

PHYSICS
(SCIENCE PAPER 1)

Maximum Marks: 80

Time allowed: Two hours

Answers to this Paper must be written on the paper provided separately.

*You will **not** be allowed to write during first **15** minutes.*

This time is to be spent in reading the question paper.

The time given at the head of this Paper is the time allowed for writing the answers.

Section A is compulsory. Attempt **any four** questions from Section B.

The intended marks for questions or parts of questions are given in brackets [].

SECTION A (40 Marks)

*(Attempt **all** questions from this Section.)*

Question 1

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

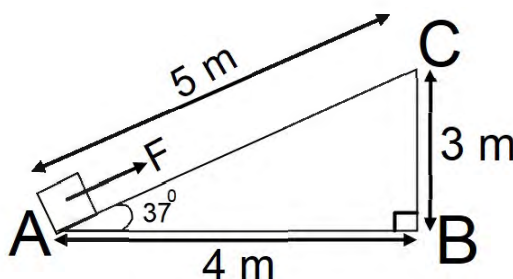
[15]

(Do not copy the questions, write the correct answers only.)

- (i) When a bell fixed on a cycle rings, then the energy conversion that takes place is:
- (a) gravitational potential energy to sound energy
 - (b) kinetic energy to sound energy
 - (c) sound energy to electrical energy
 - (d) sound energy to mechanical energy
- (ii) A door lock is opened by turning the lever (handle) of length 0.2 m. If the moment of force produced is 1 Nm, then the minimum force required is:
- (a) 5 N
 - (b) 10 N
 - (c) 20 N
 - (d) 0.2 N
-

- (iii) A force '**F**' moves a load from **A** to **C** as shown in the figure below. For the calculation of the work done, which of these lengths would you use as the displacement?

- (a) 3m
- (b) 4m
- (c) 5m
- (d) 7m



- (iv) A radioactive nucleus containing 128 **nucleons** emits a β – particle. After β – emission the number of **nucleons** present in the nucleus will be:

- (a) 128
- (b) 129
- (c) 124
- (d) 127

- (v) **Assertion (A):** Ultraviolet radiations are scattered more as compared to the microwave radiations.

Reason (R): Wavelength of ultraviolet radiation is more than the wavelength of microwave radiation.

- (a) Both A and R are true.
- (b) A is true but R is false.
- (c) A is false but R is true.
- (d) Both A and R are false.

- (vi) When the stem of vibrating tuning fork is pressed on a table, the tabletop starts vibrating. These vibrations are **definitely** an example of:

- (a) resonance
- (b) natural vibrations
- (c) forced vibrations
- (d) damped vibrations

(vii) Which of the following is a class III lever?

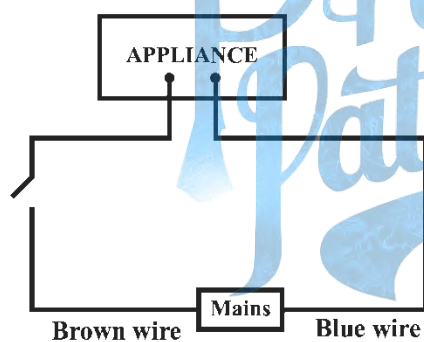
- (a) Pair of scissors
- (b) Wheelbarrow
- (c) Crowbar
- (d) Human forearm

(viii) The specific resistance of a conductor depends on its:

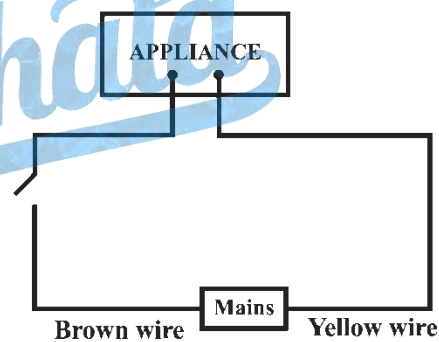
- (a) length
- (b) material
- (c) area of cross section
- (d) radius

(ix) Identify the option that displays the **correct wiring** with **correct colour code**:

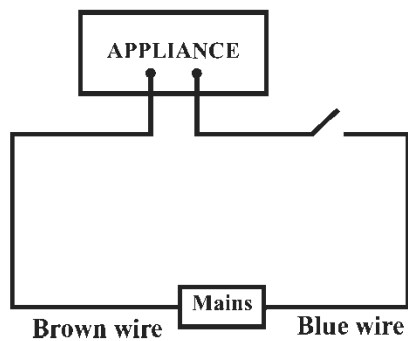
(a)



