

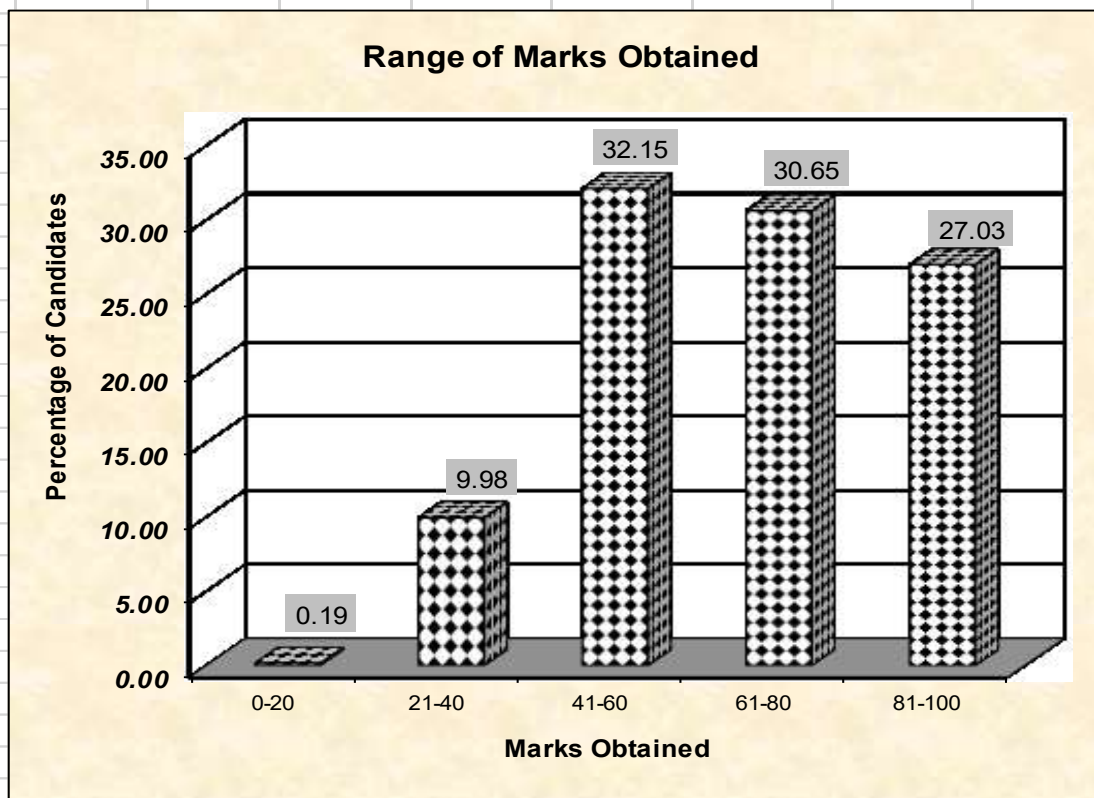
SCIENCE

STATISTICS AT A GLANCE

Total Number of students who took the examination	1,42,889
Highest Marks Obtained	100
Lowest Marks Obtained	0
Mean Marks Obtained	66.32

Percentage of Candidates according to marks obtained

Details	Mark Range				
	0-20	21-40	41-60	61-80	81-100
Number of Candidates	267	14,262	45,936	43,798	38,626
Percentage of Candidates	0.19	9.98	32.15	30.65	27.03
Cumulative Number	267	14,529	60,465	1,04,263	1,42,889
Cumulative Percentage	0.19	10.17	42.32	72.97	100.00

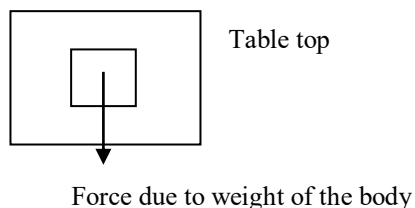


PHYSICS
SCIENCE PAPER I

I. ANALYSIS OF PERFORMANCE

Question 1

- (a) When a body is placed on a table top, it exerts a force equal to its weight downwards on the table top but does not move or fall.



