- The dimension of gravitational constant (G) is **- $[M^{-1}L^3T^{-2}]$**
- The unit of moment of inertia is **- Kilogram×metre^2**
- The unit of angular momentum is **- Joule-second**
- The dimensional formula for angular momentum is **- $[ML^2T^{-1}]$**
- The dimensional formula of momentum and impulse is **- $[MLT^{-1}]$**
- In international measurement system, 'Kelvin' is the unit of **- Temperature**
- One Joule energy is equal to erg **- 10^7 ergs**
- The unit used to measure the ultrasonic speed is **- Knots**
- The number of base unit in the S.I. system is **- 7 (seven)**
- One nano is equal to **- 10^{-9} metre**
- One micro is equal to **- 10^{-6} metre**
- One pico is equal to **- 10^{-12} metre**
- 'Tesla' (T) is the unit of **- Intensity of magnetic field**
- A manometer is used to measure **- Pressure**
- In C.G.S system the name of the unit of charge is **- esu**
- The unit used to measure the distance of a star is **- Light year**
- Which type of scale is used to measure the distance between the sun and earth **- Indirect scale**
- Measured by direct scale **- distance, length, weight**
- The first type of measuring instrument is used **- simple scale**
- In the measurement of which physical quantity after making 2 transformations, the observation is presented **- Electric current**
- Expresses the range of a scale **- 0 to R_{max}**
- The span of a scale is shown by **- $R_{max} - R_{min}$**
- The accuracy of a measurement method is expressed in **- Close to the actual value**
- Accuracy shows **- The closeness of the actual value to the measured value**
- If the errors in a measuring instrument are less than its accuracy will be affected **- It will increase**
- The accuracy and error of a measuring instrument is related to **- Accuracy $\propto \frac{1}{\text{error}}$**
- Electric current is measured by **- Ammeter**
- The time taken by the earth to revolve around the sun is of the order of **- 10^7 second**
- The value of 1$\mathring{A}$ in micron is **- 10^{-4} micron**
- The length of one division of the venier scale than the length of one division of the main scale is **- little less**
- How many millimeters (mm) are in one micron **- $\frac{1}{1000}$mm**
- One nanometer is equal to centimeter (cm) **- 10^{-7} cm**
- The minimum reading marked on the scale is called **Actual Value**
- The quality of an instrument which caste difference between two suitable values **-Transfer persistence**
- If the input were more in the measurement sub-section **-Ductility decreases**
- Mechanical measuring instruments are **-less sensitive**
- Electrical measuring instruments are **-Less durability**
- Nature of mechanical measuring instrument is **-Less sensitivity , more stability**
- What have an impact on stability when the sensitivity of a speech increases **-Decreases**
- The difference between the upper limit and lower limit of any measurement is called **-Tolerance**
- What effect on the auspiciousness, when the accuracy of the measuring instrument increases **-Decreases**
- In any type of measurement , there is a reasons for error **- Indirect and direct both**
- The function of measuring system is **-Pointer function, recording function, control function**

PREVIOUS YEAR QUESTIONS

1. Which one of the following physical quantities is a vector quantity?

(a) Gravitational Potential energy
(b) Electric Power
(c) Electric current
(d) Dipole Moment

RRB ALP CBT II Physics & Maths 21 .01.2019 Shift I

Ans. (d) :**Dipole moment** - The product of the charge and the distance between the two charges is called dipole moment. It is a vector quantity.

$$\vec{P} = q \times \vec{d}$$

Where, p = dipole moment
q = charge
d = distance.

Electric Current - The rate of flow of charge is called electric current. It is a scalar quantity.

Gravitational Potential Energy- The energy stored in an object due to its position above the earth's surface is called gravitational potential energy. It is scalar quantity.

Electric Power: It is electrical energy per unit time.It is a scalar quantity.

2. Which of the following is not a vector quantity?

(a) Speed (b) Velocity
(c) Displacement (d) Acceleration

RRB ALP CBT II Physics & Maths 21 .01.2019 Shift I

Ans. (a) : **Vector Quantity -** A physical quantity which has both magnitude and direction. Displacement, velocity, acceleration, momentum, force, weight are examples of vector Quantity.

Scalar quantity- A scalar quantity only has a magnitude. Some common examples of scalar quantity are mass, speed, volume, temperature, density etc.

3. $kgms^{-1}$ is the SI unit of ——

(a) Momentum (b) Pressure
(c) Force (d) Velocity

RRB ALP CBT II Physics & Maths 21 .01.2019 Shift I

Ans. (a) : Momentum - It is the product of the mass and velocity of an object whose change with respect to time gives force.

$P = m \times v$

Where P = momentum
m = mass of object
v = velocity

• The S.I. unit of momentum is kg-m/sec. and dimension is $[MLT^{-1}]$.

4. Which of the following has no unit

(a) Pressure (b) Density
(c) Distance (d) Relative Density

RRB ALP CBT II Physics & Maths 21 .01.2019 Shift I

Ans. (d) : Relative density - It is defined as the ratio of density of a substance with respect to the density of water. It is denoted by R.D.

$$R.D = \frac{\text{Density of substance}}{\text{Density of water}}$$

• Relative density is a dimensionless quantity.

Pressure - The force applied perpendicular to the surface area of an object is known as pressure. It is denoted by 'P'.

$$P = \frac{F}{A}$$

Where, F = Force applied by the body (N)
A= Total area of the object (m^2)

• The S.I unit of pressure is Pascal (Pa) or N/m^2.

Density - It is defined as mass per unit volume. It is denoted by ρ. The unit of Density is kg/m^3.

$$\rho = \frac{\text{Mass}(m)}{\text{Volume}(v)}$$

Distance - The complete path travelled by an object. The unit of Distance is meter (m).

5. Which among the following is a derived unit ?

(a) Length (b) Density
(c) Time (d) Mass

RRB ALP CBT II Physics & Maths 21 .01.2019 Shift II

Ans. (b) : Derived Unit :- The combination of two base units is called derived units.

• Density is derived unit because it is a combination of two basic units mass and volume and it is given by kg/m^3.

6. S.I. Unit of universal gravitational constant is

(a) Nkg^2/m^2 (b) kg^2/Nm^2
(c) Nm^2/kg^2 (d) N^2m^2/kg^2

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Ans. (c) : As per universal law of gravitations,

$$F = \frac{GMm}{d^2}$$

$$G = \frac{Fd^2}{Mm}$$

Where,
The SI units of Gravitational force = Newton (N)
The SI unit of Distance = Meter (m)
The SI units of Masses (M, m) = kg

Therefore, The SI unit of G = Nm^2kg^{-2} or $\frac{Nm^2}{Kg^2}$

7. The dimensional formula of speed

(a) $[MLT^{-1}]$ (b) $[M^0LT^{-1}]$
(c) $[ML^0T^{-1}]$ (d) $[MLT^2]$

RRB ALP CBT II Physics & Maths 21 .01.2019 Shift III
RRB ALP CBT II Physics & Maths 22 .01.2019 Shift I

Ans. (b) : We know that,

$$\text{Speed}\left(v = \frac{d}{t}\right)$$

$$v = \frac{[L]}{[T]}$$

The dimensional Formula of speed = $[M^0LT^{-1}]$

- M = Mass
- L = Length
- T = Time

8. Light year is the unit of

(a) Length (b) Time
(c) Mass (d) Area

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Ans. (a) : The light year is a unit of length. It is used to express Astronomical distances.

• It is equal to about 9.46 trillion kilometers (9.46×10^{12}km) or 5.88 trillion miles (5.88×10^{12}miles).

9. Light year is the unit of a quantity whose unit can also be

(a) Second (b) Kg
(c) Square metre (d) Angstrom

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Ans. (d) : Light year is the unit of a quantity whose unit can also be Angstrom.

The distance travelled by light in one year is called one light - year. It is the unit of astronomical distance.

The unit of length which is equal to 10^{-10} meters is called 1 Angstrom. It is denoted by Aº.

10. The distance covered by a particle in time 't' is given by $s = at + bt^2$ where 'a' and 'b' are two constants. The dimensional formula of 'b' is:

(a) $\left[M^0L^1T^{-2}\right]$ (b) $\left[M^0L^2T^{-1}\right]$
(c) $\left[M^0L^1T^{-1}\right]$ (d) $\left[M^0L^2T^{-2}\right]$

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Ans. (a) : Given : $S = at + bt^2$ --------(i)

From the principle of dimensional homogeneity , the L.H.S of the equation dimensionally equal to the R.H.S of the equation.

So, the dimension of (s), (at) and $(bt)^2$ is same.

Dimensional formula of distance (s) = $[L]$

For the first term

$\therefore [L] = [a][T]$

$[a] = \frac{[L]}{[T]} = [LT^{-1}]$

For the second term

$\therefore [L] = [b][T^2]$

$[b] = \frac{[L]}{[T^2]} = [LT^{-2}]$

Hence, the dimensional formula of 'b' is $[M^{o}L^{1}T^{-2}]$

11. Which of the following is dimensionless?

(a) Velocity (b) Angle

(c) Mass (d) Area

RRB ALP CBT II Physics & Maths 22 .01.2019 Shift II

Ans. (b) : Angle is defined as the ratio of the length of arc to the radius.

$\text{Angle } (\theta) = \frac{\text{length of arc}(\ell)}{\text{radius}(r)}$

$\theta = \frac{[M^{o}LT^{o}]}{[M^{o}LT^{o}]} = 1$

Hence, an angle is a dimensionless quantity.

12. The dimensional formula of force :

(a) $[ML^{-3}T^{2}]$ (b) $[MLT^{-2}]$

(c) $[ML^{-2}T^{-2}]$ (d) $[ML^{-1}T^{-1}]$

RRB ALP CBT II Physics & Maths 22 .01.2019 Shift II

Ans. (b) : Dimensional Formula of Force

Force = Mass ×Acceleration .....(i)

$\therefore$ Acceleration = Velocity/time

$= \frac{\text{distance / time}}{\text{time}}$

$= \frac{L/T}{T} = [LT^{-2}]$

$\therefore$ Mass = $[M]$

Put both the values in eq (i)

Force = $[M] \times [LT^{-2}] = [MLT^{-2}]$

13. Which one of the following physical quantities represent stress?

(a) Force/length (b) Impulse/volume

(c) Restoring force/area (d) Energy/area

RRB ALP CBT II Physics & Maths 22 .01.2019 Shift III

Ans. (c) : Stress a physical quantity that defines force per unit area applied to a material. It is denoted by σ.

$\text{Stress} = \frac{\text{Force}}{\text{cross - sectional area}}$

$\sigma = \frac{F}{A}$

The S.I. Unit of stress is Newton/meter^2 or Pascals (Pa).

$\frac{\text{Force}}{\text{length}} = \text{Surface tension}$

Surface tension is the attraction force found which is responsible for pulling surface molecules in the rest of the liquid.

14. Which one of the following physical quantities is a scalar quantity?

(a) Dipole moment

(b) Angular momentum

(c) Torque

(d) Electric current

RRB ALP CBT II Physics & Maths 22 .01.2019 Shift III

Ans. (d) :

- A scalar quantity is defined as the physical quantity that has only magnitude e.g. Mass, electric current, volume, speed, temperature etc.
- A vector quantity is defined as the physical quantity that has magnitude as well as direction e.g. Angular momentum, torque, force, acceleration, displacement, dipole moment etc.

15. Which of the following is not the SI base unit?

(a) Coulomb (b) Metre

(c) Kilogram (d) Ampere

RRB ALP CBT II Physics & Maths 22 .01.2019 Shift III

Ans. (a) : Fundamental unit/SI base unit:-

- The SI unit of a fundamental quantity is called a fundamental unit
- There are 7 fundamental quantities and their fundamental units are given below

Fundamental Quantities	
Quantities	**S.I. base unit**
Mass	Kilogram (kg)
Length	Meter (M)
Time	Second (s)
Temperature	Kelvin (K)
Electric current	Ampere (A)
Luminous intensity	Candela (cd)
Amount of substance	Mole (Mol)

- We can say that the coulomb is not the SI base unit. So option (a) is correct.

16. Which of the following is NOT a base unit?

(a) Radian (b) Mole

(c) Ampere (d) Candela

RRB ALP & Tech. 23.01.2019 Shift-I

Ans: (a) Fundamental quantities in SI system and their units -

Physical Quantity	Name of Unit	Symbol of Unit
Mass	Kilogram	kg
Length	Meter	m
Time	Second	S
Temperature	kelvin	K
Luminous intensity	Candela	Cd
Electric current	Ampere	A
Amount of substance	Mole	Mol

17. Farad per meter is the unit of———.

(a) Permeability
(b) Electric conductance
(c) Permittivity
(d) Watt per steradian

RRB ALP & Tech. 23.01.2019 Shift-I

Ans : (c) Farad per meter is the unit of permittivity.
- Electric conductance → Siemen (s)
- Permeability → Henry/ meter

18. Henry per meter is the unit of .....

(a) permeability
(b) electric conductance
(c) watt per steradian
(d) permittivity

RRB ALP & Tech. 23.01.2019 Shift-II

Ans : (b) Henry per meter is the unit of permittivity.

19. Which of the following is NOT a derived unit?

(a) Mol (b) Volt
(c) Radian (d) Lumen

RRB ALP & Tech. 23.01.2019 Shift-II

Ans : (a) Derived unit: Those units of physical quantities which are derived from units of fundamental quantities are called derived units. ex –
Unit of mass, length etc.
Mol is a fundamental unit.

20. Which of the following is a base unit?

(a) candela (b) hertz
(c) radian (d) ohm

RRB ALP & Tech. 08.02.2019 Shift-I

Ans : (a) : Candela is base unit, Hence option (a) is correct.

21. Katal is the unit of_____.

(a) catalytic activity (b) stress
(c) capacitance (d) entropy

RRB ALP & Tech. 08.02.2019 Shift-I

Ans : (a) : Katal is the unit of catalytic activity. It is equivalent to 1 mole/second.

22. Which of the following option does not have SI unit?

(a) Frequency
(b) Amount of substance
(c) Electric current
(d) Luminous Intensity

RRB ALP & Tech. 23.01.2019 Shift-III

Ans : (a) Frequency does not have S.I base unit. The SI unit of frequency is hertz which is the reciprocal of time period.

23. One mile is approximately equivalent to _____ kilometers.

(a) 0.8 (b) 1.2
(c) 1.4 (d) 1.6

RRB ALP & Tech. 22.01.2019 Shift-I

Ans : (d) 1 mile = 1.69344 Kilometers
Hence, option (d) is correct.

24. Heat supplied to a system is measured in____.

(a) joules (b) amperes
(c) kilowatts (d) degrees kelvin

RRB ALP & Tech. 22.01.2019 Shift-I

Ans : (a) Heat supplied to a system is measured in Joule or Calorie.
1 Calorie = 4.18 Joule

25. Which meter is used for the measurement of heat ?

(a) Energy meter (b) Calorimeter
(c) Ammeter (d) Wattmeter

RRB ALP & Tech. 21.01.2019 Shift-I

Ans : (b): Instrument	**Uses**
• Calorimeter	To measure the thermal change
• Ammeter	To measure current in the circuit
• Wattmeter	To measure and estimate the electric power
• Energy	To measure the total power

26. When you convert one inch from British to SI unit, it becomes ..... cm.

(a) 25.4 (b) 12
(c) 2.54 (d) 0.254

RRB ALP & Tech. 21.01.2019 Shift-I

Ans : (c) : One inch from British to SI unit is equal to the 2.54 cm.

27. The SI unit for electrical resistivity is :

(a) Tesla (b) Ohm meter
(c) Ampere (d) Volt/meter

RRB ALP & Tech. 21.01.2019 Shift-I

Ans : (b) SI unit of electrical resistivity is ohm meter.
- Electric field Resistivity – Ohm-meter
- Magnetic field strength – Tesla or Ampere/meter
- Electric field strength – Volt/meter

28. What is the S.I unit of potential difference ?

(a) Coulomb (b) Tesla
(c) Volt (d) Ampere

RRB ALP & Tech. 22.01.2019 Shift-III

Ans : (c)		**SI Unit**
Electric charge	–	Coulomb
Electric field	–	Tesla
Potential difference	–	Volt
Electric current	–	Ampere

29. Generally, the capacity of a battery is expressed in -

(a) Tesla (b) Kilowatt hour
(c) Ampere (d) Ampere hour

RRB ALP & Tech. 22.01.2019 Shift-III

Ans : (d) An ampere hour is a unit in which capacity of battery can be expressed.
1 Ampere – hour is equal to 3600 Coulombs. It is a useful metric to determine the capacity of an energy storage device, such as a rechargeable battery or deep cycle battery.

30. What is the S.I. unit of transferred heat energy?

(a) Kelvin (b) Ampere
(c) Kilowatt (d) Joule

RRB ALP & Tech. 22.01.2019 Shift-III

Ans : (d)

Physical quantity	SI unit
Temperature	Kelvin (K)
Electric current	Ampere (A)
Power	Killowatt (kW)
Heat energy	Joule.

31. Which of the following is a unit of momentum?

(a) Nm (b) kg m s^{-1}
(c) kg m s^{-2} (d) kg m^{-2}

RRB JE Bhopal Paper-I (Shift-II), 28.08.2015

Ans. (b) :

Physical quantity	Unit
Work done	N-m
Linear momentum	Kg-ms^{-1}
Force	Kg-ms^{-2}

32. SI unit of force is-

(a) kg-ms^{-2} (b) kg-ms^{-1}
(c) kg-m^2s^{-2} (d) kg-m^3s^{-1}

RRB Chennai Section Engineer, 12.02.2012

Ans. (a) : Force = mass × acceleration
Force = kg × m - s^{-2}
SI Unit of force is equal to kg – m-s^{-2}

33. C.G.S. unit of force is-

(a) Newton (b) kg
(c) Dyne (d) None of these

DMRC Junior Engineer (Electronics), 03.08.2014

Ans. (c) : Unit of force –

M. K. S	kg-m/sec^2
S.I	Newton
C.G.S	Dyne

34. How much watt in one horse power-

(a) 1000 (b) 750
(c) 746 (d) 748

RRB Trivandrum (Tech.), 09.11.1997

Ans. (c) : 1 horse power = 746 watt

35. Kilowatt hour is the unit of-

(a) mass
(b) time
(c) Electrical energy
(d) Electrical power

RRB Secunderabad Technical-III (Electrical), 11.12.2005

Ans. (c) : Kilowatt hour is a unit of electrical energy.

36. eV is the unit of -

(a) energy
(b) Charge of electron
(c) Potential difference
(d) Power

RRB Kolkata Technical-III, 20.08.2006

Ans. (a) : eV is a unit of energy.
1 eV= 1.602×10^{-19} Joule

37. Which of the following is a vector quantity-

(a) momentum
(b) pressure
(c) energy
(d) work

RRB Patna Technical Eng., 27.07.2008

Ans. (a) : Momentum is a vector quantity.

38. 'Parsec' is the unit measurement of

(a) Density of stars
(b) Astronomical distance
(c) Brightness of heavenly bodies
(d) Orbital velocity of giant stars

RRB Chandigarh Section Eng. (Civil), 26.02.2012

Ans. (b) : Parsec is the unit of astronomical distance.
1 astronomical = 9.46×10^{15} meter

39. One atmospheric pressure is equal to.....bar:

(a) 1.01325 (b) 10.3
(c) 760 (d) 101.325

DMRC JE Mech. 18.02.2017

Ans : (a) 1 atm pressure = 1.01325 bar
= 10.3 meter (height of water)
= 760 mm (height of mercury)
= 101. 325 (kilo pascal)

40. The specific gravity of liquids is usually measured by means of a:

(a) Hygrometer
(b) Thermometer
(c) Piezometer
(d) Hydrometer

DMRC JE Mech. 07.09.2014

Ans : (d) The specific gravity of liquids usually measured by means of hydrometer.

Hygrometer	– To measure amount of humidity
Piezometer	– To measure underground water pressure
Thermometer	– To measure temperature of matter

41. What does the voltmeter measure?

(a) Strength of current
(b) Potential difference between two points
(c) Resistance
(d) Energy consumed

RRB Ajmer (Technical), 25.01.1998

Ans. (b): Voltmeter is used to measure electric potential difference between two point in an electric circuit.

42. A barometer is used to measure :

(a) Very low pressure
(b) Very High pressure
(c) Pressure difference between two points
(d) Atmospheric pressure

RRB JE Bhopal Paper-I (Shift-II), 28.08.2015

Ans. (d) : A barometer is used to measure atmospheric pressure.

43. Which one of the following instruments will be used for measuring electric current?

(a) Voltmeter
(b) Ammeter
(c) Ohmmeter
(d) Wavemeter

RRB Bilaspur JE (red) , 14.12.2014

Ans. (b) : Ammeter is used to measure electric current.

44. The order of magnitude of 0.00542 is –

(a) 10^{-5} (b) 10^{-4}
(c) 10^{-3} (d) 10^{-2}

RRB Ajmer (Technical), 01.03.1998

Ans. (d) : If given no is greater than 3.16 then given no is multiplied by 10^1 i,e

$5.42 > 3.16$

$\Rightarrow \quad 5.42 \times 10^{-3} \times 10^1$

$\Rightarrow \quad 5.42 \times 10^{-2}$

Order of magnitude is 10^{-2}

If given no is less than 3.16 then the given value is unchanged.

45. The order of magnitude of 1.6×10^6 is-

(a) 10^7 (b) 10^8
(c) 10^0 (d) 10^6

RRB Trivandrum (Technical), 11.04.1999

Ans. (d) : The order of magnitude of 1.6×10^6 is 10^6.

46. In one measurement, the diameter is 1.308 cm, the significant no is.

(a) 2 (b) 4
(c) 5 (d) 0

RRB Trivandrum (Technical), 29.06.1999

Ans. (b) : The significant no of 1.308 is 4.

47. What is the order of magnitude of time taken by the earth to revolve around the sun.

(a) 10^5 second
(b) 10^7 second
(c) 10^9 second
(d) None of the above

RRB Kolkata (Technical), 29.08.1999

Ans. (b) : The time taken by the earth to revolve the sun is-

$= 365 \times 24 \times 60 \times 60$

$= 3.1536 \times 10^7$ second

$= 10^7$ second

48. The value of 1 A° is.

(a) 10^{-10} Micron
(b) 10^{-6} Micron
(c) 10^{-4} Micron
(d) 10^{-2} Micron

RRB Bangalore Technical (Engineering), 22.04.2007

Ans. (c) : $1\ A° = 10^{-10}$

$= 10^{-10} \times 10^6$ micron

$= 10^{-4}$ micron

49. The length of one division of the vernier scale is equal to the length of one division of the main scale

(a) less than (b) greater than
(c) equal (d) (a) and (b)

RRB Asst. Loco Pilot (Chandigarh)-2003

Ans. (a) : The length of one division of the vernier scale is slightly less than the length of one division of the main scale.

50. If the observed measurement of an object is 2.85 cm. When object is measured with vernier calipers having a positive error of 0.05 cm then actual measurement of the object will be

(a) 2.90 cm
(b) [2.85 + (0.05/2)] cm
(c) 2.80 cm
(d) None of these

RRB Asst. Loco Pilot (Gorakhpur)-2003

Ans. (c): Actual measurement of the object = observed value + error value

Note:- decrease on positive value and increase on negative value

Actual value = 2.85-0.05 = 2.80

51. The top scale of screw gauge is marked with 50 division, if the pitch of the screw is 1 mm then the least count of the screw gauge.

(a) 0.50 mm (b) 0.002 mm
(c) 0.02 mm (d) 0.05 mm

RRB Asst. Loco Pilot (Mumbai)-2005

Ans. (c) : Least count $= \dfrac{\text{Pitch}}{\text{no.of divisions}} = \dfrac{1}{50}$

L. C = 0.02 mm

52. The no of significant figure in 0.00237×10^5 is.

(a) 1 (b) 2 (c) 3 (d) 4

RRB Asst. Loco Pilot (Ranchi)-2005

Ans. (c) : Standard from $= 2.37 \times 10^2$

Significant no = 3

Order of magnitude $= 10^2$

53. 1 micron is equal to

(a) 1/10 mm (b) 1/100 mm
(c) 1/1000 mm (d) 1/10000 mm

RRB Asst. Loco Pilot (Kolkata)-2006

Ans. (c) : 1 micron $= 10^{-6}$ m $= 10^{-3}$ mm

$= \dfrac{1}{1000}$ mm

54. One nanometer is

(a) 10^{-6} cm (b) 10^{-7} cm
(c) 10^{-8} cm (d) 10^{-9} cm

RRB Asst. Loco Pilot (Kolkata)-2006

Ans. (b) : 1 nanometer $= 1.0 \times 10^{-9}$ m $= 10^{-7}$ cm

- Archimedes law is related **- law of flotation**
- When an object is fully or partially immersed in a liquid then its weight appears decreases and equal to the weight appears decreases and equal to the weight of the liquid displaced by that object. It is based on the principle of **-Archimedes Principle**
- The scientist related to buoyancy is **- Archimedes**
- A piece of iron should not float on the surface of the water is due to **- The weight of the mass displaced by it is less than iron ball.**
- Which country did the great scientist Archimedes belong. **-Greece**
- When a stone is brought from the surface of the moon to the earth, then **- Its weight will change but mass not change.**
- A person sitting in a lift feel his weight more when **-lift moving upward with uniform velocity**
- The tennis ball lands higher on a hill than on the field due to **- Earth's Gravitational acceleration on mountains gets less.**
- If the gravitational force of the earth suddenly vanishes, then **- The weight of the object will become zero, but the value remain the same.**
- Steel bullet floats in mercury because **-The density of mercury is higher than that of steel.**
- When a boat goes to sea from river then **- Rises slightly upward.**
- On changing the quantity of the object will remain unchanged **-Density**
- The wall below the dam is built thick because **-Pressure of liquid increases with increases in depth.**
- The distance covered by a body free fall is proportional to **- Square of time of fall**

PREVIOUS YEAR QUESTIONS

1. A 10 N force is applied on a body which produces in it an acceleration of 2 m/s^2. The mass of the body is

(a) 5 kg (b) 10 kg
(c) 15 kg (d) 20 kg

RRB ALP CBT II Physics & Maths 21 .01.2019 Shift III

Ans. (a) : Given, F = 10 Newton
Acceleration (a) = 2 m/s^2
The mass of the body = ?

