wrote that with the increase in temperature, the specific resistance of a semiconductor increases or remains the same.

(d) (i) In the definition of resonant vibrations following glitches were observed

- keyword such as increase in amplitude was missing.
- natural frequency matching with forced vibration was written instead of frequency of forced vibration.

(ii) Many candidates wrote it correctly as Quality but quite a number of candidates also wrote as loudness, pitch, frequency.

(e) Most of the candidates wrote first part correctly as 'No' barring some of them who wrote 'Yes'. But they found it difficult to give reason for the same. Various reasons were observed

Suggestions for teachers

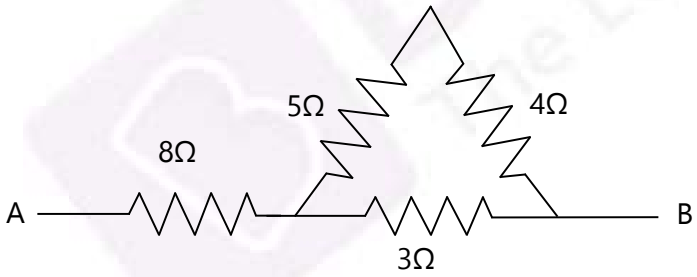
- Demonstrate an increase in the focal length of a convex lens when it is placed in water.
- Devise an activity to show the relation between radius of curvature and the focal length of a lens clearly.
- Teach students the relation between the intensity of a wave and its amplitude or frequency clearly. Give enough practise on related numerical.
- Instruct students that a fraction cannot be accepted in place of a ratio. Stress upon expressing final answer in the asked form in the question like in ratio or in decimal form up to required decimal places or significant figures etc.
- Explain the difference between a semiconductor and a metal and effect of temperature on the specific resistance of metals and semiconductors.
- Stress upon writing the key words while defining the scientific terms/key words.
- Discuss the characteristics of sound with a number of examples.
- Discuss the terms nucleus, its structure, atomic number, mass-number, radioactivity, changes within the nucleus in detail giving ample number of examples.

such as Hydrogen is not a radioactive substance, after Alpha emission atomic number decreases by 2 and mass number decreases by 4, Hydrogen has one proton and one neutron or hydrogen has one proton and one electron. Some candidates gave irrelevant explanation. Very few candidates attempted it to explain with a nuclear reaction.

MARKING SCHEME Question 3	
(a)	(i) The focal length of the lens will increase in water (Focal length of the lens depends on the refractive index of the material of lens relative to its surrounding medium) (ii) thinner
(b)	(i) $I_1/I_2 = (a_1/a_2)^2 = (1/3)^2 = 1/9 \quad \therefore I_1 : I_2 = 1 : 9$ (ii) 1:1 (because pitch is same)
(c)	(i) Increases (ii) Decreases
(d)	(i) Vibrations of greater amplitude when frequency of forced vibration is equal to the frequency of free vibration. (ii) Quality / Timbre
(e)	No. The nucleus does not contain two protons and two neutrons

Question 4

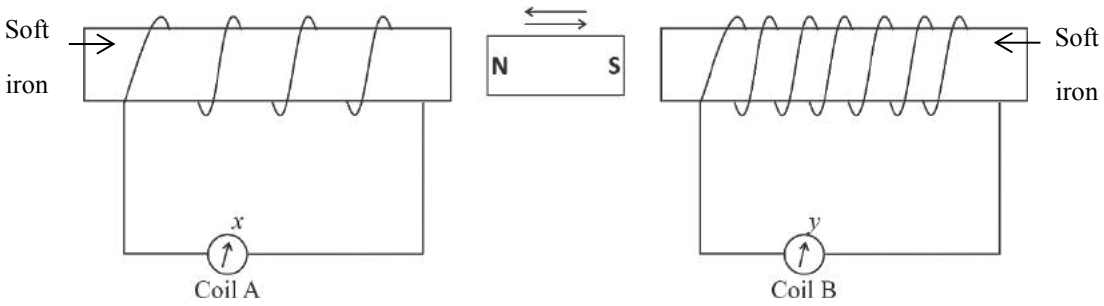
(a) Calculate the effective resistance across AB: [2]



(b) (i) State whether the specific heat capacity of a substance remains the same when its state changes from solid to liquid. [2]

(ii) Give one example to support your answer.

(c) A magnet kept at the centre of two coils A and B is moved to and fro as shown in the diagram. The two galvanometers show deflection. [2]



State with a **reason** whether:

$x > y$

or

$x < y$. [x and y are magnitudes of deflection.]