- (i) Name the force exerted by the table top.
- (ii) What is the direction of the force? [2]
- (b) (i) Name one factor that affects the lateral displacement of light as it passes through a rectangular glass slab.
- (ii) On reversing the direction of the current in a wire, the magnetic field produced by it gets ----- . [2]
- (c) (i) On what factor does the position of the centre of gravity of a body depend?
- (ii) What is the S.I unit of the moment of force? [2]
- (d) Name the factors affecting the turning effect of a body. [2]
- (e) (i) Define equilibrium.
- (ii) In a beam balance when the beam is balanced in a horizontal position, it is in _____ equilibrium. [2]

Examiners' Comments

- (a) (i) Most candidates answered correctly, however some named the force incorrectly as force applied or force due to friction.
- (ii) Many candidates simply wrote the direction to be upward rather than stating it to be vertically upward.
- (b) Most candidates answered it correctly though some wrote changed instead of reversed for direction.

Suggestions for teachers

- The topic on centre of gravity should be explained by giving a variety of examples so that students understand that even bodies of same volumes or same mass can still have different positions of centre of gravity.

- (c) (i) The factors affecting the position of centre of gravity of a body was mentioned incorrectly by many candidates. The factors stated were incorrect as it dealt with size, volume or mass.
- (ii) The S.I unit of movement of force was incorrectly answered by many candidates.
- (d) Answered correctly by most candidates though many overlooked the importance of mentioning the perpendicular distance of the line of action of force from the axis of rotation.
- (e) Most candidates stated the condition for equilibrium rather than defining equilibrium.

- Highlight the difference between distance and perpendicular distance while explaining factors affecting the turning effect.
- Train students to read the question carefully to enable correct answers being written.
- Important keywords of the definition should be stressed on.
- Insist on students reading the question carefully and understanding exactly what is expected as an answer.
- Highlight the difference between upwards and vertically upwards while teaching the direction of reaction forces.
- Explain that the word changed will imply the change in magnitude/direction/both whereas reversed is used only for direction.

MARKING SCHEME

Question 1

- (a) (i) Normal reaction force
- (ii) Vertically upwards.
- (b) (i) Thickness of glass slab / angle of incidence/refractive index of glass/colour of light/ wave length of light (Any one)
- (ii) reversed in direction
- (c) (i) Shape of body/distribution of mass of body.
- (ii) Nm.
- (d) (i) magnitude of the force applied .
- (ii) Perpendicular distance of line of action of the force from the axis of rotation./ Moment arm / perpendicular distance between point of application of force and point of rotation (Any one)
- (e) (i) When a number of forces acting on a body produce no change in its state of rest or motion, the body is said to be in equilibrium.
- (ii) Static.

Question 2

- (a) How is work done by a force measured when the force :
- (i) is in the direction of displacement
 - (ii) is at an angle to the direction of displacement. [2]
- (b) State the energy changes in the following while in use:
- (i) Burning of a candle.
 - (ii) A steam engine. [2]
- (c) (i) A scissor is a _____ multiplier.
- (ii) $1 \text{ kWh} = \text{_____ J}$. [2]
- (d) Explain the motion of a planet around the sun in a circular path. [2]
- (e) Rajan exerts a force of 150 N in pulling a cart at a constant speed of 10 m/s. [2]
Calculate the power exerted.

Examiners' Comments

- (a) Answers were generally correct if stated in terms of equations but misleading and contradictory when described in words. Some candidates used vague symbols, which were irrelevant.
- (b) Most candidates answered this question correctly. Some however made errors in the sequence of energy conversions.
- (c) Relationship between kWh and Joules was stated incorrectly as the relationship between kWh and mega joule.
- (d) Inappropriate explanations were written by many candidates. They should have explained that for planetary motion the gravitational pull of the sun provides the necessary centripetal and not centrifugal force. Many candidates wrote answers which conveyed the meaning partially.
- (e) Many candidates did not seem to be familiar with the formula $P=F.v$. Hence, a variety of methods were tried. Incorrect unit of power was stated by many candidates.

