9th Class 2017

Physics	Group-II	Paper-I
Time: 15 Minutes	(Objective Type)	Marks: 12

Note: Four possible answers A, B, C and D to each question are given. The choice which you think is correct, fill that circle in front of that question with Marker or Pen ink in the answer-book. Cutting or filling two or more circles will result in zero mark in that question.

1-1- One tera is equal to:

(a) 10^{-12} (b) 10^{-18}

(c) 10^{12} ✓   (d) 10^{18}

2- Least count of metre rule is:

(a) 1 cm   (b) 1 mm ✓

(c) 1 dm   (d) 0.01 cm

3- A body has translatory motion if it moves along a:

(a) Circle   (b) Straight line

(c) Curved path   (d) Line without rotation ✓

4- Inertia depends upon:

(a) Velocity   (b) Mass ✓

(c) Weight   (d) Speed

5- Two equal but unlike parallel forces having different line of action produce:

(a) Torque   (b) Couple ✓

(c) Equilibrium   (d) Neutral equilibrium

6- Earth's gravitational force of attraction vanishes at:

(a) 6,400 km   (b) Infinity ✓

(c) 42,300 km   (d) 1,000 km

7- The value of 'g' at a height one Earth's radius above the surface of Earth:

(a) 2 g

(b) $\frac{1}{2}$ g

(c) $\frac{1}{3}$ g

(d) $\frac{1}{4}$ g ✓

8- Work will be maximum when the angle between force and displacement will be:

(a) 90°

(b) 0° ✓

(c) 60°

(d) 180°

9- At sea level, the atmospheric pressure is:

(a) 10107 Pascal

(b) 10300 Pascal

(c) 10130 Pascal

(d) 101300 Pascal ✓

10- The water converts into ice at a temperature:

(a) 0°F

(b) 32°F ✓

(c) −273 K

(d) 0 K

11- Rooms are heated using gas heaters by:

(a) Conduction only

(b) Convection and radiation ✓

(c) Radiation only

(d) Convection only

12- The thermal conductivity of brick is:

(a) $0.8 \, Wm^{-1} k^{-1}$

(b) $1.7 \, Wm^{-1} k^{-1}$

(c) $0.6 \, Wm^{-1} k^{-1}$ ✓

(d) $0.2 \, Wm^{-1} k^{-1}$

(v)   Differentiate between scalar and vector.

Ans A physical quantity which can be completely described by its magnitude is called a **scalar**.

A **vector** can be described completely by magnitude along with its direction.

(vi)   State the Newton's third law of motion.

Ans Newton's third law of motion states that "To every action force there is an equal and opposite reaction force."

(vii)   What is meant by centripetal force?

Ans Centripetal force is a force that keeps a body to move in a circle.

$$F_c = \frac{mv^2}{r}$$

(viii)   What is meant by vernier constant?

Ans Vernier constant or least count is the minimum distance that can be measured with the help of vernier callipers.

3.   Write short answers to any FIVE (5) questions: 10

(i)   Differentiate between like and unlike parallel forces.

Ans Like parallel forces have same direction. But unlike parallel forces have opposite direction.

(ii)   Define the resolution of forces.

Ans Splitting up of a force into two mutually perpendicular components is called the resolution of that force.

$$F = F_x + F_y$$

9th Class 2017

Physics	Group-II	Paper-I
Time: 1.45 Hours	(Subjective Type)	Marks: 48

(Part-I)

2.   Write short answers to any FIVE (5) questions: 10

(i)   Write two names of measuring instruments.

Ans The names of two measuring instruments are:

1.   The meter rule
2.   The measuring tape

(ii)   Differentiate between base quantities and derived quantities.

Ans Base quantities are the quantities on the basis of which other quantities are expressed.

The quantities that are expressed in terms of base quantities are called derived quantities.

(iii)   Define acceleration.

Ans Acceleration is defined as the rate of change of velocity of a body.

$$\text{Acceleration} = \frac{\text{change in velocity}}{\text{time taken}}$$

$$\text{Acceleration} = \frac{\text{final velocity} - \text{initial velocity}}{\text{time taken}}$$

$$a = \frac{V_f - V_i}{t}$$

(iv)   Define vibratory motion.