(d) (i) Why is a nuclear fusion reaction called a thermo nuclear reaction? [2]

(ii) Complete the reaction:

$^{3}He_{2} + {}^{2}H_{1} \longrightarrow {}^{4}He_{2} + \ldots\ldots\ldots\ldots + \text{Energy}$

(e) State two ways to increase the speed of rotation of a D.C. motor. [2]

Comments of Examiners

(a) Majority of the candidates answered this subpart correctly. However, some candidates were confused in understanding the series and parallel combination of resistors. Some made calculation errors. Some of them wrote an incorrect expression at stage 1(instead of $\frac{1}{R}$ as L.H.S they wrote R) hence, in the last step mathematical result was incorrect. Some candidates left the final answer in improper fraction.

(b) (i) Most of the candidates answered it correctly but some of them made the following errors:

- wrote specific heat capacity remains the same.
- got confused with latent heat and specific heat capacity.
- got confused between specific heat capacity and specific resistance.

(ii) Some of them wrote example of water and ice but they did not mention the values. Those who said specific heat capacity remains the same on changing the state of a substance, validated the

Suggestions for teachers

- Give sufficient practice of numerical problems based on series and parallel combination of resistors.
- Explain the meaning of specific heat capacity of a substance in detail giving some examples.
- Discuss the values of specific heat capacity of water and specific heat capacity of ice and explain why these values are different.
- Clarify to the students the difference between a coil and number of turns of coil.
- Revise conceptual questions based on electromagnetic induction in the class through oral questioning and regular written tests.
- Familiarize students with the technical terms and insist on its use in the answers.

same even in examples. Several candidates made mistakes while stating the units of the values of specific heat capacities.

(c) Almost all the candidates answered it correctly. But while giving reason some candidates wrote the statement which was not conveying the correct meaning.

(d) (i) Majority of the candidates wrote about large amount of heat energy being released during the reaction but did not talk about the reaction taking place at very high temperature. Some candidates explained nuclear fusion reaction in terms of heat released.

- Interpret nuclear fusion comprehensively to the students.
- Drill students to write nuclear reactions.
- Teach in depth to the students about the DC motor like purpose, principle, main parts, brief description, and the ways to increase the speed of rotation of a DC motor.

(ii) Some candidates could balance the reaction correctly but majority of them could not do so. They could not apply the principle of conservation of mass number and atomic number in completing the reaction. Some candidates wrote He in place of H.

(e) Many candidates could answer correctly but the following errors were observed:

- Use of correct technical terms was missing
- Some got confused with the induction.
- wrote number of coils in place of number of turns of a coil

MARKING SCHEME

Question 4

(a)	$R_1 = \frac{9 \times 3}{9 + 3}$ $= \frac{27}{12} = \frac{9}{4}\Omega$ $\therefore\ R = 8 + \frac{9}{4} = \frac{32 + 9}{4} = \frac{41}{4} = 10.25\ \Omega$
(b)	(i) No, it changes (ii) Specific heat capacity of ice = 2.1 J/g ^{o}C and that of water is 4.2 J/g ^{o}C
(c)	$x < y$ Induced e.m.f. is directly proportional to the number of turns of the coil.
(d)	It requires extremely high temperature to take place. $^{3}He_2 + {}^{2}H_1 \rightarrow {}^{4}He_2 + {}^{1}H_1$ + Energy
(e)	– increasing the number of turns of the coil. – increasing the strength of the magnetic field. – increasing the area of the coil. – increasing the current through the coil *(Any two points)*

SECTION II (40 Marks)

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

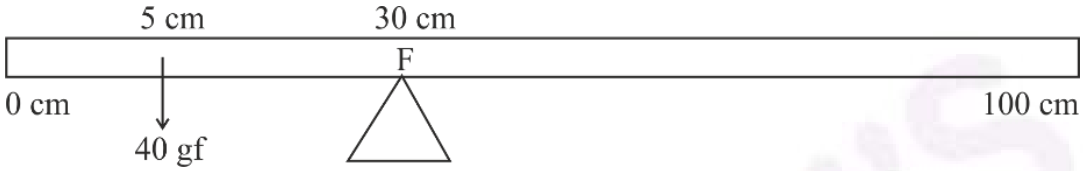
Question 5

(a) A body of mass 10 kg is kept at a height of 5 m. It is allowed to fall and reach the ground. [3]

(i) What is the total mechanical energy possessed by the body at the height of 2 m assuming it is a frictionless medium?