$F = m \times a$
$10 = m \times 2$
$m = 5$ kg

2. If a force of 250 N acts on a body at rest, the momentum required is 125 kgm/s. The time for which the force acts on the body is

(a) 0.5 s (b) 0.2 s
(c) 0.1 s (d) 0.3 s

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Ans. (a) : Given that,
F = 250 N
Change in momentum = Impulse (ΔP) = 125 Kgm/s
Δt = ?

$\Delta P = F \times \Delta t$

$\Delta t = \frac{\Delta P}{F}$

$\Delta t = \frac{125}{250}$

Δt = 0.5 sec

3. Two spheres of masses m and M are situated in air and the gravitational force between them is F. The space between the masses is now filled with a liquid of specific gravity 3. The gravitational force will now be

(a) F/3 (b) F/9
(c) 3F (d) F

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Ans. (d) : Gravitational force is given by

$F = \frac{GMm}{R^2}$

Clearly the Gravitational force is dependent only on mass of objects and distances between them. It does not depend on any medium between them. Hence, the force will remain same i.e. F.

4. If three particles, each of mass M are placed at the three corners of an equilateral triangle of side a , the force exerted by this system on another particle of mass M placed at the midpoint of a side is

(a) $4GM^2/2a^2$ (b) $4GM^2/3a^2$
(c) $2GM^2/3a^2$ (d) $2GM^2/5a^2$

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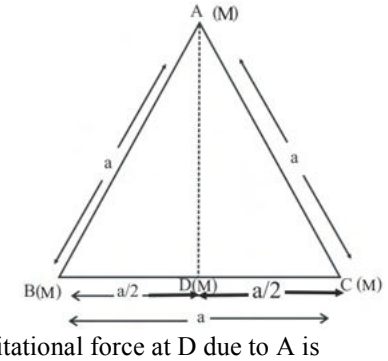
Ans. (b) : We know that,

$$\left[F = \frac{GM_1M_2}{R^2}\right]$$

According to Question-



The gravitational force at D due to A is

$F_{AD} = \frac{GMM}{AD^2}$

Now,
$AC^2 = AD^2 + DC^2$

$$(a)^2 = (AD)^2 + \left(\frac{a}{2}\right)^2$$

$$a^2 - \frac{a^2}{4} = AD^2$$

$$\boxed{\frac{3a^2}{4} = AD^2}$$

Then,

$$\boxed{F_{AD} = \frac{4GM^2}{3a^2}}$$

5. The quantity of motion of a body is best represented by

(a) Its velocity
(b) Its speed
(c) Its mass
(d) Its linear momentum

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Ans. (d) : $\Rightarrow$ The quantity of motion of a body is best represented by 'its linear momentum'.

$$\boxed{P = m \times V}$$

Where,

P = Momentum
m = Mass
V = Velocity

6. A spring when compressed by 4 cm has 2 J energy stored in it. The force required to extend it by 8 cm will be

(a) 2 N (b) 20 N
(c) 2000 N (d) 200 N

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Ans. (d) : Energy stored in a spring is given by,

$$E = \frac{1}{2}Kx^2$$

Where K is spring constant and x is compression/ expansion of spring

$$E = \frac{1}{2} \times K \times x^2$$

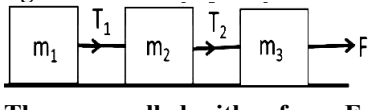
$$2 = \frac{1}{2} \times K \times 16 \times 10^{-4}$$

$$K = \frac{4}{16 \times 10^{-4}} = 2500\,N/m$$

Now force required to extend it by 8 cm is

$$F = Kx = 2500 \times 8 \times 10^{-2} \Rightarrow \boxed{F = 200N}$$

7. Three blocks of masses m_1 , m_2 and m_3 are connected by mass less strings as shown in figure on a frictionless table.



They are pulled with a force F = 40 N. If m_1 = 10 kg, m_2 = 6 kg and m_3 = 4 kg then tensions T_2 will be

(a) 20 N (b) 40 N
(c) 10 N (d) 32 N

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Ans. (d) : Given,

F = 40N
m_1 = 10 kg, m_2 = 6 kg, m_3 = 4 kg

We know that,

F = ma

Total mass of the system

$m = m_1 + m_2 + m_3$
$= 10 + 6 + 4$
$= 20$ kg

Then,

Total acceleration of the system

$40 = 20 \times a \Rightarrow \boxed{a = 2m/s^2}$

Now,

Tension T_2 will be,

$T_2 = (m_1 + m_2)\, a = (10+6) \times 2$
$T_2 = 16 \times 2$

$\Rightarrow \quad \boxed{T_2 = 32N}$

8. Which of the following force is conservative?

(a) Frictional force (b) Air resistance
(c) Electrostatic force (d) Viscous force

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Ans. (c) : A conservative force is one for which the work done is independent of path.
For example - Gravity force, Electrostatic force.
The electrostatic force is an attractive as well as repulsive force caused by the electric charge particles. It is also known as Coulomb's force.

9. A man weighs 'W' on the surface of earth and his weight at a height '2R' from surface of earth is (R is the Radius of earth).

(a) $\frac{w}{9}$ (b) $\frac{w}{6}$
(c) w (d) $\frac{w}{3}$

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Ans. (a) : $g = \frac{GM}{R^2}$ [given h = 2R]

$$g' = \frac{GM}{(R+h)^2}$$

$$g' = \frac{GM}{(R+2R)^2} = \frac{GM}{(3R)^2} = \frac{GM}{9R^2} = \frac{g}{9}$$

$w = mg$
$w' = mg'$

$$w' = \frac{mg}{9}$$

$$\boxed{w' = \frac{w}{9}}$$

10. A bullet of mass 0.05 kg is moving with a speed of 90 m/s and hits a heavy wooden block. The bullet enters the block and stops at a depth of 30 cm. Then the average force exerted by the wooden block on the bullet to resist the motion is

(a) 675 N (b) 150 N
(c) 250 N (d) 270 N

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Ans. (a) : Given that,

Mass(m) = 0.05 kg

Initial speed (u) = 90m/sec

Travelling distance (s) = 30 cm = $\frac{30}{100}$ m

Finally the bullet comes to rest after travelling some distance i.e. Final velocity (v) = 0

From 3rd equation of motion :

$v^2 - u^2 = 2as$

Put the value in above equation

$$0 - (90)^2 = \frac{2 \times a \times 30}{100}$$

$$-8100 = \frac{3a}{5}$$

$$a = \frac{-8100 \times 5}{3}$$

$a = -13500$ m/sec^2

Negative sign shows that it is retardation,

$a = 13500$ m/sec^2

Force = mass × acceleration

$= 0.05 \times 13500$

$= 675$N

11. Two wires, A and B, of same material and length are stretched by applying the same load. If the diameter of wire A is twice that of wire B, then the ratio of the extensions produced in the wires by applying the same load will be

(a) 1 : 2 (b) 2 : 1

(c) 1 : 4 (d) 1 : 1

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Ans. (c) : Given that,

Diameter of A = 2× diameter of B

Let diameter of B = d,

So,

diameter of A = 2d

Change in length $(\Delta\ell) = \frac{F.\ell}{\gamma.A}$

Where, F = Force or load

ℓ = original length

γ= Young's modules

A = cross section area

From the questions,

The force, original length (ℓ) and young's modulus is same for both wire.

So,

Change in length of wire A, $(\Delta\ell)_A = \frac{F.\ell}{\gamma.A}$

$(\Delta\ell)_B = \frac{F.\ell}{\gamma.A'}$

Area of wire $B_A(A') = \frac{\pi(2d)^2}{4}$

Area of wire A(A) = $\frac{\pi d^2}{4}$

Put the value of Area of wire A and B

So, $\frac{(\Delta\ell)_A}{(\Delta\ell)_B} = \frac{\frac{F\ell}{\gamma\frac{\pi}{4}(2d)^2}}{\frac{F.\ell}{\gamma\frac{\pi}{4}d^2}}$

ratio = $\frac{(\Delta\ell)_A}{(\Delta\ell)_B} = \frac{1}{4}$

12. Moment of inertia of a thin circular ring of mass M and R rotating about an axis, passing through its centre and perpendicular to the plane is

(a) MR^2 (b) $MR^2/4$

(c) $MR^2/2$ (d) $(2/5)\,MR^2$

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Ans. (a) : Given, the mass of the circulating ring is 'M' and radius 'R'.

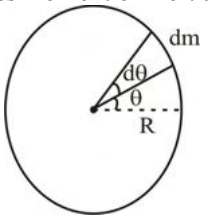
We take elementary unit section of the ring

$$dm = \frac{M}{2\pi R}$$

So, $dI = dm(R)^2$ $\quad \because I = mr^2$

$$dI = \frac{M}{2\pi R}.R^2$$

Integrating the mass moment of inertia



$$\int dI = \int \frac{M}{2\pi R}.R^2.dx$$

$$I = \frac{M}{2\pi}.R\int_0^{2\pi R} dx$$

$$= \frac{M}{2\pi}.R(2\pi R - 0)$$

$I = MR^2$

13. Which of the following will not exist for a liquid in a gravity – free space

(a) Viscosity (b) Surface tension

(c) Upward thrust (d) Pressure

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Ans. (c) :

Upward thrust is defined as the force that is exerted on an object by the fluid when the object is submerged. It is also called as buoyant force. It always acts upwards. It always acts against the weight of an object.

$F_{buoyant} = \rho \times g \times V$

Where, ρ = density of fluid

g = acceleration due to gravity

V = volume of fluid

In gravity free space,

$F_{buoyant} = 0$

That is upward thrust will not exist in a gravity free space.

Viscosity : The property of a fluid which opposes the relative motion between the layer is called viscosity.

Surface tension : It is a property of liquids characterized by the surface molecules tendency to shrink into a lower surface area as a result of bulk force from inner molecules.

$$\text{surface tension} = \frac{\text{force}}{\text{length}}$$

Pressure : Fluid pressure is a measurement of the force per unit area on an object in the fluid or on the surface of a closed container.

- Viscosity, surface tension and pressure does not depends on the gravity.

14. Two objects A and B of masses 4 kg and 6 kg are acted upon by the forces F_1 and F_2 required to accelerate them at 7 m/s^2 and 4 m/s^2 respectively. Which of the following relationships between the force F_1 and F_2 holds true for the required purpose?

(a) $F_1 > F_2$ only
(b) $F_1 = F_2$
(c) $F_1 < F_2$ or $F_1 > F_2$, depending on the mass density of the material of the objects.
(d) $F_1 < F_2$ only

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Ans. (a) : Given that,
Mass $(m_1) = 4$ kg
Mass $(m_2) = 6$ kg
Acceleration $(a_1) = 7$ m/sec^2
Acceleration $(a_2) = 4$m/sec^2
We know that,
Force (F) = Mass (m) × Acceleration (a)
So,

$F_1 = m_1 \times a_1$
$= 4 \times 7$
$= 28$ N
$F_2 = m_2 \times a_2$
$= 6 \times 4 = 24$N

Relationship between the force = $F_1 > F_2$.
So option (a) is correct.

15. Dirt can be removed from a carpet by shaking it vigorously for some time in process that is based on

(a) Second law of motion
(b) Both third and second laws of motion
(c) Third law of motion
(d) First law of motion

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Ans. (d) :

- Newton's first law of motion also known as the law of inertia. The property of inertia is the property of a body that causes it to tend to stay in a steady state of motion or at rest unless an external force is applied to the body.
- When a carpet is shaken with a stick the material of the carpet moves in forward and backward directions. The dust particles on the carpet tend to remain at rest due to their property of inertia. Since the dust particles get separated from the carpet because they are still at rest, they fall under the force of gravity. Thus it is based on the first law of motion.

16. What is the relative density of a solid of mass 50 gm which when fully immersed in water weighs 10 gm?

(a) 0.8 (b) 1.25
(c) 2.5 (d) 5

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Ans : (b)
Mass of solid = 50 gram
Decrease in weight of solid = 50-10 = 40 gram
density of water = 1 gm/cc
Volume of solid = 40 cc

$$\text{Hence, the density of solid} = \frac{\text{Mass}}{\text{Volume}} = \frac{50}{40} = 1.25 \text{ gm/cc}$$

$$\text{relative density} = \frac{\text{density of solid}}{\text{density of water}} = \frac{1.25}{1} = 1.25 \text{ gm/cc}$$

17. Find the length (in cm) of the edge of a cube of a piece of wood which weighs 80 N. (Use g = 10 m/s^2, density of wood = 1g/cm^3)

(a) 60 (b) 20
(c) 80 (d) 40

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Ans : (b) Let the side of cubical piece = a
Volume $= a^3$
Force = 80 N
g $= 10 m/s^2$
density $(\rho) = 1 g/cm^3 = 1000 kg/m^3$
Force $= m \times g$
$80 = m \times 10$
$m = 8$ kg

$$\text{density}(\rho) = \frac{\text{m (mass)}}{\text{v (volume)}}$$

$$1000 = \frac{8}{v}$$

$$V = \frac{8}{1000}$$

$$(a)^3 = \frac{8}{1000}$$

$$a = \frac{2}{10} m$$

$$a = \frac{2}{10} \times 100 \text{ cm}$$

$$\boxed{a = 20 \text{ cm}}$$

18. Find mass of an iron cube of side 2 cm. (Density of iron is 7.8 gm/cm^3)

(a) 15.6gm (b) 3.9gm
(c) 0.975gm (d) 62.4gm

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Ans : (d) Volume of iron cube $= 2 \times 2 \times 2$
$= 8$ cm^3
Mass of cube = volume × density
$= 8 \times 7.8$
$= 62.4$ gm

19. An object with greater———has greater inertia
(a) Acceleration (b) Mass
(c) Velocity (d) Volume

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Ans : (b) Inertia is depend on the mass of the object Hence, an object with greater mass has greater inertia.

20. Acceleration due to gravity on moon is 1/6th that on earth. How would an astronaut weigh on moon if he weight 90 kgf on earth? (acceleration due to gravity on earth = 10m/s^2)
(a) 9N (b) 90N
(c) 150N (d) J15

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Ans : (c) Mass (m) = 90 kg
acceleration due to gravity = 10 m/sec^2
Astronaut weight on earth,
$W = m \times g$
$= 90 \times 10$
$= 900$ N

$$\text{Weight on moon} = \frac{1}{6} \times \text{weight on earth}$$
$$= \frac{1}{6} \times 900$$
$$= 150 \text{ N}$$

21. Acceleration due to gravity on Jupiter is two and a half times that on earth. How much would a 250 kg satellite weight (in N) on Jupiter? (acceleration due to gravity on earth = 10m/s^2)
(a) 6250 (b) 10
(c) 625 (d) 100

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Ans : (a) Mass on earth (m) = 250 kg
Acceleration due to gravity (g) = 10 m/s^2
Weight on earth (w) = m × g
$= 250 \times 10$
$= 2500$ N

$$\text{Weight on Jupiter} = \frac{5}{2} \times 2500 = 6250 \text{ N}$$

22. A block of metal of mass 500 g has a relative density of 2.5. What will be its apparent mass when it is fully immersed in water?
(a) 250g (b) 300g
(c) 200g (d) 400g

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Ans : (b) Actual mass = 500
relative density = 2.5
apparent mass = ?

$$\text{Relative density} = \frac{\text{Actual mass}}{\text{Actual mas - appearant mass}}$$
$$2.5 = \frac{500}{500 - x}$$
$$2.5\,(500 - x) = 500$$
$$1250 - 2.5x = 500$$
$$2.5x = 1250 - 500$$
$$x = \frac{750}{2.5}$$
$$\boxed{x = 300\text{g}}$$

23. A uniform meter scale weights 50g. It is pivoted at the 70cm mark. Where should a 40 g mass be placed so that the scale is in equilibrium?
(a) At the 45 cm mark (b) At the 25 cm mark
(c) At the 95 cm mark (d) At the 5 cm mark

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Ans : (b) In equilibrium condition :-
$\sum m = 0$
$40 \times x = 20 \times 50$
$$x = \frac{20 \times 50}{40}$$
$x = 25$ cm

24. Find the mass (in kg) of a tank completely filled with kerosene of dimensions 5m × 2m × 1m (Density of kerosene is 800 kg/m^3)
(a) 8000 (b) 1250
(c) 800 (d) 12500

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Ans : (a) $\text{density} = \frac{\text{Mass}}{\text{Volume}}$
$\therefore$ mass = density × volume
mass of kerosene = 800 × 5 × 2 ×1 = 8000 kg

25. Acceleration due to gravity is highest at_____.
(a) the poles (b) the equator
(c) at an infinite distance from the earth
(d) the center of the earth

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Ans : (a) Acceleration due to gravity (g) is highest at the poles. As the distance decreases from the centre g decrease and vice – versa.

26. Find the density (in kg/m^3) of a piece of wood measuring 6cm×8cm×5cm and weighing 1.92N (g = 10m/sec^2)
(a) 3000 (b) 300
(c) 8000 (d) 800

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Ans : (d) Given that,
Volume (V) = 6 cm × 8 cm × 5 cm
$$= \frac{240}{1000000} = \frac{24}{100000} \text{m}^3$$
Weight (W) = 1.92 N
(g) = 10 m/s^2
$w = mg$
$1.92 = m \times 10$
$$m = \frac{1.92}{10}$$
$m = 0.192$ kg

$$\text{(density) (d)} = \frac{\text{mass(m)}}{\text{volume(v)}} = \frac{0.192}{\frac{24}{100000}}$$
$$\text{(d)} = \frac{0.192 \times 100000}{24} = \frac{19200}{24} = 800 \text{ kg/m}^3$$

27. Find the length of the edge of a metal cube of density 8 g/cm^3 which weight 17.28 kN. (Use g = 10 m/s^2)
(a) 9 cm (b) 8 cm
(c) 10 cm (d) 6 cm

RRB ALP & Tech. 08.02.2019 Shift-I

Ans : (d) : $\text{volume} = \frac{\text{mass}}{\text{density}}$

$\text{Volume of cube} = \frac{17.28\times10^3}{10\times8} = 216\text{cm}^3$

$\because$ Volume of cube $= a^3$ (a = side of cube)

$a^3 = 216\ \text{cm}^3$

$a = (216)^{\frac{1}{3}}\ \text{cm} = 6\ \text{cm}$

28. Two children of 24 kg and 16 kg sit on one side of a see-saw at a distance of 1 m and 0.625 m respectively, from the fulcrum. If a body of 'm' kg sits on the other side of the see-saw at a distance of 1.6 m from the fulcrum and the see-saw is in equilibrium. Find m.

(a) 21.25 kg (b) 32.25 kg
(c) 27.75 kg (d) 36.75 kg

RRB ALP & Tech. 08.02.2019 Shift-I

Ans : (a) : Since, the children of 24kg and 16kg are sitting on the one side and one child of mass 'm' is sitting on another side of mass 'm'. Therefore in equilibrium position -

$(24\times1) + (16\times0.625) = m\times1.6$

$24 + 10 = m \times 1.6$

$m = \frac{34}{1.6}$

$m = 21.25\ \text{kg}$

Hence, the weight of the child sitting on the other side will be 21.25kg.

29. The gravitational acceleration is _____m/s^2 at the equator.

(a) 9.87 (b) 9.72
(c) 9.78 (d) 9.83

RRB ALP & Tech. 08.02.2019 Shift-I

Ans : (c) : The acceleration due to gravity at the equator is 9.78 m/sec. The diameter of the earth at the equator is approximately 12,756 km. The equator divides the earth into the Northern Hemisphere and southern hemisphere.

30. Acceleration due to gravity on Mars is 1/3rd that on earth. How much would an astronaut weight on Mars if he weighs 72 kg on earth? (Acceleration due to gravity on earth = 10 m/s^2)

(a) 720 N (b) 240 N
(c) 120 N (d) 360 N

RRB ALP & Tech. 08.02.2019 Shift-I

Ans: (b) : Weight on earth $(W_1) = 72$ kg

Acceleration due to gravity $(g) = 10\ m/s^2$

Gravity on mars $(g) = g/3$

$= \frac{10}{3}\ m/s^2$

$g' = \frac{g}{3} = \frac{72}{3} = 24\ \text{kg}$

Weight on mars $= 24\times10 = 240$ N

31. What is the relative density of a solid of mass 75 gm which when fully immersed in water weighs 25 gm?

(a) 1.5 (b) 0.8
(c) 1.6 (d) 2.5

RRB ALP & Tech. 08.02.2019 Shift-I

Ans : (a) :

Weight of solid = 75 gm

Weight of solid on sinking = 25 gm

Amount of water displaced by solid (75-25) = 50 gm

$\text{relative density} = \frac{\text{mass of solid}}{\text{amount of water displaced by solid}}$

$= \frac{75}{50} = \frac{3}{2} = 1.5$

32. The effort done to shift a load is 15 units and the work done by the machine is 3. Then find the weight.

(a) 45unit (b) 3unit
(c) 5 unit (d) 15 unit

RRB ALP & Tech. 23.01.2019 Shift-III

Ans : (a) The effort done to shift a load is 15 units and the work done by the machine is 3 units. The weight will be 45 unit.

33. If the specific gravity of a body is less than 1, it will float on ___.

(a) Water (b) Liquid
(c) Mercury (d) Air

RRB ALP & Tech. 23.01.2019 Shift-III

Ans : (a) If specific gravity comes out to be less than one. It simply means that it is less than dense than water. Hence, it will float on water, And if the value is more than one, it means it is denser than water and it would sink in water.

34. The volume of a certain amount of water between 0°C to 4°C is ____.

(a) Increases (b) Decreases
(c) Remains constant (d) Zero

RRB ALP & Tech. 23.01.2019 Shift-III

Ans : (b) The density of water is highest at 4°C and the volume is least. The volume of water increase when is heated or cooled at a temperature higher or lower than 4°C. Thus, volume of given amount of water decrease between 0°C and 4°C while it increase above 4°C.

35. If a body is not homogeneous, then its density is a function of its ____.

(a) Pressure (b) Position
(c) acceleration (d) velocity

RRB ALP & Tech. 23.01.2019 Shift-III

Ans : (b) If a body is not homogeneous, then its density is a function of its position. The density of a substance is equal to mass per unit volume. The density of a homogeneous material is equal at all points on an object.

36. It is mainly due to the gravitational effect of the ____ on the rotating earth that the level of water in the sea rises and falls.

(a) Moon (b) Venus
(c) Mercury (d) Sun

RRB ALP & Tech. 23.01.2019 Shift-III

Ans : (a) The rise and fall of sea level is mainly due to the gravitational effect of the moon on the rotating earth.

37. An object weighs X units on the earth. If we take the same object to the moon, its weight there will be.....

(a) more than X (b) equal to X
(c) less than X (d) zero

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Ans : (c) The value of acceleration due to gravity on the moon is $\frac{1}{6}$ of the acceleration due to gravity on the earth. If the weight of the object is x unit on the earth than weight of the object on the moon is $\left(w = \frac{m \times g}{6}\right)$ decreases by $\frac{x}{6}$ unit. Hence, if we take the same object to the moon, its weight decrease.

38. A block of wood floats on water, with 65% of its volume under water. Its density (in kg/m^3) is approximately.

(a) 0.55×10^3 (b) 0.35×10^2
(c) 0.25×10^2 (d) 0.65×10^3

RRB ALP & Tech. 22.01.2019 Shift-I

Ans : (d) Total volume of wood = 100%
Volume of wood immersed in water = 65%
Density of water = 1000kg/m^3
Density of wood = x = ?

$$\frac{\text{Volume of wood immersed in water}}{\text{Total Volume of wood}} = \frac{\text{Density of wood}}{\text{density of water}}$$

$$\frac{65}{100} = \frac{x}{1000}$$

$x = 650$ kg/m^3
$x = 0.65 \times 10^3$ kg/m^3

39. The density of fresh water is_____ the density of salt water :

(a) less than (b) more than
(c) negligible compared with
(d) equal to

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Ans: (a) When salt is dissolved in fresh water the density of water increase due to the increase in the mass of the water therefore, the density, of fresh water is less than the density of salt water.

