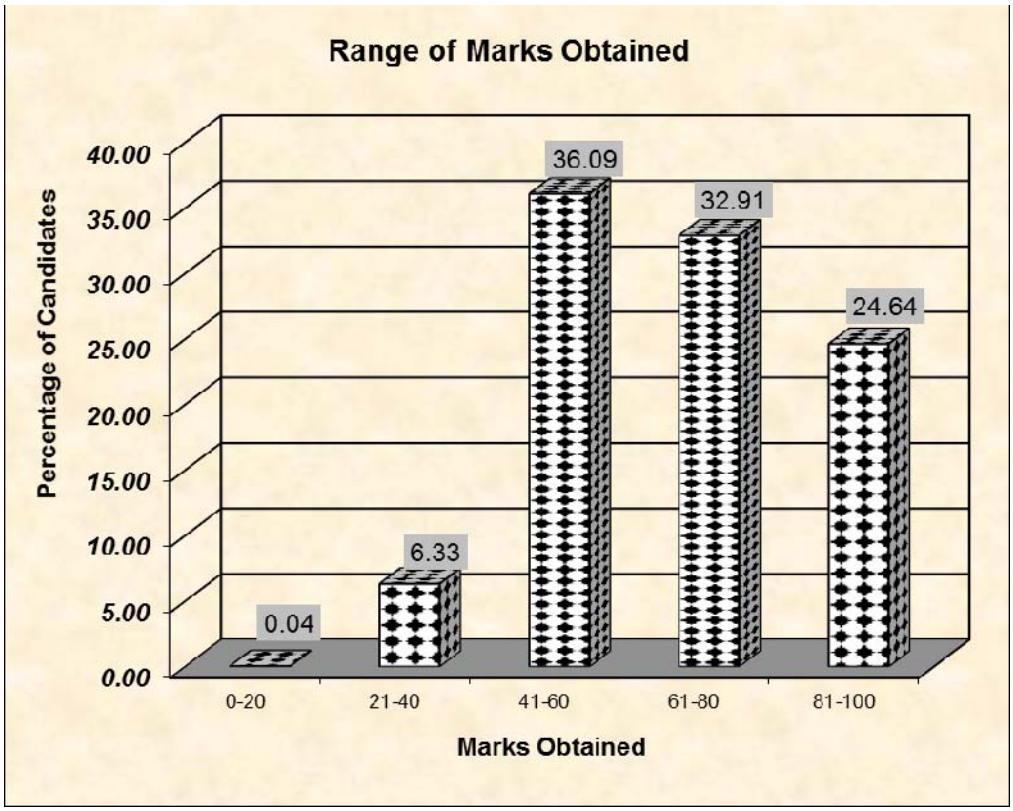
SCIENCE

STATISTICS AT A GLANCE

Total Number of students who took the examination	1,34,183
Highest Marks Obtained	100
Lowest Marks Obtained	13
Mean Marks Obtained	66.08

Percentage of Candidates according to marks obtained

Details	Mark Range				
	0-20	***21-40***	***41-60***	***61-80***	***81-100***
Number of Candidates	51	8494	48421	44160	33057
Percentage of Candidates	0.04	6.33	36.09	32.91	24.64
Cumulative Number	51	8545	56966	101126	134183
Cumulative Percentage	0.04	6.37	42.45	75.36	100.00



PHYSICS

SCIENCE Paper 1

I. ANALYSIS OF PERFORMANCE

(a) A force is applied on (i) a non-rigid body and (ii) a rigid body. How does the effect of the force differ in the above two cases? [2]

(b) A metallic ball is hanging by a string from a fixed support. Draw a neat labelled diagram showing the forces acting on the ball and the string. [2]

(c) (i) What is the weight of a body placed at the centre of the earth?

(ii) What is the principle of an ideal machine? [2]

(d) Is it possible to have an accelerated motion with a constant speed? Explain. [2]

(e) (i) When does a force do work?

(ii) What is the work done by the moon when it revolves around the earth? [2]

Examiners' Comments

(a) Most candidates knew the effect of force on a rigid as well as a non-rigid body, however the answer on the difference in the effect lacked conviction.
In many cases only the effect on a non-rigid or rigid body was written but no comparison was done with the other body.
Most candidates wrote the correct basis of differences.

(b) Most candidates answered correctly with proper labelling of forces and their directions.
Some candidates did not show the support in the diagram.
Either forces were not named or directions were not marked clearly.
Some candidates drew a spring in place of a stretched string.

(c)(i) Most candidates wrote the answer as negligible instead of zero.
Some wrote maximum/more or greater.

(ii) Most candidates answered the question correctly.
The principle of ideal machine was confused with the principle of moments.

Suggestions for teachers

- Insist on students reading the question carefully and understanding exactly what is expected as an answer.
- Explain the difference between rigid body and non-rigid body with examples.
- Diagrammatic representation of forces needs to be emphasized.
- Develop the habit of explaining concepts by drawing diagrams wherever possible.
- Concept of gravity to be explained with clarity.
- Explain how g = 0 at the centre of of the earth and how it varies at different places and at different altitudes.
- Train students to read the question carefully so as to answer what is asked.

