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10th Science – Physics Minimum Study Material

Important 5 marks

1. What are the types of inertia? Give an example for each type.

Types of Inertia

a) **Inertia of rest:** resistance of a body to change its state of rest.
Eg: shake the branches of a tree, some of the leaves and fruits detach and fall down

b) **Inertia of motion**: resistance of a body to change its state of motion.
Eg: An athlete runs some distance before jumping.

c) **Inertia of direction:** The resistance of a body to change its direction of motion.
Eg: a sharp turn while driving a car, tend to lean sideways

2. State Newton's laws of motion?

Newton's First Law
Every body continues to be in its state of rest or the state of uniform motion along a straight line unless it is acted upon by some external force.

Newton's Second Law
The force acting on a body is directly proportional to the rate of change of linear momentum of the body and the change in momentum takes place in the direction of the force.

Newton's Third Law
For every action, there is an equal and opposite reaction.

3. Deduce the equation of a force using Newton's second law of motion.

According to this law, "**the force acting on a body is directly proportional to the rate of change of linear momentum of the body and the change in momentum takes place in the direction of the force**".

Initial momentum of the body $P_i = mu$

Final momentum of the body $P_f = mv$

Change in momentum $\Delta P = P_f - P_i = mv - mu$

By Newton's second law of motion

Force, $F \propto$ rate of change of momentum

$F \propto$ change in momentum / time

$$F \propto \frac{mv - mu}{t}$$

$$F = \frac{km(v - u)}{t}$$

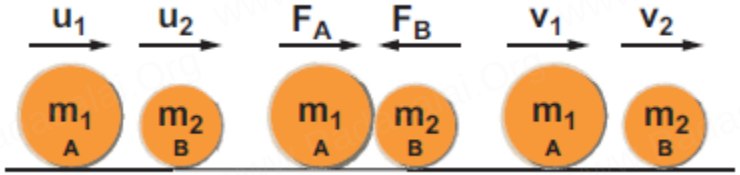
$$F = \frac{m(v - u)}{t}$$

$$a=(v-u)/t.$$

$$F = m \times a$$

Force = mass × acceleration

4. State and prove the law of conservation of linear momentum.



By Newton's III law of motion,

Action force = Reaction force

$F_A = -F_B$

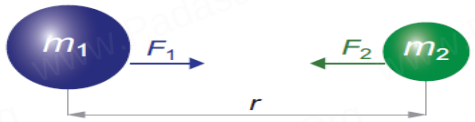
$m_1 (v_1-u_1)/t = -m_2 (v_2-u_2)/t$

$$m_1v_1 + m_2v_2 = m_1u_1 + m_2u_2$$

In the absence of an external force, the algebraic sum of the momentum after collision is numerically equal to the algebraic sum of the momentum before collision.

5. State the universal law of gravitation and derive its mathematical expression

The gravitational force is directly proportional to the product of their masses and inversely proportional to the square of the distance between the centers of the masses.



$$F \propto m_1 \times m_2$$

$$F \propto 1/r^2$$

$$F \propto \frac{m_1 \times m_2}{r^2}$$

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

G is the universal gravitational constant. Its value in SI unit is $6.674 \times 10{-}11$ N m^2 kg^{-2}.

6. Give the applications of gravitation.

- ✓ Dimensions of the heavenly bodies can be measured
- ✓ Helps in discovering new stars and planets.
- ✓ In 'Wobble'condition the mass of the star can be calculated
- ✓ Helps to explain germination of roots, a property of geotropism
- ✓ Helps to predict the path of the astronomical bodies.

7.List any five properties of light

- ✓ Light is a form of energy.
- ✓ Light always travels along a straight line.
- ✓ It can even travel through vacuum.
- ✓ The speed of light in vacuum or air is, $c = 3 \times 10^8$ ms^{-1}.
- ✓ Light is in the form of waves, characterized by $c = \nu \lambda$
- ✓ Different coloured light has different wavelength and frequency.

