Roll No. : _____ FBD-11-1-23 200 / 136

Objective

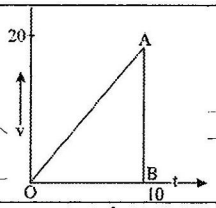
Paper Code **6477**

Intermediate Part First

PHYSICS (Objective) GROUP - I

Time: 20 Minutes Marks: 17

Q.No.1 **You have four choices for each objective type question as A, B, C and D. The choice which you think is correct, fill the relevant circle in front of that question number on computerized answer sheet. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero marks in that question. Attempt as many questions as given in objective type question paper and leave other circles blank.acf**

S.#	Questions	A	B	C	D
1	Centripetal force performs:	Positive work	No work	Negative work	Maximum work
2	Which one is correct?	1 torr = 13.33 Nm^{-2}	2 torr = 26.66 Nm^{-2}	5 torr = 65.65 Nm^{-2}	10 torr = 1333 Nm^{-2}
3	Which other quantity has the same unit as spring constant has Nm^{-1} ?	Torque	Momentum	Surface tension	Rotational K.E
4	If a wave is travelling in a rarer medium and incident on a denser medium then the phase change is:	360°	180°	90°	0°
5	When air column is closed from one end then the fundamental frequency becomes:	$1.0\left(\frac{v}{\ell}\right)$	$0.5\left(\frac{v}{\ell}\right)$	$0.75\left(\frac{v}{\ell}\right)$	$0.25\left(\frac{v}{\ell}\right)$
6	When fringe spacing in Young's double slit experiment is increased by increasing wavelength then number of fringes will be:	Decreased	Increased	Constant	Disappear
7	For incident angles equal to or greater than the critical angle, the glass-air boundary will act as:	Lens (Biconvex)	Mirror (Plane)	Lens (Concave)	Lens (Plano convex)
8	When the work is done at the cost of internal energy, then the equation becomes:	$W = \Delta U$	$W = Q$	$W = -\Delta U$	$W = \Delta V$
9	Pick the correct condition for the relation $C_P - C_V = R$:	Internal energy is kept constant for both processes	Pressure is kept constant for both processes	Temperature is kept constant for both processes	Volume is kept constant for both processes
10	How many number of zeros in 7.4000 and 8000 kg are significant, if the later quantity has 1 kg least count?	None and none	Three and three	Three and two	Two and one
11	What choice would you have to pick for the percentage uncertainty in measuring 2.3cm with meter rod and 2.45cm with vernier calliper?	4.3% and 0.4%	4.0% and 0.1%	0.1% and 0.01%	3.9% and 0.52%
12	The distance of point P of position vector $\vec{r} = 3\hat{i} + 3\hat{j} + 3\hat{k}$ from the origin is:	3.0 unit	6.4 unit	5.2 unit	2.5 unit
13	Two vectors to be combined have magnitudes 60N and 35N with different directions. Pick the correct answer:	95 N	25 N	Both A & B	Can be any value between option A & B
14	What is the distance travelled by a body in the following velocity time graph? 	100 m	20 m	10 m	5 m
15	Water flows out from a pipe at $3Kgs^{-1}$ and its velocity changes from $5ms^{-1}$ to zero on striking the ball, then force is:	10 N	15 N	20 N	25 N
16	Solar energy at normal incidence outside the Earth's atmosphere is:	$1.0Wm^{-2}$	$1.4Wm^{-2}$	$1.0kWm^{-2}$	$1.4kWm^{-2}$
17	For one radian, arc length 'S' and radius 'r' of circle has the relation:	S > r	r > S	S = r	S = 2r