Suggestions for teachers

- If $\theta=0^\circ$ then $\cos \theta = 1$ and hence $W=FS$. Also when θ is at an angle less than 90° then $W=FS \cos \theta$ needs to be made clear to the students so that the concept is understood correctly.
- Discuss examples of energy conversions.
- Students should be trained to state important energy changes and in a proper sequence.
- Students should avoid selective study and attach importance to all topics.
- Train students to use the correct language which can explain the phenomenon in a comprehensive way.
- Additional practice on numerical problems needs to be given. Students need to be trained to present the answer with the correct unit.

MARKING SCHEME

Question 2.

- (a) (i) $W = F \times S$
(ii) $W = F \times S \cos \theta$.
- (b) (i) Chemical energy to Light energy and heat energy.
(ii) Chemical energy to Heat energy to Mechanical energy
- (c) (i) Speed
(ii) $3.6 \times 10^6 \text{ J}$.
- (d) A planet moves around the sun in a nearly circular path for which the gravitational force of attraction on the planet by the sun provides the centripetal force.
- (e) $P = F \times V$
 $= 150 \times 10$
 $= 1500 \text{ W}$

Question 3

- (a) (i) Give the expression for mechanical advantage of an inclined plane in terms of the length of an inclined plane.
(ii) Name a common device where a gear train is used. [2]
- (b) The speed of light in glass is $2 \times 10^5 \text{ km/s}$. What is the refractive index of glass? [2]
- (c) (i) Draw a graph between displacement and the time for a body executing free vibrations.
(ii) Where can a body execute free vibrations? [2]
- (d) (i) What happens to the resistivity of semi-conductors with the increase of temperature?
(ii) For a fuse, higher the current rating _____ is the fuse wire. [2]
- (e) (i) Name the high energetic invisible electromagnetic waves which help in the study of the structure of crystals.
(ii) State an additional use of the waves mentioned in part (e) (i). [2]

Examiners' Comment

- (a)(i) Candidates were unable to understand the question and hence many of them wrote $MA = \frac{1}{\sin \theta}$ or $\frac{L}{E}$. Some even wrote that $MA = \frac{h}{l}$
- (ii) Many candidates did not seem to be familiar with a common device using a gear train.
- (b) Some candidates while solving did not convert the speed in the same units and hence obtained incorrect answers.
- (c) (i) The negative displacement was not shown by many candidates. Some candidates drew graphs which had a decreasing amplitude.
- (ii) Most candidates did not understand that the "where" in the question meant the medium and hence answered incorrectly.
- (d) Effect of temperature on resistivity of semi-conductors was not known by many candidates. Some treated semi-conductors as conductors and hence wrote incorrect answers.
- (e) Most candidates were unable to identify the X-rays correctly.

Suggestions for teachers

- Students must answer the question asked rather than write an unconnected detailed version.
- It is advisable to write simple examples rather than irrelevant ones.
- Stress on using data in the same units while solving numerical problems.
- Reading and understanding of graphs should be given greater weightage.
- While teaching conductors the topics of semi-conductors and super conductors could be taken up simultaneously so as to help in a better understanding.
- Teach students to identify the electromagnetic radiations by wavelength; uses and characteristics.
- Wavelength ranges for different radiations should be taught and candidates made to revise regularly.
- While teaching ensure that uses and properties of waves are related to each other rather than teaching them independently.

MARKING SCHEME

Question 3.

(a) (i) M.A. = l/h

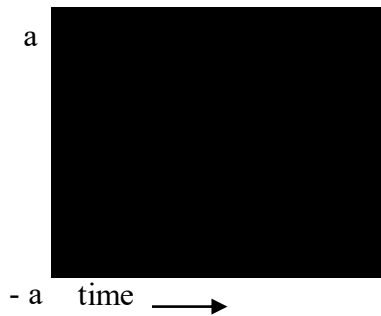
(ii) It is used in a clock or a watch

(b) Refractive index of glass = speed of light in vacuum / speed of light in glass

$$= 3 \times 10^8 / 2 \times 10^5 \times 1000$$

$$= 1.5$$

(c) (i)



(ii) in Vacuum.