(ii) What is the kinetic energy possessed by the body just before hitting the ground? Take g = 10 m / s^2.

(b) A uniform meter scale is in equilibrium as shown in the diagram: [3]



(i) Calculate the weight of the meter scale.

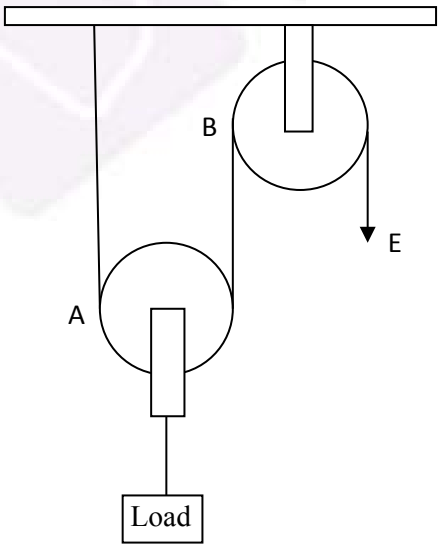
(ii) Which of the following options is correct to keep the ruler in equilibrium when 40 gf wt is shifted to 0 cm mark?

F is shifted towards 0 cm.

or

F is shifted towards 100 cm.

(c) The diagram below shows a pulley arrangement: [4]



(i) Copy the diagram and mark the direction of tension on each strand of the string.

(ii) What is the velocity ratio of the arrangement?

(iii) If the tension acting on the string is T, then what is the relationship between T and effort E?

(iv) If the free end of the string moves through a distance x, find the distance by which the load is raised.

Comments of Examiners

(a) (i) A large number of candidates answered correctly. However, in some scripts the following mistakes were observed:

- For calculation of potential energy height was taken as 2 m in place of 5 m.
- Did not mention about the use of principle of conservation of energy.
- Calculated kinetic energy and potential energy separately but for finding velocity they took the distance travelled to be 2 m in place of 3 m. They added this to get the total mechanical energy which was asked in the second part and therefore, even the second answer went incorrect.

(ii) Some candidates made mistakes due to improper conversion of units. i.e. mass was taken in gram in place of kg.
Some adopted the longer way by calculating the velocity at the bottom and then calculating the kinetic energy.
Some candidates calculated 200 J in subpart (i), by applying the principle of conservation of energy, and stated the same answer in subpart (ii).
Some candidates substituted 5 metre in place of velocity and calculated kinetic energy using $\frac{1}{2}mv^2$.

Suggestions for teachers

- Give adequate practice of numerical problems based on the principle of conservation of energy.
- Teach students conversion of units.
- Stress upon the concept of clockwise and anticlockwise moment.
- Instruct students to read the question carefully and answer as per the requirement of the question.
- Explain in detail about the pulley system. Also, discuss diagram-based questions on Pulley system.
- Drill students in drawing labelled diagrams of pulley systems.
- Discuss the procedure to obtain the relation between the tension in the strand and Load as well as Effort for different pulley systems.

(b) (i) Many candidates used 100 cm in place of 50 cm for the calculation of the torque on the other side. Some candidates got confused between the unit of mass and weight that is g and gf.

(ii) Some candidates wrote that F is shifted towards 100 cm. They failed to understand that since the forces are same, the moment can be equalised by adjusting their torque arms.

(c) (i) Most of them marked arrows correctly but some of them marked the arrows in two different directions on the two strands.

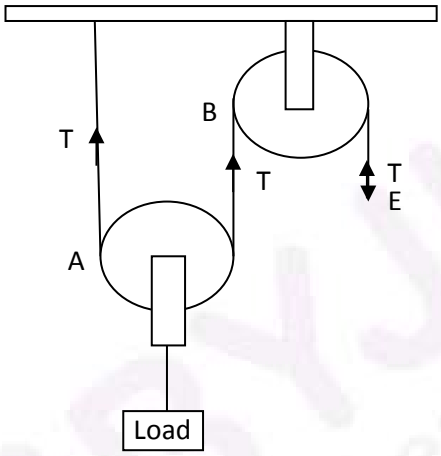
(ii) Majority of the candidates answered correctly. Some of them derived and obtained the answer.

(iii) Most of them answered it as E = T but some of them due to lack of clarity answered it as E = 2T. Some even answered using inequality.

(iv) Many candidates answered correctly as $\frac{x}{2}$ but some of them wrote it as $2x$. Some wrote in terms of L. The concept that the velocity ratio depends upon the number of strands supporting the load was missing.

