RPSC

Rajasthan Public Service Commission

ASSISTANT ENGINEER EXAMINATION

GENERAL SCIENCE

Comprehensive Theory with **Practice questions**
and **Previous year solved questions**

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General Science

RPSC Assistant Engineer Examination

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Preface

B. Singh (Ex. IES)

The compilation of this book **General Science** was motivated by the desire to provide a concise book which can benefit students who are preparing for Rajasthan Public Service Commission (RPSC) Assistant Engineer Examination.

It would be worth mentioning that the entire syllabus of General Studies for RPSC Assistant Engineer Examination consists of five subjects namely Current Affairs, History & Culture, General Science, G.K. & Economic Developments with special reference to Rajasthan, and Geography & Natural Resources. The textbook of all five subjects will have special focus to Rajasthan which will help the aspirants immensely.

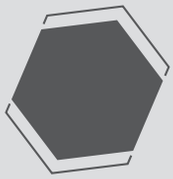
This particular textbook provides all the requirements of the students, i.e. comprehensive coverage of theory, fundamental concepts and objective type questions articulated in a lucid language. The concise presentation will help the readers grasp the theory of this subject with clarity and apply them with ease to solve objective questions quickly. This book not only covers the syllabus of RPSC Assistant Engineer Examination in a holistic manner but is also useful for other examinations conducted by RPSC. All the topics are given the emphasis they deserve so that mere reading of the book clarifies all the concepts. We have put in our sincere efforts to present detailed theory and MCQs without compromising the accuracy of answers.

Our team has made their best efforts to remove all possible errors of any kind. Nonetheless, we would highly appreciate and acknowledge if you find and share with us any printing and conceptual errors.

It is impossible to thank all the individuals who helped us, but we would like to sincerely thank all the authors, editors and reviewers for putting in their efforts to publish this book.

With Best Wishes

B. Singh (Ex. IES)
CMD, MADE EASY Group



General Science

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PHYSICS

1 CHAPTER

INTRODUCTION

- Physics is a branch of science which is concerned with all aspects of nature on both the microscopic and macroscopic level. Its scope of study encompasses not only the behavior of objects under the action of forces but also the nature of gravitational, electromagnetic, nuclear forces among others.
- The ultimate objective of physics is to formulate comprehensive principles that bring together and explain all such phenomena.

Unit

- Unit is the chosen standard used for measuring a physical quantity.
- There are basically two types of unit:
  1. **Fundamental Unit:** These units are a set of measurements, defined arbitrarily and from which other units are derived. Examples: meter, kilogram, second, etc.
     The fundamental unit of some of the physical quantities are given below:

Sl.	Physical Quantity	S.I. Unit
1	Length	Meter (m)
2	Mass	Kilogram (kg)
3	Time	Second (s)
4	Temperature	Kelvin (K)
5	Electric Current	Ampere (A)
6	Luminous Intensity	Candela (Cd)
7	Amount of Substance	Mole (mol)
8	Plane Angle	Radian (rad)
9	Solid Angle	Steradian (sr)

  2. **Derived Unit:** All the units which are expressed in terms of fundamental units are known as derived units. Examples: Newton, Joule, etc.
- Internationally, there are four types of unit systems. These are:
  1. **S.I. Units/System:** It is the modern form of the metric system, and is the most widely used system of measurement. It comprises a coherent system of units of measurement built on seven base units namely kilogram, meter, second, candela, ampere, kelvin and mol.
  2. **CGS System:** The centimeter-gram-second (CGS) system of units is a variant of the metric system based on centimetre as the unit of length, gram as unit of mass, and the second as the unit of time.
  3. **FPS System:** The foot-pound-second (FPS) system is a system of units built on three fundamental units: the foot for length, the pound for mass and the second for time.
  4. **MKS System:** The MKS system of units is a physical system of units that expresses any given measurement using base units of the metre, kilogram, and second.

PRESSURE

Pressure

Pressure is defined as force acting normally on unit area of the surface. SI unit of pressure is N/m^2 also called Pascal (***Pa***). Pressure is an scalar quantity.

$$\text{Pressure } (P) = \frac{F}{A} = \frac{\text{Normal force acting on the surface}}{\text{Area of the surface}}$$

Atmospheric Pressure

Atmospheric pressure is that pressure which is exerted by the atmospheric gases and measured by a mercury column of 76 cm length at 0°C at 45° latitude at the sea-level. It is equal to weight of 76 cm column of mercury of cross-section area 1 cm^2. Generally, it is measured in bar.
Atmospheric pressure 1 atm = 1.01 bar = 1.01×10^5 N/m^2

Interesting Facts

- It is difficult to cook on the mountain as the pressure is low on mountain in comparison to plain areas as atmospheric pressure decreases with the increase of height.
- The fountain pen of a passenger leaks in aeroplane at height, due to reduction in atmospheric pressure.

Measurement of Pressure

- Barometer measures the atmospheric pressure.
- Sudden fall in barometric reading is the indication of storm.
- Slow fall in barometric reading is the indication of rain.
- Slow rise in the barometric reading is the indication of clear weather.

Pascal's Law of Pressure

It states that "the pressure exerted anywhere at a point of confined fluid is transmitted equally in all directions throughout the liquid". Examples: Hydraulic lift, hydraulic press, hydraulic brake, etc. work on the Pascal's law.

