PRACTICE PAPER 1

Time Allowed : 1½ Hour | *Maximum Marks :* 80

General Instructions—

(*i*) *This question paper is divided into two sections.*
(*ii*) *Section I is compulsory.*
(*iii*) *Attempt any four questions in Section II.*
(*iv*) *The intended marks for questions or parts of questions are given in brackets [ ].*

SECTION–I (Attempt all questions) 40 Marks

Q1. (*a*) Name four common units of time which are greater than the second but less than a year. **[2]**
(*b*) What is the value of 100 dyn on a system based on metre, kilogram and second ? **[2]**
(*c*) How do weather changes affect atmospheric pressure ? **[2]**
(*d*) Draw a sketch of distance-time graph of a body moving with uniform speed when its initial displacement is (*i*) zero (*ii*) not zero. **[2]**
(*e*) A railway locomotive with a mass of 80 tonnes accelerates at a rate of 2 m/s^2. What force does the engine of the locomotive exert ? **[2]**

Q2. (*a*) In what conditions of a spring, does it exert force on objects attached at its ends ? **[2]**
(*b*) Name two sources of carbon dioxide gas in the atmosphere. **[2]**
(*c*) Why does a person fall off the back of a stationary horse if the horse darts off suddenly ? **[2]**
(*d*) Let the surface of a lake is frozen and the temperature of air in contact is – 10 °C. Mention the maximum expected temperature in contact with the lower surface of layer of ice and in the bottom of the lake. **[2]**
(*e*) What temperature Fahrenheit is equivalent to (*i*) 0 °C (*ii*) 100 °C ? **[2]**

Q3. (*a*) Distinguish between heating an object by doing work on it and by supplying heat to it. **[2]**
(*b*) State first law of thermodynamics. **[2]**
(*c*) Light comes through a small key hole. An inverted image of a building outside is seen through the door of your school's dark room on the opposite wall of the dark room. Explain why. **[2]**
(*d*) An object is placed between two plane parallel mirrors. Why do they get fainter and fainter ? **[2]**
(*e*) Why are the concave mirrors used as shaving mirrors ? **[2]**

Q4. (*a*) An observer moves towards a stationary plane mirror at a speed of *V* m/s. With what speed will his image move towards him ? **[2]**
(*b*) Why does the sound travel faster on a cloudy day than on a dry day ? **[2]**
(*c*) Time period of the particles of a medium is 2×10^{-3} s and wavelength of corresponding wave is 3 m. Find the speed of the wave in the medium. **[2]**
(*d*) A primary and a secondary cell are of same *e.m.f.* From which can we draw a maximum current ? **[2]**
(*e*) Can you separate the two magnetic poles ? **[2]**

SECTION–II (Attempt any four questions) 40 Marks

Q5. (*a*) A vernier scale has 10 divisions and on its main scale 1 cm is divided in ten parts. The number of divisions on the left hand of zero of vernier scale is 56 and 8th vernier scale division coincides with the main scale. If the instrument has 0.09 cm of negative zero error, calculate the corrected length. **[3]**

(*b*) Express the smallest possible value measured accurately using the following instruments :

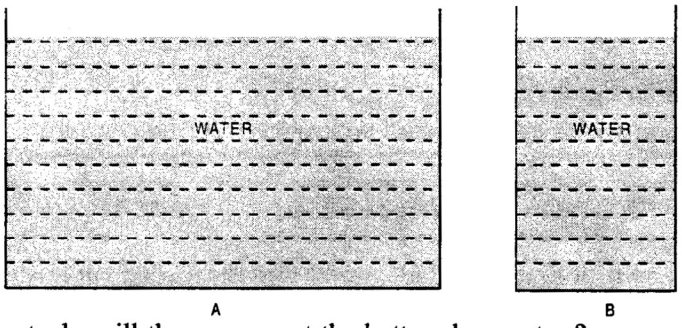
(*i*) Metre rule (in mm) (*ii*) Vernier callipers (Least count 0.1 mm)

(*iii*) Screw gauge (Least count 0.001 cm) (*iv*) Thermometer (0.1°C)

(*v*) Protractor (in degrees) (*vi*) Spring balance (Least count 5 g). **[3]**

(*c*) (*i*) What do you mean by graph ? Mention two necessary rules to plot a graph ?

