

ATUL VIDYALAYA
SECOND PRELIMINARY EXAMINATION 2012 - 13
SCIENCE PAPER I (PHYSICS)

STD : X
DATE: 21-11-12
SESSION : I

MM:80
TIME: 1½ HRS

*Answers to this paper should 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.
Time given at the head of the paper is the time allowed for writing the answers.
Attempt **all** questions from **Section I** and **any four** questions from **Section II**.
The intended marks for questions or parts of questions are given in the brackets [].*

Section I

All questions in this section are compulsory

Question 1

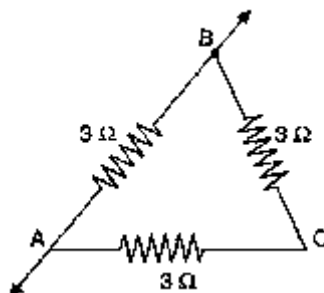
[2 x 5 = 10]

- (a) A light mass and a heavy mass have equal momentum. Which will have more kinetic energy and why?
- (b) Give one example each, for the conversion of sound energy to electric energy and chemical energy to light energy.
- (c) Draw a ray diagram to illustrate the formation of an image in a simple microscope.
- (d) Draw a labelled diagram of a single movable pulley system used to raise a load. Indicate directions of the load, effort and tension in the string.
- (e) Why violet light is scattered more than red light.

Question 2

[2 x 5 = 10]

- (a) What are the SI units of heat capacity and specific heat capacity?
- (b) State any two differences between total internal reflection from a prism and reflection from a plane mirror.
- (c) A, B and C are resistors of resistance 1 , 2 and 3 respectively. Calculate their equivalent resistance.



- (d) State the changes taking place in speed and frequency of a light ray as it travels from an optically rarer medium to a denser one.
- (e) Define non-contact force and state one factor on which its magnitude depends.

Question 3

[2 x 5 = 10]

- (a) Arrange the following in ascending order of frequency: X-rays, radiowaves, IR radiation, γ -rays, UV rays
- (b) State two properties of fuses wire.
- (c) Why is the core of the electromagnet used in an electric bell made of soft iron and not steel? Give two reasons.
- (d) An isotope of uranium, ${}_{92}\text{U}^{238}$ is radioactive. It emits an alpha particles and gamma rays. Using standard symbols, write down an equation to illustrate the changes in the nuclei.
- (e) State two precautions used while handling radioactive substance.

Question 4

[2 x 5 = 10]

- (a) Can a transformer work when it is connected to a D.C. source?
- (b) Explain, how β emission changes the nucleus of an unstable element.
- (c) Why should the internal resistance of a cell be low?
- (d) Draw a labelled sketch of a step-up transformer.
- (e) Calculate the heat energy required to melt 10 kg of ice at 0°C and become water at 0°C . (Take latent heat of ice as 334 kJ/kg. Express your answer in SI units).

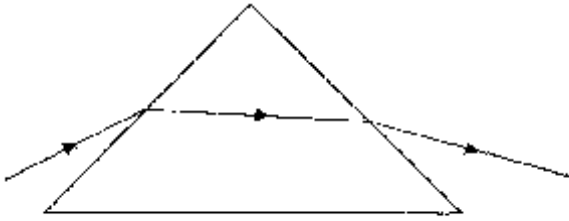
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Section II

Answer any four out of six questions

Question 5

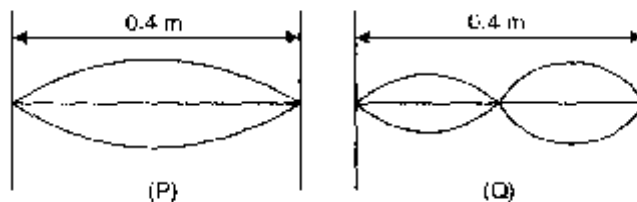
- (a) Figure shows a prism and refraction of a monochromatic ray through it. Complete the diagram to show (i) angle of incidence, (ii) angle of refraction (iii) angle of emergence, (iv) angle of deviation [4]