Ans The back and forth motion of a body, about its position of equilibrium (mean position) is called vibratory motion. For example, motion of pendulum.

(iii)   Define centre of mass.

Ans Centre of mass of a system is such a point where an applied force causes the system to move without rotation.

(iv)   State Newton's law of gravitation.

Ans Everybody in the universe attracts every other body with a force which is directly proportional to the product of their masses and inversely proportional to the square of the distance between their centres.

(v)   What is meant by geo-stationary satellites?

Ans The satellites which complete their orbit once around Earth in 24 hours are called "Geo-stationary satellites". These remain in front of same point on Earth, all the time.

(vi)   Why can we not feel gravitational force between the bodies around us?

Ans As from formula of Law of Gravitation,

$$F = G \frac{m_1 m_2}{d^2}$$

where G is the proportionality constants and value of G is 6.673×10^{-11} Nm² Kg⁻².

Due to small value of G, the gravitational force of attraction between objects around us is very small and we don't feel it.

(vii)   Define unit of work, joule.

Ans SI unit of work is Joule. It is defined as:

"The amount of work is one joule when a force of one newton displaces a body through one meter in the direction of force."

$$1 J = 1 N \times 1 m$$

(viii) Write down the two disadvantages of fossil fuels.

Ans Disadvantages of fossil fuels are given below:

1. Fossil fuels release harmful waste products which pollute the environment.

2. Fossil fuel release the toxic substance that can cause serious health problems such as headache, tension, nausea, allergic reactions, irritation of eyes, nose and throat, asthma, lungs cancer, heart diseases and even damage to brain, nerves and other organs of our body.

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4. Write short answers to any FIVE (5) questions: 10

(i) What is meant by density? What is its SI unit?

Ans Density:

Density is defined as mass per unit volume.

Formula:

$$\text{Density} = \frac{\text{mass}}{\text{volume}}$$

SI Unit:

SI unit of density is $Kg\ m^{-3}$.

(ii) Define elasticity.

Ans The property of the body because of which they restore its original shape when external force ceases to act.

(iii) State Pascal's law.

Ans Pascal's law is stated as:

"Pressure applied at any point of a liquid enclosed in a container, is transmitted without loss to all other parts of the liquid."

(iv) Define specific heat capacity and write its formula.

Ans Specific heat capacity of a substance is the amount of heat required to raise the temperature of 1 kg mass of that substance through 1 K.

Its formula is:

$$c = \frac{\Delta Q}{m \, \Delta T}$$

(v) **Gaps are left in railway tracks. Why?**

Ans Gaps are left in railway tracks to compensate thermal expansion during hot season.

(vi) **What causes a glider to remain in air?**

Ans A glider is a small aeroplane without engine. Glider pilot uses upward movement of hot air current due to convection of heat. These rising currents of hot air is called thermals. Glider rides over these thermals. The upward movement of air current in thermals helps them to stay in the air for long time.

(vii) **What is greenhouse effect?**

Ans As the concentration of CO_2 in air increases, less heat energy is lost from the surface of the Earth. Therefore, the average temperature of the surface gradually increases. This is called greenhouse effect.

(viii) **We wear white and light coloured clothes in summer. Why?**

Ans We wear white and light coloured clothes in summer because, white and light colours are bad absorber and good reflector of heat. That's why heat is not absorbed by white or light coloured clothes.

(Part-II)

Note: Attempt any TWO (2) questions.

Q.5.(a) Write the advantages and disadvantages of friction.

(4)

Ans **Advantages and Disadvantages of Friction:**

Friction has the advantages as well as disadvantages. Friction is undesirable when moving at

high speeds because it opposes the motion and thus limits the speed of moving objects. Most of our useful energy is lost as heat and sound due to the friction between various moving parts of machines. In machines, friction also causes wear and tear of their moving parts.

However, sometimes friction is most desirable. We cannot write if there would be no friction between paper and the pencil. Friction enables us to walk on the ground. We cannot run on a slippery ground. A slippery ground offers very little friction. Hence, anybody who tries to run on a slippery ground may meet an accident. Similarly, it is dangerous to apply brakes with full force to stop a fast moving vehicle on a slippery road. Birds could not fly, if there is no air resistance. The reaction of pushed air enables the birds to fly. Thus in many situations, we need friction while in other situations we need to reduce it as much as possible.

