PHYSICS

SCIENCE Paper – 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) (i) Define the least count of an instrument. [2]

(ii) What is the least count of a standard laboratory micrometer screw gauge?

(b) A spring balance is used to find the weight of a body X on the surface of the moon. The mass of the body X is 2 kg and its weight is recorded as 3.4 N. The weight of another body Y recorded by the same balance is found to be 7.65 N. Calculate the mass of the body Y. [2]

(c) State two differences between mass and weight. [2]

(d) Two pendulums P and Q have equal lengths but their bobs weigh 10gf and 20gf respectively. [2]

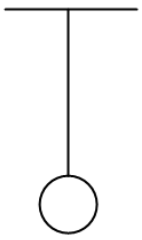
(i) Compare their time periods.

(ii) Give a reason for your answer.

(e) Why do we need to run a certain distance before getting into a moving bus? [2]

Question 2

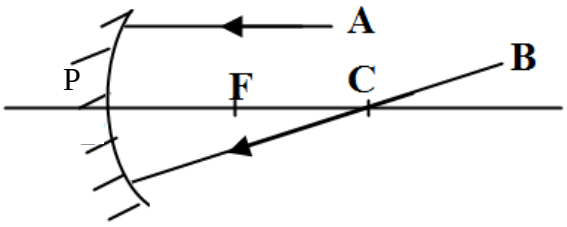
(a) Copy the diagram below and clearly mark the directions of the forces that act on it and name the forces. [2]



(b) If I travel from Mumbai to Pune (150 Km) in 2½ hrs via the Express Highway and return to Mumbai via the old High way (180 km) in 3½ hrs, calculate the average velocity during the entire journey. [2]

(c) Define retardation and give an example of a body having this motion. [2]

(d) Copy the diagram and complete the path of the rays A and B. [2]



(e) State the purpose of using the following in an electric circuit. [2]

(i) Ammeter

(ii) Rheostat

Question 3

(a) A sound wave of frequency 500Hz and wavelength 0.66m is travelling in a medium. Calculate the velocity of the wave in the medium. [2]

(b) Sound waves A & B are travelling in two different media. Find which wave will be travelling faster, when: [2]

(i) A is travelling in water and B is travelling in CO_2.

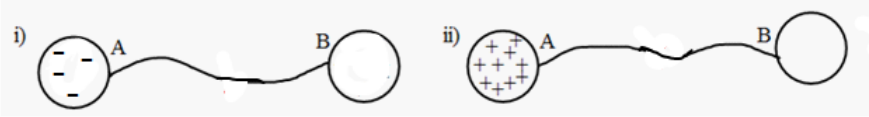
(ii) A is travelling in CO_2 and B is travelling in hydrogen

Also support your answers with reasons.

(c) A body is completely immersed in a fluid. [2]

State two factors on which the upthrust acting on the body depends.

(d) A and B are two metal spheres which are connected with the help of a metal wire. State the direction of flow of electrons in each case. [2]



(e) Why do we use a convex mirror as a rear view mirror? [2]

Question 4

(a) State two differences between an electromagnet and a permanent magnet. [2]

(b) Why does a magnet suspended freely from its CG, always come to rest along the north south direction of the earth? [2]

(c) State the second law of Thermodynamics in energy flow (Law of conservation of energy). [2]

(d) Name and state the principle on which the hydraulic brakes of a car work. [2]

(e) State two main human activities which are responsible for the increase of carbon dioxide gas in the atmosphere. [2]

SECTION II (40 Marks)

*Attempt any **four** questions from this Section*

Question 5

(a) A train is moving at a velocity of 25 ms^{-1}. It is brought to rest by applying the brakes which produces a uniform retardation of 0.5 ms^{-2}. Calculate [3]

(i) the velocity of the train after 10 s

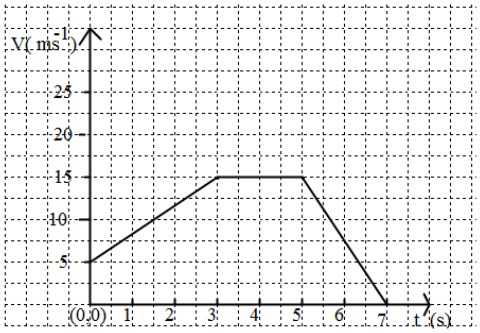
(ii) If the mass of the train is 20000 kg then calculate the force required to stop the train.

(b) (i) State the universal law of gravitation. [3]

(ii) Express it in a mathematical form. (Explain the symbols used.)

(iii) State the value of universal gravitation constant in S.I. unit.