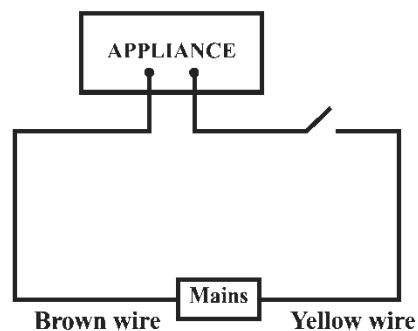
(b)



(c)



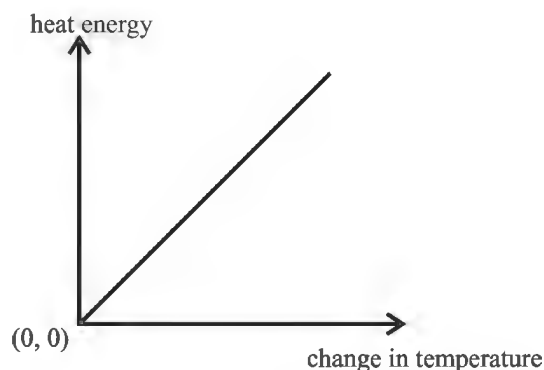
(d)



- (x) The potential difference between terminals of a cell in a closed electric circuit is:
- (a) terminal voltage
 - (b) electro motive force
 - (c) voltage drop
 - (d) none of these
- (xi) During melting of ice at 0°C the:
- (a) energy is released and temperature remains constant.
 - (b) energy is absorbed and temperature remains constant.
 - (c) energy is released and temperature decreases.
 - (d) energy is absorbed and temperature increases.
- (xii) Linear magnification(m) produced by a concave lens is:
- (a) $m < 1$
 - (b) $m > 1$
 - (c) $m = 1$
 - (d) $m = 2$
- (xiii) A radioactive element is placed in an evacuated chamber. Then the rate of **radioactive decay** will:
- (a) Decrease
 - (b) Increase
 - (c) Remain unchanged
 - (d) Depend on the surrounding temperature

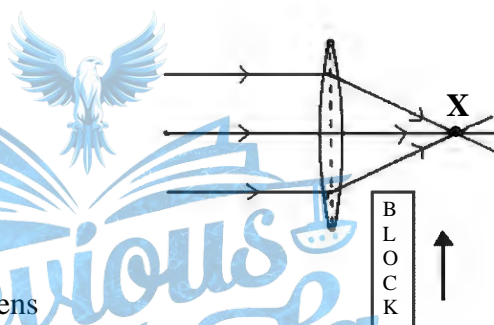
- (xiv) The graph given below shows heat energy supplied against change in temperature when no energy is lost to the surrounding. The slope of this graph will give:

- (a) Specific heat capacity
- (b) Latent heat of fusion
- (c) Latent heat of vaporization
- (d) Heat capacity



- (xv) A block of glass is pushed into the path of the light as shown below. Then the converging point **X** will:

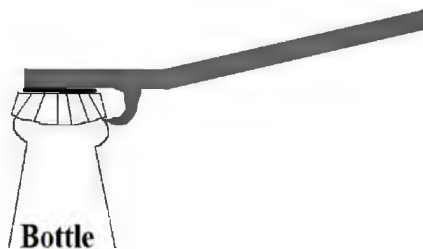
- (a) Move away from the slab
- (b) Move towards the slab
- (c) Not shift
- (d) Move towards the left side of the lens



Question 2

- (i) (a) In the following atoms, which one is a radioisotope? Give *one* use of this isotope. [3]
 O^{16} , C^{14} , N^{14} , He^4

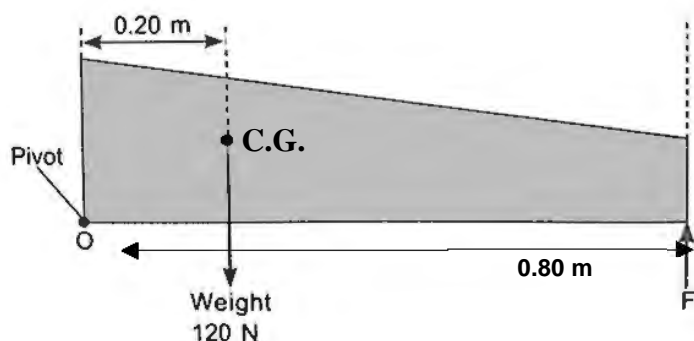
- (b) Name the class of the lever shown in the picture below:



- (ii) Fill in the blanks: [2]

- (a) When a stone tied to a string is rotated in a horizontal plane, the tension in the string provides _____ force necessary for circular motion.
- (b) Work done by this force at any instant is _____.