(d) (i) Resistivity decreases with the increase of temperature

(ii) Thicker

(e) (i) X rays

(ii) to detect the fracture in bones.

Question 4

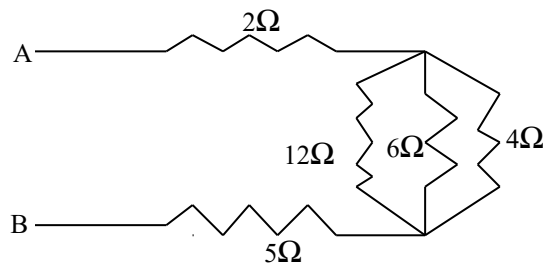
(a) Rishi is surprised when he sees water boiling at 115°C in a container. Give reasons as to why water can boil at the above temperature. [2]

(b) (i) Why does a current carrying, freely suspended solenoid rest along a particular direction?

(ii) State the direction in which it rests.

[2]

(c) Find the equivalent resistance between points A and B.



[2]

(d) Give two similarities between an A.C generator and a D.C motor. [2]

(e) (i) Why is a cathode ray tube evacuated to a low pressure?

(ii) What happens if the negative potential is changed on a grid?

[2]

Examiners' Comments

- (a) Most candidates wrote the correct reason but were unable to explain it further on the basis of the stated reason.
- (b) Most candidates were able to understand that the solenoid gets magnetized but missed out that the solenoid starts behaving like a bar magnet and hence were unable to state the direction in which it rests.
- (c) For parallel combination of equivalent resistance many candidates wrote R_p instead of $\frac{1}{R_p}$ in the L.H.S of the equation. No unit was written in the final answer.
- (d) Basic similarities between the two were not clearly understood by many candidates. Some wrote differences instead of similarities.
- (e) Many candidates were unable to comprehend the question as they were not aware of the specific functions of various parts in a C.R.T.

Suggestions for teachers

- Advise students to revise the topic on 'HEAT' thoroughly.
- Guide students to explain the dependence on the stated factor and not on some other factor.
- Solenoid is an important topic and hence it should be thoroughly explained that when current passes through it, it behaves like a bar magnet.
- Students need to be given adequate practice in solving numerical problems that should be mathematically correct.
- The AC generator and DC motor ought to be taught simultaneously so that students are aware of the basic differences and similarities in their working.
- Through the help of a labelled diagram of a C.R.T, explain the various parts and their specific functions rather than teaching it as a whole.

MARKING SCHEME

Question 4.

- (a) Because of the presence of impurity. (salt)
More the impurity more will be the boiling point.
- (b) (i) A current carrying freely suspended solenoid behaves like a bar magnet
(ii) Geographic north south direction
- (c) $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$
 $= \frac{1}{12} + \frac{1}{6} + \frac{1}{4}$
 $= \frac{6}{12}$
 $= \frac{1}{2}$
 $R = 2 \Omega$
 $R' = 2 + 2 + 5 = 9 \Omega$

- (d) Both in an A.C generator and D.C motor a coil rotates in magnetic field between the pole pieces of a powerful magnet / presence of carbon brushes/ presence of armature coil (any two)
- (e) (i) to avoid collisions of electrons with the air molecules
(ii) The brightness of the pattern on the screen can be changed.

Question 5

- (a) Draw a simplified diagram of a lemon crusher, indicating direction of load and effort. [2]
- (b) (i) Name the physical quantity measured in terms of horse power.
(ii) A nut is opened by a wrench of length 20cm. If the least force required is 2N, find the moment of force needed to loosen the nut.
(iii) Explain briefly why the work done by a fielder when he takes a catch in a cricket match is negative. [4]
- (c) A block and tackle system has V.R. = 5.
(i) Draw a neat labelled diagram of a system indicating the direction of its load and effort.
(ii) Rohan exerts a pull of 150 Kgf. What is the maximum load he can raise with this pulley system if its efficiency = 75%? [4]

Examiners' Comments

- (a) Candidates paid more attention to drawing an actual lemon crusher instead of drawing a simplified diagram. Direction of the load and effort either was not shown or drawn correctly.
- (b) Calculation errors were common as candidates did not convert the length to S.I unit. Many stated the answer in mixed units. Answer in part (iii) was neither explained in terms of force and displacement nor any mention of 180° as the angle between the both was stated.
- (c) Many candidates were unable to draw the diagram correctly showing the support and the direction of load and effort. In part (ii) errors were made in calculation and mathematical presentation. A few candidates took MA as 5 and missed out that efficiency was given as 75%.