MARKING SCHEME

Question 5

(a)	(i) Total mechanical energy possessed by the body at the height 2 m = P.E at the maximum height or pr. of conservation of energy implied. = 10 x 10 x 5 = 500 J (ii) K.E possessed by the body just before hitting the ground = P.E at the maximum height = 500 J
(b)	(i) By pr. of moments $40 \times 25 = w \times 20$ $\therefore\ w = \frac{40 \times 25}{20} = 50\ gf$ (ii) F is shifted towards 0 cm
(c)	(i)  (ii) V.R. = No. of stands supporting load = 2 (iii) E = T (iv) V.R. $= \frac{d_E}{d_L} \therefore\ 2 = \frac{x}{d_L} \therefore d_L = \frac{x}{2}$

Question 6

(a) How does the angle of deviation formed by a prism change with the increase in the angle of incidence? [3]

Draw a graph showing the variation in the angle of deviation with the angle of incidence at a prism surface.

(b) A virtual, diminished image is formed when an object is placed between the optical centre and the principal focus of a lens. [3]

(i) Name the type of lens which forms the above image.

(ii) Draw a ray diagram to show the formation of the image with the above stated characteristics.

(c) An object is placed at a distance 24 cm in front of a convex lens of focal length 8 cm. [4]

(i) What is the nature of the image so formed?

(ii) Calculate the distance of the image from the lens.

(iii) Calculate the magnification of the image.

Comments of Examiners

(a) (i) Most candidates answered this subpart correctly. However, a few made following errors:

- gave incorrect relation between the angle of incidence and the angle of deviation.
- drew diagram of prism instead of graph.
- incorrect graph showing the variation in the angle of deviation with the angle of incidence
- incorrect labelling on the graph.

(b) Many candidates named the type of lens correctly as a concave lens. Some candidates were tricked by the words 'object between the optical centre and the principal focus of a lens as well as virtual image' and they did not pay attention to the characteristic that image is virtual and diminished. Those who identified the lens correctly drew correct ray diagram but those who identified the lens incorrectly, draw incorrect ray diagram. Some candidates did not draw arrows on the rays in the diagram.

(c) (i) Many candidates identified the nature of image correctly but some of the candidates wrote as real and virtual or real and erect or real and magnified.

(ii) Several candidates applied mirror formula in finding the distance of the image from the lens. Many candidates were not clear about the sign convention. In the final answer unit was also missing.

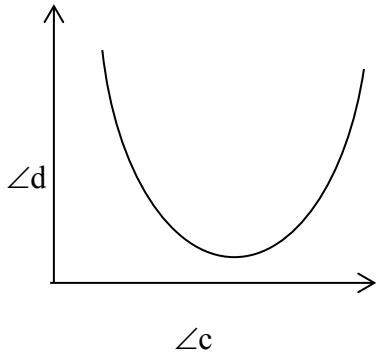
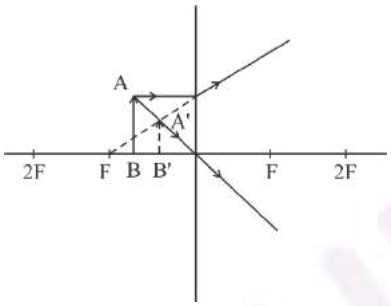
(iii) Many candidates got this part incorrect because their previous answer was incorrect. Some candidates made calculation errors. Several candidates expressed answer in fraction.

Suggestions for teachers

- Allow students to have first-hand experience of verifying the variation in the angle of deviation with the angle of incidence at a prism surface experimentally.
- Clarify students that while drawing the graph, label the axes correctly.
- Advise students to read the question prudently taking note of all the information given in the question.
- Instruct students to practice the ray diagrams keeping in mind that arrow should be marked before and after refraction and virtual image should be shown by a dotted line. Apparent intersection of the rays should be shown by dotted lines.
- Explain the sign convention properly to the students. Give adequate practice of the lens related problems.
- Instruct students to express the final answer in decimal form or in ratio form but not to leave it as a fraction.