(c) Using the following velocity time graph of a body answer the following questions. [4]



(i) During which time intervals is the body moving with variable velocity?

(ii) What is the acceleration of the body during the interval 3 s to 5 s?

(iii) What is the displacement of the body in the last four seconds of its motion?

Question 6

(a) (i) Differentiate between the terms supersonic and ultrasonic. [3]

(ii) State two uses of ultrasound.

(b) State three factors on which the speed of sound depends. [3]

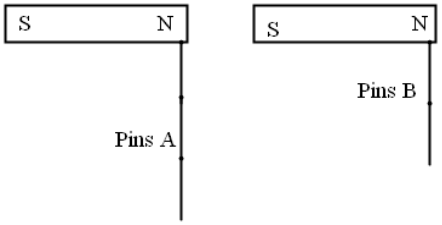
(c) The speed of sound in air is 320 ms^{-1} and in water it is 1600ms^{-1}. It takes 2.5 s for sound to reach a certain distance from the source placed in air. [4]

(i) Find this distance.

(ii) How much time will it take for sound to travel the **same distance** when the source is in water?

Question 7

(a) The diagrams below show pins suspended from the same magnet to their maximum limit in two different cases. State with a reason whether the set of pins A or the set of pins B are made out of soft iron. Also define the magnetic process which enables us to suspend the pins one below the other. [3]



(b) (i) Define a secondary cell. [3]

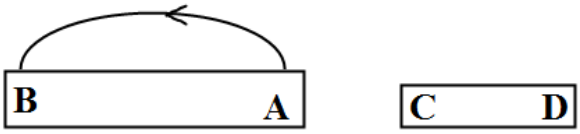
(ii) Give one example of a secondary cell.

(iii) State one advantage of a secondary cell over a primary cell.

(c) (i) Define a neutral point. [4]

(ii) In the diagram below AB is a magnet and CD is an iron bar.

Study the diagram and determine the polarities at the ends A,B and D.



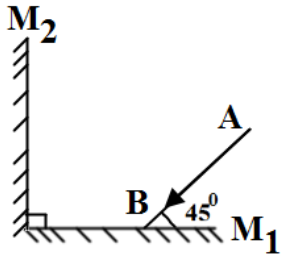
Question 8

(a) The area of pistons in hydraulic machine are 6 cm^2 and 576 cm^2. What force on the smaller piston will support a load of 1152 N on the larger piston? [3]
State the assumption made in the above calculation.

(b) (i) Define global warming. [3]

(ii) State two ways by which global warming impacts on life on earth.

(c) Complete the path of the ray AB over plane mirrors M_1 and M_2 and label all the angles of incidences. [4]



Question 9

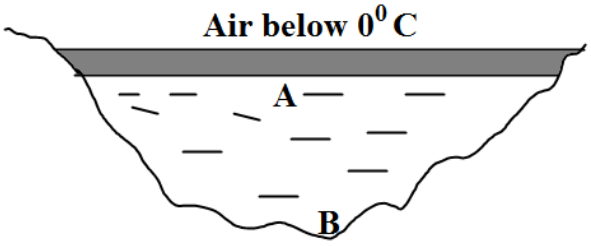
(a) (i) Why does a piece of steel sink in water but float on mercury? [3]

(ii) If a bowl is formed from the same steel piece then it can float in water. Why?

(b) The diagram below shows a frozen pond in a cold region. [3]

(i) State the expected temperatures at A and B.

(ii) Name the phenomenon responsible for these temperatures mentioned in part (i)



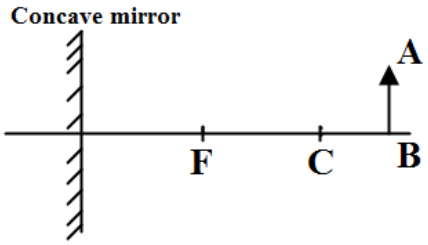
(c) A metal piece weighs 200 gf in air and 150 gf when completely immersed in water. [4]

(i) Calculate the relative density of the metal piece.

(ii) How much will it weigh in a liquid of density 0.8 gcm^{-3}?

Question 10

(a) Copy and complete the following ray diagram to obtain the image of the object AB kept in front of the concave mirror. [3]



(b) An object of height 20 cm is kept at a distance of 48 cm in front of a mirror of focal length 12 cm. If the mirror forms a virtual, diminished image of the object then calculate [3]

(i) the distance of the image from the mirror.

(ii) its magnification.

(c) Study the diagram below and [4]

(i) Identify the electrical components labelled A,B and C.

(ii) State whether the circuit given below is open or closed.