40. The mass density or density of a material is defined as its _____.

(a) mass per unit volume
(b) mass per unit length
(c) mass per unit area
(d) mass per ampere

RRB ALP & Tech. 22.01.2019 Shift-I

Ans : (a) $\text{Density} = \frac{\text{mass}}{\text{volume}}$
Density is scalar quantity. Unit of density is kg/m^3.

41. Let W_e and W_m be the weight of an object on the Earth and the Moon, respectively. Then, the ratio W_e/W_m is equal to _____.

(a) 2 (b) 1
(c) 6 (d) 4

RRB ALP & Tech. 22.01.2019 Shift-I

Ans : (c) Let, mass of object = m
Weight on earth surface = $W_e = m\times g$

Weight on moon surface = $W_m = m \times \frac{g}{6}$

$$\frac{W_e}{W_m} = \frac{m \times g}{m \times \frac{g}{6}}$$

$$\frac{W_e}{W_m} = 6$$

42. The relative density of gold is 19.3. Its density in SI unit is:

(a) 19.3 kg/m^3 (b) 19.3×10^3 kg/m^3
(c) 1.93×10^2 kg/m^3 (d) 19.3×10 kg/m^3

RRB ALP & Tech. 22.01.2019 Shift-II

Ans : (b) Relative density of gold = 19.3

$$\text{relative density} = \frac{\text{density of object}}{\text{density of water}}$$

density of gold = relative density × density of water gold.
$= 19.3\times1000$
$= 19300$ kg/m^3
$= 19.3\times10^3$ kg/m^3

43. If an object has a mass of 100 kg on Earth, what would be its mass on the Moon?

(a) 980 kg (b) 100 kg
(c) 0 kg (d) 16.7 kg

RRB ALP & Tech. 22.01.2019 Shift-II

Ans : (b) : If an object has a mass of 100 kg on earth, then its mass on the moon is 100 kg i.e. remains same.
Weight = mass × gravity
$\boxed{W = mg}$

44. The Ideal-gas equation is ____.

(a) P/VT = μR (b) T/PV = μR
(c) PV/T = μR (d) PV/T = (1/μ)R

RRB ALP & Tech. 22.01.2019 Shift-II

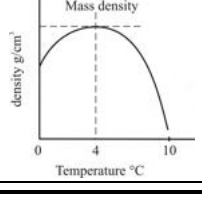
Ans : (c) : Ideal gas equation:-
PV = μRT _____ equ.(i).
Where,
P = atmospheric pressure
V = volume
μ = mole of the gas
R = Gas constant
T = Temperature
equ. (i) $\Rightarrow \frac{PV}{T} = \mu R$

45. Water has the maximum density at ___°C.

(a) 4 (b) 22
(c) 2 (d) 0

RRB ALP & Tech. 22.01.2019 Shift-II

Ans : (a) : Water has maximum density at 4°C. Graph between temperature and density:-



46. Consider a planet whose mass and radius both are one half to that of Earth. An object of weight W on Earth will weigh ____ on that planet.

(a) W/2 (b) 2W
(c) W/4 (d) W

RRB ALP & Tech. 22.01.2019 Shift-II

Ans : (d) : There will be no change in the mass of object. only the weight will change due to gravitational acceleration. The mass of the object remain unchanged.

47. A cubical block of side 10 cm and with a mass of 600 g floats in water. How much of the cube is submerged?

(a) 30% (b) 40%
(c) 60% (d) 50%

RRB ALP & Tech. 22.01.2019 Shift-II
RRB ALP & Tech. 22.01.2019 Shift-III

Ans : (c) : Side of cube = 10 cm

Volume of cube = $(10)^3 = 1000\ cm^3$

Mass of cube = 600 g = 0.6 kg

density of cube (d) = m/V

$$= \frac{600}{1000} = 0.6 g/cm^3$$

Percentage of immersed cube in water

$= 0.6 \times 100 = 60\%$

48. The actual weight of a person is determined by his:

(a) Mass and the acceleration due to gravity
(b) Mass
(c) Mass and width
(d) Mass and height

RRB ALP & Tech. 22.01.2019 Shift-II

Ans : (a) : The actual weight of a person is:-

Weight = mass of object × gravity

$\boxed{W = mg}$

49. The acceleration due to gravity on the Moon is (1/6) of that on the Earth. Hence, an object weighing 12 N on the Earth will weigh ..... on the Moon.

(a) 6 N (b) 72 N
(c) 2 N (d) 12 N

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Ans : (c) : Weight of body on the earth (W) = 12N

Weight of body on the moon

$$= \frac{1}{6} \times W$$

$$= \frac{1}{6} \times 12N$$

$= \boxed{2N}$

50. Identify the variable from below that does not describe the behaviour of a gas.

(a) Temperature (b) Volume
(c) Pressure (d) Time

RRB ALP & Tech. 21.01.2019 Shift-I

Ans : (d) : Ideal gas equation is –

PV = nRT

Where, P = atmospheric pressure

V = Volume

n = no. of moles

R = Gas constant

T = Temperature

Hence, time is not describe the behaviour of gas.

51. The density of an ideal gas can be doubled by halving the :

(a) Absolute temperature (b) Velocity
(c) Mass (d) Pressure

RRB ALP & Tech. 21.01.2019 Shift-I

Ans : (a) : From ideal gas equation :-

$$PV = nRT$$

$$P = \frac{n}{V}RT$$

$$P = \frac{\rho}{M}RT$$

$$\rho = \frac{MP}{RT} \quad \ldots\ldots (eq^n(i))$$

From eq^n (i), It is clear that the density of an ideal gas can be doubled by halving the temperature.

52. An object of a specific mass will weigh -

(a) more on earth than on the moon
(b) same on both earth and moon
(c) less on the earth than on the moon
(d) zero on the earth

RRB ALP & Tech. 22.01.2019 Shift-III

Ans : (a) We know that

$W = mg$ ... eq(i)

On the moon, $g' = \frac{g}{6}$ ...eq(ii)

From equation(i), it is clear that the weight is directly proportional to the acceleration due to gravity.

From equation (ii) and equation (i) it is clear that the weight on the surface of earth is more than that on the Moon's surface.

53. The density of ice is ———— compared to the density of water.

(a) Equal (b) Negligible
(c) Less (d) More

RRB ALP & Tech. 22.01.2019 Shift-III

Ans : (c) The density of ice is less compared to the density of water. Ice has low density than water because it has a cage like structure. In this structure, a lot of vacant spaces are left when water molecules linked in ice.

54. The mass of an object is a numerical measure of its ————.

(a) Velocity (b) Gravity
(c) Inertia (d) Acceleration

RRB ALP & Tech. 22.01.2019 Shift-III

Ans : (c) The tendency of an object to resist changes in its state of motion varies with mass is called inertia of an object, Inertia is basically a measure of the mass of the body.

55. The apparent mass of a piece of metal when fully immersed in water is 60 gm. If the relative density of this metal piece is 2.5, find its actual mass (in gm)?

(a) 300 (b) 40
(c) 400 (d) 100

RRB ALP & Tech. 21.01.2019 Shift-II

Ans : (d) : Given : relative density = 2.5
Apperant mass = 60 gram
Actual mass = x

$$\text{relative density} = \frac{\text{Actual Mass}}{\text{Actual Mass} - \text{Appearant Mass}}$$

$$2.5 = \frac{x}{x-60}$$
$$\frac{5}{2} = \frac{x}{x-60}$$
$$5x - 300 = 2x$$
$$3x = 300$$
$$x = 100 \text{ gram}$$

56. Find the volume (in cm^3) of a piece of metal of density 5000 kg/m^3 and which weights 10.8 N. (Use g = 10 m/s^2)
(a) 21.6 (b) 216
(c) 540 (d) 54

RRB ALP & Tech. 21.01.2019 Shift-II

Ans : (b) : Given : density (d) = 5000kg/m^3
Weight (W) = 10.8 N
Gravitation (g) = 10m/sec^2

$$W = mg$$
$$10.8 = m \times 10$$
$$m = \frac{108}{100} =$$
$$m = 1.08 \text{ kg}$$
$$d = \frac{m}{V}$$
$$V = \frac{m}{d} = \frac{1.08}{5000} m^3$$
$$V = \frac{1.08}{5000} \times 10^6 cm^3 \left[\because 1m = 100cm\right]$$
$$= 216 \text{ } cm^3$$

57. A body of mass 60 kg weight 222 N on Mars. What is the acceleration due to gravity (in m/s^2) on Mars?
(a) 4.9 (b) 13.32
(c) 19.8 (d) 3.7

RRB ALP & Tech. 21.01.2019 Shift-II

Ans : (d) : Given,
m = 60 kg
W = 222 N
g = ?
From W = mg

$$g = \frac{W}{m}$$
$$g = \frac{222}{60}$$
$$g = 3.7 m/sec^2$$

Hence, on the mars acceleration due to gravity will be 3.7m/sec^2.

58. The weight of the object appears on one pan of a faulty scale as W_1 and on the other pan as W_2. True weight of the object-
(a) (W_1+W_2) (b) $\frac{W_1 + W_2}{2}$
(c) $\sqrt{W_1 \times W_2}$ (d) $W_1 \times W_2$

RRB Asst. Loco Pilot/Technician (Ahmedabad)-2014

Ans. (c) : According to the question, it the weight of an object is W in one pan of an defective scale and W_2 on the other pan, then the correct weight of the object is equal to the geometrical mean of W_1 and W_2.
i.e

$$W = \sqrt{W_2 \times W_2}$$

59. On the placing of body successively in the pans of a faulty balance. whose sides are unequal, its weight appeared to be 6.4 grains and 10 grams. The correct weight of the body is –
(a) 10 gm (b) 14 gm
(c) 8.2 gm (d) 8 gm

RRB Asst. Loco Pilot/Technician (Ranchi)-2014

Ans. (d): Actual weight $= \sqrt{W_1 \times W_2}$
$= \sqrt{6.4 \times 10}$
$= 8$ gram.

60. A wooden plank can rotate on a horizontal axis fixed in the middle. A child of mass 20 kg sits on one side the axis at a distance of 1.5m from the axis and on the other side another child of weight 16 kg sits at a distance of 2.0 m from the axis, then which boy will rise.
(a) 20 kg-weight (b) 16 kg-weight
(c) None of these (d) both (a) and (b)

RRB Asst. Loco Pilot/Technician (Kolkata)-2014

Ans. (a) : The child whose torque is less about the middle point of the frame will rise up. the torque of the 20W boy is 20 × 1.5, less then the torque (16 × 2 = 32) of the 16 W boy. therefore, 20W boy will rise up.

61. In comparison to the measurement of the surface of the Earth, those on top of Mr. Everest demonstrate :
(a) decrease in weight with mass remaining the same
(b) increase in the mass with weight remaining the same
(c) decrease in both mass and weight
(d) increase in both mass and weight

RRB SSE Secundrabad (Shift-I), 01.09.2015

Ans. (a) : The mass of a system is always a constant, i.e same in each case but the value of g decrease on going above or below the surface of the earth. The weight of an object always depends on the acceleration due to gravity (g). Hence the weight of the object decrease at the height but mass remains the same.

62. If two liquids of same mass and densities D_1 and D_2 are mixed then density of mixture-
(a) $\frac{D_1 + D_2}{2}$ (b) $\frac{D_1 D_2}{D_1 + D_2}$
(c) $\frac{2D_1 D_2}{D_1 + D_2}$ (d) $\frac{D_1 + D_2}{D_1 D_2}$

RRB Kolkata Chemical & Metallurgical Er., 01.12.2002

Ans. (c) : Density of mixture (D) = $\frac{\text{Total mass(m)}}{\text{total volume(V)}}$

$$= \frac{\text{m+m}}{\frac{\text{m}}{D_1}+\frac{m}{D_2}}$$

$$\text{D} = \frac{2D_1D_2}{D_1+D_2}$$

63. The mass of an object is 100kg. If acceleration due to gravity on the moon is $\frac{1}{6}$ then mass of an object on the surface of the moon will be –

(a) 100/6 kg (b) 60 kg
(c) 100 kg (d) 600 kg

RRB Bangalore Section Engineer (Civil) 01.02.2009

Ans. (c) Mass always remains constant. Therefore the mass on the moon will be only 100 kg.

64. It is easier to swim in the sea than in the river because –

(a) Sea water is deep
(b) Density of sea
(c) Water keep rising in the ocean
(d) The density of water in the sea is less

DMRC Mechanical Engineering, 18.02.2017

Ans. (b) : It is easier to swim in the sea than in the river because the density of sea water is more in comparison to river.

65. The weight of an object is maximum

(a) on the equator
(b) on the surface of the earth
(c) at the centre of the earth
(d) on the poles of the earth

RRB Chandigarh Section Engineer (Civil), 26.02.2012

Ans. (d) : The weight of a body is maximum at the poles of the earth because the value of acceleration due to gravity is maximum at the poles while the weight of the body at the equator is minimum. The weight of the object at the centre of the earth is zero.

66. The weight of a body at the centre of earth is:

(a) half the weight at the surface
(b) infinite
(c) twice the weight at the surface
(d) zero

RRB Chandigarh Section Engineer (Mech.), 26.02.2012

Ans. (d) The weight of the object at the centre of the earth is zero because the value of accretion due to gravity is zero.

at centre $h = R_e$

$g' = 0$

The acceleration due to gravity at any depth is given as –

$$g_d = g\left(1-\frac{d}{R}\right)$$

Where, g_d = acceleration due to gravity at some depth.

d = depth from its surface.

at centre d = R

$$\boxed{g_d = 0}$$

$W = mg_d$

$$\boxed{W = 0}$$

67. The relative density of ice is 0.9 then what part of it will be above the water when it is put in water?

(a) 0.9 (b) 0.1
(c) zero (d) None of these

DMRC Electronics Engineering, 21.09.2014

Ans. (b) : Let volume of cube = $(1\times1\times1)\ cm^3$

relative density of ice = 0.9

$$\frac{\rho_{ice}}{\rho_w} = \frac{x}{h}$$

$$\frac{0.9}{1} = \frac{x}{1}$$

$x = 0.9$ cm

Therefore, 0.9 part of ice under the water and 0.1 cm part of ice above the water.

68. The weight of body in air is 30g and when immersed in water is 26.25g. The relative density of the material of the body is –

(a) $\frac{8}{9}$ (b) $\frac{8}{7}$
(c) 8 (d) $8g/cm^3$

RRB Ranchi Signal Maintainer Group-III, 20.11.2005

Ans. (c) :

Relative density of substance = $\frac{\text{Wair}}{W_{air} - W_{water}}$

$$= \frac{30}{(30-26.25)}$$

$$= \frac{30}{3.75}$$

$= 8$

69. Two liquids which are equal to weight, are mixed, their density are ρ_1 and ρ_2 respectively. The density of mixture will be -

(a) $\frac{\rho_1+\rho_2}{2}$ (b) $\frac{2\rho_1\rho_2}{\rho_1+\rho_2}$
(c) $\frac{\rho_1+\rho_2}{\rho_1\rho_2}$ (d) $\frac{\rho_2-\rho_1}{2}$

RRB Allahabad Signal Maintainer-II, 22.01.2006

Ans. (b) : Let, weight of the liquids are W and volume are V_1 and V_2.

$$\text{density of mixture} = \frac{\text{total mass of maxture}}{\text{total volume of mixture}}$$

$$\frac{(M_1+M_2)}{(V_1+V_2)} = \frac{2M}{\frac{M}{\rho_1}+\frac{M}{\rho_2}} \left\{\because W_1 = W_2 = W \right\} \left\{\therefore M_1 = M_2 = M\right\}$$

$$= \frac{2}{\frac{1}{\rho_1}+\frac{1}{\rho_2}} = \frac{2}{\frac{\rho_1+\rho_1}{\rho_1\rho_2}}$$

$$\boxed{\text{Density of mixture} = \frac{2\rho_1\rho_2}{\rho_1+\rho_2}}$$

70. A vessel has, mercury (density =13.6 g/cm^3) at the bottom and oil (density 0.8 g/cm^3) at the top. Half of the volume of a floating homogeneous sphere is immersed in mercury and half, in oil. The density (g/cm^3) of the material of the sphere.

(a) 3.3 (b) 6.4 (c) 7.2 (d) 12.8

Delhi Metro Rail Corporation Train Operators', 14.09.2003

Ans. (c) : Density of substance of sphere $= \frac{\rho_{Hg} + \rho_{oil}}{2}$

$= \frac{(13.6 + 0.81)}{2}$

$= \frac{14.4}{2} = 7.2$

71. The reading of spring balance when a block of air is suspended from it is 60 N. When the block is immersed in less volume in water. The reading of a balance changes to 40 N – the relative density of the block should be -

(a) 3 (b) 2 (c) 6 (d) $\frac{3}{2}$

RRB Bangalore Material Superintendent, 21.11.2004

Ans. (a) : Relative density of block $= \frac{W_{air}}{W_{air} - W_{water}}$

$= \frac{60}{(60-40)}$

$= \frac{60}{20} = 3$

72. A vessel is filled with oil of relative density 1.2 up to a height of 3cm and water is filled up to 10 cm above it. If the relative density of mercury is 13.6 then the bottom of the vessel will be.

(a) Equal to 1 cm of Hg (b) Equal to 5 cm of Hg
(c) Equal to 13cm of Hg
(d) Equal to 15 cm of Hg.

RRB Trivandrum (Tech.), 09.11.1997

Ans. (a) : According to the question-

$\rho_{Hg}\, gh = \rho_{oil}\, gh_1 + \rho_{water}\, gh_2$

$13.6 \times gh = 1.2 \times g \times 3 + 1 \times g \times 10$

$13.6\, h = 3.6 + 10$

$h = \frac{13.6}{13.6}$

$h = 1$ cm of Hg.

73. Among four substance M_1, M_2, M_3 and M_4 of different masses having the same volume. Which substance will have the least density If $M_2 > M_3 > M_1 > M_4$ then.

(a) M_1 (b) M_3 (c) M_4 (d) M_2

RRB Trivandrum (Tech.), 11.04.1999

Ans. (c): By formula, density $= \frac{\text{mass}}{\text{volume}}$

According to the question, given that $M_2 > M_3 > M_1 > M_4$ and volume is constant and by the formula M_4 has least density

74. If the volume of four bodies of equal mass are V_1, V_2, V_3 and V_4 respectively then which body will have greater density if $V_4 > V_2 > V_3 > V_1$ then

(a) V_2 (b) V_3
(c) V_1 (d) V_4

RRB Trivandrum (Tech.), 29.06.1999

Ans. (c) : By the formula-

$\text{density} = \frac{\text{mass}}{\text{volume}}$ .....(i)

(Mass is same for all bodies)

According to the equation (i), which body has less volume, has more density.

Hence, V_1 has density. (given: $V_4 > V_2 > V_3 > V_1$)

75. What is density. of solid metals when hearted

(a) Increases (b) Decreases
(c) Equal (d) None of these

RRB Kolkata (Tech.), 29.08.1999

Ans. (b) : When metals are heated, they expand due to which volume increase but mass remains constant by formula-

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

therefore, when metals are heated, their density decrease.

76. Generally, the density of any liquid increases with increases temperature -

(a) decrease (b) increase
(c) remains constant
(d) first increase and then decreases

RRB Kolkata Supervisor (P. Way), 20.02.2000

Ans. (a) : Generally, the density of a liquid decrease with increase in temperature. Because by increasing the temperature the volume of a liquid increase. But the mass remains constant.

77. Whose density will be higher in the same quantity of viscous (thick) liquid and non-viscous liquid.

(a) viscous (b) non-viscous liquid
(c) None (d) both (a) and (b)

RRB Mumbai Electrical/ Diesel Drivers', 03.06.2001

Ans. (a) : If the quantity of thick (viscous) and non-viscous liquid are equal then the no. of molecules in the viscous liquid will be more than the no. of molecules in the non-viscous liquid. Hence, the mass of the viscous (thick) liquid will also be more. The density will be higher than that of a viscous liquid.

78. A body of a substance whose density is d is immersed in a liquid of density &, which completely sinks then -

(a) $d > \rho$ (b) $\rho > d$
(c) $d = \rho$ (d) None of these

RRB Bhopal Section Engineer, 24.11.2002

Ans. (a) : If a body made of a substance is placed in a liquid and the body is completely submerged then the density of the body is greater than the density of the liquid. So, $d > \rho$

- Which force is responsible for providing the necessary centripetal force to plants moving around the Sun **- Gravitational force**
- If we suspend the pendulum in a vessel filled with liquid **- The pendulum will stop soon**
- How much force is required to rotate a body of mass 6 kg in a circle of radius 3m with a velocity of 10 m/sec. **- 200 N**
- A particle is moving in a uniform circular motion with a uniform speed 'v' parallel to a circle of radius r. The acceleration of a particle is **- $\frac{v^2}{r}$**
- If the horizontal range of a projectile if four times the maximum height, then the angle of projection is **- 45°**
- What is the magnitude of force which when applied on a body of mass 0.6 kg produces an acceleration of 0.08 m/sec^2. **- 0.048 N**
- A force of 30 N acts on a body of 5 kg for 2 seconds then the acceleration will be **- 6 m/sec^2**
- A second's pendulum is taken in a transport vehicle find the period of oscillation when the vehicle moves with an acceleration of 4 m/sec^2 vertically upwards **- 1.93 second**
- What will be the speed of the body after three seconds if the body is mioving along a straing line at a speed of 20 m/sec and under goes an acceleration of 4 m/sec^2 **- 32 m/sec**
- A stone is dropped from a cliff its speed after it has fallen 100 m is **- 44.72 m/sec**
- Friction between two objects is due to **- Irregularities on the surface**
- A thumb-tripped nail goes easily into wood because **- Move force acts on less area**
- When a gun is fired, it exerts a forward force on the bullet. The bullet also exerts on equal and opposite reaction force on the gun. This phenomenon is explained by **- Third law of motion**
- When a moving bus suddenly applies brakes, the passengers fall in the forward direction. It is because **- Newton's law of inertia**
- A boy sitting in a train moving with constant speed throws a ball straight in the air, then the ball will fall **- into the Hand**
- When an object is moving with uniform velocity with respect to time then velocity-time graph represents **- Straight line**
- An object is moving with non- uniform velocity and uniform acceleration then **- Velocity time graph will be linear**
- If the velocity- time graph is parallel to the time axis, then **- The object is moving with constant velocity**
- The time - graph for uniformly accelerated body **- Straight line.**
- An iron ball and a wooden ball of equal radius are dropped from height h in vacuum. The time taken by both to reach the earth is - **Approximately same.**
- Velocity of body is said to be uniform when **- Both the value and direction of velocity are constant.**

PREVIOUS YEAR QUESTIONS

1. A car accelerates uniformly from 5 ms^{-1} to 10ms^{-1} in five seconds. Find the acceleration of the car

(a) 1 ms^2 (b) 1 ms^{-2}
(c) 1 ms^1 (d) 1 ms^{-1}

RRB ALP CBT II Physics & Maths 21 .01.2019 Shift I

Ans. (b) : Given :
Initial velocity = 5 m/sec.
Final velocity = 10 m/sec.
Time = 5sec.

ΔV = Final velocity – Initial velocity
= 10 – 5
= 5 m/sec.

Acceleration of car (a) = $\frac{\Delta V}{t}$

$= \frac{5 m/sec}{5 sec}$

= 1 m/sec^2 or, 1ms^{-2}

2. Which one of the following physical quantities is a scalar quantity?

(a) Electric current (b) Electric field
(c) Torque (d) Impulse

RRB ALP CBT II Physics & Maths 21 .01.2019 Shift II

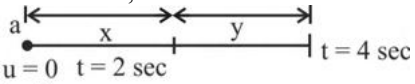
Ans. (a) : Scalars are the physical quantities that only have the magnitude and other characteristics. A scalar is unvaried by any changes in the coordinate system.
Examples: volume, energy, mass, density, time, electric current are scalar quantity.
A vector Quantity is one which is characterized by both magnitude and direction. Examples are: Torque, Impulse, Electric field.

