

THE CATHEDRAL AND JOHN CONNON SCHOOL
PHYSICS PRELIMINARY EXAMINATION

STD X

DATE : 10- 01- 2019

MARKS: 80

TIME: 2 hrs+10m RT

This paper consists of 5 printed sides.

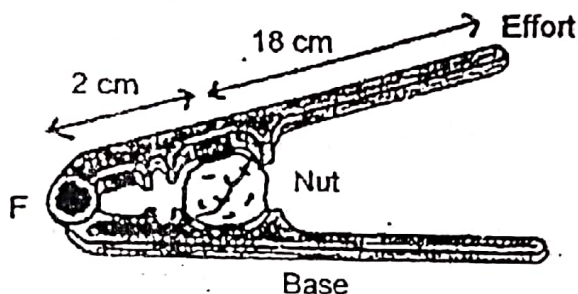
Take $g = 10 \text{ m/s}^2$, SHC of water = $4.2 \text{ J/g } ^\circ\text{C}$, SLHF of ice = 336 J/g wherever necessary.

SECTION 1 (40 MARKS) ATTEMPT ALL QUESTIONS.

Each question carries 2 marks.

QUESTION 1

- a. The diagram alongside shows a nutcracker with a wooden base. If the effort required to crack the nut is 50 N, find the resistance offered by the nut. [2]



- b. Which physical quantity does the MeV measure? How is it related to the S I unit of this quantity? [2]
- c. Draw a neat labeled diagram of a combination of one fixed and one movable pulley to raise a load, marking the directions of all the forces acting on it. [2]
- d. Calculate the number of alpha and beta particles emitted when uranium nucleus ${}_{92}\text{U}^{238}$ decays to lead ${}_{82}\text{Pb}^{206}$. [2]
- e. How much work is done when a body moves along an arc of a circular path? Explain your answer. [2]

QUESTION 2

- a. Draw a neat, labelled diagram of an A.C. generator. [2]
- b. Mention two reasons why soft iron core is used within the coil of an electromagnet. [2]
- c. State the function of a split ring in a D.C. motor. [2]
- d. State the energy conversions taking place in each of the following cases:

- (i) Water freezes to ice.
(ii) Electric toaster being used.

[2]

[2]

c. Copy and complete the following table:

Type of lens	Position of object	Nature of image	Size of image
Convex	At F		
Concave	At infinity		

QUESTION 3

- a. Why does it become very cold after a hailstorm? [2]
- b. A 10 ohm thick wire is stretched so that its length becomes three times. Calculate the resistance of the new wire. [2]
- c. Explain why water is used in hot water bottles for fomentation? [2]
- d. What is the cause of dispersion? [2]
- e. A force of 20 N acts on a wheel of 50 cm radius, tangentially. What is the torque acting on the wheel? [2]

QUESTION 4

- a. An electric heater of power 500 W raises the temperature of 5 kg of a liquid from 20 °C to 35 °C in 2 minutes. Calculate the heat capacity of the liquid. [2]
- b. Name two factors on which the deviation produced by a prism depends. [2]
- c. Two resistors when connected in series have a resistance of 36 ohms and when connected in parallel, have a resistance of 8 ohms. Find the value of each resistance? [2]
- d. (i) What is the angular deviation of the emergent ray from a glass block with respect to the incident ray ?
(ii) What should be the ratio of the speed of light through a liquid to the speed of light through glass so that there is no refraction of light at the boundaries of the glass, when the system is illuminated by a monochromatic ray of light? [2]
- e. (i) ${}_{12}\text{Mg}^{27}$ emits a beta – particle and is transformed to aluminium. Write down the mass number and atomic number of aluminium.
(ii) Aluminium emits a gamma ray. What is the resulting nucleus? [2]

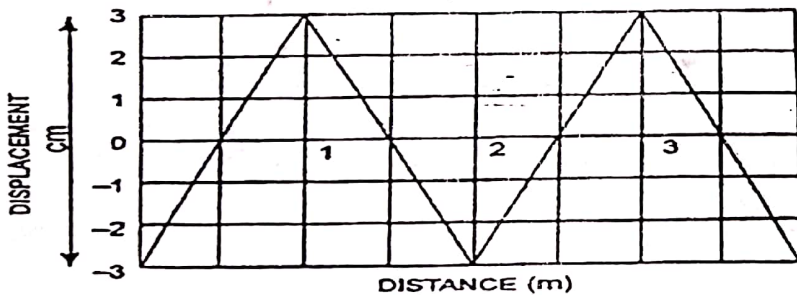
SECTION II (40 MARKS) -- ATTEMPT ANY FOUR QUESTIONS.