MARKING SCHEME

Question 6

(a)	Angle of deviation decreases, reaches to minimum value and then increases. 
(b)	(i) Concave lens  (ii) Correct ray diagram with one ray passing through optical centre which goes undeviated Another ray parallel to the principal axis undergoing refraction and appears to pass through the principal focus. (Dotted line for virtual image and extended refracted rays & arrows marked on the rays)
(c)	(i) Real, inverted diminished (ii) $1 / v - 1 / u = 1 / f$ $1 / v = 1 / 8 + 1 / (-24)$ $1 / v = 3 - 1 / 24$ $v = 24 / 2 = 12$ cm (ii) $m = +v / -u = 12 / -24 = -1/2 = -0.5$

Question 7

(a) It is observed that during march-past we hear a base drum distinctly from a distance compared to the side drums. [3]

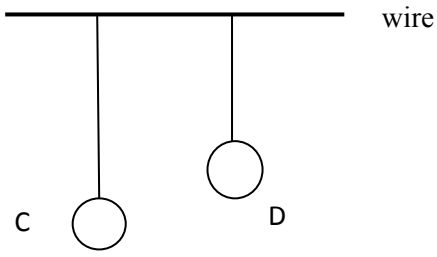
(i) Name the characteristic of sound associated with the above observation.

(ii) Give a reason for the above observation.

(b) A pendulum has a frequency of 4 vibrations per second. An observer starts the pendulum and fires a gun simultaneously. He hears the echo from the cliff after 6 [3]

vibrations of the pendulum. If the velocity of sound in air is 340 m/s, find the distance between the cliff and the observer.

(c) Two pendulums C and D are suspended from a wire as shown in the figure given below. Pendulum C is made to oscillate by displacing it from its mean position. It is seen that D also starts oscillating. [4]



(i) Name the type of oscillation, C will execute.

(ii) Name the type of oscillation, D will execute.

(iii) If the length of D is made equal to C then what difference will you notice in the oscillations of D?

(iv) What is the name of the phenomenon when the length of D is made equal to C?

Comments of Examiner

(a) (i) Some candidates answered it correctly as loudness but majority of them wrote pitch or quality. It seems candidates were unaware about base drums and side drums.

(ii) Very few could relate the answer to the surface areas of the two drums and therefore the difference in the loudness, but majority of the candidates wrote vague answers.

(b) Many candidates attempted it correctly but, in some scripts, following errors were noticed:

- could not calculate the time taken from the number of oscillations of the pendulum.
- formula applied $v = \frac{d}{t}$ *in* place of $v = \frac{2d}{t}$.
- did not write the unit.
- velocity of sound was substituted as 320 m s^{-1} instead of 340 m s^{-1}.

(c) (i) Many candidates could identify it as free oscillations but some of them wrote it forced oscillations.

(ii) Several candidates answered it correctly as forced oscillation but some of them wrote it resonance. But for others conceptual understanding was missing between free and forced oscillations.

Suggestions for teachers

- Explain characteristics of sound comprehensively relating them with examples from daily life.
- Clarify the basic mathematics required to solve the numerical problems related to reflection of sound waves.
- Give enough practice in numerical of different types to the students.
- Stress upon the importance of unit.
- Demonstrate to the students about the free vibrations, forced vibrations and resonance for better understanding of the concept.

(iii) Many candidates failed to write about increased amplitude but talked about increase in frequency. Some also mentioned that oscillations remain the same. Some of them missed the keyword amplitude.

(iv) Almost all the candidates wrote correctly as resonance but some of them wrote it forced oscillations.

MARKING SCHEME Question 7	
(a)	(i) Loudness (ii) Base drum has greater surface area compared to the side drums. Loudness is increased with the increase in surface area of vibration.
(b)	∵ 4 vibrations in 1s ∴ 6 vibrations =? $\therefore t = \frac{6}{4} = \frac{3}{2} = 1.5\ s$ $V = \frac{2d}{t} \therefore 340 = \frac{2d}{1.5}$ $\therefore d = \frac{340 \times 1.5}{2} = 255\ m$
(c)	(i) Free vibration / damped vibrations (ii) Forced vibrations (iii) D vibrates with the same amplitude as C or C and D vibrate with maximum amplitude alternately. (iv) Resonance.

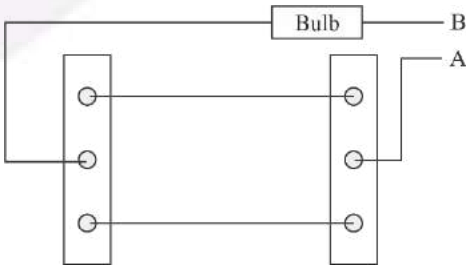
Question 8

(a) (i) Write one advantage of connecting electrical appliances in parallel combination. [3]

(ii) What characteristics should a fuse wire have?

