The Times Secondary School
Dillibazar, Kathmandu
First Terminal Examination – 2080

Grade: - XI   Set A   Full Marks:-75
Stream: Science   Pass Marks:-30
Subject: - Physics   Time : 3hrs

Candidates are required to give their answers in their own words as far as practicable. The figures in the margin indicate the full marks.
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Group-A

Rewrite the best alternative to the following questions.   [1×11=11]

1. The damping force on a moving object in a situation is given by $F=Kv^2$, the Dimension of quantity K are
   a) $[M T^{-2}]$ b) $[M L^{-1}]$ c) $[M L^2 T^{-3}]$ d) $[MT^{-1}]$

2. The angle between A = 2i+ 3j +4k and B = 4i+ 6j+8k is
   a) 0°   b) 45°   c) 180°   d) 90°

3. A dimensionless physical quantity
   a) never has unit   b) may have unit   c) must have unit   d) never exist

4. What will be the y-component of the same applied force if the x-component of a force of 50N is 30N?
   a) 20N   b) 25N   c) 40N   d) 45N

5 Two forces of 200 N and 120 N are inclined at an angle of 60°. The resultant force will be
   (a) 40 N   (b) 180 N   (c) 280 N   (d) 340 N

6. A 5kg weight is accelerated from rest to 20m/s in 2 seconds. The force acting on the body is
   a) 30 N   b) 40 N   c) 50 N   d) 60 N

7 The laws of reflection hold good for
   (a) Plane mirror only   (b) concave mirror only
   (c) Convex mirror only   (d) all mirrors irrespective of their shape

8. The radius of curvature of a mirror is 20cm the focal length is
   a) 20cm   b) 10cm   c) 40cm   d) 5cm

9. If a body is charged by rubbing, its weight
   (a) May increase or decrease slightly   (b) decreases slightly
   (c) Increases slightly   (d) becomes zero

10.____ is responsible for the current to flow in a closed circuit.
   a) Electric charge   b) Potential difference
   c) Resistance   d) All of the above

11. What is the rest mass energy of an electron?
   a) 3 eV   b) 931 MeV   c) 0.51 eV   d) 0.51 MeV

Group-B
Answer the following Questions. .   [5×8=40]

12.
a) State triangle law of vector addition and write down only the formula for the magnitude and direction of resultant of two vectors.   (2)
b) If a vector has zero magnitude, in what sense it is a vector?   (1)
c) If the scalar product of the two vectors is equal to the magnitude of the vector product, find the angle between them.   (2)

OR

a) What is meant by resolution of a vector? Find the rectangular components of a vector.   (3)
b) Can the sum of two equal vectors be equal to either of the vectors? And when?   (2)

13
a) Define linear and cubical expansivity.   (2)
b) Establish the relation in between them.   (3)

14
a) what is Real and Apparent expansivity of Liquid?   (2)
b) A copper vessel with a volume of exactly a volume of 1.80m^3 at temperature 20°C is filled with glycerin. If temperature rises to 30°C, how much glycerin will spill out?
   (α for copper = $1.67×10^{-6}$ °C^{-1}, Υ for glycerin = $5.3×10^{-4}$ °C^{-1})   (3)

15
a) What is differential expansion? Why invar is used in a simple pendulum clock?   (2)
b) A clock which has a brass pendulum keeps correct time in 10°C. How many Seconds it will lose or gain per day when the temperature of surrounding rises to 35°C.
   [Linear expansivity of brass = 0.000019]   (3)

16
a) Can a convex mirror forms a real image?   (1)
b) Define magnification of a curved mirror.   (1)
c) Obtain an expression for the relation between objet distance, image distance and the focal length in the case of convex mirror.   (3)

17
a. Define quantization of charge.   (1)
b. Calculate the number of electrons in 5 coulomb charge.   (2)

c. Vehicles carrying inflammable fluid drags a chain along the ground. Why?　　(2)

18
a. What is electric charge?　　(1)
b. What do you mean by electrostatic induction?　　(1)
c. How can we charge a spherical body permanently positive by the method of
　induction?　　(3)

19
a) State and explain Coulomb's Law in electrostatics.　　(3)
b) Can a charged body attracts uncharged body? Explain　　(2)

Group – C
Answer the following long questions. .　　**[3×8=24]**

20
a) State the parallelogram law of vector addition.　　(2)
b) Derive an expression for the magnitude and direction of the resultant of two vectors
　inclined at an angle θ from each other.　　(3)
c) A disoriented physics professor drive 3.25 km north, the 4.75 km west and then 1.50
　km south. Find the magnitude and direction of resultant displacement.　　(3)

21
a) State the uses of dimensional analysis. What are the limitations of dimensional
　analysis?　　(3)
b) Assuming length [L], mass [M] and force [F] as fundamental units, find the
　dimension of time.　　(2)
c) Assuming that the mass 'm' of the largest stone that can be moved by a flowing river
　depends upon the velocity v, the density 'ρ' and acceleration due to gravity 'g', Show
　that 'm' varies with sixth power of the velocity of flow.　　(3)

OR

a) Define precision and significant figures.　　(2)
b) Is dimensionally correct equation necessarily be a correct physical relation?　　(1)
c) What are the dimensions of a and b in the relation $F = a + b S$, where F is force and S
　is distance?　　(2)
d) Convert 7 joule into erg. Joule is the unit of work in SI system and erg is the unit of
　work in cgs system　　(3)

22
a) Define nuclear mass and nuclear size of an atom with formula.　　(2)
b) Explain the significance of Einstein's mass energy equivalence relation　　(2)
c) What is atomic mass unit (amu)? What is its value?　　(2)
d) The mass of the nucleus of the isotope $3Li7$ is 7.014351 a mu. Find its mass defect
　and packing fraction. (Mass of proton = 1.007275 amu., mass of neutron = 1.008665
　amu.)　　(2)