(d) Most candidates answered this question correctly having a correct idea of a uniform circular motion.

Some answered incorrectly as the difference between constant speed and acceleration was not clear.

In many places Yes was not written clearly and it was difficult to draw a conclusion from the explanation written by candidates whether it meant Yes or No.

(e)(i) "in the direction of the force" was missing in the answers of most candidates.

(ii) Most candidates answered this correctly but some did not know that when the force is perpendicular to the displacement, only then work done is zero.

Suggestions for teachers

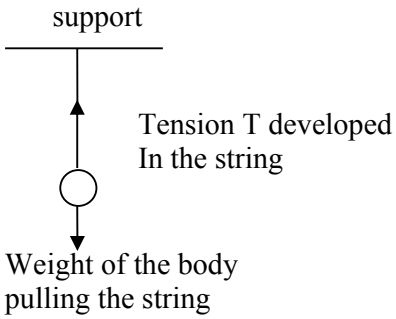
- When choice based questions are posed then Yes or No should be answered. Make it clear to students that indirect answers are not accepted.
- Concept between vectors and scalars should be made clear and also it should be made clear how vector quantity changes with only change in the direction.
- Important key words of the definitions should be stressed upon.
- "W = 0 as θ=90º during the motion of a body on a circular track." This concept should be dealt clearly with the students.
- In many cases students are under the impression that the work done is zero during the motion of a body on a circular track is due to zero displacement. This concept needs to be rectified.

MARKING SCHEME

Question 1.

(a) Dimensions change in the non rigid body whereas no change in dimensions of a rigid body.

(b)



(c) (i) Weight = 0 because value of g = 0 at the centre of the earth.

(ii) principle of an ideal machine is
work done by a machine = work done on the machine/work out put = work input

(d) Yes
uniform circular motion is an accelerated motion.

(e) (i) When the applied force produces displacement in the direction of the force.

(ii) Zero

Que**stion 2**

(a) Calculate the change in the Kinetic energy of a moving body if its velocity is reduced to 1/3rd of the initial velocity? [2]

(b) State the energy changes in the following devices while in use:

(i) A loud speaker.

(ii) A glowing electric bulb. [2]

(c) (i) What is nuclear energy?

(ii) Name the process used for producing electricity using nuclear energy. [2]

(d) State one important advantage and disadvantage each of using nuclear energy for producing electricity. [2]

(e) (i) The conversion of part of the energy into an undesirable form is called _____.

(ii) For a given height h, _____ the length l of the inclined plane, lesser will be the effort required. [2]

Examiners' Comments

(a) Candidates appeared confused whether to write the changed kinetic energy or to write the difference between final and initial kinetic energy due to the word 'change' in the question.
Some candidates squared the velocity after finding the difference between final and initial velocity rather than subtracting them after taking their squares.

(b) Most candidates answered this question correctly.
Some however made errors in the sequence of energy conversion.

(c) (i) Most candidates wrote the definition of nuclear energy correct but some committed errors by not making it clear by stating 'from nucleus'.

(ii) Most candidates wrote nuclear fission but some wrote nuclear fusion instead.
It was also noticed that since this topic is included under EVS, inadequate attention is paid to it in class.

(d) Most candidates stated disadvantages whereas some stated only advantages.The reason is attributed to limited significance being attached to its teaching.

(e)(i) Most candidates answered the question correctly.

(ii) Many candidates wrote words which conveyed the meaning partially but grammatically were incorrect. eg. Higher the length was used in certain answers.

Suggestions for teachers

- In such cases it is better to show working of both energies separately and with statements students could have stated answers of both possibilities.
- Additional practice of sums needs to be given.
- Discuss more examples of energy conversions.
- Students should be trained to state important energy changes and in proper sequence.
- Explain the definition clearly and emphasise on important points.
- Adequate writing practice would help in eliminating these errors.
- Students should avoid selective study of topics.
- Students must attach importance to all topics.
- Ambiguous points need to be avoided. For eg. Nuclear energy was given as clean source of energy whereas it is still a debatable point.
- Teaching of science involves grammar too that cannot be neglected.

MARKING SCHEME

Question 2.

(a) $K.E_1 : K.E_2$
$1/2 \times m \times (1)^2 : 1/2 \times m \times (1/3)^2$ Correct ratio calculation
1 : 1/9 K.E becomes 1/9
9 : 1

(b) (i) Electrical energy to Sound energy
(ii) Electrical energy to heat energy to light energy

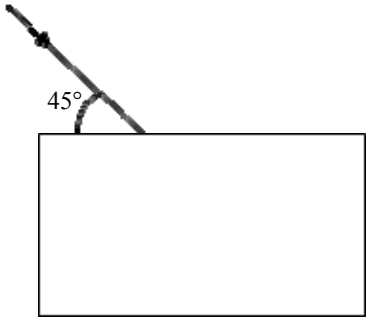
(c) (i) The energy released during the process of nuclear fission and fusion is called nuclear energy. OR nuclear energy is the energy inside the atomic nucleus.
(ii) Nuclear fission
(iii) Nuclear fission.