Suggestions for teachers

- Students should be trained to draw the schematic diagram of levers and not waste time over the actual pictorial diagrams. Emphasis must be put on the direction of load and effort and the relative position of fulcrum load and effort.
- Students need to be advised to write the answer with the correct unit and given sufficient practice in solving numerical problems.
- Concept of negative work needs to be explained clearly with adequate examples.
- Emphasize on the drawing of support and marking of the direction of the various forces in the pulley system.
- Inculcate the habit of writing the formula or equation while solving numerical problems.

MARKING SCHEME

Question 5.

- (a) Lemon crusher :
- (b) (i) Power of the appliance.
(ii) Moment of force = Force x Moment arm
$$= 2 \times 20/100$$
$$= 0.4\text{Nm}$$

(iii) Force exerted on the ball and the displacement of the ball are in opposite directions or they make 180° with one another.
- (c) (i) Correct diagram drawn with directions of load and effort shown correctly
(ii) Efficiency = M.A / V.R
$$75 / 100 = \text{M.A} / 5 \quad \text{M.A} = 3.75$$
$$\text{M.A} = \text{Load} / \text{Effort}$$
$$3.75 = \text{Load} / 1500 \quad \text{or} \quad 3.75 = \text{Load} / 150$$
$$\text{Load} = 5625 \text{ N} \quad \text{or} \quad \text{Load} = 562.50 \text{ kgf}$$

Question 6

- (a) (i) Where an object should be placed so that a real and inverted image of the same size as the object is obtained using a convex lens?
(ii) Draw a ray diagram to show the formation of the image as specified in the part a (i) [3]
- (b) (i) Why does the Sun appear red at sunrise?
(ii) Name the subjective property of light related to its wavelength. [3]
- (c) Jatin puts a pencil into a glass container having water and is surprised to see the pencil in a different state.
(i) What change is observed in the appearance of the pencil?
(ii) Name the phenomenon responsible for the change.
(iii) Draw a ray diagram showing how the eye sees the pencil. [4]

Examiners' Comments

- (a) Many candidates wrote F_2 in place of $2F$. The following errors were observed in the ray diagram-
1. When the optical plane was represented by a straight line, it was not labelled.
 2. Incorrect arrows or arrows not marked.
 3. Real image shown by a dotted line.
 4. Actual path of the rays shown with dotted lines.
- (b) Most candidates gave a confused explanation with the word scattering being incorrectly addressed as dispersion, deviation, etc. The concept that the intensity of scattered radiation decreases with an increase of wavelength was not clearly understood. Many did not seem to understand the meaning of 'subjective'.
- (c) Many candidates wrote that the pencil will appear at a different place. Probably the phrase "different state" in the question was misunderstood. In the diagram the following errors were commonly spotted:
1. Arrows not drawn or marked incorrectly.
 2. Dotted lines were drawn at wrong places.
 3. Incorrect bending of rays.
 4. Incorrect image location.

Suggestions for teachers

- Adequate practice of drawing correct ray diagrams needs to be given.
- Distinguish between F_1 , F_2 , $2F_1$, $2F_2$.
- Insist that virtual rays and virtual images should be represented through dotted lines. All ray diagrams need to be practiced several times.
- A clear understanding of dispersion, deviation and scattering should be brought out by examples and natural phenomenon.
- Students should be explained on the difference between subjective and objective properties.

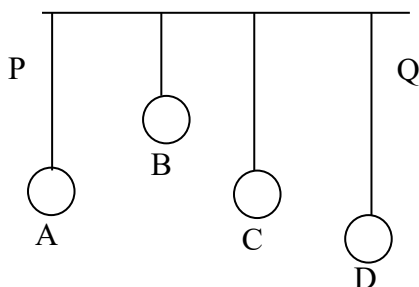
MARKING SCHEME

Question 6.