3. A particle starts moving from rest under uniform acceleration. It travels a distance 'x' in the first two seconds and a distance 'y' in the next two seconds. If y = nx, then n =

(a) 1 (b) 3
(c) 2 (d) 4

RRB ALP CBT II Physics & Maths 21 .01.2019 Shift III

Ans. (b) : Given that,



u = 0 t = 2 sec
t = 0

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

$x = \frac{1}{2} a \times 4$

x = 2a .... (i)

and $S = ut + \frac{1}{2} \times at^2$

$x + y = \frac{1}{2} \times a \times 4 \times 4$

$x + y = 8a$ .... (ii)

From equation (i) and (ii), we get

$x + y = 8a$

$2a + y = 8a$

$y = 6a$

Given, $y = nx$

$y = 3 \times 2a$

$\Rightarrow$ $n = 3$

4. A planet moves around the sun in elliptical orbit. When earth is closest from the sun, it is at a distance *r* having a speed ν. When it is at a distance *4r* from the sun its speed is

(a) ν/4 (b) 4ν (c) 2ν (d) ν/2

RRB ALP CBT II Physics & Maths 21 .01.2019 Shift III

Ans. (a) :

Kepler's second law $\frac{dA}{dt} = \frac{1}{2} r \times v$ ...(i)

If distance is 4r then,

$\frac{dA}{dt} = \frac{1}{2} 4r \times v_2$ ...(ii)

From equation (i) and (ii)

According to question,

$\frac{1}{2} \times r \times v = \frac{1}{2} \times 4r \times v_2$

$v_2 = \frac{v}{4}$

5. A car moving with a speed of 50 km/hr can be stopped by brake after travelling at least 6 m. If the same car is moving at a speed of 100 km/hr, the minimum stopping distance is

(a) 18 m (b) 12 m (c) 24 m (d) 6 m

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Ans. (c) : Speed of the car when stopping distance is 6 m is given as, $u_1 = 50 \frac{km}{hr}$ and $u_2 = 100 \frac{km}{hr}$

Now,

$v^2 = u^2 - 2aS$

$0 = u^2 - 2aS$

$S = \frac{u^2}{2a}$

$S \propto u^2$

(a is constant and negative as considering retarding)

$\therefore$ $\frac{S_2}{S_1} = \frac{(u_2)^2}{(u_1)^2}$

$\frac{S_2}{S_1} = \frac{(100)^2}{(50)^2}$

$\frac{S_2}{S_1} = 4$

$S_2 = 4S_1$

$S_2 = 4 \times 6$

$S_2 = 24m$

6. A spacecraft of mass 2000 kg moving with a velocity of 600m/s suddenly explodes into two pieces. One piece of mass 500 kg is left stationary. The velocity of the other part must be (in m/s)

(a) 1000 (b) 600

(c) 800 (d) 1500

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Ans. (c) : Given that,

mass (m) = 2000kg

velocity (v) = 600m/s

$m_1 = 500kg$, $v_1 = 0$

Explodes in two piece, then mass = $m_1 + m_2$

$2000 = 500 + m_2$

$m_2 = 1500kg$

Formula P = mv

Momentum before explosion = 2000×600

Momentum after explosion = $P_1 + P_2$

$= (m_1 v_1 + m_2 v_2)$

$= 1500 \times v_2$

sine, there is no external fore, the momentum is conserved

So, Momentum before explosion = Momentum after explosion

$2000 \times 600 = 1500\ v_2$

$v_2 = 800$ m/s

7. A body is thrown with a velocity 20 m/s at an angle of 30º with the horizontal. The time taken to reach the maximum height is (Take g = 10m/s^2)

(a) 2 s (b) 5 s

(c) 4 s (d) 1 s

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Ans. (d) : Given,

Initial velocity (u) = 20 m/s

The angle of inclination (θ) = 30º

The time taken to reach the maximum height is equal to half of the time of flight.

Time of flight (T) = ?

$T = \frac{2 \cdot u \cdot \sin\theta}{g}$

$= \frac{2 \times 20 \times \sin 30^\circ}{10}$

$= \frac{2 \times 20 \times \frac{1}{2}}{10} = 2 \sec$

The time taken to reach the maximum height is,

$\frac{T}{2} = 1 \sec$

Hence, option (d) is correct.

8. A body is projected horizontally with a velocity u from a point which is at a height h above the ground level. The range (R) is (Take acceleration due to gravity = g units)

(a) $R = h\sqrt{\frac{2u}{g}}$ (b) $R = u\sqrt{\frac{2g}{h}}$

(c) $R = g\sqrt{\frac{2h}{u}}$ (d) $R = u\sqrt{\frac{2h}{g}}$

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Ans. (d): Horizontal distance covered is = velocity × time

$$R = ut$$

Vertical displacement

$$h = vt + \frac{1}{2}gt^2$$

Given, $v = 0$, for vertical displacement

$$\Rightarrow \quad h = 0 + \frac{1}{2}gt^2$$

$$\Rightarrow \quad \boxed{t = \sqrt{\frac{2h}{g}}}$$

Now,

$$R = ut$$

$$\boxed{R = u\sqrt{\frac{2h}{g}}}$$

9. An automobile that is towing a trailer is accelerating on a level road. The force that the automobile exerts on the trailer is

(a) Equal to the force the trailer exerts on the automobile
(b) Greater than the force the trailer exerts on the automobile
(c) Equal to the force the trailer exerts on the road
(d) Equal to the force the road exerts on the trailer

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Ans. (a) : An automobile that is towing a trailer is accelerating on a level road. According to Newton's third law The force that the automobile exerts on the trailer is equal to the force the trailer exerts on the automobile.

10. A body falling from rest has a velocity 'v'. After it falls through a distance 'h', the distance it has to fall down further, for its velocity to become double is _____ time 'h'.

(a) 0.5 (b) 1.5
(c) 2 (d) 3

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Ans. (d) : We know that, $v^2 = u^2 + 2gh$

Given, $v_1 = v$

$v_2 = 2v$

Then,

$$v_1^2 = u^2 + 2gh$$

$$h = \boxed{h = \frac{v^2}{2g}} \quad \{\because u = 0 \text{ as body initially at rest}\}$$

$$v_2^2 = u^2 + 2gh_2$$

$$(2v)^2 = u^2 + 2gh_2$$

$$4v^2 = 2gh_2$$

$$\boxed{h_2 = \frac{4v^2}{2g}}$$

Required distance, $h_1 = h_2 - h$

$= 4h - h = 3h \Rightarrow \boxed{h_1 = 3h}$

11. An object of mass 3 kg is at rest. Now a 6 N force is applied on the object for 3 second. Find the velocity of the object acquired by it in m/s.

(a) 12 (b) 6
(c) 9 (d) 8

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Ans. (b) : Given, An object of mass (m) = 3 kg

Force (F) = 6 N

time (t) = 3 second

v =?

From Newton's second law.

$$F = m\left(\frac{v-u}{t}\right)$$

$$\Rightarrow 6 = 3\left(\frac{v-0}{3}\right) \Rightarrow \boxed{v = 6m/s}$$

12. If 'c' is the velocity of light in free space, the time taken by light to travel a distance x in medium of refractive index μ is given by

(a) μxc (b) $\frac{\mu x}{c}$
(c) $\frac{\mu c}{x}$ (d) $\frac{x}{\mu c}$

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Ans. (b) :

Refractive index of a medium is given by $\mu = \frac{c}{v}$

Where v is velocity of light in given medium

Distance = speed × time

$$\Rightarrow \text{Time (t)} = \frac{\text{distance}\ (x)}{\text{speed}(v)}$$

$$\Rightarrow \boxed{t = \frac{\mu x}{c}}$$

13. A boy throws two balls in air in such a manner that when the first ball is at maximum height he throws the second ball. If the balls are thrown with the time difference of one second, the maximum height attained by each ball is ($g = 10m/s^2$)

(a) 2.5 m (b) 5 m
(c) 10 m (d) 3.5 m

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Ans. (b) : Given $t = 1$ second

$g = 10\ m/s^2$

Then, from Newton's first equation of motion

$v = g\,t = 1\times10 \Rightarrow (v = 10m/s)$

From Newton's third equation of motion

$$h = \frac{v^2}{2g} = \frac{10\times10}{2\times10} = 5m \Rightarrow \boxed{h = 5m}$$

14. Average Acceleration =

(a) $\frac{\text{toatal displacement}}{\text{total time}}$ (b) $\frac{\text{change in velocity}}{\text{time taken}}$
(c) $\frac{\text{distance}}{\text{time}}$ (d) $\frac{\text{change in mass}}{\text{time}}$

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Ans. (b) : The change in velocity divided by the elapsed time is the average acceleration. i.e.

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

15. A body is allowed to slide down a frictionless track from rest position at its top under gravity. The track ends in a circular loop of diameter D. Then, the minimum height of the inclined track (in terms of D) so that it may complete successfully the loop is

(a) 3D/4 (b) 9D/4
(c) 5D/4 (d) 7D/4

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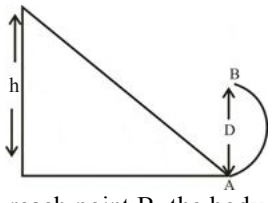
Ans. (c) :



For the body to reach point B, the body must have least velocity of $\sqrt{5gr}$ (from vertical circular motion) at A.

So, for a body falling from height h

Velocity (v) = $\sqrt{2gh}$

From both the velocities

$$\sqrt{5gr} = \sqrt{2gh}$$

$$\sqrt{5g\frac{D}{2}} = \sqrt{2gh}$$

On squaring both sides, we get

$$5g\frac{D}{2} = 2gh$$

$$\boxed{h = \frac{5D}{4}}$$

Hence, the loop is $\frac{5D}{4}$

16. A rope of length 10 m and linear density 0.5 kg/m is lying length wise on a smooth horizontal floor. It is pulled by a force of 25 N. The tension in the rope at a point 6 m away from the point of application is:

(a) 10 N (b) 20 N
(c) 15 N (d) 5 N

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Ans. (a) : Given : Length of rope (L) = 10 m

Linear Density (λ) = 0.5 kg/m

Force (F) = 25N

L_1 = 6 m, L_2 = 4 m

Total mass of rope = $\lambda \times L$

$= 0.5 \times 10$

$= 5$ kg

Acceleration of rope $[F = ma]$

$$a = \frac{F}{m} = \frac{25}{5} = 5 m/s^2$$

$T = m' \times a$

$m' = 0.5 \text{ kg/m} \times 4m = 2$ kg

$T = 2 \times 5 = 10$ N

17. A constant force (F) is applied on a stationary particle of mass 'm' They velocity attained by the particle after a certain displacement will be proportional to

(a) $\frac{1}{\sqrt{m}}$ (b) m (c) 1/m (d) $\sqrt{m}$

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Ans. (a) : Given : Force = F , Mass = m

Initial velocity (u) = 0 m/s

Acceleration of particle, $a = \frac{F}{M}$

The equation of motion of the particle after moving a certain displacement is given by-

$v^2 - u^2 = 2as$

Put the values.

$$v^2 = (0)^2 = 2\left(\frac{F}{M}\right)s$$

$$v = \sqrt{2\left(\frac{F}{M}\right)s}$$

From the above equation, it is clear

$$\boxed{v = \frac{1}{\sqrt{m}}}$$

18. A horizontal force F produces an acceleration of $6m/s^2$ on a block resting on a smooth horizontal surface. The same force produces an acceleration of 3 m/s^2 on a second block resting on a smooth horizontal surface. If the two blocks are tied together and the same force acts, the acceleration produced will be

(a) 1 m/s^2 (b) 2 m/s^2
(c) 4.5 m/s^2 (d) $9m/s^2$

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Ans. (b) : Given:

Acceleration of first block (a_1) = $6m/s^2$

Acceleration of second block (a_2) = $3m/s^2$

Given that force acted on the block is same.

So,

$$F_1 = F_2 = F$$

Force, F = ma

$$m = \frac{F}{a}$$

The mass of first block -

$$m_1 = \frac{F}{a_1} \text{ ---------(i)}$$

The mass of second block -

$$m_2 = \frac{F}{a_2} \text{ ------(ii)}$$

Add equation (i) & (ii), we get

$$m = m_1 + m_2$$

$$\frac{F}{a} = \frac{F}{a_1} + \frac{F}{a_2}$$

$$\frac{1}{a} = \frac{1}{a_1} + \frac{1}{a_2} = \frac{a_2 + a_1}{a_1 a_2}$$

$$a_{total} = = \frac{a_1 a_2}{a_1 + a_2}$$

Put the given values of a_1 & a_2 , we get

$a_{total} = \frac{6\times3}{6+3} = \frac{18}{9} = 2m/s^2$

Hence, the acceleration produced will be $2m/s^2$

19. To keep a particle moving with constant velocity on a frictionless surface, an external force:

(a) should act continuously
(b) should act opposite to the direction of motion
(c) is not necessary
(d) should be of variable magnitude

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Ans. (c) : To keep a particle moving with constant velocity on a frictionless surface, an external force is not necessary.
This is based on Newton's first law of motion - A body remains at rest, or in motion at a constant speed in a straight line, unless acted upon by a force.

20. When light travels from one medium to another, which of the following does not change?

(a) Wavelength (b) Intensity
(c) Velocity (d) Frequency

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Ans. (d) : Whenever light goes from one medium to another (from air to glass), the frequency of light and phase of light does not change. However, the velocity of light and wavelength of light change.

21. By applying the brakes without causing a skid, the driver of a car is able to stop his car within a distance of 5m, if it is going at 36 kmph. If the car were going at 72 kmph, using the same brakes, he can stop the car over a distance of:

(a) 10 m (b) 20 m
(c) 40 m (d) 2.5 m

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Ans. (b) :

Given: Initial velocity $(u_1) = 36$ km/h $= 36\times\frac{5}{18} = 10$ m/s
Distance (s) = 5m
Final velocity $(v_1) = 0$
Using second equation of motion -
$v^2 - u^2 = 2as$
$(0)^2 - (10)^2 = 2\times a\times 5$
$-100 = 10a$
$a = -10 m/s^2$
Now again from question–

Initial velocity $(u_2) = 72$ km/h $= 72\times\frac{5}{18} = 20 m/s$
Final velocity $(v_2) = 0$ m/s
& Acceleration (a) $= -10\ m/s^2$
Distance (s) = ?
Again, using second equation of motion –
$v_2 - u_2 = 2as$
$(0)^2 - (20)^2 = 2\times(-10)\times s$
$-400 = -20\times s$
$s = 20m$

22. A rigid body is made to rotate about an axis of rotation. Its moment of inertia about the axis of rotation depends on

(a) Its angular momentum only
(b) Its angular velocity only
(c) The distribution of its mass about the axis about which it rotates, and also the orientation and position of this axis of rotation
(d) The torque applied only

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Ans. (c) : Moment of inertia of a rigid body about a fixed axis is defined as the sum of the product of the masses of the particles constituting the body and its square of a distance from the axis of rotation.

$I = mr^2$

Moment of inertia of a body made up of number of particles $= m_1r_1^2 + m_2r_2^2 + m_3r_3^2 + ...$
So it can be said that moment of inertia depends on the mass and its distribution about the axis which it rotates.
So, option (c) is correct.

23. A ball, having speed V_0 moves in a straight line under the influence of a constant acceleration a. Then its final speed after travelling a distance x for time t will be

(a) $\left(\frac{x}{t}\right) - v_0$ (b) $V_0^2 + 2ax$
(c) $V_0 + \frac{1}{2}\ at^2$ (d) $\left(\frac{2x}{t}\right) - v_0$

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Ans. (b) :
Given that,
Initial velocity (u) = V_0
Acceleration (a) = a
Distance (s) = x
The motion of the equation is only valid when -
- Acceleration is constant
- The motion is in straight line.

From third motion equation,
$v^2 = u^2 + 2as$ -------- (1)
Where, v = Final velocity
Put the values in equation (1)
So, $V^2 = V_0^2 + 2ax$

24. An object of mass m follows a circular path of radius r with a constant speed v in uniform circular motion. Then, the work done by the centripetal force for the object to move once in a full circle is

(a) $(MV^2/r).2r$ (b) Zero
(c) $(Mv^2/r).2\pi r$ (d) $(MV^2/r).2\pi r$

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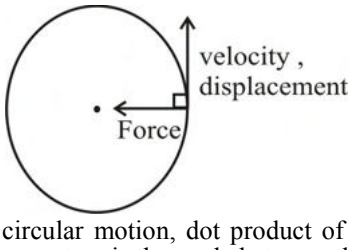
Ans. (b) : Work done on an object is the force applied and the displacement covered in the direction of the force applied.
i.e. $W = f.d\cos\theta$



In uniform circular motion, dot product of two mutual perpendicular vectors is the angle between them is 90°.
Then, $\cos 90° = 0$

$W = f.d.\cos 90°$
$W = 0$
Hence, the work done in a uniform circular motion is always zero.

25. A ball is thrown vertically upwards with initial velocity V_0 and returns to its starting point in 6 seconds then the initial velocity with which the ball was thrown will be
(a) 58.8 m/s (b) 19.6 m/s
(c) 39.2 m/s (d) 29.4 m/s

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Ans. (d) : Given that,
Time (t) = 6 second
Initial velocity (u) = V_0
Acceleration (a) = $-g = -9.8$ m/sec^2
The ball returns to its initial point, so displacement (s) = 0
According to motion equation

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

$$0 = 6V_0 + \frac{1}{2}(-9.8)\times(6)^2$$

$$6V_0 = \frac{1}{2}\times 9.8\times 36$$

$$V_0 = 29.4 \text{ m/sec.}$$

26. An object is made to move with uniform speed such that the magnitude of its velocity remains constant with its direction of motion continuously changing with time. Then, the unbalanced force acting on the object will be in the direction.
(a) Inclined at an angle of 60° with the direction of its acceleration
(b) Opposite to that of its velocity
(c) Parallel to that of its velocity
(d) Parallel to the direction of its acceleration

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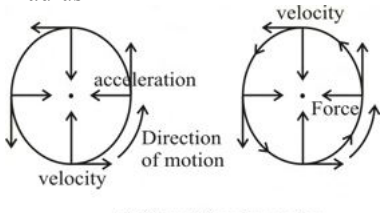
Ans. (d): From the question it is example of uniform circular motion.
• The circular motion in which the speed of the particle remains constant is called uniform circular motion. In uniform circular motion, force supplies the centripetal acceleration.

$$a_c = \frac{v^2}{r}$$

where, v = velocity
r = radius



Uniform Circular motion

• In uniform circular motion, force is parallel to the direction of its acceleration i.e. towards the center.

27. A bullet travels 90 m in 0.2 seconds. Find its speed in km/hr.
(a) 162 (b) 1620
(c) 125 (d) 1250

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Ans : (b) Speed of bullet = $\frac{\text{distance}}{\text{time}}$

$$= \frac{90}{0.2}\times\frac{18}{5}$$
$$= 1620 \text{km/hr}$$

28. Two cars, X and Y, travel from A to B at average speeds of 50 km/hr and 75 km/hr respectively. If X takes 2 hours more than Y for the journey, then the distance between A and B in km is——.
(a) 800 (b) 400
(c) 300 (d) 600

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Ans : (c) Let, y take t hours to reach from A to B, therefore, time taken by x to reach from A to B = (t +2) hours.
from, $r_1t_1 = r_2t_2$
$50\times(t+2) = 75\times t$
$50t + 100 = 75t$
$25t = 100$
$t = 4$ hours
So, desired distance = 75×4
= 300km

29. By cycling 7/9 times his usual speed, Anwar reaches his school 4 minutes late. How many minutes does Anwar take to reach school at his usual cycling speed?
(a) 14 (b) 20 (c) 18 (d) 16

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Ans : (a) Let, the normal speed of answer be x and with this speed its time to reach school.
From, $s_1t_1 = s_2t_2$

$$x\times t = \frac{7}{9}x\times(t+4)$$

$\Rightarrow$ $9t = 7t + 28$
$\Rightarrow$ $2t = 28$
$\Rightarrow$ $t = 14$ min
Hence, answer takes 14 min to reach school at normal speed.

30. A truck travels 450 km in two and a half hours. Find its speed in m/s.
(a) 60 (b) 90
(c) 50 (d) 75

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Ans : (c) Given,

$$t = 2\frac{1}{2} \text{ hour}$$
$$= \frac{5}{2} \text{ hour}$$
$$s = 450\text{km.}$$

$$\text{speed} = \frac{s}{t}$$
$$= \frac{450}{\frac{5}{2}} = 180\text{km/h}$$
$$= 180\times\frac{5}{18}$$
$$= 50\text{m/s}$$

31. A rocket travels 108 m in 0.3 seconds. Find its speed in km/hr.

(a) 1296 km/h (b) 6300 km/h
(c) 1692 km/h (d) 3600 km/h

RRB ALP & Tech. 08.02.2019 Shift-I

Ans : (a) : $t = 0.3$ sec
distance = 108 m

$$\text{speed} = \frac{\text{distance}}{\text{time}}$$
$$= \frac{108}{0.3}$$
$$= 360 \text{ m/sec}$$
$$= 360 \times \frac{18}{5} \text{ km/hour}$$
$$= 72 \times 18$$
$$= 1296 \text{ km/hour}$$

32. A body starts moving form rest. Its displacement is propational to ____ when its acceleration is constant.

(a) Velocity (b) Work
(c) Time squared (d) Time

RRB ALP & Tech. 23.01.2019 Shift-III

Ans : (c) Let, constant acceleration is a initial velocity $u = 0$,

$$s = ut + \tfrac{1}{2}at^2$$
$$s = 0 \times t + \tfrac{1}{2}at^2$$
$$s = \tfrac{1}{2}at^2$$
$$\boxed{s \propto t^2}$$

Therefore, displacement of object is directly proportional to the square of time.

33. A motorcycle covers a distance of 1000 m at a speed of 36 km/hr. Find the time (in seconds) taken by the motorcycle to cover this distance.

(a) 300 (b) 200
(c) 100 (d) 400

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Ans : (c)
$$\text{Time} = \frac{\text{distance}}{\text{speed}}$$
$$= \frac{1000}{36 \times \frac{5}{18}}$$
$$= 100 \text{ second}$$

34. An object starts from rest at x = 0 m and rotates with a constant acceleration of 1.6 m/s^2 about the x-axis. What is its average velocity during its journey from x= 12.8 m to x= 20.0 m?

(a) 2.4m/s (b) 3.6m/s
(c) 7.2m/s (d) 8.8m/s

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Ans:(c) T_1, T_2 and V_1, V_2 shows time and displacement respectively.

Initial velocity (u) = 0, acceleration (a) = 1.6 m/s^2

$$S = ut + \frac{1}{2}at_1^2$$
$$12.8 = 0 + \frac{1}{2} \times 1.6 \times t_1^2$$
$$1.6\, t_1^2 = 25.6$$
$$t_1^2 = 16$$
$$t_1 = 4$$
$$v_1 = u + at_1$$
$$v_1 = 0 + 1.6 \times 4$$
$$v_1 = 6.4 \text{ m/s}$$
$$20 = ut + \frac{1}{2}at_2^2$$
$$t_2 = 5$$
$$t_2 = 5 \text{ sec}$$
$$v_2 = u + at_2$$
$$v_2 = 0 + 1.6 \times 5$$
$$v_2 = 8 \text{ m/s}$$
$$\text{Average velocity} = \frac{v_1 + v_2}{2} = \frac{8 + 6.4}{2} = 7.2 \text{ m/s}$$

35. An airoplane flies at a speed of 50 m/s. How much distance will it cover in 5 hours?

(a) 895 (b) 880
(c) 850 (d) 900

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Ans : (d) distance = speed × time
$$= 50 \times \frac{18}{5} \times 5 = 900 \text{ km.}$$

36. A ball is thrown vertically upward with a speed of 30 m/s. The magnitude of its displacement after 4 s will be _____.

(a) 30m (b) 50m
(c) 15m (d) 40m

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Ans : (d) Given:
u = 30 m/sec
t = 4 sec
g = 10 m/sec^2
h = ?
by 2nd equation of motion -

$$h = ut - \frac{1}{2}gt^2 \text{ (in ward directive)}$$
$$h = 30 \times 4 - \frac{1}{2} \times 10 \times 4 \times 4$$
$$h = 120 - 80$$
$$h = 40 \text{ m}$$

37. ..... is defined as the total path length travelled by an object divided by the total time interval during which the motion has taken place.

(a) Instantaneous acceleration
(b) Average speed
(c) Uniform acceleration
(d) Instantaneous velocity

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Ans : (b) Average speed is defined as the total path length covered by an object which is divided by time interval during which the motion occurred.

38. An object is moving with a speed 100 m/s. Find the distance travelled by this object in one minute.

(a) 100 km (b) 0.6 km
(c) 6 km (d) 10 km

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Ans : (c) : Distance = speed × time
= 100 × 60
= 6000 m {∵ 1 km = 1000 m}
= 6 km

39. An object starts from rest at x = 0 m and t = 0 sec. It moves with constant acceleration of 3 m/s^2 along x axis. What is its average velocity between time 4 s and 8 s?

(a) 6 m/s (b) 18 m/s
(c) 12 m/s (d) 3 m/s

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Ans : (b) : t = 8–4 = 4 sec
u = 0
a = 3 m/s^2
v = u + at
v = 0 + 3×4
V = 12 m/s
From 2nd equation of motion -

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

$$S = 12\times4 + \frac{1}{2}\times4\times4\times3$$

S = 72 m

$$\text{Average velocity} = \frac{\text{total distance}}{\text{total time}} = \frac{72}{4} = 18 \text{ m/s}$$

40. An object starts moving from rest, with constant acceleration. Its velocity is:

(a) Directly proportional to time
(b) Inversely proportional to time
(c) Inversely proportional to time square
(d) Directly proportional to time square

RRB ALP & Tech. 22.01.2019 Shift-II

Ans : (a) : $\text{Acceleration} = \frac{\text{Velocity}}{\text{time}}$
Velocity = acceleration × time
Velocity $\propto$ time
Velocity of object is directly proportional to time.