FBD-11-1-23

Intermediate Part First

Roll No. _____

PHYSICS (Subjective) GROUP - I

Time: 02:40 Hours Marks: 68

SECTION – I

2. **Write short answers to any EIGHT parts.** 16

(i) The period of simple pendulum is measured by a stop watch. What type of errors are possible in the time period?
(ii) Write the dimensions of (a) pressure (b) density.
(iii) Given that $V = (5.2 \pm 0.1)$ volt. Find its percentage uncertainty.
(iv) What are supplementary units? Define only one unit.
(v) Under what circumstances would a vector have components that are equal in magnitude?
(vi) Suppose the sides of a closed polygon represent vector arranged head to tail rule. What is the sum of these vectors?
(vii) Define the two conditions of equilibrium.
(viii) Explain the circumstances in which the velocity $\vec{v}$ and acceleration $\vec{a}$ of a car are (a) anti-parallel (b) $\vec{v}$ is zero but $\vec{a}$ is not zero.
(ix) Define impulse and show that how it is related to linear momentum?
(x) What is isolated system? State the law of conservation of momentum.
(xi) What is the effect on the speed of a fighter plane chasing another when it opens the fire?
(xii) Explain the difference between laminar flow and turbulent flow.

3. **Write short answers to any EIGHT parts.** 16

(i) Calculate the work done in kilo joules in lifting a mass of 10kg (at steady velocity) through a vertical height of 10m.
(ii) What sort of energy is in the (a) compressed spring (b) water in high dam?
(iii) Define escape velocity. Write the formula to find escape velocity.
(iv) Why does a diver change his body positions before and after diving in the pool?
(v) When mud flies off the tyre of a moving bicycle, in what direction does it fly? Explain.
(vi) Show that $S = r\theta$
(vii) What is the total distance travelled by an object moving with simple harmonic motion in time equal to its period, if its amplitude is A?
(viii) Explain the relation between total energy, potential energy and kinetic energy of a body oscillating SHM.
(ix) Draw the graph between amplitude and time in damped oscillations.
(x) Explain the terms crest, trough, node and antinode.
(xi) Explain why sound travels faster in warm air than in cold air.
(xii) Speed of sound in air at 0°C is $332 ms^{-1}$. Find its speed at 15°C.

4. **Write short answers to any SIX parts.** 12

(i) How is the distance between interference fringes affected by the separation between the slits of Young's experiment? Can fringes disappear?
(ii) An oil film spreading over a wet footpath shows colours. Explain how does it happen?
(iii) Find the grating element of the diffraction grating containing 2000 lines / cm.
(iv) Explain briefly the single mode step index fiber.
(v) Why would it be advantageous to use blue light with a compound microscope?
(vi) Give at least two postulates of kinetic theory of gases.
(vii) Derive Boyle's law on the basis of kinetic theory of gases.
(viii) Give an example of a process in which no heat is transferred to or from the system but temperature of the system changes?
(ix) Is it possible to construct a heat engine that will not expel heat into the atmosphere? Explain.

SECTION – II Attempt any THREE questions. Each question carries 08 marks.

5. (a) What is a scalar product? Discuss its physical interpretation and write its three characteristics. 05
(b) Ten bricks, each 6.0cm thick and mass 1.5kg lie flat on a table. How much work is required to stack them one on the top of another? 03

6. (a) State and explain law of conservation of linear momentum. 05
(b) A gramophone record turntable accelerates from rest to an angular velocity of 45.0 rev min^{-1} in 1.60s. What is its average angular acceleration? 03

7. (a) Define Stoke's law and show that the terminal velocity is directly proportional to square of radius of the water droplet. 05
(b) A heat engine performs 100J of work and at the same time rejects 400J of heat energy to the cold reservoirs. What is the efficiency of the engine? 03

8. (a) Discuss the motion of a horizontal mass spring system and find the values of time period, instantaneous displacement and instantaneous velocity. 05
(b) A pipe has a length of 1m. Determine the frequencies of the fundamental and the first two harmonics if the pipe is closed at one end. 03

9. (a) Explain diffraction of x-rays by crystals and derive Bragg's equation. 05
(b) A simple astronomical telescope in its normal adjustment has an objective of focal length 100cm and an eye piece of focal length 5.0cm (i) where is the final image formed (ii) calculate the angular magnification. 03