(d) Advantage
A very small amount of nuclear fuel can produce a tremendous amount of energy OR Once the nuclear fuel is loaded into a nuclear plant, it continues to release energy for several years. (Any one)
Disadvantage
It is not a clean source of energy because very harmful nuclear radiations are produced in the process which are highly penetrating. OR
The nuclear waste causes environmental pollution.
(Any one)

(e) (i) dissipation of energy
(ii) longer.

Question 3

(a) Draw the diagram given below and clearly show the path taken by the emergent ray. [2]



(b) (i) What is consumed using different electrical appliances, for which electricity bills are paid?

(ii) Name a common device that uses electromagnets. [2]

(c) (i) A ray of light passes from water to air. How does the speed of light change?

(ii) Which colour of light travels fastest in any medium except air? [2]

(d) Name the factors affecting the critical angle for the pair of media. [2]

(e) (i) Name a prism required for obtaining a spectrum of Ultraviolet light.

(ii) Name the radiations which can be detected by a thermopile. [2]

Examiners' Comment

a) Some confusion in comprehension was witnessed as information about the rectangular material was not mentioned.Some candidates drew the diagram with correct refraction but some failed to do so.
Arrows on the path of rays were missing.
Some candidates even showed partial reflection along with refraction.

(b) (i) Many candidates wrote correct answers due to a better understanding and comprehension.
Many candidates wrote electric current, electricity, BTU, power, kWh in place of electrical energy. However some wrote only energy.

(ii) Some candidates wrote a number of examples that were vague and irrelevant in some cases making their evaluation cumbersome.
In some cases candidates wrote the term "bell" instead of electric bell.

(c) (i) Most candidates answered this question correctly, however a few related it to bending of the light in different media.
Some candidates did not relate that water and air means denser and rarer. Thus they attempted to write actual speeds in the two media rather than referring to speed increases.
A few candidates wrote incorrect and irrelevant answers.
In some cases candidates just mentioned changes but refrained from stating reasons to support their answers.

(ii) Most candidates answered correctly. However some failed to mention violet, blue instead of red.

(d) Many candidates wrote different points as answers. For eg. Colour of light and wavelength was given as two separate points. Similarly refractive indices, nature of medium and optical density were mentioned as separate points.
Some candidates were unable to recollect the factors at all.
They wrote about the angle of incidence, angle of prism and some also stated the conditions of TIR.

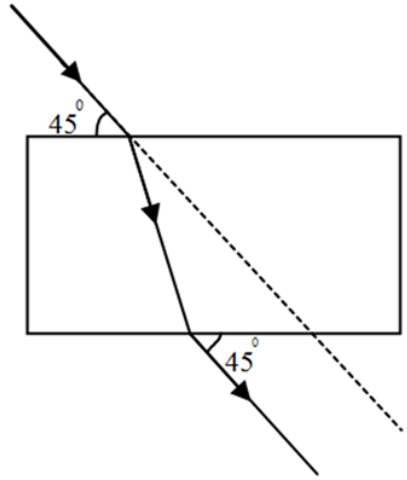
(e) (i) Some candidates got confused between rock salt and quartz.Some candidates were unaware that UV rays are absorbed by ordinary glass prism hence mentioned equilateral prism.

Suggestions for teachers

- Students should be trained to mark the arrows on the rays to show the direction.
- More practice of drawing labelled ray diagrams is needed.
- The difference between current, power electricity and the other related terms needs to be explained clearly.
- Emphasis should be laid on accuracy of answers.
- It is advisable to stick to simple examples rather than uncommon examples.
- Instead of just naming the uncommon appliance it is advisable to mention which part the electromagnet is used.
- The concept of change in the speed of light in different media should be made clear to the candidates.
- Students can be tested by asking questions relating to the speed of different colours.
- Factors affecting the speeds of light need to be discussed with the candidates.
- Inter relation between speed, wavelength, frequency, colour, refractive index must be explained correctly.
- Additional revision to be conducted periodically.
- The meaning of thermopile needs to be explained thoroughly.

(ii) Most candidates wrote correct answers as infra-red radiations but some candidates wrote X-rays, gamma rays instead.
Conceptual clarity on the many kinds of radiations is to be comprehensively studied as candidates appeared confused between their properties, method of detection and their uses.
Some candidates could not answer as they did not know the meaning of thermopile.

MARKING SCHEME
Question 3.