- (a) (i) At $2F_1$ or centre of curvature
(ii) A ray shown parallel to the principal axis and passing through F_2 .
A ray shown passing through optical centre and moving undeviated.
Both rays drawn correctly.
Real image shown correctly.
- (b) (i) At sunrise light has to travel longest distance in atmosphere, blue light gets scattered more and is lost.
Red Light has long wavelength, scatters the least and reaches the observer.
- (ii) Colour of light
- (c) (i) The pencil will be seen bent.
(ii) Refraction of light.
(iii) Two rays correctly drawn.
(iv) Image shown correctly.

Question 7

- (a) (i) State the safe limit of sound level in terms of decibel for human hearing.
(ii) Name the characteristic of sound in relation to its waveform. [2]
- (b) A person standing between two vertical cliffs and 480 m from the nearest cliff shouts. He hears the first echo after 3s and the second echo 2s later.
Calculate:
(i) The speed of sound.
(ii) The distance of the other cliff from the person. [3]
- (c) In the diagram below, A, B, C, D are four pendulums suspended from the same elastic string PQ. The length of A and C are equal to each other while the length of pendulum B is smaller than that of D. Pendulum A is set into a mode of vibrations.



- (i) Name the type of vibrations taking place in pendulums B and D?
(ii) What is the state of pendulum C?
(iii) State the reason for the type of vibrations in pendulums B and C. [5]

Examiners' Comments

- (a) Many candidates misunderstood the question and wrote the audible range of human hearing in terms of frequency rather than the safe limit of sound in terms of decibel. Characteristics of sound not very clear to many candidates.
- (b) Many candidates displayed lack of practice in solving numerical problems. Units either not mentioned or mentioned incorrectly.
- (c) In part (i) many candidates wrote resonance and part (ii) as forced vibrations. Many did not seem to be aware that same length means same natural frequencies.

Suggestions for teachers

- Questions must be read carefully before attempting to answer them.
- Safe limit of sound level should be explained clearly on the basis of loudness in terms of decibel.
- Clear explanation of loudness, intensity, pitch and quality needs to be given.
- Additional practice in solving numerical problems must be allotted. Encourage students to write the formula used and stress on correct S.I units.
- Thorough revision of resonance and forced vibration with examples must be conducted.

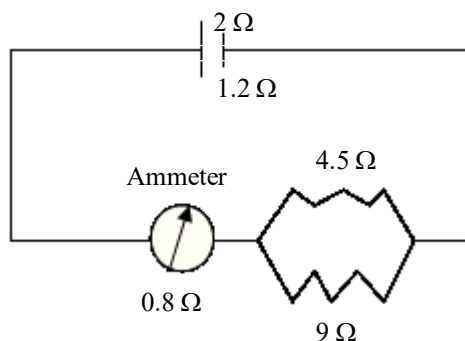
MARKING SCHEME

Question 7.

- (a) (i) Safe limit of sound level - upto 120 db
(ii) Quality of sound waves
- (b) (i) $V = 2 \text{ distance} / \text{time}$
 $= 2 \times 480 / 3$
 $= 320 \text{ m/s}$
- (c) (i) Pendulum B and D execute forced vibrations
(ii) Pendulum C will be in a state of Resonance
(iii) Natural frequency of B does not match with Natural frequency of A
Natural frequency of C matches that of A

Question 8

- (a) (i) Name the device used to increase the voltage at a generating station.
(ii) At what frequency is A.C supplied to residential houses?
(iii) Name the wire in a household electrical circuit to which the switch is connected. [3]
- (b) The relationship between the potential difference and the current in a conductor is stated in the form of a law.
(i) Name the law.
(ii) What does the slope of V- I graph for a conductor represent?
(iii) Name the material used for making the connecting wire. [3]
- (c) A cell of Emf 2V and internal resistance 1.2Ω is connected with an ammeter of resistance 0.8Ω and two resistors of 4.5Ω and 9Ω as shown in the diagram below:



- (i) What would be the reading on the Ammeter?
(ii) What is the potential difference across the terminals of the cell? [4]

Examiners' Comments

- (a) An incorrect name of the device was stated by a few candidates. Many wrote the frequency of A.C supplied as 220V in place of 50Hz. Some candidates wrote that the switch is connected to live and neutral both.
- (b) The law was correctly identified by most candidates though for part (ii) many gave the answer as $1/R$ or $V \propto I$ or is a straight line. Many candidates wrote nichrome, manganin or tungsten as the material used that was incorrect.
- (c) The concept of series and parallel resistance is not clear to many candidates. Some candidates considered 0.8Ω as a part of parallel resistance; hence the remaining working was incorrect too.

Suggestions for teachers

- Both voltage and frequency must be clearly explained while teaching A.C.
- Clearly explain the characteristics required by a connecting wire, resistance wire, etc.
- The concept of 'slope' must be made clear in case of a graph.
- Adequate practice of numerical problems must be carried out regularly in class.

MARKING SCHEME

Question 8.

(a) (i) Step up transformer

(ii) 50 hertz

(iii) Live wire.

(b) (i) Ohm's Law.

(ii) Resistance of the conductor.

(iii) Copper / Aluminium

(c) (i) $1/R = 1/R_1 + 1/R_2$

$$= 1/9 + 1/4.5$$

$$= 1/3$$

$$R = 3 \Omega$$

$$i = E/R + r$$

$$= 2/(3 + 1.2 + 0.8)$$

$$= 0.4 \text{ A}$$

Ammeter reading 0.4 A

(ii) $V = E - ir$

$$= 2 - 0.4 \times 1.2$$

$$= 1.52 \text{ V}$$

$$\text{Or } V = iR$$

$$= 0.4 \times (3 + 0.8)$$

$$= 1.52 \text{ V}$$

Question 9

- (a) (i) Name a gas caused by the Greenhouse effect.
(ii) Which property of water makes it an effective coolant? [2]
- (b) (i) Water in lakes and ponds do not freeze at once in cold countries. Give a reason in support of your answer.
(ii) What is the principle of Calorimetry?
(iii) Name the law on which this principle is based.
(iv) State the effect of an increase of impurities on the melting point of ice. [4]
- (c) A refrigerator converts 100 g of water at 20° C to ice at -10° C in 35 minutes.
Calculate the average rate of heat extraction in terms of watts.
Given: Specific heat capacity of ice = 2.1 J g⁻¹ ° C⁻¹
Specific heat capacity of water = 4.2 J g⁻¹ ° C⁻¹ [4]
Specific Latent heat of fusion of ice = 336 J g⁻¹

Examiners' Comments

- (a) Most candidates wrote the correct answer, however along with the correct option they also wrote an incorrect option. Many either wrote the incorrect value of SHC of water or wrote incorrect units.
- (b) Many candidates held high SHC of water to be responsible rather than high SLHC of fusion. Many failed to specify “if the system is fully insulated” part in the principle of calorimetry. Incorrect answers were written by many in part (iv).
- (c) Many candidates showed an incorrect working with Heat equations formed incorrectly. Conversion from minutes to seconds was also not shown in many cases.

Suggestions for teachers

- 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
- When only one option is asked for in the question, students must be advised to refrain from writing a large number of options as their answers.
- Students should be advised to memorize the values and units of important physical constants.
- Sufficient practice of numerical problems involving different types should be given.
- Encourage a correct analysis of numerical problems.
- Answers with correct S.I units should be insisted on.

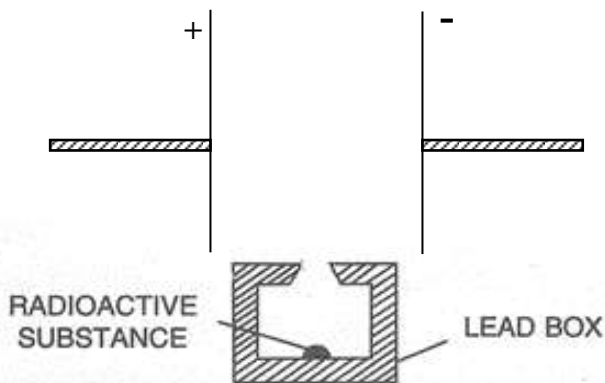
MARKING SCHEME

Question 9.