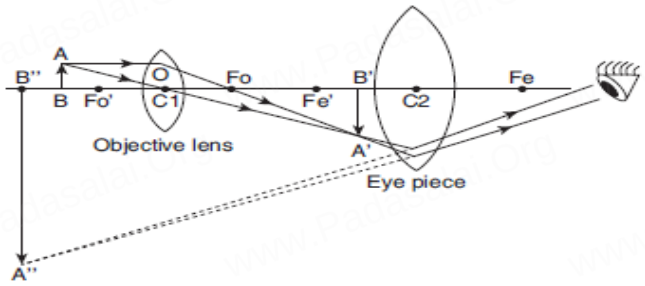
8. Differentiate the eye defects: Myopia and Hypermetropia

S.No	Parameters	Myopia	Hypermetropia
1.	Othername	Short sightedness	Long sightedness
2.	Corrected by	Concave lens	Convex lens
3.	eye ball	Lengthening	Shortening
4.	Clear vision	Near object	Distant object
5.	focal length of eye lens	reduced	increased

9 .Explain construction and working of a Compound Microscope

Construction

- ✓ A compound microscope consists two convex lenses.
- ✓ The lens with shorter focal length is 'objective lens'
- ✓ The lens with larger focal length is 'eye lens'
- ✓ Both the lenses are fixed in a narrow tube with adjustable provision.



Working

- ✓ The object (AB) is placed at a distance slightly greater than the focal length of objective lens.
- ✓ A real, inverted and magnified image (A'B') is formed
- ✓ This image behaves as the object for the eye lens.
- ✓ This eye piece forms a virtual, enlarged,erect image (A" B")
- ✓ Compound microscope has 50 to 200 times more magnification than simple microscope

10.Derive the ideal gas equation.

The ideal gas equation relates all the properties of an ideal gas.

Boyle's law	Charles' law	Avogadro's law
$PV = constant$	$V/T = constant$	$V/n = constant$

Combining we get

$PV/nT = constant$

$PV/\mu NAT = constant$ $(n = \mu NA.)$

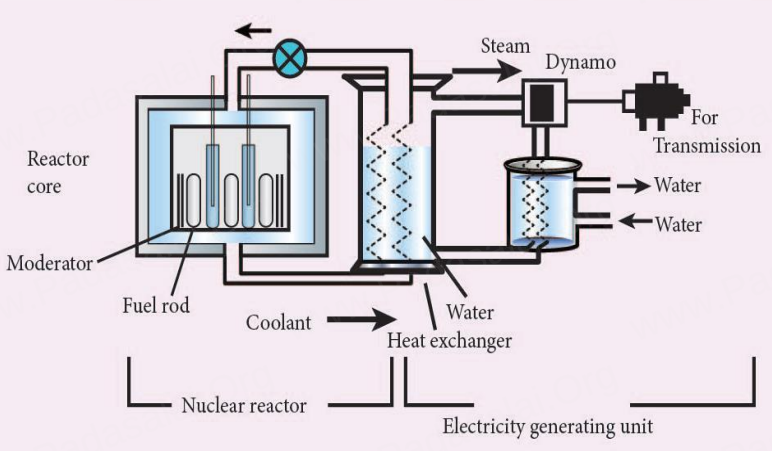
$PV/\mu NAT = k_B$ (value $=1.38 \times 10^{-23}$ JK^{-1}).

$PV = \mu NA\ k_B\ T$

$\mu NAkB = R$(value $=8.31\ J\ mol^{-1}\ K^{-1}$)

$PV = RT$

11.What is a nuclear reactor? Explain its essential parts with their functions.



A Nuclear reactor produce nuclear fission reaction in a self-sustained and controlled manner to produce electricity.

Parts	functions	Examples
Fuel	fissile material	Uranium
Moderator	slow down high energy neutrons to slow neutrons	Graphite, heavy water
Control rod	control the number of neutrons	Cadmium, boron
Coolant	remove the heat produced	Air, water, helium
Protection wall	prevent the harmful radiations	Lead

12.Explain the process of controlled and uncontrolled chain reactions.

Controlled chain reaction

- ✓ Neutron absorber absorb the extra neutrons
- ✓ The number of neutrons released is maintained to be one
- ✓ The fusion reaction is sustained in a controlled manner.
- ✓ The energy released is used for constructive purposes
- ✓ Eg.nuclear reactor

Uncontrolled chain reaction

- ✓ In neutrons multiplies indefinitely and causes fission reaction.
- ✓ release of a huge amount of energy within a fraction of a second.
- ✓ used in the atom bomb to produce an explosion.