(b) **A stone is dropped from the top of the tower. The stone hits the ground after 5 seconds. Find the height of the tower and the velocity with which the stone hits the ground.** (5)

Ans

$$\text{Initial velocity } v_i = 0$$

$$\text{Gravitational acceleration } g = 10 \text{ ms}^{-2}$$

$$t = 5 \text{ s}$$

$$S = h = ?$$

$$v_f = ?$$

Applying the equation,

$$h = v_i t + \frac{1}{2} g t^2, \text{ we get}$$

$$h = 0 \times 5 \text{ s} + \frac{1}{2} \times 10 \text{ ms}^{-2} \times (5 \text{ s})^2$$

or

$$h = (0 + 125) \text{ m}$$

$$\therefore \qquad h = 125 \text{ m}$$

Applying the equation to find the velocity of the stone

$$v_f^2 - v_i^2 = 2gh$$

$$v_f^2 - (0)^2 = 2 \times 10 \text{ ms}^{-2} \times 125 \text{ m}$$

$$v_f^2 = 2500 \text{ m}^2\text{s}^{-2}$$

$$v_f = 50 \text{ ms}^{-1}$$

∴ Thus the height of the tower is 125 metres and it will hit the ground with a velocity of 50 ms⁻¹.

Q.6.(a) Define torque or moment of force. Explain on what factors, does it depend? **(4)**

Ans "The turning effect of a force is called torque or moment of the force."

The torque or moment of a force depends upon the force F and the moment arm L of the force. Greater is a force, greater is the moment of the force. Similarly, longer is the moment arm greater is the moment of the force. Thus the moment of the force or torque τ is determined by the product of force F and its moment arm L. Mathematically,

Torque $\qquad \tau = F \times L$

SI unit of torque is newton-metre (Nm). A torque of 1 N m is caused by a force of 1 N acting perpendicular to the moment arm 1 m long.

(b) Calculate the power of a pump which can lift 70 kg of water through a vertical height of 16 metres in 10 seconds. Also find the power in horse power.

(5)

Ans Mass of water $m = 70 \text{ kg}$

$\qquad$ Height $S = 16 \text{ m}$

$\qquad$ Time taken $t = 10 \text{ s}$

$\qquad$ Force required $F = w = mg$

$\qquad\qquad\qquad = 70 \text{ kg} \times 10 \text{ ms}^{-2}$

$\qquad\qquad\qquad = 700 \text{ N}$

$\qquad$ Work done $W = F \times S$

or $W = 700 \text{ N} \times 16 \text{ m}$

$= 11200 \text{ J}$

Power $= \dfrac{W}{t}$

$P = \dfrac{11200 \text{ J}}{10 \text{ s}} = 1120 \text{ Js}^{-1}$

$= 1120 \text{ watts}$

As $1 \text{ hp} = 746 \text{ watts}$

$P = \dfrac{1120 \text{ watts}}{746 \text{ watts}} \text{ hp}$

$= 1.5 \text{ hp}$

Thus, power of the pump is 1.5 hp.

Q.7.(a) Define Young's Modulus. Derive the formula and write the unit. (4)

Ans For Answer see Paper 2015 (Group-I), Q.8.(a).

(b) A brass rod is 1 m long at 0°C. Find its length at 30°C. (Coefficient of linear expansion of brass = $1.9 \times 10^{-5} \text{ k}^{-1}$) (5)

Ans

$L_o = 1 \text{ m}$

$t = 30°C$

$t_o = 0°C$

$T_o = 0 + 273 = 273 \text{ K}$

$T = 30 + 273 = 303 \text{ K}$

$\Delta T = T - T_o$

$= 303 \text{ K} - 273 \text{ K}$

$= 30 \text{ K}$

$\alpha = 1.9 \times 10^{-5} \text{ K}^{-1}$

Since, $L = L_o(1 + \alpha \Delta T)$

$L = 1 \text{ m} \times (1 + 1.9 \times 10^{-5} \text{ K}^{-1} \times 30 \text{ K})$

$L = 1.00057 \text{ m}$

Hence, the length of the brass bar at 30°C will be 1.00057 m.