



BEACON HIGH  
Preliminary Exam  
Physics - Paper 1

Grade: X  
Date: 12<sup>th</sup> Jan 09

MM: 80  
Time: 1 ½ Hr.

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 indented marks for questions or parts of questions are given in brackets [ ]

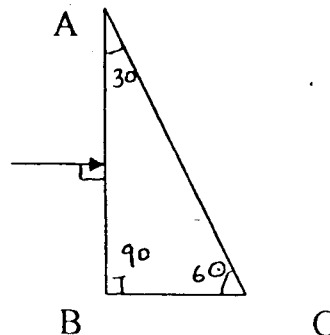
**SECTION I (40 Marks)**

**Compulsory: To be attempted by all candidates.**

**Question 1**

a) Mention two effects of refraction of light when it travels from denser medium to a rarer medium. [2]

b) A light ray PQ is incident normally on the face AB of the prism ABC. Show the path of emerging ray. [2]



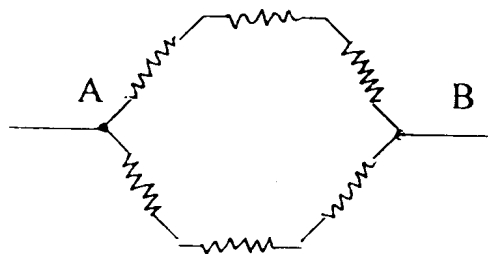
- c) What type of lens should be used to obtain a magnified image of a slide or a small filmstrip on a screen? Where should the slide be placed? [2]
- d) Name one electromagnetic wave which has frequency less than that of visible light. State one use of it. [2]
- e) If a monochromatic beam of light undergoes minimum deviation through an equiangular prism, (i) how does the beam pass through the prism, with respect to its base? (ii) If white light is used in the same way as in (i) what change is expected in the emergent beam? [2]

### Question 2

- a) The velocity of sound in air is 330 m/s. A man claps his hands while standing at a distance of 165 cm from the high wall. Will he hear a distinct echo of his clap. Give reason for your answer. [2]
- b) What change if any would you expect in the characteristics of musical sound when we increase: (i) its frequency and (ii) its amplitude [2]
- c) A radioactive nucleus  ${}^A_Z X$  first emits a beta particle and then an alpha particle and the resulting nucleus is represented by  ${}^P_C Y$ . What are the values of P and C in terms of A and Z. [2]
- d) Explain the meaning of the term latent heat. State its SI unit. [2]
- e) How much heat is needed to convert 5 kg of liquid ammonia into gas at the boiling temperature of ammonia ( $L = 1.4 \times 10^6 \text{ J/kg}$ ) [2]

### Question 3

- a) Why are thick copper wires used as connecting wires? [2]
- b) Calculate the equivalent resistance of the circuit as shown in the figure in which six equal resistors of 1 ohm each are connected in hexagonal form. [2]



- c) State the functions of the split rings in a dc motor.

d) Applying emf to primary coil is 210V. If the number of turns in the primary coil is 200 and that of secondary coil is 20 turns, find the output voltage. Name the type of transformer. [2]

e) You have just paid the electricity bill for your house

(i) what was it that your family consumed, for which you had to pay ?

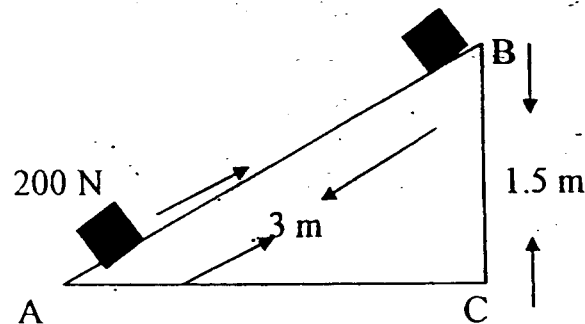
(ii) In what unit was it measured ? [2]

#### Question 4

a) i) Electric power  $P$  is given by the expression  $P = Q V / t$ . Express power in terms of current and resistance.

ii) Write joule's law of heating in mathematical equation. [2]

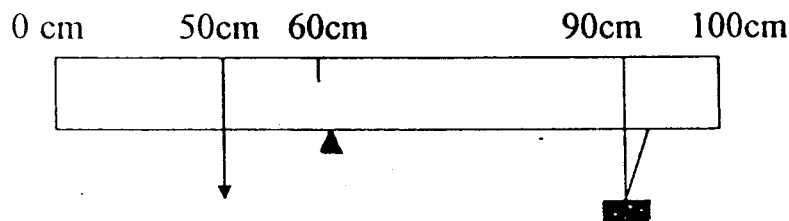
b) A block of mass 30 kg is pulled up a slope (diagram below) with a constant speed by applying a force of 200 N parallel to the slope. A and B are initial and final positions of the block. Calculate (i) the work done by the force moving the block from A to B (ii) the potential energy gained by the block. [2]



c) Give one point of difference between mass and weight. [2]

d) Justify by giving proper reasoning whether the work done in the following case is positive, negative or zero. -Work done by resistive force of air on vibrating pendulum in bringing it to rest. [2]

e) A uniform meter scale is kept in equilibrium when supported at 60 cm mark and as shown in the figure. State with reason whether weight of the scale is greater than, less than or equal to the weight of the mass  $M$ . [2]