(a) Correct path of the refracted ray shown.
Correct path of emergent ray shown.
(b) (i) Electrical energy
(ii) Electrical bell / Electric motor / microphone / Any other suitable example.
(c) (i) Speed of light increases
(ii) Red
(d) Wavelength of light
temperature of the medium, refractive index of the pair of media.
(e) (i) quartz prism
(ii) Infrared radiations

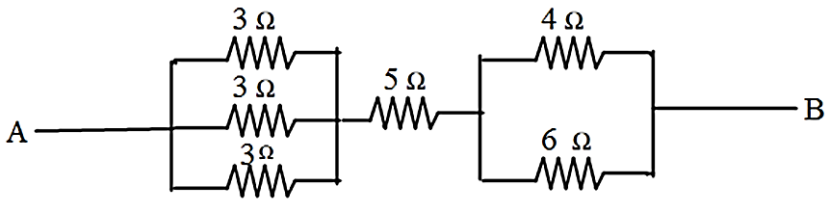
Question 4

(a) Why is the colour red used as a sign of danger? [2]

(b) (i) What are mechanical waves?

(ii) Name one property of waves that do not change when the wave passes from one medium to another. [2]

(c) Find the equivalent resistance between points A and B [2]



(d) 50 g of metal piece at 27 ºC requires 2400 J of heat energy so as to attain a temperature of 327 ºC. Calculate the specific heat capacity of the metal. [2]

(e) An electron emitter must have _____ work function and _____ melting point. [2]

Examiners' Comments

(a) Most candidates answered correctly.
Most candidates only wrote it can be seen from a distance but no other explanation was offered.
The word scattering was wrongly addressed as dispersion, deviation, penetration.

(b) (i) Most candidates were unable to answer this question. Lack of revision of what mechanical waves were was led to incorrect answers.
(ii) Many candidates answered it correctly but some also mentioned 'V' or 'λ as an answer.

(c) Calculation errors were common in most answers.
Most candidates answered this correctly but some made calculation errors and some errors in mathematical presentation.
In many an answer no unit was written for the final answer.

(d) Most candidates correctly solve this numeral.
Since some candidates were not thorough with the unit hence substituted 2400 J in place of specific heat capacity.

(e) Most candidates answered correctly however some due to careless errors wrote the opposite i.e. high work function and low melting point.

Suggestions for teachers

- Concept of Rayleigh scattering needs to be explained clearly and it should be explained how it is different from dispersion and refraction.
- The general concept should be clear that as wavelength increases the intensity of scattered radiation decreases.
- Teach the difference between mechanical waves and electromagnetic waves more clearly.
- The concept that the frequency depends only on the source of the wave should be made absolutely clear to the students.
- Students need to be given sufficient practice in solving numericals.
- Students need to be trained to present the answer with the correct unit.
- While solving a numerical, the steps should be mathematically correct.
- More practice of numericals is required.
- Students can be given an equation and by changing the subject ask them to find the unit of the subject.
- Answers in decimal with correct unit should be insisted on during class teaching.
- Effect of change in work function of a metal needs to be explained clearly.

MARKING SCHEME
Question 4.

(a) Wavelength of red light is longest therefore red light is scattered the least in the atmosphere, therefore red colour can be seen from farthest distance.

(b) (i) Waves which require a medium for their propagation.

(ii) frequency

(c) $1/R_1 = 1/3 + 1/3 + 1/3$ $\quad$ $1/R_2 = 1/4 + 1/6$

$1/R_1 = 3/3$ $\quad$ $1/R_2 = (3 + 2)/12$

$R_1 = 1\Omega$ $\quad$ $R_2 = 12 / 5$

$R_2 = 2.4\ \Omega$

Equivalent Resistance between A and B = $1 + 5 + 2.4 = 8.4\ \Omega$

(d) $Q = m\ c\ \theta$

$2400 = 50 \times c \times (327 - 27)$

$2400 = 50 \times c \times 300$

$2400/15000 = c$

$c = 24/150$ $\quad$ $c = 0.16\ J\ g^{-1}\ {}^{0}C^{-1}$

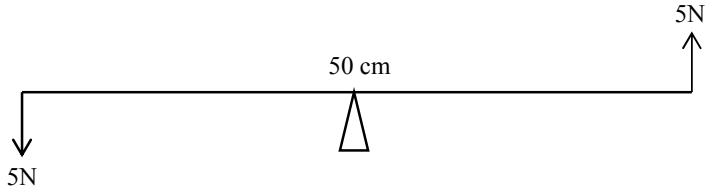
(e) low

high

Question 5

(a) (i) A man having a box on his head, climbs up a slope and another man having an identical box walks the same distance on a levelled road. Who does more work against the force of gravity and why?

(ii) Two forces each of 5N act vertically upwards and downwards respectively on the two ends of a uniform metre rule which is placed at its mid-point as shown in the diagram. Determine the magnitude of the resultant moment of these forces about the midpoint. [4]



(b) (i) A body is thrown vertically upwards. Its velocity keeps on decreasing. What happens to its kinetic energy as its velocity becomes zero?

(ii) Draw a diagram to show how a single pulley can be used so as to have its ideal M.A= 2. [3]

(c) Derive a relationship between mechanical advantage, velocity ratio and efficiency of a machine. [3]

Examiners' Comments

(a) (i) Some candidates were able to write the answer correctly but were unable to explain it. They were unable to explain work = 0 when man walks on a levelled road.
Some candidate's explanation contradicted the answer given by them in the first part.
Part of the reason was present in the question itself that confused the candidates.
(ii) Many candidates did not comprehend the sum properly. They calculated the moment of each force and subtracted them rather than calculating the moment of couple.
Many candidates did not convert cm to m or stated the unit wrongly.