Effects:

- If gravitational attraction is negligible in equilibrium condition, pressure is same at all points in a liquid.
- If an external pressure is applied to an enclosed fluid, it is transmitted undiminished to every direction.

Effect of pressure on Melting Point and Boiling Point

(i) The melting point of substances which expands on fusion increases with the increase in pressure. **Example:** Wax.

(ii) The melting point of substances which contracts on fusion decreases with the increase in pressure. **Example:** Ice.

(iii) Boiling point of all the substances increases with the increase in pressure.

GRAVITATION

Gravitation

Each and every massive body attracts each other by virtue of their masses. This phenomenon is called gravitation.

Newton's Law of Gravitation

The gravitational force of attraction between two bodies is directly proportional to the product of their masses and inversely proportional to the square of the distance between them.

Gravitational force (F) = $G.m_1.m_2/ r^2$

Where G is the gravitational constant = 6.67×10^{-11} Nm^2kg^{-2}, m_1 and m_2 are the masses of two bodies and r is the distance between them.

Acceleration due to Gravity of Earth

The acceleration produced in a body due to the gravitational pull of the earth is called acceleration due to gravity.

$$g = GM/R^2$$

Where M is the mass of the Earth and R is the radius of the Earth.

Note:

- The value of g slightly changes from place to place but its value near the Earth's surface is 9.8 ms^{-2}.
- Gravitational force is the weakest force in nature.

Factors affecting the value of g:

- **Shape of Earth:** The shape of Earth affects the value of acceleration due to gravity. Therefore, the value of g is maximum at poles and minimum at the equator.
- **Rotation of Earth on its axis**: The value of g decreases if angular speed of Earth increases and vice-versa.
- **Effects of Altitude:** The value of g decreases with the increase in height.
- **Effects of depth:** The value of g decreases with depth and become zero at the centre of the earth.

Do You Know?

The Centre of Gravity of a body is that point at which whole weight of the body appears to concentrated.

Mass and Weight

- The mass of a body is the quantity of matter contains in it. Mass is a scalar quantity and its S.I. unit is kg. Mass of a body does not change from place to place.
- The weight of the body is the force with which it is attracted towards the centre of the earth. Weight of the body is a vector quantity and its unit is Newton. The weight of the body is a variable quantity and it changes from place to place.

$$w = mg$$

***Cases*: Weight of a body in a lift:**

- When the lift is at rest or in uniform motion then the apparent weight is equal to the real weight of the body. i.e. $w = mg$.
- When the lift is accelerating upward then apparent weight is greater than the real weight of the body. i.e. $w = m(g + a)$
- When the lift is accelerating downward then the apparent weight of the body is less than the real weight of the body. i.e. $w = m(g - a)$.
- When lift is falling freely under gravity the apparent weight of the body is zero. i.e.

$$w = m(g - g) = 0 \text{ [As } a = g\text{]}$$

Note: The weight of the body on the moon is lesser than that of on the earth as the acceleration due to gravity at the moon is less than the acceleration due to gravity on earth. The value of g on Earth is 6 times than that of on the moon.

OPTICS

Light

- Light is a form of energy, which is propagated as an electromagnetic wave. It is the radiation which makes our eyes able to see the object.
- Since, electromagnetic waves are transverse, hence light energy is also represents transverse wave.
- The light energy emitted from the sun takes 8 minute 19 second to reach on the earth. The speed of light is 3×10^8 m/s.
- When light falls on the surface of an object it can be absorbed, transmitted or reflected.
  - **Absorption of light:** The absorption process said to occur when an object absorbs all or some fraction of the light falling on it. If an object absorb all light falling on it, will appear perfectly black. For example: a blackboard.
  - **Transmission of light:** The transmission process said to occur when an object transmits light i.e. it allows light to pass through itself and such objects will appear transparent. For example : a glass jar.
  - **Reflection of light:** The reflection process said to occur when an object sends back light rays falling on its surface. In other words, when a ray of light falls on a boundary separating two media comes back into the same media, then this phenomenon is called the reflection of light. For example : a mirror.

Laws of Reflection of light

There are two fundamental laws of reflection of light:

(i) The angle of incidence is equal to the angle of reflection.

(ii) The incident ray, the reflected ray and the normal to the mirror at the point of incidence all lie in the same plane.

Do You Know?

Due to refraction from Earth's atmosphere, the stars appear to twinkle.

Laws of Refraction of Light

There are two laws of refraction:

(i) The incident ray, the refracted ray and the normal at the point of incidence all three lie in the same plane.

(ii) The ratio of sine angle of incidence to the sine angle of refraction remains constant for a pair of media i.e.

$\text{Sin } i / \text{Sin } r = \mu_2/\mu_1 = \text{constant}$, this law is known as Snell's law.

Where μ_1 and μ_2 are refractive indices of two different mediums.

Applications of Refraction

There are various applications of refraction process. Some of them are:

- When light travels through a denser medium towards a rarer medium it deviates away from the normal, therefore a pond appears shallower.

- A coin appears at lesser depth in water.
- Writing on a paper appears lifted when a glass slab is placed over the paper.