(*ii*) Two tanks A and B are filled with water to the same height as shown in the figure given below.



In which of the two tanks will the pressure at the bottom be greater ? **[4]**

Q6. (*a*) A lift gets accelerated from rest to a speed of 72 km/h in $\frac{1}{12}$ minute. It then moves uniformly for next 30 s before coming to rest at the topmost storey of the building in 8 s. Draw

(*i*) Velocity-time graph of the lift. (*ii*) What is the acceleration of the lift ?

(*iii*) What is the retardation of the lift ? (*iv*) What is the height of the building ? **[4]**

(*b*) A body starts from rest and moves with a constant acceleration *a*. Show its instantaneous velocity varies directly as the square root of the distance travelled. **[3]**

(*c*) (*i*) A body has constant acceleration. During its motion, is it possible that body can travel opposite to the direction of acceleration ? Give an example.

(*ii*) Why does square of time occur in a unit of acceleration ? **[3]**

Q7. (*a*) State Newton's law of gravitation. Distinguish between gravity and gravitation. **[4]**

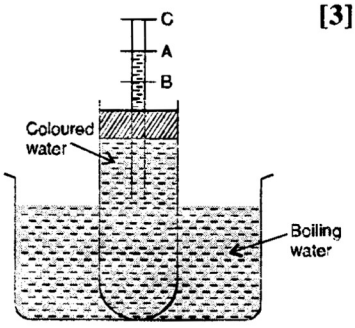
(*b*) Why are girders supporting bridges mounted on rollers ? **[3]**

(*c*) (*i*) Is it correct to say that second law of motion is the real law of motion ?

(*ii*) A mass of 5 kg is acted upon by a force of one newton. Starting from rest, how much is distance covered by the mass in 20 s ? **[3]**

Q8. (*a*) The area of a copper plate at 0 °C is 3 m^2. Calculate the area of plate when it is heated through 40 °C. Take coefficient of linear expansion of copper = 0.000016 $°C^{-1}$. **[3]**

(*b*) Given figure shows a hard glass test tube containing coloured water such that level of water is up to point A. The test tube is placed in a large beaker containing boiling hot water, it is observed that level of coloured water first drops to B and then rises up to C. Answer the following questions :



(*i*) Why is there a drop in the level of water ?

(*ii*) Why does the level of water start rising after sometime ?

(*iii*) State two important deductions which can be made regarding the action of heat on liquids from the above observations.

(*iv*) If the test tube is placed in ice cold water, instead of boiling hot water, state your observations with reasons. **[4]**

(*c*) (*i*) Write the relation between coefficient of volume expansion and coefficient of linear expansion.

(*ii*) A metallic ball is heated through a certain temperature. Out of radius, surface area and volume, which will undergo least percentage increase and which will undergo largest percentage increase ? Why ? **[3]**

Q9. (*a*) State three practical uses of ultrasonic vibrations. **[3]**

(*b*) (*i*) A clock having marks instead of numbers on its dial appears to indicate 4 : 35 when viewed through a plane mirror. What is the correct time ? Explain the anomaly.

(*ii*) Draw a neat ray diagram to illustrate how a concave mirror is used as a shaving mirror. **[3]**

(*c*) Answer the following questions :

(*i*) Which mirror has the highest radius of curvature ?

(*ii*) Which mirror (plane/spherical) has the least focal length ?

(*iii*) What is the relation between mirror radius and its focal length ?

(*iv*) Why are dish antenna's shaped hemispherical ? **[4]**

Q10. (*a*) A conductor is mounted on an insulating stand. A glass rod rubbed with silk is brought near the conductor (not touched).