(b) (i) Majority of candidates were able to answer the question correctly whereas only a few made vague errors.
(ii) Many candidates drew the diagram correctly but made mistakes in labelling and marking the directions of load and effort.
Many candidates overlooked the single pulley in the question and drew a fixed pulley in combination as well.

(c) Most candidates could not derive this relation correctly.
Many used effort arm and load arm in place of displacement of effort and displacement of load.
There was confusion in symbolic representation of displacement of effort and displacement of load.

Suggestions for teachers

- Concept of work done in three cases i.e. when $\theta=0^o$,$\theta=180^o$ and $\theta=90^o$ needs to be clearly explained with lots of examples.
- It should also be explained to students the meaning of negative work.
- The concept of clockwise and anticlockwise moment needs to be explained clearly.
- Additional practice of numericals involving couple cases must be given.
- Emphasise on correct answers with the correct unit.
- Students need to be trained in analysing the question correctly.
- In general drawing of any pulley diagram stress on labelling of load, effort and tension in the strands and in marking their directions.
- The difference between d_E and E.A. as well as d_L and L.A. should be made clear.
- Derivation to be explained in the class and thoroughly revised to be then tested on paper.

MARKING SCHEME
Question 5.

(a) (i) man climbing the slope because he has to work against the force of gravity, whereas for the man moving on the leveled road work done = 0 because displacement is normal to the force of gravity.

(ii) Resultant moment of force = moment of couple
= F x perpendicular distance between the forces
= 5 x 1 = 5 N m

(b) (i) Kinetic Energy completely changes to Potential Energy

(ii) Single movable pulley drawn correctly
load and effort shown with correct direction

(c) (i) Work input = Effort x displacement of effort $E \times d_E$
Work output = Load x displacement of load $L \times d_L$

Efficiency = $\frac{L \times d_L}{E \times d_E}$ Efficiency = $\frac{M.A}{V.R}$

Question 6

(a) (i) Light passes through a rectangular glass slab and through a triangular glass prism. In what way does the direction of the two emergent beams differ and why?

(ii) Ranbir claims to have obtained an image twice the size of the object with a concave lens. Is he correct? Give a reason for your answer. [4]

(b) A lens forms an erect, magnified and virtual image of an object.

(i) Name the lens.

(ii) Draw a labelled ray diagram to show the image formation. [3]

(c) (i) Define the power of a lens.

(ii) The lens mentioned in 6(b) above is of focal length 25cm. Calculate the power of the lens. [3]

Examiners' Comments

(a) (i) Many candidates were unable to comprehend the question and wrote incorrect answers.
Some candidates related the answer to the dispersion.
Some could answer the difference in the direction correctly but could not relate the reason to the difference in the physical structure of both.

(ii) Most candidates answered the question correctly however some lacked the basic preparation.
Yes or No was not stated clearly from the explanation, hence conclusions based on assumptions had to be made whether candidates meant Yes or No.

(b) Many candidates answered correctly but made the following errors in the ray diagram.

1. When straight line showing optical plane was drawn, it was not labelled.
2. Arrows on the rays were missing and in some cases arrows were drawn on dotted lines.
3. Dotted lines were drawn at wrong places.
4. Principal focus was not marked.
5. Apparent intersection of rays was shown by continuous straight lines instead of dotted lines.
6. Concave lens was drawn in place of convex lens.

(c) (i) Many candidates were not able to answer this question correctly .

Suggestions for teachers

- Make it clear that when students learn refraction through a rectangular glass block, they should be able to apply it to all the cases in which opposite surfaces of refracting medium are parallel. Similarly when they learn refraction through a triangular prism, they should be able to apply it to all the cases in which opposite surfaces of refracting medium are not parallel.
- During experimentation this point can be stressed upon.
- Students need to be trained to read all parts of the question carefully and to answer them accordingly.
- Adequate practice of drawing correct ray diagrams needs to be given.
- The differences between the characteristics of images formed by concave and convex lens when the object is at different position should be made clear.
- Keep in mind that the syllabus is a guideline and its interpretation can differ to some extent by different teachers. Therefore while teaching any topic it is advisable to do the related basic concepts.

From the mistakes made by the candidates it was clear that this was not discussed thoroughly with them.

(ii) Candidates were given the benefit of doubt and marks were awarded to all the candidates who attempted this question.

MARKING SCHEME

Question 6.

(a) (i) In a glass slab, the emergent ray is laterally displaced because the two refracting surfaces are parallel to each other whereas in case of prism the emergent ray is deviated because two refracting surfaces are inclined at an angle A.

(ii) No, he is wrong because the image formed by a concave lens can never be magnified, it is always diminished.

(b) (i) Convex

(ii) Object drawn between the optical centre and principal focus

(iii) A ray shown passing through O and moving undeviated.
A ray shown parallel to the principal axis and then passing through focus virtual Image shown correctly.