Critical Angle

The angle of incidence in a denser medium for which the angle of refraction in rarer medium becomes 90°, is called the critical angle.

Total Internal Reflection

- When a light ray travelling from a denser medium to the rarer medium, at the interface if the angle of incidence becomes greater than critical angle, then light rays reflected back into the denser medium. This phenomenon is known as total internal reflection.
- The examples of total internal reflection are sparkling of diamond, mirage, shinning of the air bubble in water, Optical fibre, etc.

Mirror

Spherical Mirror

It is a type of mirror which has the shape of a piece cut-out of a spherical surface.
There are mainly two type of spherical mirrors:

1. **Concave mirror:** The image formed by a concave mirror is generally real and inverted.

   Uses of Concave Mirror
   - As a shaving mirror
   - As a reflector for the headlights of a vehicle, searchlight, etc.
   - In ophthalmoscope to examine the eye, ear, nose by doctors. In solar cookers, etc.

2. **Convex mirror:** The image formed by a convex mirror is always virtual, erect and diminished.

   Uses of Convex Mirror
   - As a rear view mirror in the vehicle because it provides the maximum rear field of view and image formed is always erect.
   - In sodium reflector lamp.

Basic Terms related to Spherical Mirrors

1. **Centre of Curvature (c):** The centre of the hollow glass sphere of which the mirror is a part, is known as centre of curvature.
2. **The radius of Curvature (R):** The radius hollow sphere of which the mirror is a part, is known as radius of curvature
3. **Pole (P):** The mid-point of a spherical mirror is called pole.
4. **Focus (F):** When a parallel beam of light rays is incident on a spherical mirror then after reflection it meets or appears to meet at a point on the principal axis, called focus of the spherical mirror.
5. **Focal length (f):** It is the distance from the pole of mirror to its focus.

   Focal length= R/2, where R is radius of curvature.
6. **Principal axis:** The Principal axis of a spherical mirror is the straight line passing through the centre of curvature and pole of a spherical mirror, produced on both the sides.
7. **Aperture:** The portion of the mirror from which the reflection of light actually takes place is called the aperture of the mirror, it is also called linear aperture of the mirror.

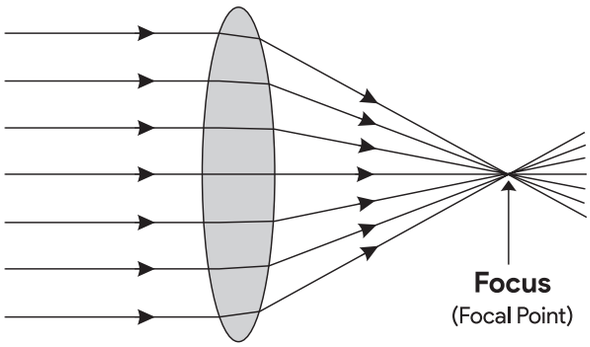
Images formation by a Concave Mirror

Position of object	Position of image	Size of image with comparison to object	Nature of image
At infinity (∞)	At focus	Very small	Real and inverted
Between centre of curvature and infinity	Between focus and centre of curvature	Small	Real and inverted
At centre of curvature	At centre of curvature	Equal in length	Real and inverted
Between focus and centre of curvature	Between centre of curvature and infinity	Large	Real and inverted
At focus	At infinity (∞)	Very large	Real and inverted
Between pole and focus	Behind the mirror	Large	Virtual and erected

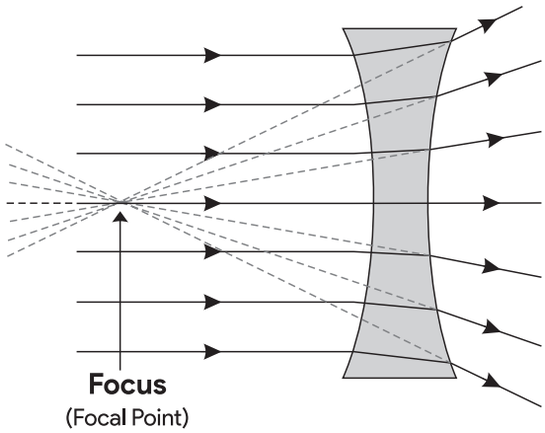
Images formation by a Convex Mirror			
Position of object	**Position of image**	**Size of image with comparison to object**	**Nature of image**
At infinity (∞)	At focus	Very small	Virtual and Erect
Anywhere except infinity (∞)	Between focus and Pole	Small	Virtual and Erect

Lenses

- A lens is a uniform refracting medium bounded by two spherical surface or one plane surface.
- Lenses are of two types:
  - **(i) Convex lens:** A convex lens is converging lens. When parallel rays of lights pass through a convex lens, the refracted rays converge at one point call the principal focus.



  - **(ii) Concave lens:** A concave lens is diverging lens. The rays of light that pass through the lens are spread out (they diverge). The image formed is virtual and diminished.



Magnification of lens

It is the ratio of height of image to height of object.

Prism

Prism is a uniform transparent refracting medium bounded by plane surfaces inclined at some angles forming a triangular shape.

Dispersion of light

- When a light is incident on a glass prism, it disperses into its seven colour components in the following sequence VIBGYOR, and this is known as the dispersion of white light.
- The refractive index of glass is maximum for violet colour and minimum for the red colour of light, therefore the violet colour of light deviated maximum and red colour of light deviated least.