A proof plane is touched to the surface of the conductor far from the rod and then the proof plane is touched to the cap of a positively charged gold-leaf electroscope. What will be your observation ? Give a reason for it. **[3]**

(*b*) Is dry cell really dry ? Explain. **[3]**

(*c*) (*i*) Two long needles are attached to the poles of a horse-shoe magnet. Show the positions on a diagram occupied by the needles and name the phenomenon which comes into play.

(*ii*) State one way in which magnetism can be lost. **[4]**

Answers

Ans. 1. (*a*) (*i*) minute (*ii*) hour (*iii*) day (*iv*) month.

(*b*) 10^5 dyn = 1 kg m/s^2

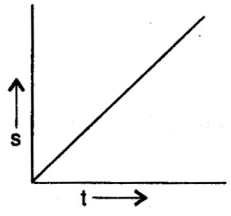
$\therefore$ 100 dyn = $\frac{1}{10^5} \times 100$ kg m/s^2 = 10^{-3} kg m/s^2 or 10^{-3} N.

(*c*) Two simple aspects are :

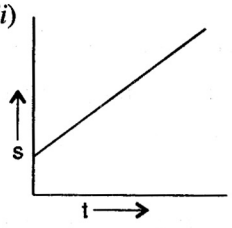
(*i*) Rise in temperature lowers the density of air and hence lowers the atmospheric pressure ($P = h\rho g$)

(*ii*) Rise in humidity or water vapour content in the atmosphere lowers the density of atmospheric air and hence lowers the atmospheric pressure.

(*d*) (*i*)



(*ii*)



(*e*) Given m = 80 tonnes = 80 × 1000 kg = 8 × 10^4 kg

a = 2 m/s^2 F = ?

$F = ma$ = 8 × 10^4 kg × 2 m/s^2 = 160000 N

Ans.2. (*a*) Stretched spring, Compressed spring.

(*b*) Carbon dioxide gas is mostly produced by the combustion of organic matter (like coal, oil and wood), by the fermentation and by the respiration processes in living organisms.

(*c*) Initially the person and the horse are in the state of rest. When the horse darts off suddenly, the person due to inertia of rest, tends to continue in its state of rest. Hence, the person falls in the backward direction.

(*d*) 0 °C, 4 °C.

(*e*) (*i*) 32 °F (*ii*) 212 °F.

Ans.3. (*a*) One could pound a nail with a hammer and so make it hot by doing work on it. Another way is putting the nail in contact with something at a higher temperature which raises nail's temperature.

(*b*) The energy can be transformed from one form to other form, it can neither be created nor destroyed.

(*c*) Dark room acts as the box of pinhole camera, the key hole acts as the pinhole and the wall opposite to key hole as screen. Thus, the inverted, diminished image of distant building is formed on the wall.

(*d*) Distant images are produced due to multiple reflections. At each reflection a part of incident light energy is lost due to absorption.

(*e*) Concave mirror gives a magnified image which helps in shaving. For such an image, the face must be placed between pole and the focus. So the mirror should be of reasonably long focal length.

Ans.4. (*a*) Since the distance of the image from the mirror is equal to the distance of the object (observer) from the mirror at every instant during his motion. The speed of his image with respect to him will be $V + V = 2V$ m/s.

(*b*) Velocity of sound is inversely proportional to square root of density. Moist air has less density than dry air. This is why sound travels faster on a cloudy day.

(*c*) Given $T = 2 \times 10^{-3}$ s, $\lambda = 3$ m, V = ?

$$V = \frac{\lambda}{T} = \frac{3\text{ m}}{2 \times 10^{-3}\text{ s}} = 1.5 \times 10^3 \text{ m/s} = 1500 \text{ m/s}.$$

(*d*) We can draw maximum current from a secondary cell as its internal resistance is very small.

(*e*) No, on breaking a magnet each piece is a complete magnet, *i.e.*, it consists of north pole and south pole. Hence, two poles cannot be separated.

Ans.5. (*a*) Least count of Vernier callipers $= \frac{s}{n} = \frac{0.1\text{ cm}}{10} = 0.01$ cm

Measured length = MSR + VSD × LC

= 56 × 0.1 cm + 8 × 0.01 cm

= 5.6 cm + 0.08 cm = 5.68 cm.

