Class-10th ICSE **PHYSICS** **MTS-1**

(Two hours)

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

You will not be allowed to write during the 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 I** is compulsory. Attempt **any four** questions from Section II.*

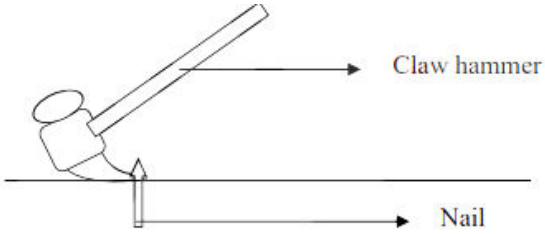
The intended marks for questions or parts of questions are given in brackets [ ].

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) (i) Define moment of force

(ii) Write the relationship between SI and CGS unit of moment of force **[2]**

(c) 400 g of mercury of specific heat capacity 0.14 $Jg^{-1}\,°C^{-1}$ is heated by a 200 W heater for 1 min. and 40 s. If initially mercury is at 0°C, calculate its final temperature. Initially mercury is at 0°C, calculate its final temperature. **[2]**

(d) (i) What do you understand by the term lateral displacement? (ii) State three factors which determine lateral displacement and also write the formula? **[2]**

(e) How will the magnetic field produced in a current carrying circular coil change if we **[2]**

(i) Increase the value of current.

(ii) Increase the distance from the coil.

(iii) Increase the number of turns of the coil?

Question 2

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

(i) Identify the radiation.

(ii) Why is this radiation mentioned by you, ideal for this purpose? **[2]**

(b) (i) What is the relation between the refractive index of water with respect to air ($_a\mu_w$) 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 5/3. Calculate the refractive index of air with respect to water ($_w\mu_a$). **[2]**

(c) State giving reasons if the following disintegration reactions are allowed or not **[2]**

(i) ${}_zX^A \longrightarrow {}_{Z-2}Y^A + \alpha$

(ii) ${}_zX^A \longrightarrow {}_{Z-1}P^A + \beta$

(d) (i) Calculate the K.E of mass 0.1 Kg and momentum 20 Kg. m/s

(ii)What is the main energy transformation that occurs in?

1. Photosynthesis in green leaves
2. Charging of a battery **[2]**

(e) (i) Name the system which enables us to locate underwater objects by transmitting ultrasonic waves and detecting the reflecting impulse.

(ii) What are acoustically measurable quantities related to pitch and loudness? **[2]**

Question 3

(a) (i) Define resonant vibrations.

(ii) Which characteristic of sound, makes it possible to recognize a person by his voice without seeing him? **[2]**

(b) How does an increase in the temperature affect the specific resistance of a: (i) Metal and (ii) Semiconductor? **[2]**

(c) Define the following

(i) Ohm's law and condition for ohms law

(ii) Ohmic and non-Ohmic conductors and graph related to them

(iii) KWH

(iv) Electrical energy **[2]**

(d) What is refractive index of a material? How is it related to?

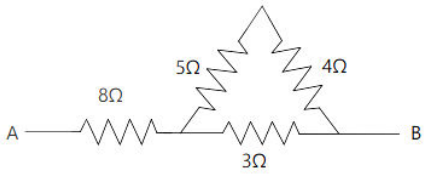
(i)Real and apparent depth

(ii)Velocity of light in vacuum or air and the velocity of light in a given medium? **[2]**

(e) Prove that efficiency of a machine is the ratio between mechanical advantage and velocity ratio.

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.

(ii) Give one example to support your answer. **[2]**

(c) (i) Describe with the help of a clear diagram the structure of a.c. transformer, suitable for lighting 12 V lamp from 240 V mains.

(ii) Explain how a transformer reduces emf? **[2]**

(d) In which situation does the lever of first order have mechanical advantage?

(a) More than 1 (b) less than 1 **[2]**

(e) (i) Why is the ratio of the velocities of light of wavelengths 4000Å and in vacuum 1:1?

(ii) Which of the above wavelengths has a higher frequency? **[2]**

SECTION II (40 Marks)

Attempt any four questions from this Section

Question 5

(a) (i) A wire of length 80 cm has a frequency of 256 Hz Calculate the length of a similar wire under similar tension, which will have frequency 1024 Hz.

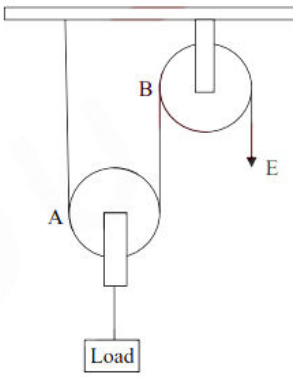
(ii) A certain sound has a frequency of 256 hertz and a wavelength of 1.3 m.

1. Calculate the speed with which this sound travels.

2. What difference would be felt by a listener between the above sound and another sound travelling at the same speed, but of wavelength 2.6m? **[3]**

(b) 0.5 kg of lemon squash at 30° C is placed in a refrigerator which can remove heat at an average rate of 30 J/s. How long will it take to cool the lemon squash to 5° C? Specific heat capacity of squash = 4200 J kg^{-1} K^{-1}. **[3]**

(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.