MOTION

Basics of Motion

Scalar Quantities

Physical quantities which have magnitude only and no direction are called scalar quantities.
Examples: Mass, speed, volume, work, time, power, energy, etc.

Vector Quantities

Physical quantities which have magnitude and direction both and which obey triangle law are called vector quantities.
Examples: Displacement, velocity, acceleration, force, momentum, torque, etc.

Tensor Quantities

Physical quantities that vary in two different directions are properly described as tensors.
Examples: Moment of inertia, pressure, refractive index, and stress.

Do You Know?

Electric current, though has a direction, is a scalar quantity because it does not obey triangle law.

Distance

Distance is the actual path travelled by a body in a given period of time.

Displacement

Displacement is the change in the position of the object in a given period of time. In other words, it is the shortest distance.

Basic difference between Distance and Displacement

Distance	Displacement
It is a scalar quantity.	It is a vector quantity.
Distance is always positive.	Displacement may be positive, negative or zero.

Speed

The distance travelled by the moving object in unit time interval is called speed.

Speed = Distance/ Time

- It is a scalar quantity and its SI unit is meter/ second (m/s).
- The speed of an object at any instant is called instantaneous speed.
- An object is said to be travelled with non-uniform speed if it covers the unequal distance in equal interval of time.

Velocity

The velocity of a moving object is defined as the displacement of the object in unit time interval.

Velocity = Displacement/ Time

- It is a vector quantity and its SI unit is meter/ second.
- If a body goes equal displacement in equal interval of time then it is called uniform velocity.
- If a body undergoes unequal displacement in equal interval of time then it is called variable velocity.

Relative Velocity

It is the velocity of a body with respect to another which is considered as being at rest.

- If the velocity of a body is V_1 and velocity of other body is V_2, then relative velocity is
  $= V_1 + V_2$, if two bodies travel in opposite direction.
  $= V_1 - V_2$, if two bodies travel in the same direction.

Acceleration

Acceleration of an object is defined as the rate of change of velocity of the object. It is a vector quantity and its SI unit is meter/second^2 (m/s^2).

Some related equations of acceleration are

$$v = u + at$$
$$S = ut + \tfrac{1}{2} at^2$$
$$v^2 = u^2 + 2as$$

Where, v is final velocity, u is initial velocity, t is a time interval, a is acceleration and s is the distance travel.

Retardation

If velocity decreases with time then the acceleration is considered as negative and it is called retardation.

Constant Acceleration

If acceleration does not change with time then it is called constant acceleration.

Circular Motion

- The motion of an object along a circular path is called circular motion.
- If the object moves with uniform speed, its motion is uniform circular motion.
- Uniform circular motion is an accelerated motion because the direction of the velocity changes continuously.

Angular Displacement

The angle subtended at the center of a circle by a body moving along the circumference of the circle is called angular displacement of the body. Its unit is radian.

Angular displacement = Length of arc/ Radius of the circle

Angular Velocity

The time rate of change of angular displacement is called angular velocity. It is generally denoted by ω.

$$\omega = \frac{\theta}{t}$$

Where θ = position angle, t = time

Force

- Force is that external cause which when acts on a body change or tries to change the initial state of the body. The SI unit of force is Newton (*N*).
- A body is said to be in equilibrium if the sum of all the forces acts on the body is zero.

Do You Know?

The nuclear force is the strongest force.

Momentum

- Momentum is the property of a moving body and is defined as the product of mass and velocity of the body.

  Momentum = mass × velocity.
- Momentum is a vector quantity. Its SI unit is kg-m/s.

Newton's Laws of Motion

Newton's First Law

It states that "If no external force acts on a body then it remains in the same state of rest or motion that is in its present state".

Inertia: Inertia is the property of a body by virtue of which it opposes any change in its state of rest or of uniform motion.

Examples of inertia are:

(i) When a bus or train at rest starts to move suddenly the passengers sitting in it feels a jerk in backward direction due to the inertia of rest.

(ii) Dust particle comes out of a carpet if we beat it with the stick.

(iii) A passenger jumping out of a train is advised to jump in the direction of the bus and ran for a short distance.

(iv) When a running bus or train stops suddenly, the passengers sitting in it jerk in the forward direction due to the inertia of motion.

Newton's Second Law

It states that "The rate of change in momentum of a body is directly proportional to the applied force on the body and takes place in the direction of the force".

$$F = ma$$

Where F is the force applied, m is mass of the body and a is the acceleration.

Newton's Third Law

It states that "To every action, there is an equal and opposite reaction".

Examples: (i) Recoil of a gun, (ii) Motion of rocket. (iii) While drawing water from the well, if the string breaks up, the drawing water falls back.

Centripetal Force

- When a body is in a circular motion, a force always acts on the body towards the centre of the circular path, this force is called centripetal force.
- If a body of mass m is moving on a circular path of radius r with uniform speed v, then the required Centripetal force, $F = mv^2/r$

Centrifugal Force

Centrifugal force is equal and opposite of Centripetal force.

Applications of Centripetal and Centrifugal forces

(i) The gravitational force of attraction between earth and sun acts as centripetal force.

(ii) Orbital motion of electrons around the nucleus.