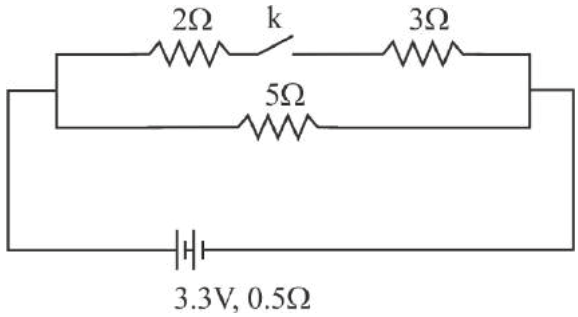
(iii) Which wire in a power circuit is connected to the metallic body of the appliance?

(b) The diagram below shows a dual control switch circuit connected to a bulb. [3]



(i) Copy the diagram and complete it so that the bulb is switched ON.

(ii) Out of A & B which one is the live wire, and which one is the neutral wire?

(c) 

[4]

The diagram above shows a circuit with the key k open. Calculate:

(i) the resistance of the circuit when the key k is open.

(ii) the current drawn from the cell when the key k is open.

(iii) the resistance of the circuit when the key k is closed.

(iv) the current drawn from the cell when the key k is closed.

Comments of Examiners

(a) (i) Many candidates wrote one advantage of connecting electrical appliances in parallel combination correctly. However, some candidates supplied vague answers like

- advantages of series combination.
- current received is 220 volts.
- work on the same current in place of voltage.
- wrote about advantages of ring system of wiring.
- same thickness of wire can be used.
- monthly Power bill is reduced.

(ii) A large number of candidates wrote characteristics of a fuse wire correctly but some of the candidates wrote only one point. Some candidates answered high melting point and low resistivity. Some even expressed about good conductance or low specific heat capacity which was irrelevant.

(iii) Many candidates answered correctly as Earth wire. It was also observed that some of the candidates had written about neutral and live wire and their combinations. Quite a few candidates had answered as fuse wire.

Suggestions for teachers

- Explain clearly to the students about the advantages of connecting the appliances in parallel combination
- Interpret the difference between current and voltage clearly to the students.
- Teach clearly to the students:
  - The characteristics of a fuse wire.
  - working of dual control switches with the diagrams.
  - the connections of live, neutral and earth wire to the appliance.
- Point out the difference between the open circuit and the open key with reference to the different circuit diagrams.
- Give ample practice to the students to solve the numerical problems based on the topic electricity.

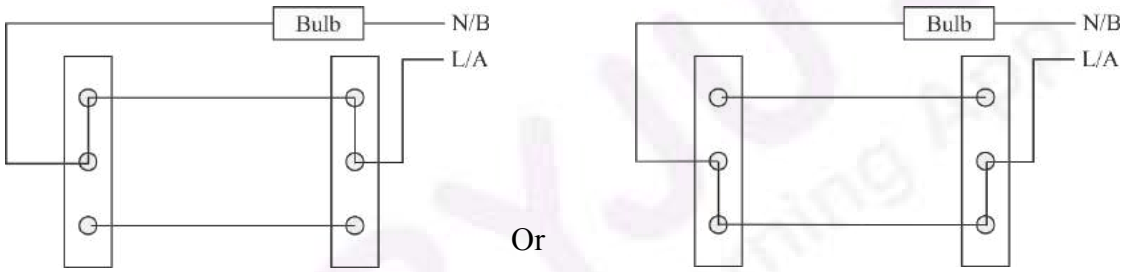
(b) (i) Several candidates copied the diagram of dual control switch circuit connected to a bulb correctly and also completed the circuit correctly but many of them kept the circuit incomplete or completed it incorrectly.

(ii) Some candidates answered correctly as A - live wire and B - neutral wire. Quite a few candidates interchanged this answer. Some candidates made careless errors by interchanging the markings A and B while copying the diagram.

(c) Some candidates solved this question correctly but many of them could not comprehend it properly. Candidates did not take into consideration the position of the key in the circuit. They did not realise that when the key is closed and when it is open, the resistance present in the circuit differs, so the resistance of the circuit is different in both cases and therefore, the current is also different in both the cases. Many candidates blindly wrote current is zero when the key k is open. The difference between open circuit and open key was not clear to the candidates. Some of the candidates did not write the units for the answers. It was also observed in some scripts that candidates were not trained in dealing with the internal resistance.