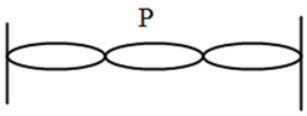
(c) (i) It is the measure of deviation produced in the path of light when it passes through the lens.

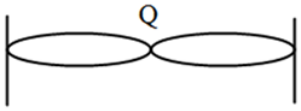
(ii) $p = \frac{1}{f} = \frac{100}{25}$

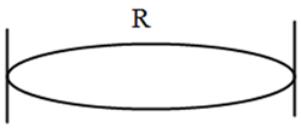
$P = +4D$

Question 7

(a) The adjacent diagram shows three different modes of vibrations P, Q and R of the same string.







(i) Which vibration will produce a louder sound and why?

(ii) The sound of which string will have maximum shrillness?

(iii) State the ratio of wavelengths of P and R. [4]

(b) A type of electromagnetic wave has wavelength 50 Å.

(i) Name the wave.

(ii) What is the speed of the wave in vacuum?

(iii) State one use of this type of wave. [3]

(c) (i) State one important property of waves used for echo depth sounding.

(ii) A radar sends a signal to an aircraft at a distance of 30 km away and receives it back after 2×10^{-4} second. What is the speed of the signal? [3]

Examiners' Comments

(a) Many candidates answered part (i) and (ii) correctly but made errors in writing wavelength ratio in part (iii). Instead of wavelength ratio; wrote frequency ratio.
Many candidates answered the question by mere guesswork.

(b) Most candidates answered this question correctly. Some however could not identify the waves as they had not learned the wavelength ranges for different electromagnetic radiations. Hence made errors in part (iii).

(c) (i) Many candidates did not state the property, they wrote the definition of an echo instead. There was lack of understanding of the property required.
Most candidates wrote on irrelevant properties but only a few could correctly answer about high directionality or less refraction etc.
(ii) Many candidates applied formula $d = v \times t$ instead of $d = \frac{v \times t}{2}$.
Most candidates forgot to convert km to m.
Some candidates wrote incorrect units and some did not write the unit of speed.

Suggestions for teachers

- Clear explanation of the terms wavelength, frequency, loudness, shrillness should be given.
- Students should be given practice to identify the above mentioned values from the figure.
- The wavelength ranges for different radiations should be taught and the candidates should be made to learn them by heart.
- All electromagnetic waves travel with the same speed in vacuum and air but not in any other medium. This concept needs to be drilled clearly in their mind.
- While teaching ensure that uses and the properties of the waves are related to each other rather than teaching them independently.
- Give sufficient practice of numericals involving reflection waves and without reflection of waves.
- Insist on writing correct answers with unit.
- Encourage students to write the given data first and to convert it in to the same units before substituting.

MARKING SCHEME

Question 7.

(a) (i) R
Its amplitude is maximum
(ii) P
(iii) 1:3

(b) (i) X rays
(ii) 3×10^8 m/s
(iii) They are used for detection of fracture in bones. OR
They are used by detecting agencies to detect the concealed precious metals OR any other use.

(c) (i) They travel un deviated through long distances OR They are not easily absorbed on the way.
(ii) V = (2 x distance) / Time
= (2 x 30 x 1000) / (2×10^{-4})
= $30 \times 1000 \times 10^4$
= 3×10^8 m / s

Question 8

(a) Two resistors of 4Ω and 6Ω are connected in parallel to a cell to draw 0.5A current from the cell.

(i) Draw a labelled circuit diagram showing the above arrangement.

(ii) Calculate the current in each resistor. [4]

(b) (i) What is an Ohmic resistor?

(ii) Two copper wires are of the same length, but one is thicker than the other.

(1) Which wire will have more resistance?

(2) Which wire will have more specific resistance? [3]

(c) (i) Two sets A and B, of three bulbs each, are glowing in two separate rooms. When one of the bulbs in set A is fused, the other two bulbs also cease to glow. But in set B, when one bulb fuses, the other two bulbs continue to glow. Explain why this phenomenon occurs.

(ii) Why do we prefer arrangements of Set B for house circuiting? [3]

Examiners' Comments

(a) (i) Most candidates drew the diagram correctly however only a few were unable to draw the cell in the diagram.

(ii) Many candidates could not solve the numerical correctly.
Errors in calculation of resistance with wrong calculations were committed due to faulty diagrams.
Confusion was even noticed in writing the units

(b) (i) Most candidates answered this correctly.

(ii) Most of the candidates answered part (1) correctly but answered part (2) wrongly as the concept of specific resistance was not clear. Many answered it by keeping in mind the relation $R \propto \frac{1}{r}$.
Candidates were unaware of the factors affecting the specific resistance.

(c) (i) Most candidates were confused with this part of the question.
Many related the answer with Tree and ring system.
Many could relate it to series and parallel combination but failed to explain how circuit breaks and remains closed in the two circuits.
Many candidates were under the impression tree system has wiring in series combination and ring system has wiring in parallel combination.