(iii) Roads are banked at turns to provide required centripetal force for taking a turn.

(iv) The cream is separated from milk when it is rotated in a vessel about the same axis.

(v) Cyclist inclined itself from vertical to obtain required centripetal force.

Principle of Conservation of Linear Momentum

If no external force acts on a system of bodies, the total linear momentum remains constant. As a consequence, the total momentum of bodies before and after collision remains the same.

Examples: As in case of the rocket, ejecting gas exerts a forward force which helps in accelerating the rocket in the forward direction.

Impulse

- When a large force acts on a body for a very small interval of time, then this type of force is called impulsive force.

  Impulse = Force × time = change in momentum
- It is a vector quantity and its direction is in the direction of the force. The SI unit of impulse is Newton-second (N-s).

Friction

It is the force which acts on a body when two bodies are in contact and one tries to move over other.

Types of Friction

The major types of friction are:

1. **Static Friction:** It is the opposing force which acts on acts on a body when it tries to move over the other but actual motion has yet not started.
2. **Limiting Friction:** It is the force that comes to play when a body is on the verge of moving over the other body.
3. **Kinetic Friction:** It is the opposing force that comes to play when one body actually moves over the surface of another body.

   Kinetic friction is of two types:

   (i) Sliding Friction: When a body slides over the surface of other.

   (ii) Rolling Friction: When a body rolls over the surface of another body.

Do You Know?

It is easier to roll a body than to slide because the sliding friction is greater than the rolling friction. Therefore, driving a bicycle is easier when its tyres are fully inflated because it decreases rolling friction.

Applications of Friction

There are many day-to-day applications of friction. Some of them are:

(i) A ball bearing is used to reduce the rotational friction.

(ii) Friction is necessary for walking and to apply breaks in vehicles.

(iii) When a pedal is applied to a bicycle, the force of friction on the rear wheel is in the forward direction and on front wheel it is in the backward direction.

(iv) Friction can be reduced by applying the polishing or applying any lubricants.

PLANETS

Planet

Planets are the heavenly bodies which revolve around the sun in a specific orbit or path. Our solar system contains eight planets namely Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune. Earlier, Pluto was considered as a planet but now it is in the category of dwarf planet.

Kepler's Laws of Planetary Motion

There are three laws given by Kepler:

1. All planets revolve around the sun in elliptical orbits with the sun at its one focus.
2. The real speed of planet around the sun is constant.
3. The square of the time period of revolution of a planet around the sun is directly proportional to the cube of the semi-major axis of its elliptical orbit.

Satellite:

A heavenly body revolving around a planet in an orbit is called a satellite.

There are two types of satellites:

1. **Natural satellites:** Moon is the natural satellite of the earth.
2. **Artificial satellites:** These satellites are man-made. They can be further divided into:

   I. Geosynchronous Satellite:

   - A geosynchronous satellite is a satellite in geosynchronous orbit, with an orbital period the same as the Earth's rotation period.

     Examples: The geostationary satellite which has a geostationary orbit (a circular geosynchronous orbit directly above the Earth's equator).
   - They revolve around the earth at the height of 36000 km.
   - Their period of rotation is same as the earth's time period of rotation around its own axis i.e. 24 hours.
   - These satellites appear to be stationary.
   - The geostationary satellite is used to telecast TV programmes, weather forecasting, in predictions of floods and droughts.

   II. Polar Satellite:

   - These satellites revolve around the earth in polar orbits at a height of around 800 km.
   - The time period of rotation of these satellites is around 84 minutes.

Practice Questions

PHYSICS

RPSC Assistant Engineer Examination

Q.1 A liquid is kept in a regular cylindrical vessel up to a certain height. If this vessel is replaced by another cylindrical vessel having half the area of cross-section of the bottom, the pressure on the bottom will
(a) Remain unaffected
(b) Be reduced to half the earlier pressure
(c) Be increase to twice the earlier pressure
(d) Be reduced to one-fourth the earlier pressure

Q.2 In SONAR, we use
(a) Ultrasonic waves
(b) Infrasonic waves
(c) Radio waves
(d) Audible sound waves

Q.3 Which one of the following reactions is the main cause of the energy radiation from the Sun?
(a) Fusion reaction
(b) Fission reaction
(c) Chemical reaction
(d) Diffusion reaction

Q.4 Two identical piano wires have same fundamental frequency when kept under the same tension. What will happen if tension of one of the wire is slightly increased and both the wire are made to vibrate simultaneously?
(a) Noise (b) Beats
(c) Resonance (d) Non-linear effects

Q.5 Which one among the following correctly defines a unit magnetic pole in SI units?
It is the pole which when placed in air at a distance of
(a) 1 foot from an equal and a similar pole repels it with a force of 1 pound
(b) 1 metre from an equal and similar pole repels it with a force of 1 newton
(c) 1 cm from an equal and a similar pole repels it with a force of 1 dyne
(d) 1 metre from an equal and a similar pole repels it with a force of 1 newton/m^2

Q.6 Which one of the following phenomena is associated with the fire flies giving cold light in night?
(a) Fluorescence
(b) Phosphorescence
(c) Chemiluminescence
(d) Effervescence