41. When you double the speed of a car, it takes ..... times more distance to stop it.

(a) four (b) one
(c) two (d) three

RRB ALP & Tech. 21.01.2019 Shift-I

Ans : (a) : $v^2 = u^2 - 2as$
$0 = u^2 - 2as$

$$s = \frac{u^2}{2a}$$

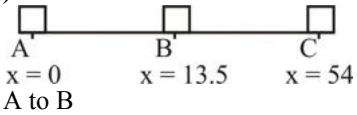
If initial velocity is 2 time then distance will be 4 times,

42. An object starts from rest at x = 0 m and moves with constant acceleration of 3 m/s^2 along x axis. During its journey from x = 13.5 m to x = 54 m, its average velocity is :

(a) 13.5 m/s (b) 10.0 m/s
(c) 8.5 m/s (d) 12.0 m/s

RRB ALP & Tech. 21.01.2019 Shift-I

Ans : (a) : u = 0 a = 3 m/s^2



Motion A to B

$$v_B^2 = 0 + 2\times3\times13.5$$

$$v_B^2 = 6\times13.5$$

$$v_B^2 = 81.0$$

$$v_B = 9 \text{ m/s}$$

motion A → C

$$u_A = 0$$

$$v_c = ?$$

$$v^2 = u^2 + 2as$$

$$v_c^2 = 0 + 2\times3\times54$$

$$v_c^2 = 6\times54$$

$$v_c^2 = 324$$

$$v_c = 18 \text{ m/s}$$

$$v_{avg} = \frac{9+18}{2}$$

$$= \frac{27}{2} = 13.5 \text{m/s}$$

43. Find the velocity (in m/s) that a car will achieve after 20 seconds if it starts and accelerates at 3.2 m/s^2.

(a) 72 (b) 36
(c) 108 (d) 64

RRB ALP & Tech. 21.01.2019 Shift-I

Ans : (d) : t = 20 second
a = 3.2 m/sec^2
u = 0
v = u + at
= 0 + 3.2 × 20
= 64 m/second

44. A car accelerating for two seconds would cover ..... times the distance of a car accelerating for only one second (cars starts from rest with the same acceleration in both the cases).

(a) Four (b) Three
(c) Two (d) One

RRB ALP & Tech. 21.01.2019 Shift-I

Ans : (a) : A car accelerating for two seconds would cover 4 time distance of a car accelerating for only one second.

45. An object covers the first distance of 200 m in 20s and takes 30s for the next 200m. What is the average speed of the object?

(a) 8m/s (b) 12m/s
(c) 4m/s (d) 6m/s

RRB ALP & Tech. 22.01.2019 Shift-III

Ans : (a) Total distance = 200+200= 400m
total time = 20+30 = 50sec

$$\text{Average speed} = \frac{\text{total distacne}}{\text{total time}}$$

$$= \frac{400}{50}$$

= 8 m/sec
Average speed of object = 8 m/sec

46. An object starts from rest at X = 0m and t = 0 s and rotates with a constant accelerration of 4m/s^2 about the x-axis. What is its average velocity between the time 2s and 6s ?

(a) 12m/s (b) 16m/s
(c) 8m/s (d) 18m/s

RRB ALP & Tech. 22.01.2019 Shift-III

Ans : (b) $a = \frac{dv}{dt}$

$$\int_{o}^{v} dv = \int_{2}^{6} a\,dt$$

$$(v - 0) = a\int_{2}^{6} dt$$

$$V = a(t)_{2}^{6}$$

$= 4[6–2] = 16\text{m/s}$ (given : $a = 4\ \text{m/sec}^2$)

Average velocity will be 16 m/sec

47. A ball is dropped freely from the top of building from an intial rest and attains a maximum velocity of 40m/s. What will be the height of the building ? (use g = 10m/s for the acceleration due to gravity)

(a) 70m (b) 80m
(c) 50m (d) 60m

RRB ALP & Tech. 22.01.2019 Shift-III

Ans : (b) $v = u + gt$

$v = 0+gt$

$v = gt$

$$t = \frac{v}{g}$$

Now, $h = ut + \frac{1}{2}gt^2$

$$h = 0 + \frac{1}{2}g \times \left(\frac{v}{g}\right)^2$$

$$h = \frac{1}{2}g \times \frac{v^2}{g \times g}$$

$$h = \frac{1}{2} \times \frac{v^2}{g}$$

$$h = \frac{1}{2} \times \frac{40^2}{10}$$

$$h = \frac{1}{2} \times \frac{40 \times 40}{10}$$

$h = 80$ m

48. A car starts from rest with a constant acceleration of 3m/s^2. Find the distance covered by this car in 10s.

(a) 250m (b) 100m
(c) 200m (d) 150m

RRB ALP & Tech. 22.01.2019 Shift-III

Ans : (d) $a = 3\text{m/s}^2$

$t = 10\text{s}$

$S = ?$

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

$$S = 0 \times 10 + \frac{1}{2} \times 3 \times 10^2$$

$$S = \frac{1}{2} \times 300$$

$S = 150$m

Total distance covered by the car is 150 m.

49. The circumference of a planet is 36,000 km. If the planet makes no other movement and takes 20 hours for one complete rotation, what is the speed of a point on its equator?

(a) 500 m/s (b) 400 m/s
(c) 300 m/s (d) 200 m/s

RRB ALP & Tech. 21.01.2019 Shift-II

Ans : (a) : If $\Delta\theta$ is the augular displacement at a time Δt then the angular speed is given by –

$$\omega = \frac{\Delta\theta}{\Delta t}$$

Angular speed $(\omega) = \frac{2\pi r}{\text{time}}$

Given that-

Circumference of the planet $(2\pi r) = 36{,}000$ km

time = 20 hours

angular speed $(\omega) = \frac{36000}{20} = 1800\ \text{km/h}$

Now, converting km/h to m/sec

$\therefore$ Angular speed $(w) = 1800 \times \frac{5}{18} = 500\,\text{m/s}$

Hence, the speed of a point on its equator will be 500 m/s.

50. A bullet is fired vertically upwards with a velocity of 196 m/sec. What is the maximum height reached by the bullet? (Assuming $g = 9.8\ \text{m/sec}^2$)

(a) 1960 m (b) 196 m
(c) 980 m (d) 490 m

RRB Bilaspur JE (red) , 14.12.2014

Ans. (a) : Given that,

$v = 196$ m/sec

$h = ?$

$(u) = 0$

$v^2 = u^2 + 2gh$

$(196)^2 = 0 + 2 \times 9.8 \times h$

$h = (1960)$m

The maximum height reached the bullet is 1960m.

51. One early morning, with no traffic on roads, Rahul while cycling down from Red Fort to his residence noted the distance covered and the total time taken to reach home. What can he calculate from this data ?

(a) Velocity
(b) Speed
(c) Acceleration
(d) Displacement

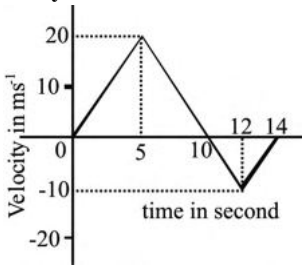
RRB SSE Secundrabad (Shift-I), 02.09.2015

Ans. (b) :

$$\text{Average speed} = \frac{\text{total distance}}{\text{total time}}$$

Average speed can be calculated from the given data.

52. In above graph ratio of average speed to average velocity is :



(a) 1 : 1 (b) 2 : 3
(c) 3 : 2 (d) 2 : 1

RRB Chennai Section Engineer, 12.02.2012

Ans. (c) :

$$\text{Average speed} = \frac{\text{total distance}}{\text{total time}}$$

$$= \frac{\frac{1}{2}\times 10\times 20 + \frac{1}{2}\times 10\times 4}{14} = \frac{120}{14}$$

$$\text{Average speed} = \frac{\text{Displacement}}{\text{time}}$$

$$= \frac{\frac{1}{2}\times 10\times 20 + \frac{1}{2}\times(-10)\times 4}{14}$$

$$= \frac{100-20}{14} = \frac{80}{14}$$

$$\therefore \quad \frac{\text{Average speed}}{\text{Average velocity}} = \frac{120}{14} : \frac{80}{14} = \frac{3}{2}$$

53. A force F produces an acceleration of $3ms^{-2}$ in a body and $6ms^{-2}$ in another body. If both the bodies are tied together and same force is applied due to acceleration in the bodies will be :

(a) $3ms^{-2}$ (b) $9\ ms^{-2}$
(c) $4.5\ ms^{-2}$ (d) $2ms^{-2}$

RRB Kolkata Supervisor (P.Way), 20.02.2000

Ans. (d) : Common acceleration of two object -

$$a = \frac{a_1 a_2}{a_1 + a_2} = \frac{3\times 6}{3+6} = 2ms^{-2}$$

54. A car travels three equal parts of its journey with average speed of 60 kmh^{-1}, 80 kmh^{-1} and 120kmh^{-1}. Average speed of car during its journey will be.

(a) $60kmh^{-1}$ (b) $80\ kmh^{-1}$
(c) $100\ kmh^{-1}$ (d) $87\ kmh^{-1}$

RRB Kolkata Apprentice Supervisors, 14.10.2001

Ans. (b) :

x x x

$$t_1 = \frac{x}{60} \qquad t_2 = \frac{x}{80} \qquad t_3 = \frac{x}{120}$$

$$\text{average speed} = \frac{\text{total distance}}{\text{total time}}$$

$$= \frac{3x}{\frac{x}{60}+\frac{x}{80}+\frac{x}{120}}$$

$$= 3x \times \frac{240}{9x} = 80 kmh^{-1}$$

55. When ball is drop from the roof of a building. It takes 3 second for the ball to reach the ground. the acceleration of the ball towards the earth is 10 m/sec then height of the building is

(a) 40 m (b) 20 m
(c) 30 m (d) None of these

RRB RRB Patna/Allahabad ESM-II , 30.01.2011

Ans. (d) : Hight of building = vertical distance travelled by the ball –

$$h = ut + \frac{1}{2}gt^2$$

$$h = 0 + \frac{1}{2}\times 10\times (3)^2$$

$[\because u = 0]$, g = 10 m/sec^2

$$\boxed{h = 45m}$$

56. Which is the correct formula to find acceleration?

(a) $a = \frac{v-u}{t}$ (b) $a = u + vt$
(c) $a = \frac{v+u}{t}$ (d) $a = \frac{v+u}{2}$

RRB Ajmer (Tech.), 01.03.1998

Ans. (a) : By first equation of motion

$$v = u + at$$
$$v - u = at$$
$$a = \frac{v-u}{t}$$

57. If an object, on a free fall from a certain height, reaches the ground in 1 second, what is its velocity on the impact with the ground?

(a) 4.9 m/s (b) 9.8 m/s
(c) 14.7 m/s (d) 19.6 m/s

RRB Mumbai Electrical/Diesel Drivers', 03.06.2001

Ans. (b): t = 1 second

initial velocity (u) = 0

velocity of collision with earth = v m/s

$$v = u + gt$$
$$v = 0 + 9.8 \times 1$$
$$v = 9.8 \text{ m/s}$$

58. In a projectile motion, a large angle with the horizontal produces .....

(a) flat trajectory
(b) curve trajectory
(c) straight trajectory
(d) high trajectory

RRB Bhubaneshwar (Tech.), 03.06.2001

Ans. (d) : When an object is project from a vertical plane making an angle with the horizontal its path is parabolic, this motion of the body is called projective motion -

$$h = \frac{u^2 \sin^2 \theta}{2g}$$

$$\theta = 90^0 \qquad h_{max} = \frac{u^2}{2g}$$

Hence, projective motion, a high trajectory is obtained at a large angle $\theta = 90°$ with the horizontal.

59. If a ball is thrown up, which of the following does not change?

(a) Acceleration (b) Speed
(c) Potential energy (d) Distance

RRB Bhubaneshwar App. Elec. Signal Maintainer, 19.08.2001

Ans. (a) : When a ball is thrown upwards, its path, is parabolic, in such a situation its speed, potential energy and distance change but acceleration remains unchanged. The value of this acceleration is always equal to g (acceleration due to gravity).

60. A 5 kg mass at rest on a frictionless table is acted upon by a constant force of 12 N. The distance travelled by it in 2s is–

(a) 1.2 m (b) 2.4 m
(c) 4.8 m (d) 9.6 m

RRB JE Bhopal Paper II (Shift-II), 26.08.2015

Ans. (c) : m = 5 kg
F = 12 N

$F = m.a$

$12 = 5.a$

$a = \frac{12}{5} m/s^2$

by 2nd equation of motion is :-

$S = ut + \frac{1}{2}at^2 \qquad (u = 0)$

$S = \frac{1}{2} \times \frac{12}{5} \times (2)^2$

$S = \frac{24}{5}$

$\boxed{S = 4.8 m}$

The distance travelled by it in 2 sec is 4.8 m.

61. A force of 1.5 Newton is applied on a body of mass 5kg for 2 second. the distance covered by the body is -

(a) 2 m (b) 1.6 m
(c) 1.2 m (d) 0.6 m

RRB Ranchi Diesel/Electric Assistant (Driver), 21.09.2003

Ans. (d): F = Ma

$a = \frac{F}{M} = \frac{1.5}{5} = 0.3 \text{ m/sec}^2$

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

$S = 0 \times 2 + \frac{1}{2} 0.3 \times (2)^2$

$S = 0 + 0.3 \times 2$

$\boxed{S = 0.6m}$

62. A car travels from A to B at a speed of 20 km/h and returns at a speed of 30 km/h. The average speed of the car during this journey will be

(a) 5 km/hour (b) 24 km/hour
(c) 25 km/hour (d) 50 km/hour

RRB Asst. Loco Pilot (Guwahati)-2006

Ans. (b) : Average speed $= \frac{2v_1v_2}{v_1 + v_2} = \frac{2 \times 20 \times 30}{20 + 30}$

$V_{avg} = \frac{1200}{50} = 24$ km/hour.

63. When a ball is dropped from the roof of a building. It takes 3 second for the ball to reach the ground. The acceleration to the ball towards the earth is 10m/sec^2 then the height of the building is

(a) 40 Meter (b) 20 Meter
(c) 30 Meter (d) None of these

RRB Mahendrughat (Patna) Diesel Driver,11.11.2001

Ans. (d) : Given u = 0, t = 3 second g = 10 m/sec^2

Then $h = ut + \frac{1}{2}gt^2$

$h = 0 \times t + \frac{1}{2}gt^2$

$= 0 + \frac{1}{2} \times 10 \times 3^2$

h = 45 meter.

64. A bullet of mass 20 grams moves with a speed of 10 m/sec. It can sink 8 cm into the target before coming the rest. if the target is only 6 cm thick, the speed with which the bullet will exist the target is.

(a) 10 m/sec (b) 7 m/sec
(c) 4 m/sec (d) 5 m/sec

RRB Asst. Loco Pilot (Guwahati)-2006

Ans. (d) : From equation of motion -

$v^2 = u^2 + 2as$

$0 = (10)^2 + 2 \times a \times (8 \times 10^{-2})$

$a = -\frac{1}{16} \times 10^4 \text{ m/sec}^2$

Now, for the 6 cm thick target -

From $v^2 = u^2 + 2as$,

$v^2 = (10)^2 - 2 \times \frac{10^4}{16} \times \left(6 \times 10^{-2}\right)$

v = 5 m/sec

PREVIOUS YEAR QUESTIONS

1. An object of mass 10kg is moving with a uniform velocity of 6ms^{-1}. What is the kinetic energy possessed by the object

(a) 180J (b) 18J
(c) 360J (d) 1800J

RRB ALP CBT II Physics & Maths 21 .01.2019 Shift I

Ans. (a) : Given:
Mass (m) = 10 kg
Velocity (v) = 6 m /sec.

We know that, Kinetic Energy (K.E) = $\frac{1}{2}mv^2$, where m is mass and v is the velocity

$\Rightarrow$ K.E = $\frac{1}{2}\times 10\times 6\times 6$

So, K.E = 180 Joule

2. Which of the given statements are correct for a conservative force field

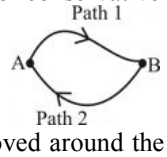
(p) The total mechanical energy is conserved.
(q) The work done round a closed path is zero
(r) Gain in kinetic energy = Loss in potential energy.

(a) (p) and (q) (b) Only (p)
(c) (p), (q) and (r) (d) (q) and (r)

RRB ALP CBT II Physics & Maths 21 .01.2019 Shift I

Ans. (c) : • Conservative force is defined as the force whose work done is independent of the path taken and depends only on the initial and final position.

• Gravitational forces, elastic forces, magnetic forces etc are the example of conservative force.



• The particle is moved around the loop and ends up at 'A' itself then the entire displacement of particle is zero which means that the total work done is zero in closed path which means that total mechanical energy is conserved.

• Total Energy = Potential Energy + Kinetic Energy. If total energy is conserved then gain in K.E is equal to the loss in P.E.

3. An electric heater is used on a 220V supply and it takes a current of 2A. How much power does it consume?

(a) 550 W (b) 440 W
(c) 400 W (d) 450 W

RRB ALP CBT II Physics & Maths 21 .01.2019 Shift I

Ans. (b) : Given :
Voltage = 220V
Current = 2A
Power (P) = Voltage × Current
= 220V × 2A = 440 W

4. An electric motor is marked 2 HP. The work done by the electric motor in 3 seconds will be nearly.

(a) 373 J (b) 497 J
(c) 1.5 kJ (d) 4.4 kJ

RRB ALP CBT II Physics & Maths 21 .01.2019 Shift II

Ans. (d) : Given:
Power of the motor (P) = 2 HP
Time (t) = 3 sec
From the work done formula- W = P × t
= 2 ×746 × 3 [∵ 1 HP = 746 W]
= 4476 Joule = 4.4 kJ

5. Identify the correct statement from among the following.

(a) Work and kinetic energy do not have the same unit
(b) Work = Energy × Power
(c) Work is equal to power per unit time
(d) Work and potential energy have the same unit

RRB ALP CBT II Physics & Maths 21 .01.2019 Shift II

Ans. (d) : The standard unit used to measure energy and work done is Joule, which is represented by J.
Work can be calculated by multiplying Force with Displacement in the direction of applied force.
W = F × d
The S.I. unit of work is Joule.
• Potential energy is stored in the form of energy that depends upon the relative position of various parts of a system.
P.E = mgh
The S.I. unit of Potential Energy is Joule.
Hence, Work and Potential Energy have the same unit.

6. When the momentum of a body is doubled, by keeping its mass unchanged, the kinetic energy is

(a) Halved
(b) Becomes three times of the original
(c) Becomes four times of the original
(d) Doubled

RRB ALP CBT II Physics & Maths 21 .01.2019 Shift III

Ans. (c) : The momentum of a body, (P) = mv
Where, m = Mass
v = Velocity of the particle
The relation between kinetic energy and the momentum is given by-

$$K.E. = \frac{P^2}{2m}$$

$$\Rightarrow \frac{K.E_1}{K.E_2} = \frac{\frac{P^2}{2m}}{\frac{(2P)^2}{2m}} \text{ (According to question)}$$

$$\Rightarrow \frac{K.E_1}{K.E_2} = \frac{1}{4}$$

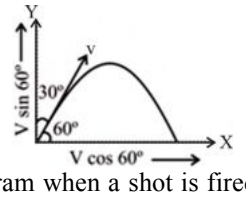
Hence, If the momentum of a body is doubled, the kinetic energy becomes 4 times of the initial kinetic energy.

7. A shot is fired at 30º with the vertical from a point on the ground with kinetic energy K. If air resistance is ignored, the kinetic energy at the top of the trajectory is

(a) K/4 (b) 2K
(c) K (d) 3K

RRB ALP CBT II Physics & Maths 21 .01.2019 Shift III

Ans. (a) :



Here is the diagram when a shot is fired at 30º with the vertical from a point on the ground with kinetic energy K.

The path will be parabolic and we have separated it into the sine and cosine components as seen in the diagram.

The sine component will come to zero at top because gravity is acting on it and hence only V cos 60º will remain for the motion.

Initial kinetic energy is $K = \frac{1}{2}mV^2$ ...(i)

Now, we will calculate the kinetic energy at the top most point. It will be $K' = \frac{1}{2}m(V\cos 60^\circ)^2$.

The value of $\cos 60^\circ = \frac{1}{2}$ putting it in above equation we will get $K' = \frac{1}{8}mv^2$ ...(ii)

Dividing equation (ii) and (i) we get $\frac{K'}{K} = \frac{\frac{1}{8}mv^2}{\frac{1}{2}mv^2}$

$$\Rightarrow K' = \frac{K}{4}.$$

Thus the kinetic energy at the top of the trajectory is $\frac{K}{4}$.

8. A freely falling body takes 4 s to reach the ground. One second after release, the percentage of its potential energy, that is still retained is

(a) 25% (b) 37.5%
(c) 93.75% (d) 6.25%

RRB ALP CBT II Physics & Maths 21 .01.2019 Shift III

Ans. (c) : Given that,
Acceleration (a) = g = 10 m/s² (freefall)
Initial velocity (u) = 0
t = 4 sec

Height of the body(H) $= ut + \frac{1}{2}at^2$

$$= 0 + \frac{1}{2} \times 10 \times 4^2 = 80 \text{ m}$$

After 1 sec releases :

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

$$\Rightarrow \quad S = 0 + \frac{1}{2} \times 10 \times (1)^2$$

$$\Rightarrow \quad S = 5\text{m}$$

So, height (h) = 80 – 5 = 75 m
Potential energy after 1 sec (PE') = mgh = mg × 75 $\Rightarrow$ (PE') = 75 mg
Initial potential energy (PE) = mgH = 80 mg

$$\% \text{ PE} = \frac{\text{PE}'}{\text{PE}} \times 100 = \frac{75\text{ mg}}{80\text{ mg}} \times 100$$

$$\Rightarrow \quad \% \text{ PE} = 93.75\%$$

So, option (c) is correct.

9. Dams are constructed to collect water flowing in high altitude river. The stored water has a lot of

(a) Both KE and PE
(b) Kinetic energy (KE)
(c) Potential energy (PE)
(d) Neither KE nor PE

RRB ALP CBT II Physics & Maths 22 .01.2019 Shift I

Ans. (c) : The energy possessed by a body (or water) by virtue of its position or height is called as potential energy .

- The water stored in dam posses potential energy.
- Kinetic energy is possessed by flowing water.

10. A pump is required to lift 600 kg of water per minute from a well 25 m deep and to eject it with a speed 50m/s. If g = 10m/s², the power required to perform the above task is

(a) 20 kW (b) 15 kW
(c) 10 kW (d) 22.5 kW

RRB ALP CBT II Physics & Maths 22 .01.2019 Shift I

Ans. (b) : Given mass to be lift M = 600kg
Depth of well (h) = 25 m
Speed (v) = 50 m/s
g = 10 m/s²
Total energy required = kinetic energy + Potential energy

$$E = \frac{1}{2}Mv^2 + Mgh$$

$$= \frac{1}{2} \times 600 \times (50)^2 + 600 \times 25 \times 10 = 900000 \text{ J}$$

$$\text{Power required} = \frac{\text{Work}}{\text{Time}} = \frac{\text{Energy}}{\text{time}} = \frac{900000}{60} = 15\text{kW}$$

11. A lorry and a car moving with the same kinetic energy are brought to rest by applying the same retarding force. Then:

(a) lorry will come to rest in a shorter distance
(b) car will come to rest in a shorter distance
(c) in order to know which one will come to rest in a shorter distance, one needs to know the masses of the lorry and the car
(d) both come to rest in same distance

RRB ALP CBT II Physics & Maths 22 .01.2019 Shift II

Ans. (d) : Stopping distance $= \frac{\text{Kinetic energy}}{\text{retarding force}}$

$$S = \frac{1}{2}\frac{mv^2}{F}$$

If lorry and car both posses same kinetic energy and retarding force is also equal then both will come to rest in the same distance.

12. A car of mass 800 Kg is moving on an expressway. In order to increase the speed of the car from 54 km/hr to 90 km/hr the work required to be done will be

(a) 150 KJ (b) 160 KJ
(c) 250 KJ (d) 200 KJ

RRB ALP CBT II Physics & Maths 22 .01.2019 Shift III

Ans. (b) : Given that,

Mass (m) = 800 kg

Initial velocity (v_1) = 54 km/hr

$= \frac{54\times1000}{3600} = 15$ m/sec

Final velocity (v_2) = 90 km/hr

$= \frac{90\times1000}{3600} = 25$m/sec.

Work done = change in kinetic energy

$= \Delta K.E$

$= \frac{1}{2}m(v_2)^2 - \frac{1}{2}m(v_1)^2$

$= \frac{1}{2}m\left[(25)^2 - (15)^2\right]$

$= \frac{1}{2}\times800(625-225) = \frac{1}{2}\times800\times400$

$= 16 \times 10^4$ Joule = 160 kJ

13. The radiant energy of the sun results from the process of

(a) Combustion (b) Nuclear fusion

(c) Nuclear fission (d) Chemical reaction

RRB ALP CBT II Physics & Maths 22 .01.2019 Shift III

Ans. (b) : The sun generates energy from a process called nuclear fusion. During nuclear fusion the high pressure and temperature in the sun's core cause nuclei to separate from their electrons. Hydrogen nuclei fuse to form one helium atom. During the fusion process radiant energy is released.