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Objective

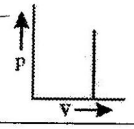
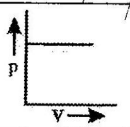
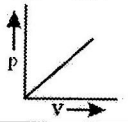
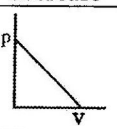
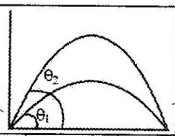
Paper Code **6478**

Intermediate Part First

PHYSICS (Objective) GROUP – II

Time: 20 Minutes Marks: 17

Q.No.1 **You have four choices for each objective type question as A, B, C and D. The choice which you think is correct, fill the relevant circle in front of that question number on computerized answer sheet. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero marks in that question. Attempt as many questions as given in objective type question paper and leave other circles blank.acf**

S.#	Questions	A	B	C	D
1	Einstein's theory of relativity inferred about the gravitational and inertial acceleration:	Are different to each other	Are precisely equivalent	Both are zero	Cannot be calculated
2	The relation between viscosity 'η' and temperature 't' can be:	$\eta \propto t$	$\eta \propto \frac{1}{t}$	There is no relation between them	All options (A,B,C) are possible
3	When 60N force elongates a spring by 30cm, what is the spring constant?	600 $\frac{N}{m}$	300 $\frac{N}{m}$	200 $\frac{N}{m}$	100 $\frac{N}{m}$
4	Out of phase points in a wave can have these series:	$0, \lambda, 2\lambda, 3\lambda, \ldots\ldots$	$\frac{\lambda}{2}, \frac{3\lambda}{2}, \frac{5\lambda}{2}, \frac{7\lambda}{2}, \ldots\ldots$	$0, \frac{\lambda}{2}, \lambda, \frac{3\lambda}{2}, 2\lambda, \ldots\ldots$	$0, 2\lambda, 4\lambda, 6\lambda, 8\lambda, \ldots\ldots$
5	What is the error in Newton's formula of speed of sound?	16% with temperature is taken as variable	16% with volume is taken as constant	16% with density is taken as constant	16% with temperature is taken as constant
6	For having more orders of spectra, the angle along the direction of normal to the grating is:	90°	45°	60°	0°
7	The real and inverted image cannot be made between:	F and 2F	Optical center and focus point	2F and infinity	F and infinity
8	When a thermodynamic system expands adiabatically the temperature of the system:	Constant	Increase	Decrease	First increase and then decrease
9	Pick the correct option for zero work done on / by a thermodynamic system:				
10	kg m^2s^{-3} and kg $m^{-1}s^{-2}$ are the basic unit of these derived units:	Pascal and Watt	Watt and Pascal	Newton and Joule	Pascal and Coulomb
11	The addition of 5.32, 11.8, 2.189 and 0.089 is up to appropriate precision:	19.4	19.43	18.2	18.23
12	Find the value of X for two perpendicular vectors $\vec{A} = \hat{i} + \hat{j} + \hat{k}$ and $\vec{B} = 4\hat{i} + \hat{j} + x\hat{k}$:	+4	+2	−5	−1
13	What is the analogous of force for rotational motion?	Angular displacement	Power	Angular momentum	Torque
14	The sum of θ_1 and θ_2 is equal to: 	90°	45°	60°	70°
15	A stone is dropped from the top of the tower and it takes 3 seconds to reach ground. What is the height of tower? Take $g = 10ms^{-2}$	10m	30m	45m	90m
16	What is the loss in work done when angle between force and displacement changes from 0° to 30°?	100%	50%	30%	14%
17	The radius of geo-stationary orbit from the center of the Earth is:	36000km	3.6×10^4m	4.23×10^4km	4.23×10^4m

FBD-11-2-23

Intermediate Part First Roll No. _____

PHYSICS (Subjective) GROUP - II

Time: 02:40 Hours Marks: 68

SECTION – I

Write short answers to any EIGHT parts. 16

(i) The length and width of a rectangular plate are measured to be 15.3cm and 12.80cm respectively. Find area of the plate.

(ii) How uncertainty is estimated in power factors?