- (iii) A non uniform beam of weight 120 N pivoted at one end is shown in the diagram below. [2]
Calculate the value of **F** to keep the beam in equilibrium.

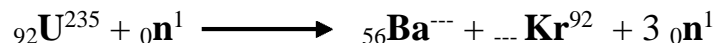


- (iv) Meera chose to use a block and tackle system of '9' pulleys instead of a single movable pulley to lift a heavy load. [2]
(a) What is the advantage of using a block and tackle system over a single movable pulley?
(b) Why should she connect more number of pulleys in the upper fixed block?
- (v) Sumit does 600 J of work in 10 min and Amit does 300 J of work in 20 min. Calculate the ratio of the powers delivered by them. [2]
- (vi) 5 bulbs are connected in **series** in a room. One bulb is fused. It is removed and remaining 4 bulbs are again connected in **series** to the same circuit. What will be the effect on the following physical quantities? (Increases, Decreases, Remain Same) [2]
(a) Resistance
(b) Intensity of light
- (vii) Rohan conducted experiments on echo in different media. He observed that a minimum distance of '**x**' meters is required for the echo to be heard in oxygen and '**y**' meters in benzene. Compare '**x**' and '**y**'. Justify your answer. [2]
Speed of sound in oxygen: 340 ms^{-1}
Speed of sound in benzene: 200 ms^{-1}

Question 3

- (i) (a) In a reading glass what is the position of the object with respect to the convex lens used? [2]
(b) Why can we **not** use concave lens for the same purpose?

- (ii) A fuse is rated 5 A. Can it be used with a geyser rated 1540 W, 220 V. Write **Yes** or **No**. Give supporting calculations to justify your answer. [2]
- (iii) State *two* factors affecting the speed of rotation of the coil in a D.C. motor. [2]
- (iv) How much heat is required to convert 500 g of ice at 0°C to water at 0°C? The latent heat of fusion of ice is 330 Jg⁻¹. [2]
- (v) Copy and complete the nuclear reaction by filling in the blanks. [2]



SECTION B (40 Marks)

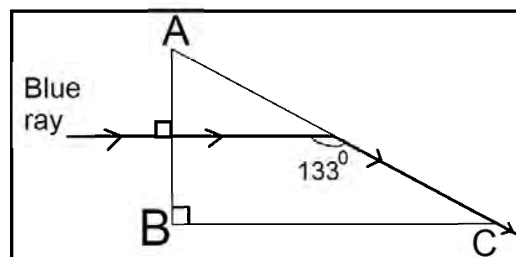
(Attempt **any four** questions from this Section.)

Question 4

- (i) The image of a **candle flame** placed at a distance of 36 cm from a spherical lens, is formed on a screen placed at a distance of 72 cm from the lens. Calculate the focal length of the lens and its power. [3]
- (ii) Below is an incomplete table showing the arrangement of **electromagnetic spectrum** in the increasing order of their wavelength. Complete the table. [3]

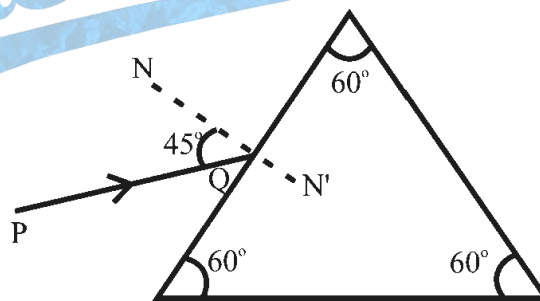
Gamma ray	X – ray	U V rays	Visible rays	Infrared	A	Radio waves
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- (a) Identify the radiation **A**. [3]
- (b) Name the radiation used to detect fracture in bones.
- (c) Name *one* property common to both **A** and Radio waves.
- (iii) (a) Why do we use red colour as a danger signal on the top of a skyscraper? [4]
- (b) The diagram below shows the path of a blue ray through the prism:
- Calculate the critical angle of the material of the prism for blue colour.
 - What is the measure of the angle of this prism (A)?
 - Which colour should replace the blue ray, for the ray to undergo Total Internal Reflection?