$^2H_1 + {}^2H_1 \xrightarrow{\text{at high }\Delta T} {}^4He_2$ (+Radiant energy)

14. Find the work done (in kJ) if a force of 750 N pushes a cart of mass 30 kg by 16 m.

(a) 28 (b) 48

(c) 36 (d) 12

RRB ALP & Tech. 23.01.2019 Shift-I

Ans : (d) Given,

Force = 750 N

Displacement (s) = 16 m

Work done (w) = F.S cosθ

Where θ = 0, if cosθ = 1

W = 750 × 16 = 12000 J

$W = \frac{12000}{1000}$kJ

W = 12 kJ

15. If the speed of a car increases from 54 km/hr to 90 km/hr, its kinetic energy would increase in the ratio———.

(a) 3/5 (b) 4/9

(c) 9/16 (d) 9/25

RRB ALP & Tech. 23.01.2019 Shift-I

Ans : (d) Initial velocity (u) = 54 km/hr

Final velocity (v) = 90 km/hr

Kinetic energy $= \frac{1}{2}\times m\times v^2$

(Where, m = mass, v = velocity)

Kinetic energy for the initial velocity

$= \frac{1}{2}\times m\times54\times54$

Kinetic energy for the final velocity

$= \frac{1}{2}\times m\times90\times90$

So, the ratio of kinetic energy

$= \frac{\frac{1}{2}\times m\times54\times54}{\frac{1}{2}\times m\times90\times90} = \frac{54\times54}{90\times90}$

$= \frac{6.6}{10.10} = \frac{3.3}{5.5} = \frac{9}{25}$

16. A truck of mass 5000 kg accelerates from 25 m/s to 35 m/s, Find the change in its kinetic energy (in MJ).

(a) 1.5 (b) 1

(c) 2 (d) 2.5

RRB ALP & Tech. 23.01.2019 Shift-I

Ans : (a) Given,

Mass (m) = 5000 kg

Initial velocity (u) = 25 m/s

Final velocity (v)= 35 m/s

Kinetic energy (KE) = $\frac{1}{2}mv^2$

Kinetic energy of initial velocity

$= \frac{1}{2}\times5000\times(25)^2 = 1{,}562{,}500$ J

Kinetic energy of final velocity

$= \frac{1}{2}\times5000\times(35)^2 = 3{,}062{,}500$ J

Change in Kinetic energy $(\Delta K.E.) = \frac{1}{2}m(v^2-u^2)$

= 3, 06,2500 – 1,56, 2500

= 1500, 000 J = 1.5 MJ

17. A boy of 50 kg is riding a scooter of 100 kg mass at a speed of v m/s. Find v (in m/s) if the kinetic energy of the scooter and the boy is 76.8 kJ.

(a) 32 (b) 64

(c) 40 (d) 80

RRB ALP & Tech. 23.01.2019 Shift-II

Ans : (a)

Total mass of boy and scooter = (50 + 100)kg

= 150 kg

Kinetic energy = 76.8 KJ = 76800 J

v = ?

Kinetic energy (K) = $\frac{1}{2}mv^2$

$\Rightarrow 76800 = \frac{1}{2}\times150\times(v)^2$

$\Rightarrow 76800 = 75\ v^2$

$v^2 = \frac{76800}{75} = 1024$

$v^2 = 1024 \Rightarrow v = 32$ m/s.

18. If 1,200 J of work is done in pushing a trolley by 20 m, what was the force (in N) employed?

(a) 30 (b) 90

(c) 120 (d) 60

RRB ALP & Tech. 23.01.2019 Shift-II

Ans : (d) Given,
Work (w) = 1200 J
Displacement (d) = 20 m
Force (F) = ?
Work = Force × displacement

$\Rightarrow \quad 1200 = F \times 20$

$\Rightarrow \quad F = \frac{1200}{20}$

So, $F = 60$ N

19. Find the efficiency of a pump (rated 400 W) that can lift 500 kg of water by 30 m in 10 minutes. (Use g = 10m/s^2)
(a) 77.50% (b) 84.00%
(c) 62.50% (d) 92.00%

RRB ALP & Tech. 23.01.2019 Shift-II

Ans : (c) Given,
M = 500 kg
T = 10 min. = 600 sec.
Rate of power = 400 W
Distance = 30 m.
Work = F × s = mg×s = 500 × 10 × 30

$\Rightarrow$ W = 15×10^4 Joule

So, power (P) = $\left(\frac{\text{work}}{\text{time}}\right) = \frac{15\times10^4}{600}$

$\Rightarrow \quad P = 2.5 \times 10^2$

Thus, efficiency = $\left(\frac{\text{Power}}{\text{Rate of power}}\right)\times 100$

$= \frac{2.5\times10^2}{400}\times 100$

Efficiency = 62.5%

20. A car loses 200 kJ of kinetic energy when its speed decreases from 25 m/s to 15 m/s. Find its mass in tonnes.
(a) 1 (b) 1.5
(c) 2 (d) 2.5

RRB ALP & Tech. 23.01.2019 Shift-II

Ans : (a) Change in kinetic energy

$= \frac{1}{2}\times m \times \left(v_2^2 - v_1^2\right)$

Let, v_2 = 25m/sec and v_1 = 15 m/sec

$\Rightarrow \quad 200\times10^3 = \frac{1}{2}\times m \times \left(25^2 - 15^2\right)$

$\Rightarrow \quad 200\times10^3 = \frac{1}{2}\times m \times \left(625 - 225\right)$

$\Rightarrow \quad 200\times10^3 = \frac{1}{2}\times m \times 400$

$\Rightarrow \quad 200 \times 10^3 = 200$ m

$\Rightarrow \quad m = 1000$ kg

So, m = 1 tonnes

21. A train of mass 50,000 kg accelerates from 5 m/s to 25 m/s. Find the change in its kinetic energy.
(a) 17.5 MJ (b) 12.5 MJ
(c) 15 MJ (d) 25 MJ

RRB ALP & Tech. 08.02.2019 Shift-I

Ans : (c) : Kinetic energy = $\frac{1}{2}mv^2$, let u = 5 m/sec and v = 25 m/sec.
According to the question,
The charge in kinetic energy of the train

$= \frac{1}{2}\times 50000\left\{(25)^2 - (5)^2\right\}$

$= \frac{1}{2}\times 50000\times 600 = 15 \times 10^6$ Joule = 15 MJ

22. If the speed of a car increases from 64 km/hr to 120 km/hr then its kinetic energy would increase in the ratio_____.
(a) 15/8 (b) 225/64
(c) 25/16 (d) 125/32

RRB ALP & Tech. 08.02.2019 Shift-I

Ans : (b) v_1 = 64 km/hrs
v_2 = 120 Km/hrs
Mass is same then

Kinetic energy (K_1) = $\frac{1}{2}mv_1^2 = \frac{1}{2}$ m.$(64)^2$

$= 2048$ …(i)

$K_2 = \frac{1}{2}mv_2^2$

$= \frac{1}{2}(120)^2 = 7200$ …(ii)

From equation (i) and (ii),

Proportionate increase = $\frac{7200}{2048} = \frac{225}{64}$

23. Find the power of a pump if it can lift 750 litres of water by 150 m in 25 minutes. (Assume 75% efficiency and use g = 10 m/s^2 and density of water as 1g/cm^3)
(a) 1.5kW (b) 1kW
(c) 1.2 kW (d) 2kW

RRB ALP & Tech. 08.02.2019 Shift-I

Ans : (b) :

Power of pump = $\left(\frac{\text{Total work done}}{\text{time}}\right) = \frac{mgh}{t}$

According to question = $\left(\frac{1\times750\times10\times150}{25\times60}\times\frac{100}{75}\right)$

= 1000 Joule/second
= 1 kilowatt

24. Find the work done if a force of 1200 N pushes a trolley of mass 45 kg by 30 m.
(a) 42 kJ (b) 24 kJ
(c) 54 kJ (d) 36 kJ

RRB ALP & Tech. 08.02.2019 Shift-I

Ans : (d) : Given,
Force (F) = 1200N
Mass (m) = 45kg
Displacement (S) = 30 m
Work done = F × S

$\Rightarrow$ W = 1200N × 30m
W = 36000Nm
W = 36000J
So, W = 36 KJ (1KJ = 1000 × J)

25. How much work is required to increase the speed of a ball of mass 1 kg from 2 m/s to 4 m/s?

(a) 10J (b) 12J
(c) 8J (d) 6J

RRB ALP & Tech. 23.01.2019 Shift-III

Ans: (d) Given $\Rightarrow$ m = 1kg
$v_2 = 4$m/sec
$v_1 = 2$m/sec
work done = change in kinetic energy (ΔU)

$$\Delta U = \frac{1}{2}m\left(v_2^2 - v_1^2\right)$$

$$\Delta U = \frac{1}{2}\times 1\times\left(4^2 - 2^2\right)$$

$$\Delta U = \frac{1}{2}(16-4)$$

$$\Delta U = \frac{12}{2} = 6 \text{ Joule}$$

Thus 6 J of work is needed to increase the speed of the ball from 2 m/sec to 4 m/sec

26. The potential energy of a 20-kg object at height h is 600 J. The value of h is ——— (Take g = 10 m/s^2).

(a) 1m (b) 3m
(c) 2m (d) 30m

RRB ALP & Tech. 22.01.2019 Shift-I

Ans : (b) Given,
Potential energy (U) = 600 J
m = 20 kg
g = 10 m/sec^2
$\because$ U = mgh $\Rightarrow$ $600 = 20 \times 10 \times h$

$$h = \frac{600}{200} = 3 \text{ meter}$$

27. An object of mass 1 kg is moving with a velocity 10 m/s. Find the kinetic energy of the object.

(a) 100J (b) 10J
(c) 5J (d) 50J

RRB ALP & Tech. 22.01.2019 Shift-I

Ans : (d) given,
m = 1kg, v = 10 m/sec
KE = ?

$$KE = \frac{1}{2}mv^2$$

$$KE = \frac{1}{2}\times 1\times(10)^2$$

$$KE = \frac{100}{2} = 50 \text{ Joule}$$

28. _____ is defined as the time rate at which work is done or energy is transferred.

(a) Distance (b) Displaement
(c) Force (d) Power

RRB ALP & Tech. 22.01.2019 Shift-I

Ans : (d) Power is defined as the rate at which work is done or energy is transferred. Power is a scalar quantity. Its S.I. unit is joule/second or watt. If a person does (w) work in (t) time then power is-

$$P = \left(\frac{W}{t}\right) \text{ joule/second}$$

29. Work done will be maximum when the angle between the direction of force and the direction of displacement is.

(a) 45º (b) 0º (c) 90º (d) 60º

RRB ALP & Tech. 22.01.2019 Shift-II

Ans : (b) : Work = force acting in the direction of displacement

$$W = F.S\cos\theta$$

When, $\theta = 0$, work will be maximum because $\cos\theta = 1$
When the work done is maximum, then the direction of the force and the angle between direction of the displacement will be 0º or force acting in the direction of displacement.

30. How much work is done in moving a charge of 10 C across two points having a potential difference 20 V?

(a) 200J (b) 0.5J
(c) 10J (d) 2J

RRB ALP & Tech. 22.01.2019 Shift-II

Ans : (a) : Q = 10 C
V = 20 V
W = ?

$$\Rightarrow \quad V = \frac{\text{Work done}(W)}{\text{Charge}(Q)}$$

$$\Rightarrow \quad W = V \times Q = 20\times 10 = 200 \text{ J}$$

31. A ball of mass m is dropped from a height H. At height H/3, the ratio of its potential energy (PE) to kinetic energy (KE) is equal to:

(a) 1 (b) 1/4 (c) 1/2 (d) 1/3

RRB ALP & Tech. 22.01.2019 Shift-II

Ans : (c) : By the principle of conversation of energy, = Potential energy + Kinetic energy always remain constant.

$$\frac{P.E}{K.E} = \left(\frac{\text{Remaining polential energy}}{\text{loss in polential energy}}\right)$$

The object is at $\frac{2H}{3}$ distance from the releasing point.

So, potential energy at this point = $\frac{2mgH}{3}$

Hence, loss in energy = $\frac{2mgH}{3}$ = kinetic energy at point.

At $\frac{H}{3}$ height, potential energy = $\frac{mgH}{3}$

$\because$ $\frac{\text{Potential energy}}{\text{Kinetic energy}} = \frac{mgH}{3}\times\frac{3}{2mgH} = \frac{1}{2}$

32. If the total energy of the reactants is more than the products of the reaction, heat is released and the reaction is said to be a/an ___ reaction.

(a) Work (b) Endothermic
(c) Potential (d) Exothermic

RRB ALP & Tech. 22.01.2019 Shift-II

Ans : (d) : If the total energy of the reactants is more than the products of the reactions, then the energy is released, in such reactions in the form of heat and are called as an exothermic reaction.
Example:- formation of water, burning of graphic in air etc.

33. A girl of weight 440 N climbs up a rope through a height of 7 m in 20 s. The power expended by the girl is:

(a) 36 W (b) 15.4 W
(c) 72 W (d) 154 W

RRB ALP & Tech. 22.01.2019 Shift-II

Ans : (d) : Weight of girl (W) = mg = 440N
Height climed by the girl (h) = 7m [g = 10 m/s^2]
Power (P) = work /time
And work = Force × distance = mgh

$$\text{Power} = \frac{mgh}{t} = \frac{440\times 7}{20} = 154 \text{ watt}$$

34. A 0.5 kg ball is relased from the top of a building of height 20 m. Find the kinetic energy of the ball, just before it hits the ground (assume g = 10 m/s^2).

(a) 20 J (b) 100J
(c) 40 J (d) 80J

RRB ALP & Tech. 21.01.2019 Shift-I

Ans : (b) : Given,
m = 0.5 kg, g = 10m/s^2, h = 20 m
Kinetic energy of a body falling from a height = mgh
= 0.5 ×10 × 20
= 100J
Since the total potential energy (mgh) at the top of the building will be converted to kinetic energy before it reaches the ground.

35. 1 kilowatt hour (kWh) of energy = ... joule.

(a) 1.8×10^6 (b) 1.8×10^4
(c) 3.6×10^4 (d) 3.6×10^6

RRB ALP & Tech. 21.01.2019 Shift-I

Ans : (d) : 1 Kilowatt – hours = ? Joule
1 Kilowatt = 1000 watt
1Hours = 3600 second
1 Kilowatt = 1000 × 3600 Joule
= 3.6×10^6 Joule

36. A 100-gram ball is kept on the top of a building of 70 m height. Find the potential energy of the ball (assume g = 10 m/s^2).

(a) 50 J (b) 70J
(c) 80 J (d) 60J

RRB ALP & Tech. 21.01.2019 Shift-I

Ans : (b) : Given,
mass = 100gm, Height = 70meter, g = 10m/sec^2

$$\text{mass} = \frac{100}{1000} = 0.10 \text{ kg}$$

Potential energy of ball = 0.10 × 70 × 10
= 70 Joule

37. One horse - power (hp) 1 hp = ... W.

(a) 746 (b) 500
(c) 846 (d) 646

RRB ALP & Tech. 21.01.2019 Shift-I

Ans : (a) : 1 Horse power (H.P.) = 746 Watt
≅ 0.75 Killowatt

38. A girl weighing 40 kg limbs a rope to a height of 6 m in 16s. What is the power spent by the girl ? (Assume g = 10 m/s^2)

(a) 150W (b) 210W
(c) 240W (d) 40W

RRB ALP & Tech. 22.01.2019 Shift-III

Ans : (a) mass of Girls = 40kg
time taken by rope = 16s
and height (h) = 6m
Power spent (P) = ?
Acceleration due to gravity (g) = 10m/sc^2
W = f.d = 40×10×6 = 2400J

$$P = \frac{W}{t} = \frac{2400}{16}$$

P = 150W
Hence, the power consumed by the girl will be =150.W

39. How much work required to be done to increase the speed of a ball of mass 0.4 kg from 1 m/s to 3m/s?

(a) 1.6J (b) 1.2J
(c) 0.8J (d) 0.4J

RRB ALP & Tech. 22.01.2019 Shift-III

Ans: (a) Let the mass of ball (M) = 0.4kg
Work (W) = Change in kinetic energy (ΔKE)

$$= \frac{1}{2}m\left(v_2^2 - v_1^2\right) = \frac{1}{2}\times(0.4)\times\left(3^2 - 1^2\right)$$

So, W = 1.6 J

40. If both the mass and speed of a ball are doubled, then how many times will the kinetic energy becomes?

(a) 4 (b) 2
(c) 8 (d) 16

RRB ALP & Tech. 22.01.2019 Shift-III

Ans : (c) The kinetic energy, $K.E = \frac{1}{2}mv^2$
If $m' = 2m$ $v' = 2v$
Then the new kinetic energy $(K.E)' = \frac{1}{2}m'v'^2$

$$K.E' = \frac{1}{2}(2m).(2v)^2 = \frac{1}{2}mv^2.8$$

$$\boxed{K.E' = 8KE}$$

Hence the kinetic energy becomes 8 times.

41. A drum of mass 'm' kg was rolled down a ramp. At the bottom of the ramp its kinetic energy was 10 kJ and velocity was 20 m/s. With what velocity (in m/s) was it pushed down the ramp if its initial kinetic energy was 625 J?

(a) 10 (b) 5
(c) 7.5 (d) 2.5

RRB ALP & Tech. 21.01.2019 Shift-II

Ans : (b) Given,
mass of energy = mkg
Kinetic energy (KE) = 10 kJ = 10×10^3 J
Velocity (v) = 20 m/s

$$K.E = \frac{1}{2}mv^2$$

$$10\times10^3 = \frac{1}{2}\times m\times 20^2$$

$$10\times10^3 = \left(\frac{1}{2}m.20^2\right)$$

mass (m) = 50 kg
So, we will get the mass of the drum as 50 kg. when the kinetic energy was 10 kJ.

Since, $KE = \frac{1}{2}mv^2$

$625 = \frac{1}{2} \times 50 \times v^2$

$v^2 = \frac{625}{25} = 25$

v = 5 m/sec

Hence, the drum was pushed down with a velocity of 5m/sec.

42. A bus runs with a force of 4000 N. The work done by the bus is 2000 J. What is the distance covered by the bus?

(a) 1 meter (b) 2 meter

(c) 1.5 meter (d) 0.5 meter

RRB Group-D 06-12-2018 (Shift-III)
RRB ALP & Tech. 21.01.2019 Shift-II

Ans : (d) : Work = force × displacement

Displacement = $\left(\frac{\text{Work}}{\text{Force}}\right) = \frac{2000}{4000} = \frac{2}{4} = 0.5$ meter

43. If a box of mass 25 kg is pushed 15 m by a force of 'F' N, work done in the process is 480 J. Find F:

(a) 16 (b) 32

(c) 25 (d) 50

RRB ALP & Tech. 21.01.2019 Shift-II

Ans : (b) : given,

Mass = 25 kg

displacement = 15 meter

work = 480 J

work = force × displacement

$480 = F \times 15$

$F = \frac{480}{15} = 32N$

44. A car of 500 kg mass has a kinetic energy of 64 kJ. Find its speed (in m/s).

(a) 32 (b) 16

(c) 64 (d) 48

RRB ALP & Tech. 21.01.2019 Shift-II

Ans : (b) : Given,

Mass (m) = 500 kg

Kinetic energy (KE) = 64 kJ = 64×10^3 J

$KE = \frac{1}{2}mv^2$

$64 \times 10^3 = \frac{1}{2} \times 500 \times v^2$

$v^2 = 64 \times 4$

v = 16 m/s

$\therefore$ speed of car = 16 m/s

45. A force acting on an object of mass m changes its velocity during its course of motion. In which of the following cases, the work done by the force is maximum?

(a) When velocity of the object chages from 0 to v m/s

(b) When velocity of the object changes from v m/s to 3 v m/s

(c) When velocity of the object changes from 2 m/s to 3 v m/s

(d) When velocity of the object changes from 3 v m/s to 4 v m/s

RRB JE (Shift-I), 29.8.2015

Ans. (d) : When the velocity of the objects changes during the action of force on the object, the kinetic energy of the object also changes- therefore, the velocity change of the object for which the change in energy is maximum is equal to the maximum amount of work done.

(a) Change in kinetic energy of the object

$(\Delta K.E.) = \frac{1}{2}mv^2 - 0 = 1\left(\frac{1}{2}mv^2\right)$

(b) Change in kinetic energy of the object

$(\Delta K.E.) = \frac{1}{2}m(2v)^2 - \frac{1}{2}mv^2 = 3\left(\frac{1}{2}mv^2\right)$

(c) Change in kinetic energy of the object

$(\Delta K.E.) = \frac{1}{2}m(3v)^2 - \frac{1}{2}m(2v)^2 = 5\left(\frac{1}{2}mv^2\right)$

(d) Change in kinetic energy of the object

$(\Delta K.E.) = \frac{1}{2}m(4v)^2 - \frac{1}{2}m(3v)^2 = 7\left(\frac{1}{2}mv^2\right)$

Hence, maximum work is done on the object is in option (d).

46. A ball of mass 10 kg is moving with a velocity 5m/s. The kinetic energy of the ball is

(a) 50 J (b) 125 J

(c) 250 J (d) 25 J

RRB JE (Shift-I), 27.08.2015

Ans. (b) : mass of the ball m = 10 kg

velocity of the ball v = 5 m/s

K.E of the ball $(K.E) = \frac{1}{2}mv^2$

$K.E = \frac{1}{2} \times 10 \times (5)^2$

$\boxed{K.E = 125\,\text{Joule}}$

47. An object of 10 kg is raised through a height of 2 m. The work done is ($g = 9.8\ m/s^2$)

(a) 196 J (b) 98 J

(c) 19.6 J (d) 4.9 J

RRB JE Bhopal Paper II (Shift-II), 26.08.2015

Ans. (a): mass of an object m = 10 kg

Height gained by the object (h) = 2 m

Therefore, work done on the object during this time = potential energy acquired by object

$W = mgh = 10 \times 9.8 \times 2$

$\boxed{W = 196\,\text{Joule}}$

48. The quantity of work equal to one joule is also equivalent to–

(a) watt × second (b) watt/second

(c) $watt/second^2$ (d) watt

RRB JE (Shift-III), 27.08.2015

Ans. (a) : Work = Force × displacement

Unit of work = Newton × meter = Joule

$\text{Power (P)} = \left[\frac{\text{Work (W)}}{\text{time (t)}}\right]$

$$\text{Unit of power} = \frac{\text{Joule}}{\text{second}} = \text{Watt}$$

Therefore, watt × second = Joule

$\boxed{\text{Joule} = \text{watt} \times \text{second}}$

49. A 50 kg man uses the energy of bread, which produces 100,000 calories of heat, to climb a hill If his body works at 30% efficiency, he can climb the hill by?

(a) 200m (b) 252m
(c) 246m (d) 258m

RRB Trivandrum (Technical), 11.04.1999

Ans. (b) : According to question,
Let the person climb the hill up to a height (h).

$$100000 \times \frac{30}{100} = \frac{50 \times 10 \times h}{4.2} \quad (1\text{Joule} = 4.2 \text{ calori})$$

$$h = \frac{30000 \times 4.2}{500}$$

$\boxed{h = 252 \text{ meter}}$

50. 1 J equivalent .

(a) 1 kg×1m (b) 1 HP×1m
(c) 1 N×1m (d) 1 N×1cm

RRB Chennai Technician (Engineering), 15.04.2007

Ans. (c) : If a force 1 Newton is applied on an object and it is displaced by 1 meter in the direction of force, then the work done by the force on the object will be 1 joule.

$$W = F \times S$$

$$W = N\text{–}m = \text{Joule}$$

In S.I system it is called absolute unit of work.

51. The S.I unit of power (watt) is equal to -

(a) kg-meter –second^{-2} (b) kg-meter^2 –second^{-2}
(c) kg-meter^2 –second^{-3} (d) None of these.

RRB Asst. Loco Pilot (Gorakhpur)-2001

Ans. (c) : The rate of doing work is called power. The S.I unit of power is the watt.

$$1 \text{ Watt} = \frac{1 \text{ Joule}}{\text{second}} = \frac{1\text{N} \times \text{m}}{\text{second}} = \frac{\text{kg} \times \text{m} \times \text{m}}{\text{sec}^2 \times \text{sec}}$$

$$1 \text{ Watt} = \frac{\text{m}^2 \times \text{kg}}{\text{second}^3}$$

$\boxed{1\,\text{Watt} = 1\,\text{kg} - \text{m}^2\text{second}^{-3}}$

52. A force of 40 Newton's acts on a body. if an angle of 45° is formed between the line force and the direction of displacement, then tell the value of the work done in displacing the body by 2 meters

(a) $40\sqrt{2}$ Joule (b) $30\sqrt{2}$ Joule
(c) $20\sqrt{2}$ Joule (d) 20 Joule

RRB Asst. Loco Pilot (Kolkata)-2002

Ans. (a) : Work $W = F.s\cos\theta$

$$= (40 \times 2 \times \cos 45^0)$$

$$= 40 \times 2 \times \frac{1}{\sqrt{2}} = 40\sqrt{2} \text{ Joule}$$

53. Two bodies of equal mass of are moving with velocities 3v and 2v respectively. The ratio of its kinetic energy will

(a) 9:4 (b) 8:2
(c) 4:9 (d) 2:3

RRB Asst. Loco Pilot (Ajmer)-2005

Ans. (a) : According to question,

$V_1 = 3v$, $V_2 = 2v$

and masses are equal.