## SECTION II

### Question 5

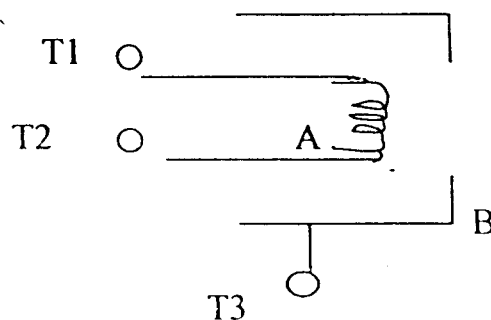
- A) The refractive index of glass is 1.5. From a point P inside a glass block. Draw rays PA, PB and PC incident on the glass-air surface at an angle of incidence  $30^\circ$ ,  $42^\circ$  and  $60^\circ$  respectively. In the diagram show the approximate direction of these rays as they emerge out of the block. Calculate the angle of refraction for the ray PB? (Take  $\sin 42^\circ = 2/3$ ). [4]
- B) An object of length 10 cm stands vertically on the principle axis of a converging lens of focal length 10 cm at a distance of 17 cm from the lens. By drawing, find the position, size & nature of the image. [3]
- C) A ray of light of wavelength  $5400 \text{ \AA}$  suffers refraction from air to glass. Taking a  $U_g = 3/2$  find the wavelength of light in glass. [3]

### Question 6

- A) A certain sound has the frequency of 256 Hz and a wavelength of 1.3 m. Calculate the speed with which this sound travels. What difference would be felt by a listener between this sound and another sound traveling at the same speed but of wavelength 2.6 m. [4]
- B) Give two conditions under which resonance occurs. [2]
- C) i) Write an expression for the resistance of a conducting wire in terms of its length and area of cross section. [2]
- (ii) State two factors on which the resistivity of wire depends [2]

### Question 7

- A) The following diagram is the simplified version of an electron gun which is an integral part of a cathode ray tube. A is the filament and B is the metal cylinder (i) copy diagram on your answer sheet. Draw a pair of plates  $P_1$  and  $P_2$  to apply electric field and an enclosure. (ii) What are functions of A, B,  $P_1$  and  $P_2$ . [6]



B) a mass of 40 g of brass of specific heat capacity  $0.85 \text{ J/g/K}$  is heated in an oven and then quickly transferred into 240 g of water at  $30^\circ \text{C}$  in a calorimeter of mass 60 g and specific heat capacity  $0.4 \text{ J/g/K}$ . If the final temperature is  $50^\circ \text{C}$ . What was the temperature of the oven? [4]

### Question 8

A (i) Which material is the calorimeter commonly made of? Why? [2]

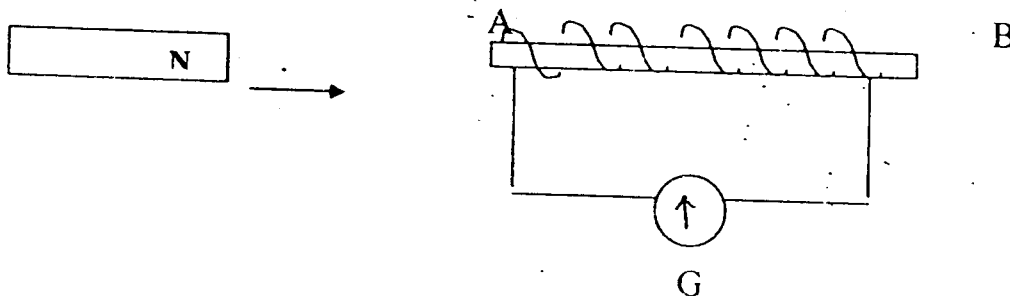
(ii) Snow on a mountain does not melt all at once. Justify your answer by giving reason. [2]

B) A cell supplies a current of 0.6 A through a 2 ohm coil, and a current of 0.3 A through a 8 ohm coil. Calculate the emf and the internal resistance. [3]

D) Draw a sketch of an electric bell with electrical connections and label the main parts. [3]

### Question 9

A) The diagram below shows a coil connected to centre zero galvanometer G. The galvanometer shows deflection to the right when the N pole of a powerful magnet is moved to the right as shown :



- Explain why the deflection occurs in the galvanometer?
- What is the direction of the current when viewed from end A?
- State the observation in G when the coil is moved away from N
- State the observation in G when, both coil and the magnet are moved to the right at the same speed. [4]

B) State the purpose of fuse in an electric circuit. [3]

C) A family uses a light bulb of 100 W, a fan of 100 W and electric heater of 1000 W each for 8 hours daily. If the cost of electricity is Rs 2.00 per unit, what is the expenditure for the family per day on electricity? [3]

### Question 10

A) (i) State Lenz's law.

[2]

(ii) State Newton's second law of motion both in words and in equation form. [3]

C) The figure below shows the combination of a movable pulley P1 with a fixed pulley P2 used for lifting up a load W.

(i) State the function of the fixed pulley P2.

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

(iii) Calculate the force to be applied at C to just raise the load  $W=20 \text{ kgf}$ , neglecting the weight of the pulley P1 and friction. [5]