13. Compare the properties of alpha, beta and gamma radiations.

properties	α ray	β rays	γ rays
Nature	Helium nucleus ($_2He^4$)	electrons ($-1e_0$)	Electro magnetic waves of photons
Charge	+2e	-e	zero
Ionising power	100 times than β rays and 10,000 times than γ rays	Comparatively low	Very less
Penetrating power	low	greater than α rays	Very high
Effect of electric & magnetic field	deflected	deflected	Not deflected
Speed	1/10 to 1/20 times speed of light	9/10 times speed of light	speed of light

Important 2 marks

1. Define inertia. Give its classification.

Ability of a body to maintain its state of rest or motion is called Inertia. Their types

- ✓ Inertia of rest
- ✓ Inertia of motion
- ✓ Inertia of direction

2. Define moment of a couple.

Rotating effect of a couple is known as **moment of a couple**.

$$M = F \times d$$

3. State the principle of moments.

When a number of like or unlike parallel forces act on a rigid body and the body is in equilibrium Moment in clockwise direction = Moment in anti clockwise direction

$$F1 \times d1 = F2 \times d2$$

4. State Newton's second law.

Force acting on a body is directly proportional to the rate of change of linear momentum of the body

5. Why a spanner with a long handle is preferred to tighten screws in heavy vehicles?

If the handle is **long**, then the moment of force will be high, then, less force is only needed.

Moment of force = F*d

6. While catching a cricket ball the fielder lowers his hands backwards. Why?

He experiences a smaller force for a longer interval of time to catch the ball, resulting in a lesser impulse on his hands.

7. What is refractive index?

The ratio of speed of light in vacuum to the speed of light in a medium is defined as refractive index 'μ' of that medium.

8. State Snell's law.

Ratio of the sine of the angle of incidence and sine of the angle of refraction is equal to the ratio of refractive indices of the two media

$$\frac{\sin i}{\sin r} = \frac{\mu_2}{\mu_1}$$

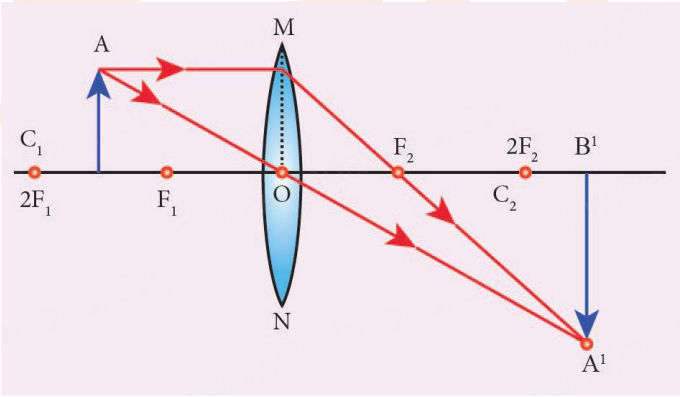
9. Define dispersion of light

When a beam of white light or composite light is refracted through any transparent media such as glass or water, it is split into its component colours

10. Differentiate mass and weight.

S.No	Mass	Weight
1	Scalar	vector
2	quantity of matter contained	depends on the acceleration due to gravity
3	Unit is kg	Unit is Newton
4	Remains same	varies

11. Draw a ray diagram to show the image formed by a convex lens when the object is placed between F and 2F.



12. State Rayleigh's law of scattering

Amount of scattering of light is inversely proportional to the fourth power of its wavelength".

$$\text{'S'} \propto \frac{1}{\lambda^4}$$

13. Differentiate convex lens and concave lens.

convex lens	concave lens
Thicker in the middle	Thinner in the middle
Converging lens	Diverging lens
Treat hypermetropia	Treat myopia
Produces real image	Produces virtual image

14. What is power of accommodation of eye?

The ability of the eye lens to focus nearby as well as the distant objects is power of accommodation of eye.

15. What are the causes of 'Myopia'?

- ✓ Lengthening of eye ball
- ✓ Reduced focal length
- ✓ Distant objects not seen clearly

16. Why does the sky appear in blue colour?

Because the blue colour (shorter wavelength) is scattered to a greater extent than the red colour (longer wavelength).