Question 5

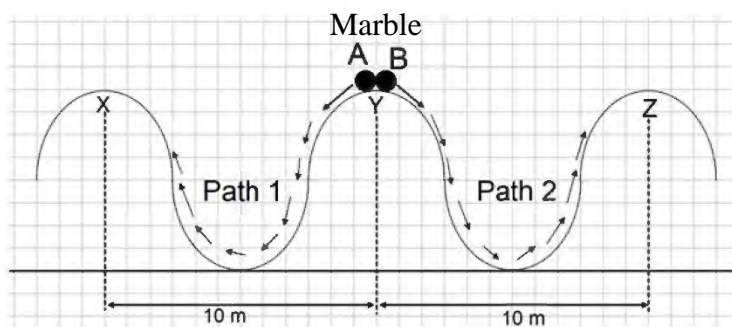
- (i) (a) Refractive index of glass with respect to water is $\frac{9}{8}$. [3]
Find the refractive index of water with respect to glass.
- (b) Name the principle used to find the value in part (a).
- (c) If we change the temperature of water, then will the ratio $\frac{9}{8}$ remain the same? Write **Yes** or **No**.
- (ii) Light travels a distance of ' $10x$ ' units in time ' t_1 ' in vacuum and it travels a distance of ' x ' units in time ' t_2 ' in a denser medium. Using this information answer the question that follows: [3]
- (a) 'Light covers a distance of ' $20x$ ' units in time ' t_1 ' in diamond.' State true or false.
- (b) Calculate the refractive index of the medium in terms of ' t_1 ' and ' t_2 '.
- (iii) A monochromatic ray of light is incident on an equilateral prism placed at **minimum deviation position** with an angle of incidence 45° as shown in the diagram. [4]
- (a) Copy the diagram and complete the path of the ray PQ.
- (b) State *two* factors on which the angle of deviation depends.



Question 6

- (i) (a) Define Centre of Gravity. [3]
- (b) A hollow ice cream **cone** has height 6 cm.
- Where is the position of its centre of gravity from the **broad base**?
 - Will its position change when it is filled completely with honey? Write **Yes** or **No**.

(ii)



[3]

Two identical marbles A and B are rolled down along Path 1 and Path 2 respectively. Path 1 is **frictionless** and Path 2 is **rough**.

- (a) Which marble will **surely** reach the next peak?
- (b) Along which path/s the **mechanical energy** will be conserved?
- (c) Along which path/s is the law of **conservation of energy** obeyed?

(iii) Given are two pulleys.

- (a) Copy and complete the labelled diagram connecting the two pulleys with a tackle to obtain Velocity Ratio = 2.
- (b) If Load = 48 kgf and efficiency is 80% then calculate:
 - 1. Mechanical Advantage.
 - 2. Effort needed to lift the load.

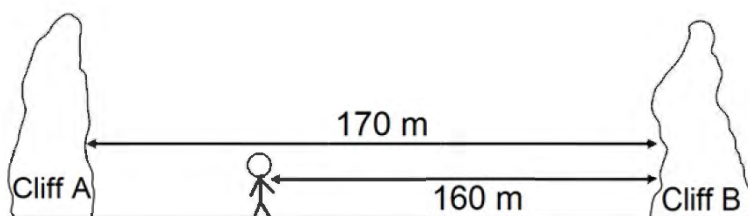


[4]

Question 7

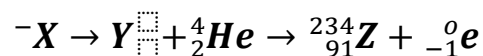
- (i) (a) Name the waves used in SONAR.
- (b)

[3]



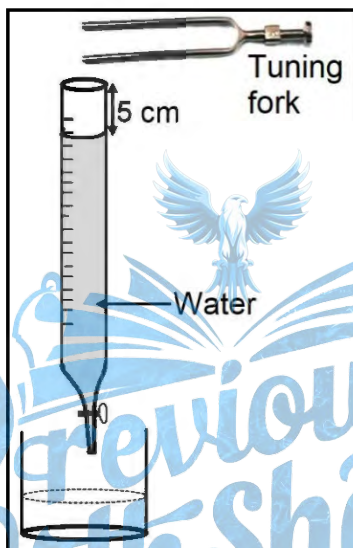
In the above diagram Lata stands between two cliffs and claps her hands. Determine the time taken by her to hear the **first** echo.
Speed of sound in air 320 ms^{-1} .

- (ii) (a) Complete the following radioactive reaction: [3]



- (b) Uranium is available in two forms U-235 and U-238. Which of the two isotopes of Uranium is **more** fissionable?