(iii) When $V = 5.2 \pm 0.1V$ and $I = 0.84 \pm 0.05A$, what is percentage uncertainty in 'R'?

(iv) Can measurement taken with a Vernier caliper be more precise than a measurement taken with a screw gauge? Explain.

(v) Under what circumstances would a vector have rectangular component that are negative?

(vi) Show that vector addition is commutative.

(vii) What is torque? Write its units.

(viii) Two row boats moving parallel in the same direction are pulled towards each other. Explain.

(ix) Can the velocity of an object reverse the direction when acceleration is constant?

(x) State Newton's 2nd law in terms of momentum.

(xi) Draw the velocity-time graph for horizontal and vertical components of velocity of a projectile projected at certain angle with the horizontal.

(xii) A projectile is fired at 45° with the horizontal. Show that Range = 4 × vertical height.

3. **Write short answers to any EIGHT parts.** 16

(i) Prove that 1kWh = 3.6Mj

(ii) An object has 1j of potential energy. Explain what does it mean?

(iii) What sort of energy is in (a) compressed spring (b) water in a high dam?

(iv) Show that 1 rad = 57.3°

(v) When mud flies off the tyre of a moving bicycle, in what direction does it fly? Explain.

(vi) State the direction of these vectors in simple situations. (a) Angular momentum (b) Angular velocity

(vii) For SHM of mass-spring system, prove that $P.E. = \frac{1}{2}kx_0^2$

(viii) In relation to SHM, explain the equations (a) $y = A\sin(\omega t + \varphi)$ (b) $a = -\omega^2 x$

(ix) What is meant by phase angle? Does it define angle between maximum displacement and the driving force?

(x) Define beats. Explain its one use.

(xi) Is it possible for two identical waves travelling in the same direction along a string to give rise to a stationary wave?

(xii) Why does sound travel faster in solids than in gases?

4. **Write short answers to any SIX parts.** 12

(i) How would you manage to get more orders of spectra using a diffraction grating?

(ii) How would you distinguish between un-polarized and plane-polarized light.

(iii) What are Newton's rings?

(iv) A simple microscope has convex lens of focal length 100cm. Find its magnifying power.

(v) What is the difference between real and virtual image?

(vi) How the power is lost in optical fiber through dispersion? Explain.

(vii) Give an example of a process in which no heat is transferred to or from the system but the temperature of the system changes.

(viii) Draw PV diagram which show four steps of Carnot engine.

(ix) Why the entropy of the universe always increases?

SECTION – II Attempt any THREE questions. Each question carries 08 marks.

5. (a) Define gravitational field. Show that work done in gravitational field is independent of the path followed and also show that work done in closed path is zero. 05

(b) Given that $\vec{A} = \hat{i} - 2\hat{j} + 3\hat{k}$ and $\vec{B} = 3\hat{i} - 4\hat{k}$ find the length of the projection of $\vec{A}$ on $\vec{B}$. 03

6. (a) Discuss the elastic collision in one dimension and prove that speed of approach is equal to the speed of separation. 05

(b) What is the least speed at which an aeroplane can execute a vertical loop of 1.0km radius so that there will be no tendency for the pilot to fall down at the highest point? 03

7. (a) What is a Carnot heat engine? Show that efficiency of a Carnot heat engine depends on the temperature of the hot and cold reservoirs. 05

(b) Water flows through a hose whose internal diameter is 1.0cm at a speed of $1.0ms^{-1}$. What should be the diameter of the nozzle if the water is to emerge at $21ms^{-1}$. 03

8. (a) Show that frequencies of stationary waves in a stretched string are quantized. 05

(b) A 100gm body hung on a spring elongates the spring by 4cm. When a certain object is hung on the spring and set vibrating, its period is 0.568s. What is the mass of the object pulling the spring? 03

9. (a) Explain diffraction of x-rays by crystals. What are the uses of diffraction of x-rays? 05

(b) A telescope is made of an objective of focal length 20cm and an eye-piece of 5.0cm, both convex lenses. Find the angular magnification. 03