Suggestions for teachers

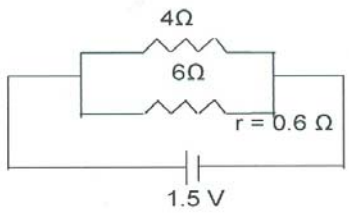
- Practice should be given in correct interpretation of information and to draw diagram accordingly.
- Mechanical approach towards numericals should be removed by giving enough practice of numericals of various types.
- Emphasis should be given on correct answers with unit.
- Explain the concept of specific resistance.
- It is necessary for teachers to explain the factors on which resistance and specific resistance depends.
- Explain the difference between the tree and the ring system and also the series and parallel combination of circuits clearly.
- The candidates should also be taught about open and closed circuits.
- Explain to the candidates that based on the position of the switch or fuse in the circuit only one or a number of appliances can get disconnected in parallel combination.

(ii) Most candidates answered this part correctly.

MARKING SCHEME

Question 8.

(a) (i) Correct circuit diagram



(ii) Ratio of current

$\frac{1}{6} : \frac{1}{4}$

$2 : 3$

Current in $4\Omega = \frac{0.5}{5} \times 3 = 0.3\text{A}$

Current in $6\Omega = \frac{0.5}{5} \times 2 = 0.2\text{A}$ OR $0.5 - 0.3 = 0.2\text{A}$

(b) (i) The conductors which obey Ohm's law

(ii) The thinner wire will have more resistance because the resistance is inversely proportional to area of cross-section.

(iii) Both wires will have same specific resistance because specific resistance depends on the nature of the material which is the same (copper) in both cases.

(c) In Set A, bulbs are arranged in Series whereas in Set B the bulbs are arranged in parallel.
overall resistance in Set A is higher than in Set B, OR overall current in Set A is lower than overall current in Set B.
Each appliance operates at the same voltage.

Question 9

(a) Heat energy is supplied at a constant rate to 100g of ice at 0 ºC. The ice is converted into water at 0º C in 2 minutes. How much time will be required to raise the temperature of water from 0 ºC to 20 ºC? [Given: sp. heat capacity of water = 4.2 J g^{-1} $°C^{-1}$, sp. latent heat of ice = 336 J g^{-1}]. [4]

(b) Specific heat capacity of substance A is 3.8 J $g^{-1}K^{-1}$ whereas the Specific heat capacity of Substance B is 0.4 J g^{-1} K^{-1}.

(i) Which of the two is a good conductor of heat?

(ii) How is one led to the above conclusion?

(iii) If substances A and B are liquids then which one would be more useful in car radiators? [3]

(c) (i) State any two measures to minimize the impact of global warming.

(ii) What is the Greenhouse effect? [3]

Examiners' Comments

(a) Most candidates wrote incorrect answers. Conversion from minutes to seconds was not done. Since no heating apparatus was mentioned the candidates did not think of calculating the power and therefore could not do the second part.
Errors were also made in writing the units**.**

(b) Majority of candidates answered the first part correctly but made errors in answering the latter parts i.e. reasoning.
Some candidates could not answer part (iii) correctly showing poor analysis of the question.

(c) Many candidates wrote vague and incorrect answers. The definition of greenhouse effect was not related to the wavelength in many cases.

Suggestions for teachers

- More practice of numericals involving different types should be given.
- Answers with correct unit should be insisted upon.
- Encourage correct analysis of the numerical.
- Make it clear to students that for *large differences* between specific heat capacities the one with lower specific heat capacity is a good conductor of heat and the one with higher specific heat capacity is a poor conductor of heat.
- Explain clearly that the substance with very high specific heat capacity takes a longer time to cool and a longer time to heat up.
- EVS topics must be given due importance in class discussions.
- It is also necessary to talk about awareness of environmental related issues while teaching physics.

MARKING SCHEME

Question 9.

(a) $Q = m L$
$= 100 \times 336 = 33600$ J
Heat supplied in 2 minutes = 33600 J
Power = Work / Time
$= (33600 / 2 \times 60) = (560/2) = 280$ W
Power x Time = m c θ
$280 \times t = 100 \times 4.2 \times 20$
t = 30 second

(b) (i) Substance B
(ii) lower the specific Heat capacity better the conducting power.
(iii) A

(c) (i) To minimize global warming the following two main measures should be taken
1. Technological measures
2. Economic measures
3. Policy measures (any two)

(ii) Greenhouse effect is the phenomenon in which infra red radiations of long wavelength given out from the surface of a planet are absorbed by its atmospheric gases to keep the environment warm at the planet's surface and the lower atmosphere.

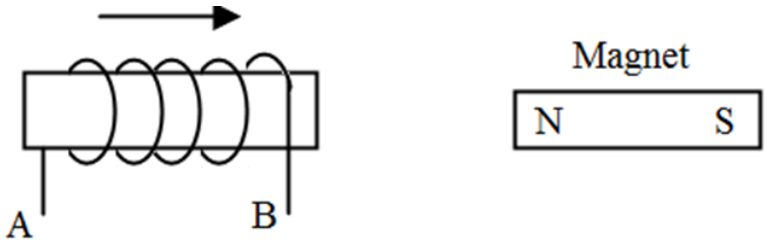
Question 10

(a) (i) Name two factors on which the magnitude of an induced e.m.f. in the secondary coil depends.