QUESTION 5

- a. (i) What do you understand by the term 'couple'?
 (ii) What is its effect?
 (iii) State the relation between the S I unit and cgs units of couple. [3]
- b. An electric motor of power 150 W is switched on for 2 minutes and 40 seconds. If 65 % of the energy of the motor is useful, calculate:
 (i) useful work done by the motor.
 (ii) load lifted by it through a vertical height of 4 m. [Take $g = 10 \text{ N / kg}$] [3]
- c. State the law of conservation of energy. Show that in the case of a freely falling body under gravity, the sum of K E and P E remains constant. [4]

QUESTION 6

- a. The diagram represents a wave motion. The wave travels at 12 m/s.
 Calculate: (i) Amplitude, (ii) Wavelength, (iii) Frequency of the wave. [3]



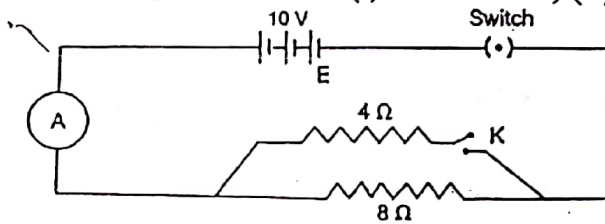
- b. Draw a neat, labelled ray diagram to illustrate the use of a spherical lens as a reading glass. [3]

- c. A postage stamp appears raised by 7.0 mm when placed under a rectangular glass block of refractive index 1.5. Find the thickness of the glass block. Also, draw a ray diagram to illustrate the above phenomenon. [4]

QUESTION 7

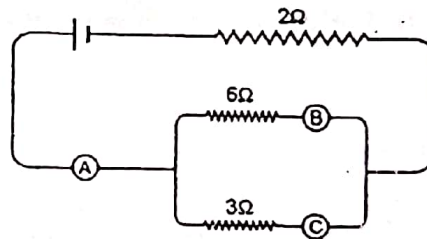
a. Calculate the reading of A when: (i) K is closed, (ii) K is open.

[3]



b. In the given figure, A, B and C are three ammeters. The ammeter B reads 0.5 A. (All ammeters have negligible resistance. Calculate: (i) the readings of ammeters A and C, (ii) the total resistance of the circuit.

[3]



c. From the diagram given below:

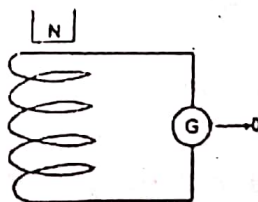
[4]

(i) What will you observe when:

- (1) The magnet is dropped into the coil.
- (2) The number of turns of the coil is increased?

(ii) What will be the direction of current flowing through the coil when the magnet is dropped in?

(iii) State the law which explains this observation



QUESTION 8

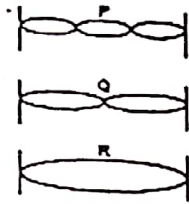
a. A radar is able to detect the reflected waves from an enemy aero plane after a time period of 0.02 milli-seconds. If the velocity of the wave is 3×10^8 m/s, calculate the distance of the plane from the radar.

[3]

b. Draw a neat labeled diagram of a horse-shoe shaped electro-magnet, showing the polarity at each end.

[3]

c. The diagram given below shows 3 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? [4]
- (iii) State the ratio of wavelengths of P and Q.

QUESTION 9

- a. Calculate the resistance of a nichrome wire which will bring 200 g of water at 25°C to its boiling point in 10 minutes, when the current flowing through it is 5 A. [3]
- b. Water falls from a height of 50 m. Calculate the rise in the temperature of water when it strikes the bottom. [3]
- c. (i) State the principle of calorimetry.
- (ii) A hot body of mass m_1 of a substance of specific heat capacity c_1 at a temperature t_1 is mixed with another body of mass m_2 of specific heat capacity c_2 at a lower temperature t_2 . Deduce an expression for the final temperature of the mixture t_3 . [4]

QUESTION 10

- a. (i) What do you understand by the term 'nuclear fusion'?
- (ii) State one advantage of using nuclear fusion to produce electricity, as compared to nuclear fission.
- (iii) State one medical use of a radio – isotope. [3]
- b. The ore of uranium found in nature contains both ${}_{92}\text{U}^{238}$ and ${}_{92}\text{U}^{235}$. Although both the types are fissionable, it is found out experimentally that one of them is more easily fissionable.
 - (i) Name the isotope of uranium which is easily fissionable.
 - (ii) Give a reason for your answer.
 - (iii) Write a nuclear reaction when U – 238 emits an alpha particle to form a Thorium (Th) nucleus. [3]
- c. (i) Name the gas formed when an alpha particle acquires two electrons.
- (ii) Why are alpha radiations used in making luminescent signs?
- (iii) Why are alpha radiations not used in radio-therapy?
- (iv) In beta emission from a radio-active substance, an electron is ejected. Where does this electron come from? [4]