Q.7 When a ball drops onto the floor it bounces back. Why does it bounce?
(a) The floor is perfectly fluid
(b) The floor heats up on impact
(c) Newton's third law implies that for every action (drop), there is a reaction (bounce)
(d) The floor exerts a force on the ball during the impact

Q.8 When you pull out the plug connected to an electric appliance, you will often observe a spark. To which property of the appliance is this related?
(a) Resistance (b) Inductance
(c) Capacitance (d) Wattage

Q.9 In scuba diving, while ascending towards the water surface, there is a danger of bursting the lungs. It is because
(a) Graham's law of diffusion
(b) Archimedes' principle
(c) Boyle's law
(d) Henry's law

Q.10 The most familiar form of radiant energy in sunlight that cause tanning and has the potential for casing melanoma in humans is called
(a) Infra-red radiation
(b) Visible radiation
(c) Ultra-violet radiation
(d) Microwave radiation

Q.11 An athlete diving off high springboard can perform a variety of exercise in the air before entering the water body. Which one of the following parameters will remain constant during the fall?
(a) The athlete's linear momentum
(b) The athlete's angular momentum
(c) The athlete's kinetic energy
(d) The athlete's moment of inertia

Q.12 Why are the inner lining of hot water made up of copper?
(a) Copper has less heat capacity
(b) Copper has high electrical conductivity
(c) Copper does not react with steam
(d) Copper is good conductor of both heat and electricity

Q.13 Hair of a shaving brush cling together when the brush is removed from water due to
(a) viscosity (b) elasticity
(c) friction (d) surface tension

Q.14 Which one of the following forces lead to separation of the cream from the churned milk?
(a) Gravitational force
(b) Cohesive force
(c) Centripetal force
(d) Centrifugal force

Q.15 By which one of the following, an old written material which cannot be read easily can be read?
(a) Alpha-rays (b) Beta-rays
(c) X-rays (d) IR-rays

Q.16 Which one of the following common devices works on the basis of the principle of mutual induction?
(a) Tube light (b) Transformer
(c) LED (d) Photodiode

Q.17 'Mirage' is a phenomenon due to
(a) Reflection of light
(b) Refraction of light
(c) Total internal reflection of light
(d) Total diffraction of light

Q.18 Who had showed that the electric and magnetic waves are equal to vacuum?
(a) Isaac Newton
(b) James Clerk Maxwell
(c) Albert Einstein
(d) Werner Heisenberg

Q.19 Neutron was discovered by
(a) Rutherford
(b) Chadwick
(c) Hahn and Strassman
(d) Millikan

Q.20 Which of the following has the most penetrating power?
(a) Alpha-particles
(b) Beta-particles
(c) Gamma-particles
(d) X-rays

Q.21 The blackboard seems black because it
(a) reflects every colour.
(b) does not reflect any colour.
(c) absorbs black colour.
(d) reflects black colour.

Q.22 The solar system is an example of
(a) conservation of energy.
(b) conservation of linear momentum.
(c) conservation of angular momentum.
(d) None of the above

Q.23 If the spinning speed of the earth is increased then the weight of body at the equator
(a) increases (b) decreases
(c) doubles (d) does not change

Q.24 Cryogenic engine finds application in
(a) washing machine
(b) frost free refrigerator
(c) rocket technology
(d) sub-marine propulsion

Q.25 A solid sphere, disc and solid cylinder all of same mass and made of same material are allowed to roll down (from rest) on incline plane then
(a) disc will reach the bottom first
(b) solid sphere will reach the bottom first
(c) solid cylinder will reach the bottom first
(d) All of them will reach the bottom at the same time

Q.26 Which one of the following planets is said to be 'Twin sister' of the Earth?
(a) Mercury (b) Venus
(c) Mars (d) Jupiter

Q.27 The melodious effect on our ear produces by the combination of two or more notes of the modern pop songs is called
(a) concord (b) chords
(c) beats (d) overtones

Q.28 Which one of the following is responsible for the energy release by stars?
(a) Fission
(b) Fusion
(c) Chemical reaction
(d) Gravitational collapse

Q.29 Which of the following statements given below is correct in the respect of a geostationary satellite?
(a) It moves in a plane containing the Greenwich meridian
(b) It moves in a plane perpendicular to the celestial equatorial plane
(c) Its height above the earth's surface is about the same as the radius of the earth
(d) Its height above the earth's surface is about six times the radius of the earth

Q.30 Which one of the following phenomena shows particle nature of light?
(a) Polarisation
(b) Photo-electric effect
(c) Interference
(d) Refraction

Q.31 What is the function of a microphone?
(a) Convert sound signals to electric signals
(b) Convert electric signals to sound signals
(c) Convert sound signals to electromagnetic waves
(d) None of the above

Q.32 Which one of the following is deviated by an electric field?
(a) Alpha-rays (b) Beta-rays
(c) Neutrons (d) X-rays

Q.33 Why is it difficult to transmit audio signals directly?
(a) A very high antenna is needed for their propagation
(b) Audio signals have a very high frequency
(c) Audio signals can't propagate alone
(d) Audio signals can't propagate through air

Q.34 The impurity atom with which pure silicon should be doped to make a p-type semiconductor are those of
(a) Phosphorus (b) Boron
(c) Antimony (d) Arsenic