(ii) In the following diagram an arrow shows the motion of the coil towards the bar magnet.

(1) State in which direction the current flows, A to B or B to A?

(2) Name the law used to come to the conclusion.



[4]

(b) A nucleus ${}_{11}Na^{24}$ emits a beta particle to change into Magnesium (Mg)

(i) Write the symbolic equation for the process.

(ii) What are numbers 24 and 11 called?

(iii) What is the general name of ${}^{24}_{12}Mg$ with respect to ${}^{24}_{11}Na$? [3]

(c) In a cathode ray tube state:

(i) the purpose of covering cathode by thorium and carbon.

(ii) the purpose of the fluorescent screen.

(iii) how is it possible to increase the rate of emission of electrons. [3]

Examiners' Comments

(a)(i) Secondary coil needs to be given with respect to the transformer.
Many candidates stated the factors correctly but many were confused with the factor in terms of number of turns of the coil.

(ii) Answers were not in accordance with the concept.
Many candidates were not aware of Lenz's law.

(b) Most candidates could answer this question correctly but a few could not write balanced nuclear equations.
Some candidates were unable to identify the difference between atomic number and atomic mass number. Some candidates used incorrect terms such as number of electrons atomic weight etc.
Most candidates wrote correct general names like isobars but many also wrote isotones. In

Suggestions for teachers

- Teach this topic with demonstrations.
- Lot of material on U tube is available to teach this topic with more understanding.
- Stress should be given on writing balanced nuclear equations.
- Give more practice of writing nuclear equations.
- The difference between atomic number and atomic mass number should be made clear.
- Difference between isotopes and isobars should also be made clear.
- Cathode ray tube to be discussed in detail.
- Function of each part needs to be discussed with demonstration. Internet related videos are available to support your teaching of CRT.

some cases difference between isotopes and isobars was not clear.

(c) Some candidates were not familiar with the parts of CRT.

Some candidates did not write the correct key words such as temperature of cathode or increasing the filament current.

For the purpose of fluorescent screen; many candidates used terms for obtaining an image without making it clear that there is conversion into light energy.

MARKING SCHEME
Question 10.
(a) (i) 1. Change in magnetic flux. 2. The time in which the magnetic flux changes. (ii) 1. A to B. 2. Lenz's Law. (b) (i) $_{11}Na^{24} \rightarrow {}_{12}Mg^{24} + {}_{-1}e^{0}$ (ii) 11 is the atomic no. (number of protons) 24 is the atomic mass no. (number of protons and neutrons) (iii) Isobars [1] (c) (i) To lower the work function or to emit electrons at lower temperature. (ii) To convert electrical signal into a visual signal. (iii) By increasing the temperature of cathode or by increasing the filament current.

Topics/Concepts found difficult or confusing

- Energy sources which is the part of EVS especially nuclear energy.
- Work done when displacement is not in the direction of the force.
- Concept of couple.
- Derivation of $Efficiency = \frac{M.A.}{V.R.}$
- Mechanical waves.
- Heat numerical
- Refraction through any refracting medium when opposite surfaces are parallel and when they are not parallel.
- The ability to diverge or converge with respect to the focal length.
- Vibrations in a stretched string in relation to the wavelength, amplitude, frequency etc.
- Drawing circuit diagram from the given information.
- In house circuit the series and parallel combination. Also the misconception is ring system has parallel wiring and tree system has series wiring.
- Specific resistance.
- Factors affecting induction in transformer

Suggestions for the students

- Use the reading time of 15 minutes judiciously to make a proper choice of questions from section II by reading the requirements of the question carefully supported with a high degree of concentration.
- Avoid writing answers which are simply repetition of the question. Instead be specific about the key word in that statement.
- Candidates must not leave any topic for option. All topics are covered in section I which is compulsory.
- Avoid changing the order of sequence of questions and numbering system.
- Handwriting should be neat and legible.
- Learn the principles, laws and definitions accurately.
- Ray diagrams and the other diagrams need to be practiced periodically.
- While writing the answers it is not only important to cover all the points but also to present them in a proper sequence.
- While solving a numerical it is advisable that the formula needs to be written in the beginning. Essential steps need to be shown and final answer needs to be expressed along with a proper unit. Avoid computation at the first step; let it be plain substitution as the marks are awarded for the correct substitution.
- Be regular in your study habits. Complete your syllabus well in time. A thorough revision of all topics is all time important.
- It is advisable to solve previous year's papers in writing.
- More emphasis should be given on writing rather than memorising.
- For speed in mathematical calculations; it is advisable to learn tables up to 30, know squares up to 30, cubes up to 15 and basics of fractions and decimal.
- It is better to inculcate the habit of underlining the important points or key words in the answer.