- (b) An electric heater raises the temperature of 5000 g of a given liquid. The electric heater is rated 1 kW power. To raise the temperature of the liquid from 25°C to 31°C, a heater required 120 seconds. Calculate: (i) the heat capacity of the liquid. (ii) the specific heat capacity of the liquid. [3]
- (c) A radio transmits waves of frequency 106 Hz. Calculate the wavelength of the waves if their speed in air is 3.0×10^8 m/s. [3]

Question 6

- (a) A sound of wavelength 68 cm travels 850 m in 2.5 s. Calculate (i) velocity of sound, (ii) frequency of sound. [4]
- (b) A stretch wire 0.4 m long is made to vibrate in of the wave in two different modes as shown. What is the wavelength of the wave in [3]



- (i) mode P (ii) mode Q (iii) in which case the note becomes louder?
- (c) What is a fuse? In which part of the wiring is it connected? [3]

Question 7

- (a) Draw two wiring diagrams of a dual control (staircase) switch, both the diagrams showing the combination turned 'ON'. [4]
- (b) (i) Define the term thermionic emission. [3]
(ii) Mention two factors which determine the rate of thermionic emission.
- (c) Answer the following questions about direct current electric motor (D.C. motor): [3]
(i) What is the function of the carbon brushes?
(ii) What is the function of laminated core?
(iii) In which position is the deflecting couple acting on the coil maximum?

Question 8

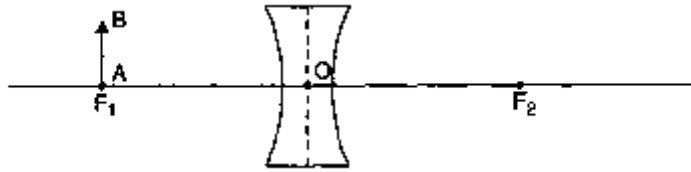
- (a) Draw a labelled sketch of a crowbar as a lever of class I. Obtain a relation between its velocity ratio, effort arm and load arm. [4]
- (b) A boy of mass 50 kg runs upstairs and reaches 8 m high first floor in five seconds. Calculate: (i) the force of gravity acting on the boy. [3]
(ii) the work done by him against gravity. (iii) the power developed by the boy.

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- (c) What happens to the kinetic energy when:
- (i) the mass of the body is doubled at constant velocity?
 - (ii) the velocity of the body is doubled at constant mass?
 - (iii) the mass of the body is doubled but the velocity is reduced to half?
- [3]

Question 9

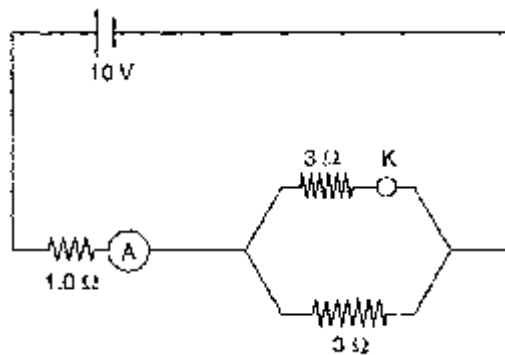
- (a) The diagram below shows a small linear object AB placed at the principal focus F_1 of a diverging lens. The points O and F_2 are the optical centre and principal focus of the lens. Using two rays, diagram to locate the image formed in the lens. Mention two characteristics of this image.
- [4]



- (b) What is meant by total internal reflection? What are the two conditions which must be fulfilled for total internal reflection to take place?
- [3]
- (c) Calculate the power of a convex lens of focal length 20 cm.
- [3]

Question 10

- (a) In the circuit shown, find the reading of the ammeter A when the key K is (i) open (ii) closed.
- [4]



- (b) What is an electromagnet? Suggest two ways by which its strength can be increased.
- [3]
- (c) A table lamp of power 60 W consumed 9 (commercial) units of electricity in the month of April. For how many hours per day, on an average, was the lamp in use?
- [3]