Q.35 Who among the following gave the first experimental value of 'g'?
(a) Cavendish (b) Brook Taylor
(c) Copernicus (d) Albert Einstein

Q.36 Which of the following has the least penetrating power?
(a) Alpha-particles
(b) Beta-particles
(c) Gamma-particles
(d) None of these

Q.37 Optical fibre mainly used in communication is based on
(a) less absorption coefficient
(b) less scattering
(c) total internal reflection
(d) refraction

Q.38 When a red glass is heated in dark room it will seem
(a) black (b) green
(c) yellow (d) red

Q.39 Which one of the following causes greenhouse effect?
(a) Cosmic rays (b) Ultra-violet rays
(c) Infrared rays (d) Radio waves

Q.40 Why is it easier to swim in sea water?
(a) Atmospheric pressure is highest at the sea
(b) Sea water contains salt
(c) Density of sea water is higher than the ordinary water
(d) None of the above

Q.41 If there were no gravity, which of the following will not be there for a fluid?
(a) Viscosity
(b) Pressure
(c) Archimedes' upward thrust
(d) Surface tension

Q.42 When the light is passed through a prism, the colour which deviates least is
(a) red (b) green
(c) violet (d) blue

Q.43 If door of a running refrigerator is kept open in a closed room, what will happen to the room?
(a) It will cool the room
(b) It will heat the room
(c) It will make no difference on the average
(d) It will make the temperature go up and down

Q.44 Which of the following cannot be emitted by radioactive substances during their decay?
(a) Electrons (b) Protons
(c) Neutrons (d) Helium

Q.45 For which one of the following is capillary not the reason only
(a) Rising of water from the roots of plant to its foliage
(b) Blotting of ink
(c) Rising of underground water
(d) Spread of water drop on a cotton cloth

Q.46 The focal length of convex lens is
(a) the same for all the colours
(b) shorter for blue light than for red
(c) shorter for red light than for blue
(d) maximum for yellow light

Q.47 A perfect black body has the unique characteristic feature as
(a) a good absorber only
(b) a good radiator only
(c) a good absorber and a good radiator
(d) Neither an absorber nor radiator

Q.48 Which one of the following is used to determine the age of human fossils?
(a) Density determination of fossil
(b) Softness of the fossil
(c) Radio-carbon dating
(d) Water content of the fossil

Q.49 How is the pressure cooker work?
(a) Heat cannot escape from the cooker
(b) Low pressure inside the cooker rises the boiling point of water
(c) High pressure inside the cooker rises the boiling point of water
(d) Steam inside the cooker makes food to cook with ease

Q.50 Which one of the following is not an amorphous substance?
(a) Glass (b) Polymer
(c) Rubber (d) Copper

Q.51 Why is the machine function well with lubricant?
(a) Because of surface tension of the lubricant
(b) Because of viscosity of the lubricant
(c) Lubricant removes moisture
(d) Lubricant induces inertia of machine

Q.52 The blue colour of sky is due to the phenomenon of
(a) reflection (b) refraction
(c) dispersion (d) scattering

Q.53 What enables us to write on the black board with chalk?
(a) Gravity (b) Cohesion
(c) Adhesion (d) Viscosity

Q.54 Soap helps in the cleaning of cloths because
(a) it reduces surface tension
(b) it increases surface tension
(c) it absorbs the dirt
(d) of some other reason

Q.55 An n-type and p-type silicon can be obtained by doping pure silicon with
(a) arsenic and phosphorus
(b) indium and aluminium
(c) phosphorus and indium
(d) aluminium and boron

Q.56 A mirror produces magnified erect image of an object. The nature of the mirror is
(a) convex
(b) concave
(c) plane
(d) Neither convex nor concave

Q.57 A coin immersed in water pond appears to be raised when view from the top. What is this due to?
(a) Total internal reflection of light
(b) Refraction of light
(c) Scattering of light
(d) Reflection of light

Q.58 Which one of the following can convert the alternating current into direct current?
(a) Transformer (b) Motor
(c) Dynamo (d) Rectifier

Q.59 The phenomenon of bursting of hydrogen balloon is based on
(a) Charles' law
(b) Boyle's law
(c) Henry's law
(d) Bernoulli's law

Q.60 Stars are twinkling due to
(a) diffraction (b) refraction
(c) scattering (d) reflection

Q.61 In the winter, we get warmer by using two blankets instead of one, why?
(a) Two blankets are thicker, so generate more heat
(b) Two blanket enclose air which does not allow the cold to penetrate
(c) Two blanket compress the air between the body and the blankets
(d) None of the above

Q.62 Which of the following is a ferromagnetic material?
(a) Nickel (b) Quartz
(c) Bismuth (d) Aluminium

Q.63 A galvanometer is converted into ammeter when we connect
(a) high resistance in series
(b) high resistance in parallel
(c) low resistance in series
(d) low resistance in parallel

Q.64 A table cloth can be pulled from a table without dislodging the dishes. It is because of
(a) Graham's law of diffusion
(b) Archimedes principle
(c) Newton's first law
(d) Newton's second law

Q.65 In a nuclear reaction, which one of the following is conserved?
(a) Atomic number
(b) Mass number
(c) Atomic number, mass number and energy
(d) None of the above