Then the ratio of kinetic energy will be-

$$= \frac{K_1}{K_2} = \frac{\frac{1}{2}mV_1^2}{\frac{1}{2}mV_2^2} = \frac{V_1^2}{V_2^2} = \frac{(3v)^2}{(2v)^2} = \frac{9v^2}{4v^2}$$

$$\frac{K_1}{K_2} = \frac{9}{4}$$

54. A man of mass of 60 kg climbs 30 steps of length 20 cm each in 20 second. Calculate the total work done by the person and his power. g = 10 m/sec^2

(a) 130 watt (b) 180 watt
(c) 100 watt (d) 50 watt

RRB Asst. Loco Pilot (Patna)-2007

Ans. (b): Total height of 30 steps.

$h = 30 \times 20 = 600 \text{ cm} = 6 \text{ meter}$

$\therefore$ Total work done by the person

$W = mgh = 60 \times 10 \times 6 = 3600$ Joule

$$P = \frac{W}{t} = \frac{3600}{20} = 180 \text{ watt}$$

55. Doubling the mass and halving the velocity of body but its kinetic energy will be?

(a) Half (b) Quarter
(c) Doubled (d) unchanged

RRB Asst. Loco Pilot (Chandigarh)-2008

Ans. (a) : Suppose a body of mass m moves with velocity (v). The kinetic energy of the body be given by-

$$\text{K. E} = \frac{1}{2}mv^2$$

According to question.

$$\text{K E}' = \frac{1}{2}(2m)\left(\frac{v}{2}\right)^2$$

$$\text{K. E}' = \frac{1}{2}2m \times \frac{v^2}{4} \Rightarrow \text{K E}' = \frac{1}{2}mv^2\left(\frac{1}{2}\right)$$

$\boxed{\text{KE}' = \frac{\text{KE}}{2}}$

56. Erg is unit of.

(a) work (b) force
(d) power (c) energy

RRB Asst. Loco Pilot (Bhuvneshwar)-2009

Ans. (a) The unit of work is Joule while 1 Joule = 10^7 ergs. That's why the unit of work is also erg.

57. A pump lifts 160kg of water to a height of 5m per second. The power of the pump will be- (g = 10 m/sec^2)

(a) 5000 watt (b) 4000 watt
(c) 6000 watt (d) 8000 watt

RRB Chandigarh Section Engineer (Mech.), 26.02.2012

Ans. (d) : Work done by the pump $W = mgh$

$W = 160 \times 10 \times 5 = 8000$

Power of pump $= \frac{W}{t} = \frac{8000}{1} = 8000$ Watt

58. A stone of mass 1 kg is observed falling down in front of a window 2 m high. The speed of the stone at the top of the window was 4m/sec. While reaching from the upper end of the window to the lower end, its kinetic energy be increased by

(a) 19.6 Joule (b) 16 Joule

(c) 8 Joule (d) 39.2 Joule

DMRC Junior Engineer (Electronics), 03.08.2014

Ans. (a): Increase in kinetic energy = decrease in potential energy.

$= mgh = 1 \times 9.8 \times 2$

$= 19.6$ Joule

59. A 40kg body runs up a ladder and reaches the first floor 9m height in $\left(\frac{1}{2}\right)$ of a minutes. The power developed by the boy is

(a) 600 watt (b) 120 watt

(c) 420 watt (d) 640 watt

RRB Bhubaneshwar App. Electrical , 19.08.2001

Ans. (b) :

$$\text{Power of the boy (P)} = \frac{\text{Work done by the boy}}{\text{Total time taken to do the work}}$$

$$P = \frac{W}{t} = \frac{mg \times h}{t} = \frac{40 \times 10 \times 9}{30} = 120 \text{ watt}$$

60. A frictional force of 100 Newton acts on a cyclist. He is going with a speed of 2m/sec his power will be

(a) 100 watt (b) 200 watt

(c) 300 watt (d) 400 watt

P. WAY/SUPERVISOR/CHASING INSPECTORr

Ans. (b) : Friction force acts on the cycle $F = 100$ N

speed of cycle $v = 2$m/s

The power of cyclist $P = \frac{W}{t} = \frac{F.s}{t} = F.V$

$P = 100 \times 2 = 200$ watt.

61. A man does 6×10^4 Joule of work in one minutes. man's power will be

(a) 10^4 watt

(b) 66×10^4 watt

(c) 110^3 watt

(d) 6×10^3 watt

Delhi Metro Rail Corporation Train Operators', 14.09.2003

Ans. (c) :

$$\text{Efficiency of man} = \frac{\text{work done by man}}{\text{Total time taken to do the work}}$$

$$\text{Power of man} = \frac{6 \times 10^4}{60} = 10^3 \text{ watt}$$

62. A box is lifted by a pulley system to a distance of 20m in 10 second with a force of 100 Newton. The power used in this will be-

(a) 50 watt (b) 20,000 watt

(c) 2000 watt (d) 200 watt

RRB Trivandrum (Tech.), 11.04.1999

Ans. (d):

Power used $P = \frac{W}{t} = \frac{F \times s}{t} = \frac{100 \times 20}{10} = 200$ watt

63. When a force of 6 Newton is applied on a body, the body travels a distance of 2 meters then the value of the work done will be

(a) 6×2 Joule (b) 6×2^2 Joule

(c) 4 Joule (d) 6/2 Joule

RRB Bangalore (Tech.), 22.08.1999

Ans. (a) : Work done on the body

= force × displacement

$= 6 \times 2 = 12$ Joule

64. A motor of 1.5k W power raises water 1.5 m high, the work (in Joules) done by the motor in one hours will be

(a) 3.6×10^6 Watt (b) 5.4×10^6 Watt

(c) 36×10^6 Watt (d) 54×10^6 Watt

RRB Kolkata (Tech.), 29.08.1999

Ans. (b) :

Power of motor (P) = 1.5 kilowatt = 1500 watt

Then in one hours = $60 \times 60 = 3600$ second

work done by the motor (W) = $P \times t = 1500 \times 3600$

$= 540 \times 10^4 = 5.4 \times 10^6$ watt

65. When a force of 50 Newton is applied to a body, the body is displaced by 5 m making an angle of 30°. With the line action of the force. The work done on the body is

(a) 125 Joule (b) $125\sqrt{2}$ Joule

(c) $125\sqrt{3}$ Joule (d) $205\sqrt{3}$ Joule

RRB Bhubaneshwar (Tech.), 03.06.2001

Ans. (c) : Work = F.s. $\cos\theta$

$= 50 \times 5 \times \cos 30^0$

$= 50 \times \frac{5\sqrt{3}}{2} = 125\sqrt{3}$ Joule

66. To lift a body of mass 30 kg 4000 Joules of work is done. How high is the body raised (g = 9.8 Newton/kg)

(a) 136 meter (b) 1.36 meter

(c) 13.6 meter (d) 0.136 meter

RRB Bhubaneshwar App. Elec. Signal Maintainer, 19.08.2001

Ans. (c) : Work done = increase in potential energy of the body.

$W = mgh \Rightarrow 4000 = 30 \times 9.8 \times h$

$\Rightarrow \quad h = \frac{4000}{30 \times 9.8} = 13.6$ meter

PREVIOUS YEAR QUESTIONS

1. The efficiency of a heat energy can never be

(a) 10% (b) 80%

(c) 100% (d) 50%

RRB ALP CBT II Physics & Maths 21 .01.2019 Shift I

Ans. (c) : Heat energy is the result of the movement of tiny particles called atoms, molecules or ions in solids, liquid and gases.

- Heat energy can be transferred from one object to another. Its transfer or flow is done by the difference in temperature between the two bodies.
- According to second law of thermodynamics, it is impossible to get 100% of efficiency because of environmental changes and some other factors. So, the efficiency of a heat energy can never be 100%.

2. The heat generated while transferring 96000 coulomb of charge is one hour through a potential difference of 50 V is

(a) 4.8×10^4 J (b) 1.33×10^3J

(c) 4.8×10^6J (d) 1.33×10^4 J

RRB ALP CBT II Physics & Maths 22 .01.2019 Shift I

Ans. (c) : Given,

V = 50 V

Q = 96000

t = 1 hour = 3600 sec

We know that-

$$H = V\,I\,t = \frac{V \times Q.t}{t} = V \times Q = 50 \times 96000$$

$$\Rightarrow \quad \boxed{H = 4.8 \times 10^6\,J}$$

3. The specific heat capacity of water is

(a) 540 J/kg°C (b) 4186 J/kg°C

(c) 2260 J/kg°C (d) 335 J/kg°C

RRB ALP CBT II Physics & Maths 22 .01.2019 Shift III

Ans. (b) : Specific heat capacity of water = 4186 J/kg°C

4. The thermal coefficient of linear expansion of a material is α. Then the thermal coefficient of its volume expansion will be

(a) $\frac{\alpha}{3}$ (b) 3α

(c) α (d) 2α

RRB ALP CBT II Physics & Maths 22 .01.2019 Shift III

Ans. (b) : First Method- Linear expansion - when the expansion due to heating occurs only along one direction. Then linear expansion,

$$\Delta\ell = \alpha\,\ell.\Delta T$$

where, $\Delta\ell$ = Change in length

ℓ = Length

ΔT = Change in temperature

α = Coefficient of linear expansion

(S.I. Unit C^{-1} or K^{-1})

Volumetric expansion - change in volume (ΔV) is directly proportional to volume (V) and ΔT

So, $\Delta V \propto \Delta T$ and $\Delta V \propto V$

$\Delta V \propto V.\Delta T$

$\Delta V = \gamma V.\Delta T \rightarrow (3)$

Where γ = the coefficient of volume expansion.

When the temperature of a cube of material of side length (ℓ) is increased by $d\ell$ then the volume will be increased by an amount dV is given by,

$$dV = \left(\frac{dV}{d\ell}\right).d\ell$$

Volume of cube (V) = ℓ^3

Put the value of V in equation (3)

$$dV = \frac{d(\ell^3)}{d\ell} \times d\ell = 3\ell^2.d\ell$$

Put the value of $d\ell$

$$dV = 3\ell^2.(\ell\,\alpha dT)$$

$$= 3\ell^3\,\alpha\,dT \qquad \because V = \ell^3$$

$$= 3\,\alpha\,VdT$$

$$dV = \gamma VdT$$

Thus, $\gamma = 3\alpha$

Second Method- We know that

$\alpha : \beta : \gamma = 1 : 2 : 3$

α = Coefficient of linear expansion

γ = Coefficient of volume expansion

β = Coefficient of Areal expansion

So, $\gamma = 3\alpha$

$\beta = 2\alpha$

5. If half litre of a hot water at 90º C is mixed with three and a half liters of cold water at 10º C, find the final equilibrium temperature (in ºC) if no heat is lost.

(a) 50 (b) 20 (c) 40 (d) 30

RRB ALP & Tech. 23.01.2019 Shift-I

Ans : (b) Heat lost = Heat gain

$m_1 c\,\Delta T_1 = m_2 c\,\Delta T_2$

$m_1\,\Delta T_1 = m_2\,\Delta T_2$

$$\frac{1}{2}(90 - T) = \frac{7}{2}(T - 10)$$

$(90 - T) = (7T - 70)$

$8T = 160$

$$T = \frac{160}{8}$$

$\boxed{T = 20^\circ C}$

6. Find the heat capacity of a pan of mass 200 g if its temperature rises by 8º C on receiving 20000 J of heat.

(a) $250JK^{-1}$ (b) $50JkG^{-1}K^{-1}$

(c) $1.25Jkg^{-1}K^{-1}$ (d) $5JK^{-1}$

RRB ALP & Tech. 23.01.2019 Shift-I

Ans : (a) Given, mass (m) = 200 gm

Difference in temperature (ΔT) = 8ºC

and heat (ΔQ) = 2000 J

$$\text{Quantity of heat} = \left(\frac{\text{Heat capacity}}{\text{Temperature increases}}\right)$$

$$= \frac{\Delta Q}{\Delta T} = \frac{2000}{8} = 250\ Jk^{-1}$$

7. Find the specific latent heat of vaporisation of 1.25 g of (in Jg^{-1}), if it releases 250 joules of heat when it condenses at its boiling point of 196º C.

(a) 500 (b) 200
(c) 312.5 (d) 469

RRB ALP & Tech. 23.01.2019 Shift-I

Ans : (b) Latent heat:- Latent heat is the heat required to change the state of unit mass of a substance at a constant temperature is called latent heat of the substance. It is denoted by L.

$Q = mL$

or $L = \frac{Q}{M}$

Given that m = 1.25 gm

$Q = 250$ J

Then, latent heat $(L) = \frac{Q}{M} = \frac{250}{1.25} = 200$

8. Find the specific heat capacity (in $Jg^{-1} K^{-1}$) of a block of metal of mass 500 g, the temperature of which rises by 80º C when it absorbs 10 kJ of heat?

(a) 1.56 (b) 0.25
(c) 0.4 (d) 0.16

RRB ALP & Tech. 23.01.2019 Shift-I

Ans : (b) Given,
Mass of metal (m) = 500 gm
Heat (Q) = 10 kJ = 10,000 J
Increase in temperature $(\Delta T) = 80ºC$
Then $Q = mc\,\Delta T$
Where Q = Heat (or thermal energy)
m = mass
c = specific heat
ΔT = increase in temperature

When $C = \frac{Q}{m \times \Delta T} = \frac{10000}{500 \times 80}$
$= 0.25\ Jg^{-1}k^{-1}$

9. – 100º Celsius = ——— Fahrenheit

(a) -148^o (b) -373^o
(c) 173^o (d) -212^o

RRB ALP & Tech. 23.01.2019 Shift-I

Ans : (a) –Using the formula = $C = \frac{5}{9}(F-32)$

$-100 = \frac{5}{9}(F-32)$

$-\frac{100 \times 9}{5} = F - 32$

$-180 = F - 32$

$F = -180 + 32$

$\boxed{F = -148}$

10. Two litres of superheated water at 190ºC is mixed with six litres of cold water at 20ºC. Find the final equilibrium temperature (in ºC) if no heat is lost.

(a) 47.5 (b) 95
(c) 62.5 (d) 55

RRB ALP & Tech. 23.01.2019 Shift-II

Ans : (c) $T_1 = 190°$
$T_2 = 20°$
$m_1 = 2$ litre
$m_2 = 6$ litre
Here, with no heat loss, let the final equilibrium temperature be T.

Heat loss	=	Heat gain
$m_1C\Delta T_1$	=	$m_2C\Delta T_2$
$m_1\Delta T_1$	=	$m_2\Delta T_2$
$2(190 - T)$	=	$6(T-20)$
$380 - 2T$	=	$6T - 120$
$8T$	=	500

$T = \frac{500}{8}$

$T = 62.5°C$

11. _____ º Celsius = 167ºFahrenheite

(a) 348 (b) 103
(c) 198 (d) 75

RRB ALP & Tech. 23.01.2019 Shift-II

Ans : (d) We know that, $ºC = \frac{5}{9}(F-32)$

$C = \frac{5}{9}(167-32) = \frac{5}{9} \times 135$

$C = 75º$

12. The specific latent heat of fusion of ethyl alcohol is 100 Jg^{-1}. Find the heat absorbed (in J) by 2.25 g of ethyl alcohol when it melts at its melting point of -114ºC.

(a) 311 (b) 45
(c) 225 (d) 100

RRB ALP & Tech. 23.01.2019 Shift-II

Ans: (c) Given,
(M) = 2.25 gm
specific heat (L) = 100 Jg^{-1}
(Q) = ?

$\because$ Specific heat $(L) = \left(\frac{\text{Heat (Q)}}{\text{mass}}\right)$

$100 = \frac{Q}{2.25}$

$Q = 2.25 \times 100$

$Q = 225$ Joule

13. Find the heat capacity of a steel vessel of mass 2.5 kg if its temperature rises by 10 degrees. Specific heat capacity of steel is 500 $Jkg^{-1}K^{-1}$.

(a) $1250JK^{-1}$ (b) 20 $Jkg^{-1}K^{-1}$
(c) $200Jkg^{-1}K^{-1}$ (d) $125JK^{-1}$

RRB ALP & Tech. 23.01.2019 Shift-II

Ans : (a) Given,
mass of steel (m) = 2.5 kg
Increase in its temperature $(\Delta T) = 10°C$
And specific heat (c) = (500 $Jkg^{-1}k^{-1}$)
Heat $Q = mC\Delta T$
$= 2.5 \times 500 \times 10$
$Q = 12500$

Heat capacity $= \left(\frac{\text{amount of heat}}{\text{Increase in temperature}}\right)$

$= \frac{12500}{10} = 1250\ JK^{-1}$

14. Find the mass (in g) of a copper calorimeter if its temperature rises by 45º when it absorbs 3.6kJ of heat. The specific heat capacity of copper is $0.4Jg^{-1}K^{-1}$.

(a) 500 (b) 405
(c) 648 (d) 200

RRB ALP & Tech. 23.01.2019 Shift-II

Ans : (d) Heat absorbed (Q) = 3.6 kJ
Increase in temperature (ΔT) = 45º
Specific heat capacitance (C) = $0.4Jg^{-1}k^{-1}$
mass (m) = ?
$Q = m C\Delta T$
$3.6 = m \times 0.4 \times 45$
$m = \frac{3.6}{18}$
m = 0.2 kg
m = 200 gram

15. Find the heat capacity of a pan of mass 180 g, if its temperature rises by 50 degree on receiving 2400 J of heat.

(a) 48 JK^{-1} (b) 16.67 $Jkg^{-1}K^{-1}$
(c) 13.33 $Jkg^{-1}K^{-1}$ (d) 36 JK^{-1}

RRB ALP & Tech. 08.02.2019 Shift-I

Ans: (a) : mass (m) · 180 gram = 0.18 kg
Q = 2400 Joule C = ?
Temperature (ΔT) = 50 Kelvin
Heat capacity (C)= $\frac{Q}{\Delta T} = \frac{2400}{50} = 48\ J\ K^{-1}$

16. If one and a half litres of hot water at 80°C is mixed with two and a half a litres of colder water at 40°C, find the final equilibrium temperature if no heat is lost.

(a) 50ºC (b) 55ºC
(c) 60ºC (d) 65ºC

RRB ALP & Tech. 08.02.2019 Shift-I

Ans : (b) : Let final equivalent temperature = TºC
We know that specific heat of water = $4200\ Jkg^{-1}{}^{o}C^{-1}$
Then,
Heat consumed by hot water = 1.5 × 4200 (80 – T)
Heat obtained by cold water = 2.5 × 4200 (T – 40)
According to the principle of mixing,
Heat loss = Heat gained
1.5 × 4200 (80 – T) = 2.5 × 4200 (T – 40)
120 – 1.5T = 2.5T – 100
4T = 220
T = 55ºC

17. Find the specific heat capacity of a block of metal of mass 300 g, the temperature of which rises by 50 degrees when it absorbs 12 kJ of heat?

(a) 2.5 $Jg^{-1}K^{-1}$ (b) 1.25 $Jg^{-1}K^{-1}$
(c) 0.5 $Jg^{-1}K^{-1}$ (d) 0.8 $Jg^{-1}K^{-1}$

RRB ALP & Tech. 08.02.2019 Shift-I

Ans : (d) : Given, m = 300 gm,
$\Delta T = 50°C$,
and Q = 12 KJ = 12000J
Specific heat (s) = ?
$Q = m.s.\Delta T$
$s = \frac{Q}{m.\Delta T} = \frac{12000}{50 \times 300} = \frac{4}{5} = 0.8\ J\ g^{-1}K^{-1}$

18. – 150° Celsius = ____ Fahrenheit

(a) –238º (b) –212º
(c) –418º (d) –373º

RRB ALP & Tech. 08.02.2019 Shift-I

Ans:(a): Formula convert degree Celsius to Fahrenheit:-
$°F = {}^{o}C \times \frac{9}{5} + 32$ or $\left(F = C \times \frac{9}{5} + 32\right)$
Given, C = –150
$F = -150 \times \frac{9}{5} + 32$
F = –270 + 32
F = – 238
So, we can say that – 150°C is equivalent to – 238°F.

19. Find the specific latent heat of vapourisation of 4.5 gm of nitrogen, if it releases 990 joules of heat when it condenses at its boiling point of – 196°C.

(a) 180 J/g (b) 220 J/g
(c) 200 J/g (d) 160 J/g

RRB ALP & Tech. 08.02.2019 Shift-I

Ans : (b) : Given,
mass (m) = 4.5 gram
Heat (Q) = 990 Joule
If the latent heat of the substance is L, then the heat required to change the state of mass of mass (m) of the substance is.
Q = mL
990 = 4.5 × L
$L = \frac{990}{4.5}$
L = 220 Joule/gram

20. Which of the following is equal to 86°F?

(a) $20^{o}C$ (b) $30^{o}C$
(c) $10^{o}C$ (d) $34^{o}C$

RRB ALP & Tech. 23.01.2019 Shift-III

Ans : (b)
$\frac{C}{5} = \frac{F-32}{9}$ [Formula]
$\frac{C}{5} = \frac{86^{o}-32^{o}}{9}$
$\frac{C}{5} = \frac{54^{o}}{9}$
$\frac{C}{5} = 6^{o}$
$C = 30^{o}$

21. The higher the ____ value of a material, the faster it will conduct heat.

(a) Resilence
(b) Melting point
(c) Latent Heat
(d) Thermal conductance

RRB ALP & Tech. 23.01.2019 Shift-III

Ans : (d) The greater the value of the thermal conductivity of material. The more rapidly it will conduct heat.

22. What is the molar specific heat capacity of a substance?

(a) $\left(\frac{1}{\mu}\right)\left(\frac{\Delta Q}{\Delta T}\right)$ (b) $\mu\left(\frac{\Delta Q}{\Delta T}\right)$

(c) $\left(\frac{1}{\mu}\right)\left(\frac{\Delta T}{\Delta Q}\right)$ (d) $(\mu)\left(\frac{\Delta T}{\Delta Q}\right)$

RRB ALP & Tech. 23.01.2019 Shift-III

Ans : (a) Molar specific heat of a substance is the amount of heat required to raise the temperature of 1 mole of a solid or liquid by 1K or 1°C. It is denoted by C_n.

$$C_n = \frac{1}{\mu}\left(\frac{\Delta Q}{\Delta T}\right)$$

23. A brass rod (conductivity 109J/(m-K)) has an area of corss section 0.042 m^2 and length 20 cm. If a temperature difference of 200 J°C is maintained at the two ends of the rod, what will be the rate of heat flow through the rod?

(a) 2.32kJ/s (b) 3.42kJ/s

(c) 4.36kJ/s (d) 5.80kJ/s

RRB ALP & Tech. 23.01.2019 Shift-III

Ans : (c) Rod of conductivity (K) = 109 J (m–k)
Area of transverse cut (A) = 0.04 m^2
length of rod (l) = 0.20 m
Difference of temperature (ΔT) = 200J°C

Rate of heat flow through rod, $Q = K\left(\frac{A}{l}\right)(\Delta T)$

$$= 109\left(\frac{0.04}{0.20}\right)\times 200$$

$$= 109\times\frac{1}{5}\times 200$$

$$= 4360 \text{ J/s} = 4.36 \text{ kJ/s}$$

24. Identify the material which has high coefficient of volume expansion.

(a) Alcohol (b) Glass

(c) Brass (d) Water

RRB ALP & Tech. 23.01.2019 Shift-III

Ans : (a) Coefficient of volume expansion:- It is the measure of the fractional change of size per unit change in the temperature with the surrounding pressure being constant. This coefficient is most applicable to fluids.

Material	**Volume coefficient expansion (/°C)**
Alcohol	– 1490
Glass	– 27.6
Brass	– 57
Water	– 210

out of given option, alcohol has higher coefficient of volume expansion.

25. Identify the material having the highest coefficient of volume expansion.

(a) Iron (b) Brass

(c) Aluminium (d) Mercury

RRB ALP & Tech. 23.01.2019 Shift-III

Ans : (d) Coefficient of volume expansion is most efficient for fluids. Among the given option, the order of the coefficient of volume expansion is given below-

Metal	**Volume expansion of coefficient (/°C)**
Iron	35×10^{-6}
Brass	56 × 10–6
Aluminum	75×10^{-6}
Mercury	180×10^{-6}

26. ____ is a mode of heat transfer by actual motion of matter.

(a) Conduction (b) Radiation

(c) Convection (d) Vaporisation

RRB ALP & Tech. 22.01.2019 Shift-I

Ans : (c) There are the three main methods of transfer or transmission of heat (energy) between substance from one place to another place-
1. Conduction
2. Convection
3. Radiation

Convection is the method of heat transfer from one place to another due to movement of fluid.

27. A 100-g block of lead is heated from 20°C to 50°C. Calculate the amount of heat transferred to the block (specific heat of lead = 127 J kg^{-1} K^{-1})

(a) 321J (b) 381J

(c) 127J (d) 230J

RRB ALP & Tech. 22.01.2019 Shift-I

Ans : (b) Given,
m = 100 gm = 0.1 kg
Difference in temperture ΔT = (50°C – 20°C) = 30°C
Specific heat of lead (c) = 127 $JKg^{-1}.K^{-1}$
ΔQ = ?
$\Delta Q = m.c.\Delta T$
$\Delta Q = 0.1 \times 127 \times 30$
ΔQ = 381 Joule

28. Conduction and convection modes of heat transfer CANNOT operate between bodies separated by.....

(a) ice (b) aluminium

(c) vacuum (d) water

RRB ALP & Tech. 22.01.2019 Shift-I

Ans : (c) Conduction and convection modes of heat transfer cannot operate between bodies separated by vacuum because both are require the presence of material medium to take place.