Corrected length = Measured length – correction

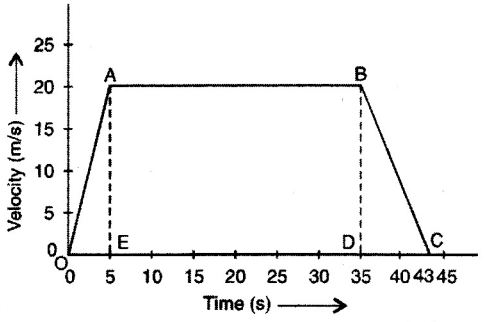
= 5.68 cm – (– 0.09 cm) = 5.77 cm.

(*b*) (*i*) 1 mm (*ii*) 0.1 mm (*iii*) 0.001 cm (*iv*) 0.1 °C (*v*) 1 degree (*vi*) 5 g.

(*c*) (*i*) Graph is a visual presentation of variation of one variable with respect to another. To plot a graph between two variables (independent and dependent variables) two necessary steps are : (1) Selection and mention of the scale used on each axis. (2) Plotting of points with crosses or dot and circle.

(*ii*) The pressure at the bottom will be equal in both the tanks because pressure depends on the height of the liquid column which is same in both the tanks ($P = h\rho g$). It does not depend on the width or shape of containers.

Ans.6. (*a*) (*i*) $v - t$ graph



(*ii*) Acceleration of the lift $= \frac{(20 - 0)\text{ m/s}}{(5 - 0)\text{ s}}$

$= 4\text{ m/s}^2$

(*iii*) Retardation of the lift $= \frac{(0 - 20)\text{ m/s}}{(43 - 35)\text{ s}}$

$= -\frac{20}{8}\text{ m/s}^2$

$= -2.5\text{ m/s}^2$

(*iv*) Height of the building

= Area of (ΔOAE + □ABDE + ΔBDC)

= 1/2 × 20 m/s × 5 s + 20 m/s × 30 s + 1/2 × 20 m/s × 8 s.

= 50 m + 600 m + 80 m = 730 m.

(*b*) We know that $v^2 = u^2 + 2as$ where $u = 0$

$\therefore \quad v^2 = 0^2 + 2as \quad \Rightarrow \quad v = \sqrt{2as}$

As the body is moving with uniform acceleration, $v \propto \sqrt{s}$

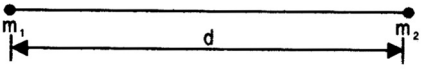
i.e., v is directly proportional to the square root of the distance travelled.

(*c*) (*i*) A body can travel opposite to its acceleration, *e.g.*, when a body is projected upwards with some initial velocity, it travels in upward direction and its acceleration, *i.e.*, g will be in the downward direction.

(*ii*) As you know Acceleration $= \frac{\text{Change in velocity}}{\text{Time taken}}$

$= \frac{\text{Change in displacement/Time taken}}{\text{Time taken}} = \frac{\text{Change in displacement}}{(\text{Time taken})^2}$

Ans.7. (*a*) Newton's law of gravitation. Each particle attracts every other particle in the universe. The force between them is directly proportional to the product of their masses and inversely proportional to the square of the distance between them



i.e, $F = Gm_1m_2/d^2$

where G is universal gravitational constant.

The force of attraction between any two bodies is known as gravitation. On the other hand, the force of attraction between the earth and a body is called gravity.

(*b*) Ends of the girders supporting iron bridges are not firmly built into the pillars of concrete on which they rest. But they are supported on rollers to allow them to expand or contract due to variation in temperature without affecting the supporting pillars.

(*c*) (*i*) It is correct to say that second law of motion is the real law because the first law of motion and third law of motion are contained in the second law of motion.