Question 6

(a) Explain the following: **[3]**

(i) Why does the weather become moderate in cold countries when the freezing of lakes and other water bodies start?

(ii) Why does it become very cold when ice starts melting in the cold countries?

(iii) Why is melting of ice a better coolant than water at zero degree Celsius?

(iv) Why does ice-cream feel colder than water at 0°C?

(v) Why does the weather become warm, when it snows?

(vi) Why does the weather become very cold after a hail storm?

(b) (i) A concave lens has focal length 15 cm. At what distance should the object from the lens be placed, so as to form an image at 10 cm from the lens. Also find magnification of the lens.

(ii) A lens which forms a real image has a focal length 8 cm. Calculate its power. **[3]**

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

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

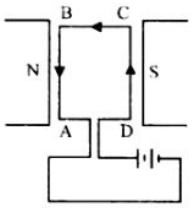
(ii) Calculate the distance of the image from the lens.

(iii) Calculate the magnification of the image.

(iv) Find the radius of curvature **[4]**

Question 7

(a) A rectangular coil ABCD is placed between the pole pieces of a horse-shoe magnet as shown in fig



(i) What is the direction of force on each arm?

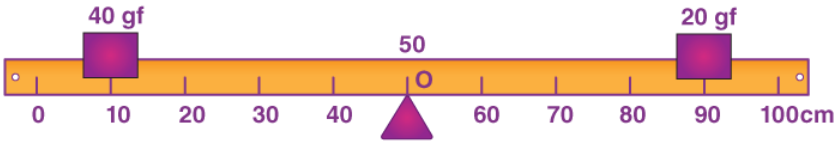
(ii) What is the effect of the forces on coil?

(iii)What is electromagnetic induction? State Faraday's laws of electromagnetic induction **[3]**

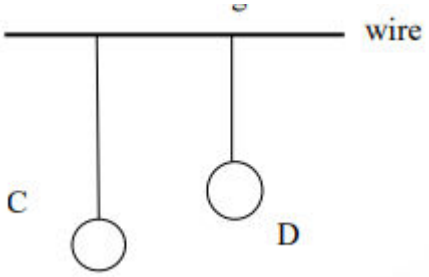
(b) Figure shows a uniform metre rule placed on a fulcrum at its mid-point O and having a weight 40gf at the 10 cm mark and a weight of 20 gf at the 90 cm mark.

(i) Is the metre rule in equilibrium? If not, how will the rule turn?

(ii) How can the rule be brought in equilibrium by using an additional weight of 40gf? **[3]**



(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



(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? **[4]**

Question 8

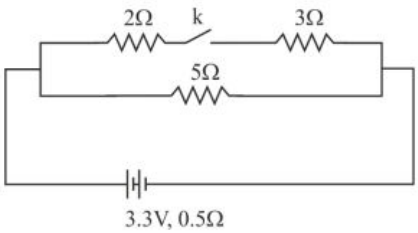
(a) (i) State the law of conservation of energy. **[3]**

(ii) Prove mathematically the law of conservation of energy.

(iii) Explain how a freely swinging pendulum obeys the law of conservation of energy.

(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 vibrations of the pendulum. If the velocity of sound in air is 340 m/s, find the distance between the cliff and the observer. **[3]**

(c) 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. **[4]**

Question 9

(a) (i) Define nuclear fission.

(ii) Rewrite and complete the following nuclear reaction by filling in the atomic number of Ba and mass number of Kr **[3]**

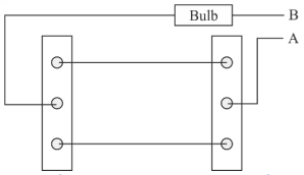
$$^{235}_{92}U + {}^{1}_{0}n \longrightarrow {}^{144}_{\quad\quad}Ba + {}^{\quad\quad}_{36}Kr + 3\,{}^{1}_{0}n + Energy$$

(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]**

Question 10

(a) The diagram below shows a dual control switch circuit connected to a bulb.



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

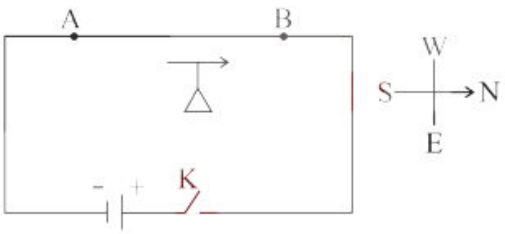
(ii) Out of A & B which one is the live wire and which one is the neutral wire? **[3]**

(b) (i) A straight wire conductor passes vertically through a piece of cardboard sprinkled with iron filings. Copy the diagram and show the setting of iron filings when a current is passed through the wire in the upward direction and the cardboard is tapped gently. Draw arrows to represent the direction of the magnetic field lines.

(ii) Name the law which helped you to find the direction of the magnetic field lines

(iii) State two ways by which the magnetic field of a solenoid can be made stronger. **[3]**

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



(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. **[4]**