29. The Fahrenheit and Celsius scales converge at _____.

(a) -50^0 (b) -40^0

(c) -30^0 (d) -20^0

RRB ALP & Tech. 22.01.2019 Shift-I

Ans : (b) Let the Fahrenheit and Celsius scale are oriented one (x).
then,

$$\frac{C}{5} = \frac{F-32}{9}$$

Where, C° = F° = x°

$$\frac{x°}{5} = \frac{x°-32}{9}$$

$9x° = 5x° - 32 \times 5$

$9x° = 5x° - 160$
$4x° = -160$
$x° = -\frac{160}{4}$
So, $x° = -40°$

30. _____ is the unit of thermal conductivity.
(a) $J \cdot s^{-1} \cdot K$ (b) $J \cdot s^{-1} \cdot m^{-1} \cdot K^{-1}$
(c) $J^{-1} \cdot s^{-1} \cdot kg^{-1}$ (d) $J \cdot s \cdot K$

RRB ALP & Tech. 22.01.2019 Shift-I

Ans : (b) In physics, heat conductivity is that property of substance which shows how easily heat can flow through that substance. Silver metal has the highest heat and electrical conductivity among metals. Thermal conductivity is a scalar quantity. Its unit is watt $meter^{-1}$ $kelvin^{-1}$ $(W.m^{-1}.K^{-1})$ or (Joule $second^{-1}$ $meter^{-1}Kelvin^{-1}$)

31. ..... is the heat per unit mass required to change a substance from solid into liquid at the same temperature and pressure.
(a) Sublimation
(b) Vaporisation
(c) Regelation
(d) Latent heat of fusion

RRB ALP & Tech. 22.01.2019 Shift-I

Ans : (d) When a solid substance is heated, its temperature increase and at a specific temperature the solid substance starts melting. This temperature is called the melting points of the solid. At the same melting point, temperature and atmospheric pressure, the amount of heat that can change the unit mass of a solid substance into liquid without changing its temperature is called the latent heat of fusion. Thus, the heat required per unit mass of a substance to change from solid to liquid at the same temperature and pressure is called latent heat of fusion.

32. Identify the conductor having the lowest resistivity.
(a) Silver (b) Aluminium
(c) Iron (d) Copper

RRB ALP & Tech. 22.01.2019 Shift-I

Ans : (a) Silver metal has the highest electrical conductivity and least electrical resistivity among metal. Therefore, out of the above options, silver metal is a good conductor with minimum resistivity. The order of the resistivity of the given metal is as follows-
Irons > Aluminum > copper > silver
Hence the resistivity of silver is minimum.

33. A brick wall having a thickness of 24 cm has an inner surface temperature of 25ºC and an outer surface temperature of 5ºC. The rate of heat loss through per square metre of the wall (thermal conductivity = 0.15 J/(s.m.K) is :
(a) 18.2J/s (b) 20.0J/s
(c) 12.5J/s (d) 23.0J/s

RRB ALP & Tech. 22.01.2019 Shift-I

Ans: (c) Given,
Thickness of wall (d) = 24 cm = 0.24 m
k = 0.15J/s.m.K
Temperature difference ($\Delta\theta$) = 25 – 5 = 20°C
Area of wall = 1 m^2, time = 1 second

$$\theta = \left(\frac{K.A.\Delta\theta.t}{d}\right)$$

$$\theta = \frac{0.15 \times 1 \times 20 \times 1}{0.24}$$

$$\theta = \frac{15 \times 20}{24} = \frac{300}{24} = 12.5 \text{ J/second}$$

34. When 1 kg of water is cooled from 4ºC to 0ºC, its volume _____.
(a) first decreases and then increases
(b) decreses
(c) remains the same
(d) increases

RRB ALP & Tech. 22.01.2019 Shift-I

Ans : (d) The density of water is maximum at 4°C and volume of a given sample of water is minimum at this temperature. But when the water cooled from 4ºC to 0ºC, its volume increases due to **Anomalous expansion** of water.

35. Identify the material having the highest coefficient of volume expansion.
(a) Iron (b) Mercury
(c) Hard rubber (d) Brass

RRB ALP & Tech. 22.01.2019 Shift-II

Ans : (c) : Hard rubber has the highest coefficient of volume expansion. The increase in volume of solid when heated is known as volumetric expansion.
Volume expansion (/ºC) of the other materials is-

Iron	-	3.55×10^{-5}
mercury	-	18.2×10^{-5}
Brass	-	6×10^{-5}
Hard rubber	-	24×10^{-5}

36. Copper expands about ____ times more than glass for the same rise in the temperature.
(a) Three (b) Five
(c) Four (d) Six

RRB ALP & Tech. 22.01.2019 Shift-II

Ans : (b) : Copper expands five times more than glass with the same increase in temperature.

37. A 50g block of copper is heated from 20°C to 60°C. How much heat is transferred to the block (specific heat of copper 386 $Jkg^{-1}K^{-1}$)?
(a) 852 J (b) 572 J
(c) 320 J (d) 772 J

RRB ALP & Tech. 22.01.2019 Shift-II

Ans : (d) : $\Delta T = (60-20) = 40°C$
m = 50 gm = 0.05 kg
specific heat (c) = 386 J Kg^{-1} K^{-1}
Transferred heat $Q = m.c.\Delta T$
$= 0.05 \times 386 \times 40$
$= 772$ J

38. The boiling and freezing points of water are exactly ____ degrees apart on the Fahrenheit scale.
(a) 273 (b) 50
(c) 100 (d) 180

RRB ALP & Tech. 22.01.2019 Shift-II

Ans : (d) : In Fahrenheit scale-
B.P of water = 212 ºF
Freezing point of water = 32 ºF
Body temperature = 98.6 ºF
And the boiling point and freezing point of water exactly 180º apart on the Fahrenheit scale.

39. 95 ºF = _____ ºC

(a) 15 (b) 25
(c) 35 (d) 45

RRB ALP & Tech. 22.01.2019 Shift-II

Ans : (c) : Formula $\left[\frac{C}{5}=\frac{F-32}{9}\right]$

Given F = 95°F

$$\frac{C}{5}=\frac{F-32}{9}$$

$$\frac{C}{5}=\frac{63}{9}\Rightarrow\frac{C}{5}=\frac{7}{1}\Rightarrow \quad C=35°$$

40. 77^0F is equal to :

(a) 25ºC (b) 20ºC
(c) 15ºC (d) 10ºC

RRB ALP & Tech. 21.01.2019 Shift-I

Ans : (a) : Fahrenheit scale was proposed by Daniel Gabriel Fahrenheit in the year 1724 AD.

Formula $\frac{C}{5}=\frac{F-32}{9}$

$$\frac{C}{5}=\frac{77-32}{9}$$

$$\frac{C}{5}=\frac{45}{9}$$

$$\frac{C}{5}=\frac{5}{1}$$

$$\boxed{C=25°C}$$

41. A steel rod with the thermal conductivity of 50.2 W/(m-K) has an area of cross-section 0.02 m^2 and length 15 cm. If the two ends of the rod are maintained at a temperature difference of 300^0C, the rate of heat flow through the rod is : 50.2 W

(a) 4.0 kJ/s (b) 1.0 kJ/s
(c) 3.0 kJ/s (d) 2.0 kJ/s

RRB ALP & Tech. 21.01.2019 Shift-I

Ans: (d) : Thermal conductivity (K) = 50.2 W/(m-K)
Length of rod (l) = 15 cm = 0.15 m
Area of cross-section of rod (A) = 0.02 m^2
Temperature difference betweens $(\theta_1-\theta_2)$ = 300°C

Rate of flow of heat (Q) $\frac{KA(\theta_1-\theta_2)}{l}$

$$=\frac{50.2\times0.02\times300}{0.15}=2008\text{ J/s}$$

= 2 kJ/second

42. How much heat should be transferred to a 100 g block of aluminum (specific heat 900 $Jkg^{-1}K^{-1}$) to increase its temperature by 10^0C ?

(a) 90 J (b) 9 J
(c) 9000 J (d) 900 J

RRB ALP & Tech. 21.01.2019 Shift-I

Ans : (d) : Given,
m = 100g = 0.1 kg
c = 900 $Jkg^{-1}k^{-1}$
$\Delta T = 10^0$C
$Q = m.c.\Delta T \Rightarrow Q = 0.1 \times 900 \times 10$
Q = 900 Joule

43. Identify the substance from the below having highest specific heat capacity :

(a) Kerosene (b) Aluminium
(c) Water (d) Ice

RRB ALP & Tech. 21.01.2019 Shift-I

Ans : (c) : Water has the highest specific capacity strong hydrogen bonding is found between water molecular, due to which the inter molecular force between water molecules is high, which requires more heat to break. Therefore the specific heat water is high. The specific heat of water is given as 4.18 J/g°C.

44. How much heat must be transferred to a block of silver weighing 100g so that its temperature increase by 40°C ? (The Specific heat of silver is 236 $Jkg^{-1}k^{-1}$).

(a) 450J (b) 1270J
(c) 1988J (d) 944J

RRB ALP & Tech. 22.01.2019 Shift-III

Ans : (d)

Let the weight (mass) silver (m) = $\frac{100\text{ gram}}{1000\text{gram}}$

= 0.1kg

Temperature $(\Delta T) = 40^oC$

Specific heat of silver = 236 Jkg^{-1}

$Q = MC\Delta T = 0.1\times236\times40 = 944J$

Hence 944J of heat will be transferred to the silver block.

45. 152° Fahrenheit is equal to ————° celsius.

(a) 36.67 (b) 66.67
(c) 86.67 (d) 56.67

RRB ALP & Tech. 22.01.2019 Shift-III

Ans : (b) $\frac{C}{5}=\frac{F-32}{9}$

Given F = 152°

$$\frac{C}{5}=\frac{152-32}{9}\qquad\frac{C}{5}=\frac{120}{9}$$

$$9C = 120.5$$

$$C=\left(\frac{120\times5}{5}\right)=\frac{40\times5}{3}$$

$$=\left(\frac{200}{3}\right)$$

= 66.67°C

46. The change from the state of ice to the state of water is due to the ———.

(a) Increase in temperature
(b) Absorption of heat
(c) Emission of heat
(d) Decrease in temperature

RRB ALP & Tech. 22.01.2019 Shift-III

Ans : (b) The change of state of ice into water is due to the absorption of heat because when ice (solid state) is converted into water (liquid state), heat is absorbed by ice and the crystalline nature of ice broken and it is available to us as water.

47. When the temperature of a certain quantity of water is increased from 0°C to 4°C, its volume ----------

(a) Decreases
(b) Increases

(c) First increases and then decreases
(d) Remains the same

RRB ALP & Tech. 22.01.2019 Shift-III

Ans : (a) When the temperature of a certain amount of water increases from 0°C to 4°C its volume decreases and density increases. This is called abnormal expansion of water. If water is cooled from its boiling point 100°C, then from 100°C to 4°C the volume of water decrease like other liquids, but from 4°C to °C the volume of liquids increases according to their freezing point whereas the volume of water is minimum at a temperature slightly higher than its freezing point.

48. A styrofoam sheet 5 cm thick and 0.25 m in area has a temperature difference of 40°C between its inner and outer saerfaces. What is the rate of heat flow on the sheet ? (Thermal Conductivity is 0.01 J(smk))

(a) 2.0J/s (b) 1.0J/s
(c) 4.0J/s (d) 3.0J/s

RRB ALP & Tech. 22.01.2019 Shift-III

Ans : (a) Thickness of Styrofoam sheet (a) = 5cm
And its area (A) = $0.25m^2$
Temperature $\Delta T = 40^oC$
Thermal conductivity k = 0.01 J/smk
The rate of heat flow through the sheet can be calculated as-

$$\frac{Q}{t} = \frac{kA\Delta T}{a}$$

$$\frac{Q}{t} = \frac{0.01 \times 0.25 \times 40}{0.05}$$

$$\frac{Q}{t} = 2.0 \text{ J/sec}$$

Hence, the rate of heat flow is 2.0 J/sec.

49. When to bodies are in thermal contact, heat will flow between them when their ———— are different.

(a) Specific heath (b) Mass
(c) Temperature (d) Density

RRB ALP & Tech. 22.01.2019 Shift-III

Ans : (c) When two bodies comes in thermal contact, heat will flow between then when their temperature are different i.e. heat can not flow from an object of lower temperature to an object of Higher temperature unless an external source is used for energy. This is according to the second law of thermodynamics.

50. The boiling and freezing points of water are exactly——degree apart on the fahrenheit seale.

(a) 90 (b) 270
(c) 180 (d) 360

RRB ALP & Tech. 22.01.2019 Shift-III

Ans : (c) The boiling point of water in Celsius is always 100°C. But in Fahrenheit it is 212 F° and the Freezing point is 32F°. that is, in English units, the boiling point of water (212F°) and the freezing point (32F°) will be exactly 180° apart.

51. Specific heat capacity of lead is 125 $Jkg^{-1}K^{-1}$. If the temperature of a block of 250 g of lead rises by 10ºC on absorbing 5 kJ of heat, then find its heat capacity.

(a) 250 $Jkg^{-1}K^{-1}$ (b) 325 $Jkg^{-1}K^{-1}$
(c) 500 JK^{-1} (d) 200 JK^{-1}

RRB ALP & Tech. 21.01.2019 Shift-II

Ans : (c) : Given,
Absorbed heat (Q) = 5 KJ

$$Q = 5 \times 1000 \text{ J.} \quad [\because 1 \text{ KJ} = 1000\text{J}].$$

$$Q = 5000 \text{ J}$$

Specific heat capacity (c) = 125 $J\,kg^{-1}, K^{-1}$
mass (m) = 250 gm = 0.25 kg
Rise in temperature (ΔT) = 10^0C
The amount of heat required to raises the temperature of a substance by 1°C. Such quantity of heat is called its heat capacity.

$$\boxed{\text{Heat capacity} = \frac{\text{Amount heat absorbed}}{\text{Raise in temperature}}}$$

$$= \frac{5000}{10} = 500 \text{ JK}^{-1}$$

$$\therefore \quad \boxed{\text{Heat capacity} = 500 \text{ J K}^{-1}}$$

52. If 2.5 *l* of hot water at 85ºC is mixed with 4.5 1 of cold water then the temperature of the cold water rises by 15ºC when equilibrium is reached. Find the initial temperature (in ºC) of the water assuming no heat is lost.

(a) 48 (b) 43
(c) 15 (d) 25

RRB ALP & Tech. 21.01.2019 Shift-II

Ans : (b) : mass of Hot water (m) = 2.5 litre
Temperature (T_1) = 85^0C
mass of cold water (m_2) = 4.5 litre
change in temperature of cold water ($T_1 - T_2$) = 15^0C
Final temperature = T^0C
The specific heat capacity is 'C'

Formula $\boxed{Q = mC\Delta T}$

$m_1c_1 (T_1–T) = m_2c_2 (T_1–T_2)$

$\boxed{C_1 = C_2 = C}$

$2.5 (85 – T) = 4.5 (T_1 – T_2)$
$2.5 (85 – T) = 4.5 \times 15$
$212.5 – 2.5T = 67.5$
$2.5 T = 145$

$\boxed{T = 58^0C}$

Hence final temperature of cold water (T) = 58^0C
Change in temperature (T_2) = 15^0C
Thus, the initial temperature of cold water is
= $58^0C – 15^0C$
= 43°C

53. By how many degrees Celsius should an 800 g calorimeter made of aluminium be heated so that it absorbs 43.2 kJ of heat? Specific heat capacity of aluminium is 0.9 $Jkg^{-1}K^{-1}$.

(a) 120 (b) 60
(c) 67.5 (d) 42.5

RRB ALP & Tech. 21.01.2019 Shift-II

Ans : (b) : ΔQ = 43.2 KJ
m = 800 gm = 0.8 kg
C = 0.9 $Jkg^{-1}K^{-1}$
ΔT = ?
From ΔQ = m.c. ΔT ,

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

$$\Delta T = \frac{43.2}{0.8 \times 0.9}$$

$$\Delta T = \frac{43.2}{0.72} = 60°C$$

54. Watt/steradian is the unit of _____.

(a) electric conductance (b) permittivity
(c) radiant intensity (d) permeability

RRB ALP & Tech. 21.01.2019 Shift-II

Ans : (c) : Radiant intensity- The radiant energy that is emitted by a source per unit time per unit solid angle.
Watt/ steradian is the unit of 'radiant intensity.
Electrical conductivity:- Ability of materials to conduct electric current. The measurement is called ' Electrical conductivity' it is denoted by 'σ'.
Permeability :- permeability in the content of electromagnetism is the ability of magnetic lines of force to pass through a medium is called the magnetic permeability of the medium. It is denoted by 'μ'. The SI units of permeability is Henry/meter.
Permittivity:- Electrical permittivity is the content of electricity. It is the property of a substance which helps in general applying an electric field in that substance. But it tells the measure of 'resistance' displayed by that material.

55. Woolen clothes keep the body warm in winter because–

(a) Wool is a bad conductor of heat
(b) Wool is a good conductor of heat
(c) Wool increases body temperature
(d) Wool decreases body temperature

RRB SSE Bilaspur (green) , 21.12.2014

Ans. (a) : Woolen clothes protect the body in winter and keeps warm due to the following reasons.
(i) wool is a bad conductor of heat. Hence the heat is of body does not escape.
(ii) the pores of wool do not allow air to enter. These holes acts as a barrier for air.

56. Which has higher temperature between boiling water or and water vapor?

(a) Boiling of water
(b) Vapour of water
(c) None of these
(d) Depends on heat supply

RRB Asst. Loco Pilot (Patna)-2001

Ans. (c) : Temperature of boiling water and water vapor the temperature is constant (100°C) and heat is given to boiling water is spent in its state change (water to vapour) this heat does not change the temperature. That's why it is called latent heat.

57. Black buffaloes remain lying in ponds in summer the reason for this is -

(a) It is their habit
(b) They feel hot
(c) Their color absorb more heat
(d) They feel more thirsty

Ans. (c) : Since black color absorbs more heat and reflects less. Hence buffaloes feel very hot and they like to sit in the pond.

58. Explain how thin blankets causes less cold than a single thick blanket because -

(a) Thickness increase
(b) Air comes between them
(c) The body gets double the heat
(d) None of these

Ans. (b) : Two thin woolen blankets are warmer than a thick wollen blanket because there is an extra layer of air trapped between thin blankets which act as an insulator and does not allow the body heat to flow out.

59. A bucket of Luke warm water will melt more ice than a cup of boiling water because

(a) The volume of bucket is more
(b) There is more water in the bucket
(c) There is more heat in water in the bucket
(d) The temperature of the water in the bucket is flowing

RRB Asst. Loco Pilot (Mumbai/Bhopal)-2003

Ans. (c) : One bucket of luke warm water will melt more ice than a cup of boiling water because there is more heat in it.

60. It is not cold on the mountains at the time of snowfall but more after. It has a reason.

(a) Ice keeps cooling the air
(b) The temperature of ice starts falling later
(c) cools the surrounding object to melt ice
(d) Jakes heat from the atmosphere to melt ice

RRB Bhopal (Technical), 21.11.1999

Ans. (d) : It is not cold on the mountains at the time of snow fall but it is more cold later because the snow absorbs heat from the atmosphere to melt, due to which the temperature of the atmosphere decreases slightly and we feel cold.

61. The value of mechanical equivalent of heat is.

(a) 4.2×10^7 ergs/cal (b) 4.2 ergs/ cal
(c) 4.2×10^7 Joule/cal (d) 4.2×10^7 joule/kcal

Ans. (a) According to Joule law- work is directly proportional to heat.
$W \propto H$
$W = JH$
Where J is Joules constant.
Which is called mechanical equivalent of heat.
Hence J = 4.2 Joule/calori
or $J = 4.2 \times 10^7$ erg/calori

62. The value of specific heat depends on:-

(a) On the nature of matter
(b) On the amount of external work done due to expansion of the substance due to increase in temperature
(c) Both (a) and (b)
(d) Neither (a) and (b)

Ans. (a) : Specific heat is characteristic property of a substance which depends on the nature of the substance.

63. Which will have the highest specific heat?

(a) Water (b) Copper
(c) Mercury (d) None of these

Ans. (a) : The specific heat of metals is less than that of liquid and the specific heat of liquid is more than of gasses.
Specific heat of water = 1 Calori/ gram°C
Specific heat of mercury = 0.3 calori / gram°C
Specific head of Copper = 0.1 Calori/gram°C

64. The unit of linear expansion coefficient is-

(a) ^0C (b) $m–^0C^{-1}$

(c) $^0C^{-1}$ (d) $m–^0C$

RRB Bhopal (Secunderabad) 2001

Ans:(c)

Linear expansion coefficient $(\alpha)=\left(\frac{\Delta L}{L\times\Delta T}\right)$

Unit of $\alpha=\left(\frac{\text{increase in length}}{\text{per unit length}\times\text{temperature}}\right)$

Unit of $\alpha = {}^0C^{-1}$

65. There is different of 25°C is the temperature of two object, this difference will be on the Fahrenheit scale

(a) 26^0F (b) 45^0F

(c) 52^0F (d) 54^0F

RRB Asst. Loco Pilot (Ranchi)-2005

Ans. (b) : $\frac{\Delta C}{5}=\frac{\Delta F}{9}$

$\therefore \quad \Delta F=\left(\frac{\Delta C}{5}\right)\times 9=\frac{25}{5}\times 9=45^0F$

66. Absolute zero temperature is-

(a) 0^0F (b) $–212^0F$

(c) $–459.40^0F$ (d) None of these

RRB Asst. Loco Pilot (Ranchi)-2005

Ans. (c) : $\frac{K-273}{5}=\frac{F-32}{9}$,

For absolute zero temperature is - $(K=0)$

$$\frac{0-273}{5}=\frac{F-32}{9}$$

$$F=\frac{2297}{5}=-459.4^0F$$

67. The maximum temperature at which human life cannot be possible is

(a) Less than 110°C

(b) Less than 110°K

(c) Less than 110°F

(d) At 110°F

RRB Asst. Loco Pilot (Patna)-2007

Ans. (c) : The normal body temperature of a healthy human being is 98°F (37°C). If human body temperature exceeds 110°F, human life is not possible.

68. The lowest mark in the thermometer is marked at 95°F. This mean-

(a) Can not measure temperature below this

(b) Man can not live below this temperature

(c) To make the calorimeter smaller

(d) Mercury can not fall below this mark

RRB Asst. Loco Pilot (Muzaffarpur)-2009

Ans. (b) : The lowest mark in the thermometer is marked at 95°F i.e. below this temperature man can not live.

69. Specific heat capacity of copper is 0.1 cal/gm. Its value in J/kg^{0}C is :

(a) 0.84×10^3 J/kg^{0}C (b) 0.42×10^3 J/kg^{0}C

(c) 0.24×10^3 J/kg^{0}C (d) 4.2×10^3 J/kg^{0}C

RRB Asst. Loco Pilot (Patna)-2001

Ans.: (b) Specific heat of copper = 0.10 calori/ gram

Specific heat of copper = (Joule/kg – °C)

$= 0.10 \times 4.2\times10^3$

= Joule/kg – °C

$= 0.42 \times 10^3$ Joule/kg –°C

70. Heat is supplied to 50 grams of a solid at the rate of 5 calori/second and the temperature rises by 11°C per minute. The specific of solid substance is calori/ gram°C.

(a) 0.545 (b) 0.90

(c) 0.45 (d) None of these

RRB Kolkata Supervisor (P.Way), 20.02.2000

Ans. (a) :

According to Question $Q = H.t = ms\Delta T$

$\Rightarrow \quad 5 \times (60 \times 1) = 50\times s\times 11$

$300 = 550 \times s$

$s=\frac{300}{550}$

$s = 0.545$ Calori/gram^{0}C

71. The mass of a metal is 500 grams and its specific heat is 0.5 calori/g°C. Its capacity is.

(a) 250 Calori/°C (b) 2500 Calori/°C

(c) 0.25 Calori/°C (d) 25 Calori/°C

RRB Bangalore (Tech.), 22.08.1999

Ans. (a) :

Heat capacity of metal C = mass×specific heat.

$C = 500 \times 0.5$

$C = 250$ Calori/^{0}C

72. The mass of the copper calorimeter is 50 grams and the specific heat of copper is 0.1 calori/gram°C the water equivalent of the calorimeter will be

(a) 5 Calori (b) 5 gram/°C

(c) 50 Calori (d) 50 gram

RRB Kolkata (Tech.), 29.08.1999

Ans. (b) : The water equivalent = m × 5

$= 50\times0.1 = 5$ gram/^{0}C

73. The heat capacities of two objects made of the same metal are in the ratio 3:4. the ratio of their masse will be

(a) 3 : 4 (b) 3 : 7

(c) 4 : 3 (d) 4 : 7

RRB Kolkata Supervisor (P. Way), 20.02.2000

Ans. (a) : Heat capacity, $C = ms$

Then $\frac{C_1}{C_2}=\frac{m_1s_1}{m_2s_2}$

For material made of same metal $s_1 = s_2$

$\boxed{\frac{3}{4}=\frac{m_1}{m_2}}$