- (a) (i) CO₂ , Water vapours, methane and chloroflouro carbons.(Any one)
- (ii) Water has high specific heat capacity/ Specific heat capacity of water is 4200J kg⁻¹ K⁻¹ or any correct value in correct unit
- (b) (i) This is because the specific latent heat of fusion of ice is sufficiently high (336 J/ g), so to freeze water, a large quantity of heat has to be withdrawn, hence it freezes slowly.
- (ii) If the system is fully insulated then
Heat energy lost by the Hot body = Heat energy gained by the Cold body.
- (iii) Law of conservation of energy.
- (iv) Increase of impurity decreases the m.pt. of ice.
- (c) $m c \theta + m L + m c \theta = P X t$
 $100 X 4.2 X 20 + 100 X 336 + 100 X 2.1 X 10 = P X 35 X 60$
 $44100 = P X 2100$
 $P = 21 W$

Question 10

- (a) (i) What is thermionic emission?
- (ii) Name the unit in which the work function of a metal is expressed. [2]



- (b) (i) Complete the diagram as given above by drawing the deflection of radioactive radiations in an electric field.
- (ii) State any two precautions to be taken while handling radioactive substances. [5]

- (c) An atomic nucleus A is composed of 84 protons and 128 neutrons.
- (i) The nucleus A emits an alpha particle and is transformed into nucleus B.
What is the composition of nucleus B?
- (ii) The nucleus B emits a beta particle and is transformed into a nucleus C.
What is the composition of nucleus C?
- (iii) Does the composition of nucleus C change if it emits gamma radiations? [3]

Examiners' Comments

- (a) Most candidates failed to understand that the thermionic emission is due to the heat energy being imparted to the metallic surface. In place of an electron volt candidates wrote joule.
- (b) Many candidates drew incorrect diagrams with either the radiations being labelled incorrectly or the deflection shown incorrectly.
- (c) Most candidates did not understand the changes coming in with the emission of an alpha particle or a beta particle. Many failed to write the composition of the nucleus or explain appropriately the number of protons and neutrons present in the nucleus after the emission with a few unable to understand the effect of Gamma emissions.

Suggestions for teachers

- Explain the difference between thermionic and electronic emission.
- The unit of work function and its relation with the S.I unit of the physical quantity which it measures can be explained at this stage.
- Comparative property of radioactive radiations in an electric field should be discussed during classroom teaching.
- Stress must also be laid to teach the atomic structure in the class so as to make it clearer.

MARKING SCHEME

Question 10.

- (a) (i) Emission of free electrons from a metal surface when heat energy is imparted to it is called the thermionic emission.
- (ii) Electron Volt.
- (b) (i) Deflection of Alpha and Beta shown correctly, Alpha deflection is less than beta Path of Gamma.
- (ii) Use of lead lined aprons/ Lead gloves / long handle lead tongs/ radioactive substance should be kept in a thick walled lead container (Any two)
- (c) (i) ${}_{82}\text{B}^{208}$ or 82 protons and 126 neutrons
- (ii) ${}_{83}\text{C}^{208}$ or 83 protons and 125 neutrons
- (iii) No.

Topics/Concepts found difficult or confusing

- Cases of inter conversion of energy.
- Concept of work. Work done for different angles between force and displacement.
- Numerical problems based on $p=f.v$ and machines.
- Interpretation of graphs and slopes.
- Vibration in a stretched string.
- Cases of resonance, forced vibrations, free vibrations, etc.
- Safe limit of sound level for humans.
- Numerical problems on “Heat”
- Difference between heat capacity, SHC and SLHC.
- Similarities between A.C generator and D.C motor.
- Cathode ray tube.
- Mass number and atomic number.

Suggestions for 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 a 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.
- 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 memorizing.
- 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.