MARKING SCHEME

Question 8

(a)	(i) Each appliance will be working at the same potential; each appliance can operate independently. (ii) high resistivity and low melting point. (iii) earth wire.
(b)	(i)  (ii) A – Live and B – Neutral
(c)	(i) R = 5 + 0.5 = 5.5 Ω (ii) $I = \frac{3.3}{5.5} = \frac{3}{5} = 0.6\ A$ (iii) $R_1 = \frac{5\times5}{5+5} = 2.5\ \Omega$ $\therefore$ R = 2.5 + 0.5 = 3 Ω (iv) $I = \frac{3.3}{3} = 1.1\ A$

Question 9

(a) (i) Define Calorimetry. [3]

(ii) Name the material used for making a Calorimeter.

(iii) Why is a Calorimeter made up of thin sheets of the above material answered in (ii)?

(b) The melting point of naphthalene is 80°C and the room temperature is 30°C. A sample of liquid naphthalene at 100°C is cooled down to the room temperature. Draw a temperature time graph to represent this cooling. In the graph, mark the region which corresponds to the freezing process. [3]

(c) 104 g of water at 30°C is taken in a calorimeter made of copper of mass 42 g. When a certain mass of ice at 0°C is added to it, the final steady temperature of the mixture after the ice has melted, was found to be 10°C. Find the mass of ice added. [Specific heat capacity of water = 4.2 $Jg^{-1}°C^{-1}$; Specific latent heat of fusion of ice = 336 Jg^{-1}; Specific heat capacity of copper = 0.4 $Jg^{-1}°C^{-1}$] [4]

Comments of Examiners

(a) (i) Several candidates in the definition of calorimetry wrote the key word study in place of measurement. In many scripts candidates stated the principle of calorimetry.

(ii) Almost all the candidates answered the name of the material used for making a Calorimeter correctly. Very few candidates gave options other than copper such as wood, mercury, iron and steel.

(iii) Many candidates answered this subpart of the question correctly. Some candidates wrote the answer as good conductor of electricity instead of good conductor of heat. They also missed the keyword Heat capacity. They did not take into consideration the word **thin** sheet.

(b) Majority of the candidates could not attempt this question correctly. The graph drawn was not correct. Some candidates drew the graph correctly. Some candidates have even shown the graph line being parallel to x-axis three times.

(c) A large number of the candidates solved this numerical correctly. However, following errors were noticed in many scripts:

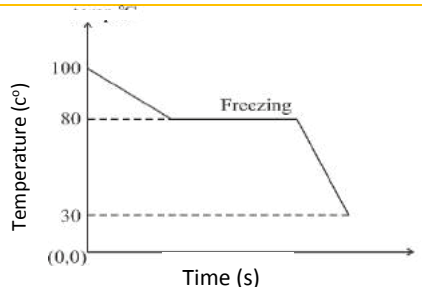
- substitution errors
- substitution was correct but made mistakes in calculation.
- for ice considered only melting and not increase in the temperature there after.
- did not take into consideration the heat absorbed by the calorimeter.
- did not write unit for the final answer.

Suggestions for teacher

- Emphasise on
  - keywords/terms in the definition.
  - difference between calorimeter and calorimetry.
  - reason for making the copper calorimeter of thin sheet.
- Train students to read the question carefully to utilise judiciously every bit of information given in the question while answering.
- Explain the heating curve to the students thoroughly and its science of reasoning to draw on the basis of information given.
- Teach students the logic of framing equations involving change of state and principle of mixtures as well as substitution in the equation exhaustively. Also, interpret the use of heating curve to construct an equation.
- Instruct students to express final answer with correct unit.

MARKING SCHEME

Question 9

(a)	(i) The measurement of the quantity of heat is called Calorimetry (ii) Copper (iii) Specific heat capacity of copper is low and by making the vessel thin its mass and heat capacity becomes low therefore it takes a negligible amount of heat from the contents to attain the temperature.
(b)	
(c)	By principle of mixtures $m_{ice}L + m_{ice}\, c_w\, t = m_w\, c_w\, (t_i - t_f) + m_{cu}\, c_{cu}\, (t_i - t_f)$ $m\,(336 + 4.2 \times 10) = 104 \times 4.2 \times (30 - 10) + 42 \times 0.4 \times (30 - 10)$ $\therefore\ m \times 4.2\,(80 + 10) = 4.2 \times (104 + 4) \times 20$ $\therefore\ m = \frac{108 \times 20}{90} = 24g$