Q.66 Which one of the following has given the centripetal force for a car moving on a road?
(a) Force of breaks
(b) The driver of the car
(c) Force by the steering wheel
(d) Friction due to tyres

Q.67 Which one of the following is the weakest force?
(a) Gravitational force
(b) Electromagnetic force
(c) Nuclear force
(d) Electrostatic force

Q.68 Which one of the following remains constant while throwing the ball upward?
(a) Force (b) Kinetic energy
(c) Acceleration (d) Velocity

Q.69 The velocity of the sound is greatest in
(a) water (b) air
(c) vacuum (d) metal

Q.70 If we move from equator to pole, the value of 'g'
(a) increases
(b) decreases
(c) remains same
(d) first increases and then decreases

Q.71 Which one of the following matter form the core of transformer?
(a) Steel (b) Soft iron
(c) Tin (d) Aluminium

Q.72 When the matter is cooled to very low temperature, it will form
(a) semi-conductor (b) super-conductor
(c) insulator (d) capacitor

Q.73 Which one of the following will have the maximum cohesive force?
(a) Liquid (b) Gas
(c) Fluid (d) Solid

ANSWER KEY

PHYSICS

1. (c)	**2.** (a)	**3.** (a)	**4.** (b)	**5.** (b)	**6.** (c)	**7.** (d)	**8.** (a)	**9.** (c)
10. (c)	**11.** (b)	**12.** (d)	**13.** (d)	**14.** (d)	**15.** (d)	**16.** (b)	**17.** (c)	**18.** (b)
19. (b)	**20.** (c)	**21.** (b)	**22.** (c)	**23.** (b)	**24.** (c)	**25.** (b)	**26.** (b)	**27.** (a)
28. (b)	**29.** (d)	**30.** (b)	**31.** (a)	**32.** (a)	**33.** (a)	**34.** (b)	**35.** (a)	**36.** (a)
37. (c)	**38.** (b)	**39.** (c)	**40.** (c)	**41.** (b)	**42.** (a)	**43.** (b)	**44.** (d)	**45.** (c)
46. (b)	**47.** (c)	**48.** (c)	**49.** (c)	**50.** (d)	**51.** (b)	**52.** (d)	**53.** (c)	**54.** (a)
55. (c)	**56.** (b)	**57.** (b)	**58.** (d)	**59.** (a)	**60.** (b)	**61.** (b)	**62.** (a)	**63.** (d)
64. (c)	**65.** (c)	**66.** (d)	**67.** (a)	**68.** (c)	**69.** (d)	**70.** (a)	**71.** (b)	**72.** (b)
73. (d)								

Previous Year Questions

RPSC
Rajasthan Public Service Commission

Assistant Engineer Examination - 2013

GENERAL SCIENCE

Q.1 35°C is equal to:
(a) 94°F (b) 95°F
(c) 96°F (d) 98.6°F

Q.2 The AC supply in our houses is:
(a) 110 V , 60 Hz (b) 110 V , 50 Hz
(c) 220 V , 50 Hz (d) 220 V , 60 Hz

Q.3 Mirage is an example of:
(a) Light reflection (b) Light dispersion
(c) Light refraction (d) Light scattering

Q.4 The weight of an object on the moon in comparison to earth will be
(a) Half (b) 6 times less
(c) Double (d) 6 times more

Q.5 Which of the following converts AC voltage into DC?
(a) Transformer (b) Amplifier
(c) Rectifier (d) Oscillator

Q.6 Night vision cameras use:
(a) Ultrasonic waves
(b) Infrared radiation
(c) Ultraviolet radiation
(d) Visible radiation

Q.7 Computer virus is:
(a) A protein (b) A type of programme
(c) DNA virus (d) Magnetic signal

Q.8 'Nero' programme is used to:
(a) Boot the Computer
(b) Store data on Hard disk
(c) Get Internet Connection
(d) Write data on Compact disk

Q.9 The amount of matter in same weight will be:
(a) Least at Equator
(b) Least at North Pole
(c) Least at Moon
(d) Same at all the above

Q.10 Moore's law is related with increase in
(a) Animal population in a specified area with time
(b) Air pollution with time
(c) Density of transistors in integrated circuits with time
(d) Increase in radiation density with time

Q.11 Optical Fibre works on the principle of:
(a) Total internal reflection
(b) Interference
(c) Scattering
(d) Diffraction

Q.12 Average life span of human RBC is
(a) 30 days (b) 60 days
(c) 80 days (d) 120 days

Q.13 A colour blind person is suffering from Protanopia
It means, he is blind to:
(a) Red (b) Green
(c) Blue (d) Voilet

Q.14 What is correct for 3G network?
1. 3G network functions at 2100 MHz frequency band.
2. 3G network functions 40 times faster than 2G network.
(a) Only statement 1 is correct
(b) Only statement 2 is correct
(c) Both 1 and 2 are correct
(d) Both 1 and 2 are irrelevant

Q.15 Largest unit of computer is:
(a) Byte (b) Bit
(c) Gigabyte (d) Megabyte

ANSWER KEY

1. (b)	2. (c)	3. (c)	4. (b)	5. (c)	6. (b)	7. (b)	8. (d)	9. (b)
10. (c)	11. (a)	12. (d)	13. (a)	14. (c)	15. (c)			