- (iii) In the given diagram, a vibrating tuning fork is kept near the mouth of a burette filled with water. The length of the air column is adjusted by opening the tap of the burette. At a length of 5 cm of the air column, a **loud sound** is heard. [4]



- (a) Name the phenomenon illustrated by the above experiment.
 (b) Why is a loud sound heard at this particular length?
 (c) If the present tuning fork is replaced with a tuning fork of higher frequency, should the length of the air column increase or decrease to produce a **loud sound**? Give a reason.

Question 8

- (i) The voltage - current readings of a certain material are shown in the table given below: [3]

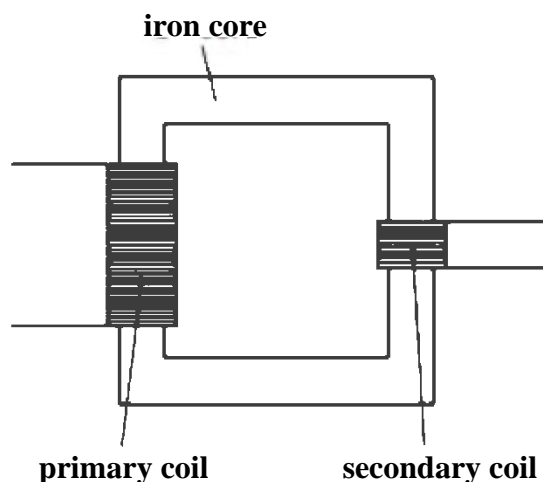
Voltage (V)	10 V	20 V	30 V
Current (I)	2 A	3 A	4 A

Study the table.

- (a) State whether the conductor used is ohmic or non-ohmic.
 (b) Justify your answer.
 (c) State Ohm's law.

(ii) Below is the diagram of a transformer:

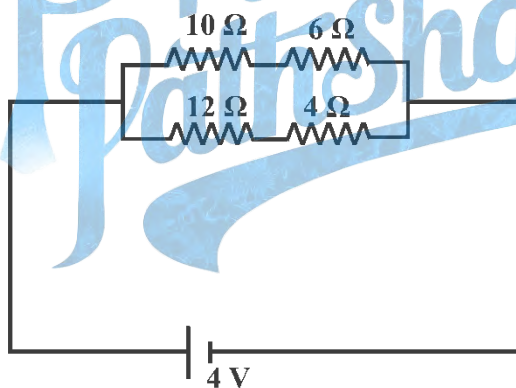
[3]



- (a) Identify the type of transformer.
- (b) In this type of transformer which of the wire is **thicker**, the primary or the secondary? Give a reason.

(iii) Study the diagram:

[4]



- (a) Calculate the total resistance of the circuit.
- (b) Calculate the current drawn from the cell.
- (c) State whether the current through 10 Ω resistor is greater than, less than or equal to the current through the 12 Ω resistor.

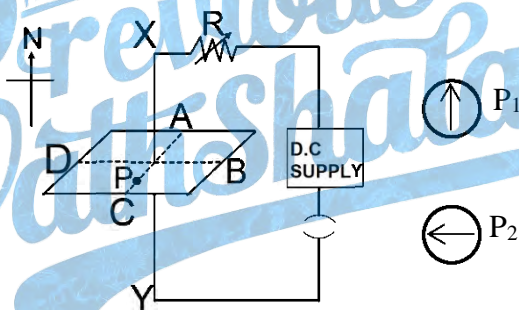
Question 9

- (i) 85 g of water at 30°C is cooled to 5°C by adding certain mass of ice. Find the mass of ice required. [3]

[Specific heat capacity of water = $4.2 \text{ Jg}^{-1}\text{C}^{-1}$, Specific latent heat of fusion = 336 Jg^{-1}]

- (ii) (a) Why does it become pleasantly warm when the lakes start freezing? [3]
(b) Water freezes to form ice. What change would you expect in the average kinetic energy of the molecules?
(c) Which will contain more heat energy 1 g of ice at 0°C or 1 g water at 0°C ?

- (iii) (a) State one factor that affects the magnitude of induced current in an AC generator. [4]
(b) Given below is a circuit to study the magnetic effect of electric current. ABCD is a cardboard kept perpendicular to the conductor XY. A magnetic compass is placed at the point P of the cardboard. P₁ and P₂ are the positions of the magnetic compass, before and after passing a current through XY respectively.



1. Name the **rule** that is used to predict the direction of deflection of the magnetic compass.
2. State the direction of current in the conductor (X to Y or Y to X) when the circuit is complete.
3. If resistance R is increased, then what will be the effect on the magnetic lines of force around the conductor?