(*ii*) $m = 5$ kg, $F = 1$ N, $u = 0$, $t = 20$ s, $s = ?$

$$a = \frac{F}{m} = \frac{1\text{ N}}{5\text{ kg}} = 0.2\text{ ms}^{-2}$$

$$s = ut + \frac{1}{2}at^2$$

$$= 0 \times 20 + \frac{1}{2} \times 0.2 \times (20)^2$$

or $s = 40$ m

Ans.8. (*a*) Original area of plate $A_1 = 3\text{ m}^2$

Increase in temperature $\Delta t = 40 - 0 = 40\ ^\circ\text{C}$

Increase in area $\Delta A = \beta A \Delta t$;

But $\beta = 2\alpha$

$= 2 \times 0.000016\ ^\circ\text{C}^{-1}$

$= 0.000032\ ^\circ\text{C}^{-1}$

$\therefore \quad \Delta A = 0.000032\ ^\circ\text{C}^{-1} \times 3\text{ m}^2 \times 40\ ^\circ\text{C}$

$= 3.84 \times 10^{-3}\text{ m}^2$

(*b*) (*i*) Test tube expands first, not the coloured water. Due to increase in volume of the test tube, the level of water drops from A to B.

(*ii*) Liquid after gaining heat expands and hence, level of liquid rises to C.

(*iii*) Liquid expands on heating. Their expansion is more than solids (glass).

(*iv*) Initially the level of liquid rises in glass tube and then falls down because initially the glass tube contracts but not coloured water. Thus, level of water rises up. However, when coloured liquid contracts, the level falls down.

(*c*) (*i*) $\gamma = 3\alpha$,

(*ii*) Radius, Volume.

Radius, will undergo least percentage increase because coefficient of linear expansion is least while that of volume expansion is largest.

Ans.9. (*a*) Ultrasonic vibrations are used for

(*i*) Welding metals having high melting point

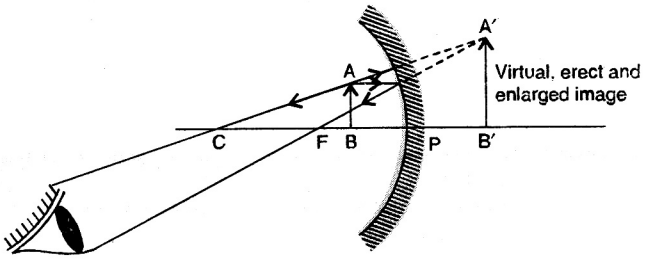
(*ii*) Scanning of various organs of human body

(*iii*) Homogenising milk

(*iv*) Insects and rats repellants.

(*b*) (*i*) Correct time is 7 : 25. Anomaly is due to lateral inversion.

(*ii*)



(*c*) (*i*) Plane mirror

(*ii*) Spherical mirror

(*iii*) Focal length of the spherical mirror, $f = \frac{\text{Radius of curvature } (R)}{2}$

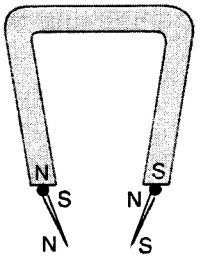
(*iv*) They receive parallel rays and focus them on the receiver.

Ans.10. (*a*) The divergence of leaf increases.

Reason : When a glass rod is rubbed with silk, the glass rod becomes positively charged. On bringing the rod near the conductor, the near surface of the conductor gets negatively charged, while the far surface gets positively charged by induction. When the proof plane is touched at the far surface of the conductor, it gets positively charged. Now when it is touched to the cap of a positively charged gold-leaf electroscope, positive charge on the plate and the leaf of the electroscope increases due to which the divergence of leaf increases.

(*b*) Dry cell is not really dry as it contains ammonium chloride jelly. Moreover, as the chemical reaction proceeds within the cell, water is one of the products. Thus the content of moisture goes on increasing as the cell is being discharged.

(*c*) (*i*) Figure shows the lower ends of the needles near each other (or touching each other). They have opposite polarities developed due to induction. The upper ends are touching the poles of the magnet, having polarities opposite to that of the magnet. This phenomenon is called magnetic induction.



(*ii*) The magnetism can be lost by heating.