The End

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Group-A

Rewrite the best alternative to the following questions.   [1×11=11]

1. The damping force on a moving object in a situation is given by $F=Kv^2$, the dimension of quantity K are
   a) $[M\ T^{-2}]$ b) $[M\ L^{-1}]$ c) $[M\ L^2\ T^{-3}]$ d) $[MT^{-1}]$

2. The angle between A = 3i+ 4j + 5k and B = 3i+ 4j-5k is
   a) 0°   b) 30°   c) 60°   d) 90°

3. Which vector has no unit?
   a) Negative vector   b) Unit vector   c) Proper vector   d) Zero vector

4. Two physical quantities having identical dimensional formula
   a) may not have same units.   b) must have same units.
   c) never have same units.   d) never exist

5. SI unit of quantity of matter is
   a)kilogram   b)Gram   c)Mole   d)Both (a) and (b)

6. A body is thrown upward and reaches the maximum height. At maximum height
   a. its velocity and acceleration both are zero
   b) its velocity is zero and acceleration is maximum
   c) its velocity is maximum and acceleration is minimum
   d) its velocity is zero and acceleration is equal to acceleration due to gravity g

7.The angle of incidence for a ray of light having zero reflection angle is
   (a) 0°   (b) 30°   (c) 45°   (d) 90°

8. The radius of curvature of a mirror is 20cm the focal length is
   a) 20cm   b) 10cm   c) 40cm   d) 5cm

9. In the process of charging, the mass of the negatively charged body
   a) increases   b) decreases
   c) remains constant   d) is not related to the charging process

10. The purpose of load in an electric circuit is to
   a) Increase the circuit current   b) Utilize electrical energy
   c) Decrease the circuit current   d) None of the above

11. The ratio between the radii of nuclei with mass number 125 and 27 is
   a. 3: 5   b. 125: 27   c. 27: 125   d. 5: 3

Group-B

Answer the following Questions. .   [5×8=40]

12
a) Are all the physical quantities having magnitude and direction be necessarily vectors? (1)
b) Give the condition when two equal vectors 'P' and 'P' give resultant equal to 2P (2)
c) State Parallelogram law of vector addition and write down only the formula for the magnitude and direction of resultant of two vectors. (2)

OR

a) What is meant by resolution of a vector? Find the rectangular components of a vector. (3)
b) Can the sum of two equal vectors be equal to either of the vectors? And when? (2)

13
a) Define following terms: (i) coefficient of linear expansion (ii) coefficient of superficial expansion (2)
b) Establish the relation in between them. (3)

14
a) What is apparent expansion of liquid. Find the relationship among real and apparent expansivity of liquid with expansivity of vessel. (3)
b) A glass flask with volume 200 cm³ is filled with mercury at 20°C. How much mercury overflows when the temperature of the system is raised to 100°C? The coefficient of linear expansion of the glass is $0.40 \times 10^{-5}\ K^{-1}$. The coefficient of volume expansion = $18 \times 10^{-5}\ K^{-1}$. (2)

15
a) What is differential expansion? Under what condition is it zero? (2)
b) A clock which has brass pendulum beats seconds correctly when the temperature of the room is 30°C. How many seconds will it gain or lose per day when the temperature of the room falls to 10°C. (Linear expansivity of brass = 0.000019°C)(3)

16
a) Can a plane mirror form a real image? (1)
b) If a spherical mirror is immersed in water, does its focal length change? (1)
c) Obtain an expression for the relation between objet distance, image distance and the focal length in the case of concave mirror. (3)

17
a. Define quantization of charge. (1)

b) How many electrons are present in one Coulomb of charge? (2)

c) We know that ordinary rubber is an insulator. But the tyres of aircrafts are made of special rubber which is slightly conducting why? (2)

(c) Express atomic mass unit in electron volt (eV) and MeV. (2)

(d). Define mass defect and packing fraction with formula. (2)

18

a) What is surface charge density at a point on the surface of a conductor? How does it depend on the shape of the conductor? (2)

b) How can we charge a spherical body permanently negative by the method of induction? (3)

The End

19

a) State and explain Coulomb's Law in electrostatics. (3)

b) A glass rod is rubbed with silk and acquires a charge of magnitude 7.50 nC. What is the change in mass of the rod? (2)

Group – C

Answer the following long questions. . **[3×8=24]**

20

a) a) State the Triangle law of vector addition. (2)

b) Derive an expression for the magnitude and direction of the resultant of two vectors inclined at an angle θ from each other. (3)

c) A boy runs 40 m towards east. He then walks 30 m towards north. The boy again runs 50 m towards north making an angle of 30° with the east. What is the magnitude and direction of resultant displacement? (3)

21

a) State the uses of dimensional analysis. What are the limitations of dimensional analysis? (3)

b) Assuming length [L], time [T] and force [F] as fundamental units, find the dimension of Density. (2)

c) The orbital velocity 'v' of a satellite may depend on its mass 'm', distance 'r' form the centre of earth and acceleration due to gravity 'g'. Obtain an expression for orbital velocity using dimensional analysis. (3)

OR

a) Differentiate between Precise measurement and accurate measurement. (1)

b) Can a quantity have units but still be dimensionless? Can a quantity have dimensions but still have no units? (2)

c) If $y = A + B t + C t^2$, where y is the distance and t is the time. What are the dimension and the unit of C? (2)

d) Convert 10 dyne to Newton. Newton is the unit of work in SI system and dyne is the unit of work in cgs system (3)

22

(a) Write down the consequence of Rutherford's alpha scattering experiment. (2)

(b). The nuclear density is almost constant for all nuclei. How? (2)