17. Why are traffic signals red in colour?

Because the red colour has highest wavelength.

18. Define one calorie.

One calorie is defined as the amount of heat energy required to rise the temperature of 1 gram of water through 1°C.

19. State Boyle's law

At constant temperature, pressure of a gas is inversely proportional to volume

$$P \propto 1/V$$

20. State-the law of volume

At constant pressure the volume of a gas is directly proportional to the temperature of the gas.

$$V \propto T$$

21. Distinguish between ideal gas and real gas.

parameters	Ideal gas	Real gas
Atoms or molecules	Do not interact	interact
Inter atomic or inter molecular forces of attraction	weak	strong

22. Define the unit of current.

SI unit of electric current is ampere

$$1 \text{ ampere} = \frac{1 \text{ coulomb}}{1 \text{ second}}$$

23. What happens to the resistance, as the conductor is made thicker?

As the conductor is made thicker, resistance decrease

24. Why is tungsten metal used in bulbs, but not in fuse wires?

Tungsten metal is used in bulbs, but not in fuse wires because it has high melting point

25. Name any two devices, which are working on the heating effect of the electric current.

Electric heater, electric iron,

26. Define electric potential and potential difference.

Electric potential:

The amount of work done in moving a unit positive charge from infinity to that point against the electric force.

Electric potential difference:

The amount of work done in moving a unit positive charge from one point to another point against the electric force.

27. What is the role of the earth wire in domestic circuits?

The earth wire serves as a protective conductor, which saves us from electric shocks

28. State Ohm's law.

At a constant temperature, the steady current 'I' flowing through a conductor is directly proportional to the potential difference

$$I \propto V. \qquad V = I R$$

29. Distinguish between the resistivity and conductivity of a conductor.

s.no	Resistivity	Conductivity
1.	resistance of a conductor of unit length and unit area of cross section	Reciprocal of resistivity
2.	Unit is ohm meter	Unit is ohm^{-1} $meter^{-1}$
3.	more for insulators than for conductors	more for conductors than for insulators

30. What connection is used in domestic appliances and why?

The circuits in a house are connected in parallel, so that the disconnection of one circuit does not affect the other circuit.

31. What are the advantages of LED TV over the normal TV?

- ✓ brighter picture quality.
- ✓ thinner in size.
- ✓ uses less power and consumes very less energy.
- ✓ life span is more.
- ✓ more reliable.

32. List the merits of LED bulb

- ✓ no loss of energy in the form of heat.
- ✓ low power requirement. .
- ✓ A wide range of colours is possible here.
- ✓ It is cost-efficient and energy efficient.

33. What is the audible range of frequency?

20 Hz to 20,000Hz

34. What is the minimum distance needed for an echo?

17.2 m

35. Name three animals, which can hear ultrasonic vibrations.

Bats, dogs, mosquitoes

36. Explain why, the ceilings of concert halls are curved.

The ceilings of concert halls are curved in order to produce multiple reflections.

37. Mention two cases in which there is no Doppler effect in sound?

- ✓ When source (S) and listener (L) both are at rest.
- ✓ When source S and L are moving in mutually perpendicular directions.

38. Write any three features of natural and artificial radioactivity.

S.No	Natural radioactivity	Artificial radioactivity
1	Spontaneous process	Induced process
2	Cannot be controlled	Can be controlled
3	Done by elements of atomic number less than 83	Done by elements of atomic number greater than 83

39. State Soddy and Fajan's displacement law.

When a radioactive element emits an alpha particle, a daughter nucleus is formed whose mass number is less by 4 units and the atomic number is less by 2 units, than the mass number and atomic number of the parent nucleus.

When a radioactive element emits a beta particle, a daughter nucleus is formed whose mass number is the same and the atomic number is more by 1 unit, than the atomic number of the parent nucleus.

40. What is stellar energy?

The stars like our Sun emit a large amount of energy in the form of light and heat. This energy is termed as the stellar energy.

41. Give any two uses of radio isotopes in the field of agriculture?

- ✓ kill the insects and parasites
- ✓ cereals exposed to radiations remain fresh beyond their normal life