Question 10

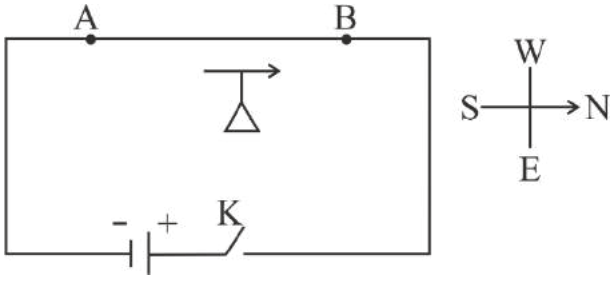
(a) Draw a neat labeled diagram of an A.C. generator. [3]

(b) (i) Define nuclear fission. [3]

(ii) Rewrite and complete the following nuclear reaction by filling in the atomic number of Ba and mass number of Kr:

$$^{235}_{92}U + {}^{1}_{0}n \longrightarrow {}^{144}_{\cdots\cdots}Ba + {}^{\cdots\cdots}_{36}Kr + 3\,{}^{1}_{0}n + Energy$$

(c) The diagram below shows a magnetic needle kept just below the conductor AB which is kept in North South direction. [4]



(i) In which direction will the needle deflect when the key is closed?

(ii) Why is the deflection produced?

(iii) What will be the change in the deflection if the magnetic needle is taken just above the conductor AB?

(iv) Name one device which works on this principle.

Comments of Examiners

(a) Some candidates drew correct diagram of an A.C. generator but in many scripts the following anomalies were noticed:

- drew battery in place of load.
- in place of slip ring they showed split rings.
- drew transformer diagram.
- drew slip rings correctly but labelled them as split ring.
- drew DC motor diagram.

(b) (i) Many candidates defined nuclear fission correctly but the common errors observed in many scripts were

- related it to the size of the nucleus instead of the mass of the nucleus
- splitting of an atom instead of nucleus.
- defined nuclear fusion.

(ii) A large number of candidates wrote atomic number and mass number correctly. By and large, it was observed that majority of them found the atomic number correctly, but while finding the mass number, did not take into consideration mass of three neutrons.

Suggestions for teacher

- Train students to differentiate between AC generator and DC motor.
- Explain principle of conservation of atomic number and mass number involved in balancing the nuclear equations clearly to the students.
- Give intensive practice in balancing the nuclear equations.
- Demonstrate Oe7rsted's experiment on the magnetic effect of electric current in the laboratory to make students clear about the effect of the magnetic field on the magnetic needle.
- Discuss application-based questions on the magnetic effect of the current with the students frequently.

(c) (i) Majority of the candidates could not apply right hand thumb rule correctly and instead of writing towards east, various incorrect answers for example, North-South, South-East, West, North, clockwise etc. were observed.

(ii) Many candidates identified it as magnetic effect of current but quite a number of candidates wrote:

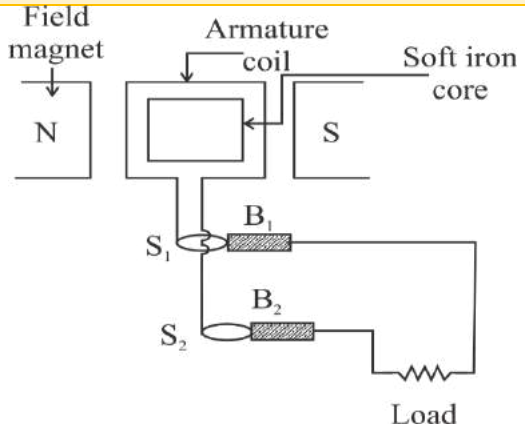
- that current is flowing through the conductor.
- about electromagnetic induction.
- about Lorentz Force.
- about electric field instead of magnetic field.

(iii)This part of the question was dependent on the first part, therefore, the candidates who wrote opposite or reversed or towards west were benefited. But several candidates wrote other answers which were incorrect.

(iv) Almost all the candidates had given correct example which means that they had identified the magnetic effect of current but failed to apply it in the given situation.

MARKING SCHEME

Question 10

(a)		
(b)	(i)	Combination of two or more lighter nuclei to form heavier nucleus.
	(ii)	$^{235}_{92}U + {}^{1}_{0}n \longrightarrow {}^{144}_{56}Ba + {}^{89}_{36}Kr + 3{}^{1}_{0}n + Energy$
(c)	(i)	Towards east
	(ii)	Magnetic effect of current
	(iii)	Deflection in the opposite direction / towards west
	(iv)	Electric Bell, Electromagnet

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.