Arts, Commerce and Science College, Bodwad

Class: F. Y. B.Sc.

PHY 101 Basic Mechanics

Unit 1 Vectors

Multiple Choice Question (1 marks)

1. If (\overline{A}) and (\overline{B}) represents two different physical quantities, which of the following mathematical operations is /are valid?.

a) $\overline{A} \cdot \overline{B}$

b) $\overline{A} + \overline{B}$

c) $\overline{A} \times \overline{B}$

d) Both (a) and (c)

2. If $(\overline{C}) = \overline{B} \times \overline{A}$, then $(\overline{A} \times \overline{B}) \times \overline{C}$ is

a) a zero vector

b) $-(\overline{\overline{C}})$

c) zero

d) none of these

3. A unit vector in the direction of the negative of the vector $(-\hat{i}-\hat{j}-\hat{k})$ is

a) $(\hat{i} + \hat{j} - \hat{k})$

b) $\frac{1}{\sqrt{3}} (\hat{i} + \hat{j} - \hat{k})$

- c) $-\frac{1}{\sqrt{3}}(\hat{i}+\hat{j}-\hat{k})$
- d) $\sqrt{3} (\hat{i} + \hat{j} \hat{k})$

4. A vector (\overline{B}) lies in the XY- plane and makes an angle (θ) with the positive Y – direction; then the (x) component of (\overline{B}) is

a) B·tan θ

b) B·cos θ

c) B·sin θ

d) B·sec θ

5. If (\overline{D}) is the resultant of (\overline{A}) , \overline{B} and \overline{C} , then the magnitude of vector $\overline{A} + \overline{B} + \overline{C} - \overline{D}$ is

- a) $\sqrt{A^2 + B^2 + C^2 + D^2}$
- b) Zero

c)
$$A+B+C-D$$

d)
$$A+B+C+D$$

6. A vector (\overline{A}) has x and y components of 4 units and 3 units respectively, while (\overline{B}) is of length 8 units and pointed to words the negative (x) – direction; then, the vector $(\overline{B} - \overline{A})$ is

a)
$$-3(4i + j)$$

b)
$$-4\hat{i} - \hat{j}$$

c)
$$-4\hat{i}+3\hat{j}$$

d)
$$3(4\hat{i} + \hat{j})$$

7. If $\overline{A} = A_x \stackrel{\wedge}{i}$, $\overline{B} = By \stackrel{\wedge}{j}$, $\overline{C} = \overline{A} + \overline{B}$ and $\overline{D} = \overline{A} \times \overline{B}$ then $\overline{C} \cdot \overline{D} = \dots$

a)
$$A_x^2 + By + A_x \cdot B_y^2$$

b) Zero

c)
$$A_x^2 By - A_x \cdot B_y^2$$
 d) $A_x \cdot B_y^2 - A_x^2 \cdot B_y$

d)
$$A_x \cdot B_y^2 - A_x^2 \cdot B_y$$

8. If, $\overline{F} = 12\hat{j}$ and $\overline{V} = 4\hat{i}$, then the component of (\overline{F}) along the (\overline{V}) is

a) 4

b) 8

c) 0

d) 16

9. If the velocity and time parameters are denoted by (\overline{V}) and (t) respectively, then the product $(t \cdot \overline{V})$ is

- a) a velocity of magnitude (t) times $|\overline{V}|$.
- b) a vector in a direction different from that of (\overline{V}) .
- c) a scalar of magnitude (t) times $|\overline{V}|$.
- d) the displacement in the direction of $\,(\overline{V})\,$.

10. If $\overline{A} \cdot \overline{B} = |\overline{A} \times \overline{B}|$ then the angle between \overline{A} and \overline{B} is

a) 0

b) 45°

11. Two Vectors (\overline{A}) and	(\overline{B}) are such that $\overline{A} + \overline{B} \mid = \mid \overline{A} - \overline{B} \mid$ then they are
a) parallel	b) antiparallel
c) perpendicular	d) inclined
12. Angle between the vect	ors $(\overline{A}) = \hat{i} + 2\hat{j} - \hat{k}$ and $(\overline{B}) = -\hat{i} - 2\hat{j} + \hat{k}$ will be
a) 180°	b) zero
c) 90°	d) 45°
13. The dot product of two will be	vectors of magnitude 3 and 6; if the angle between them is 60°
a) 3	b) 9
c) 15.5	d) 18
14. If, $\overline{A} = A\hat{i}$, $\overline{B} = B\hat{j}$, \overline{C}	$= \overline{A} + \overline{B}$ and $\overline{D} = \overline{A} \times \overline{B}$ then $\overline{C} \times \overline{D}$ is
a) zero	b) a non zero vector
c) $AB(A\hat{i} + B\hat{j})$	d) $AB(B\hat{i} + B\hat{j})$
	st, stop and turn North and go another 6 m. stop and turn west and e magnitude of the displacement is
a) 6 m.	b) 0
c) 20 m.	d) 22 m.
16. A force $\vec{F} = (2\hat{i} + 2\hat{j} - 6\hat{j} + $	$-\hat{k}$) acts on a body produces an acceleration of 1 m/s ² then mass
a) 9 kg	b) 5 kg
c) 3 kg	d) 2 kg

d) 180°

c) 90°

17.	A force $(3\hat{i} + 4\hat{j})N$ acts on	a body, which	displaces the body by $(3\hat{i} + 4\hat{j})$ M then the							
	work done by the force is									
	a) 10 J.	b) 25 J								
	c) 12 J	d) 16 J								
18.	Two vectors (\overline{A}) and (\overline{B}) a	re perpendici	llar to each other if							
	a) $\overline{A} \times \overline{B} = 0$	b) A	$\overline{A} \cdot \overline{B} = 1$							
	c) $\overline{A} \times \overline{B} = 1$	d) \overline{A}	$\vec{A} \cdot \vec{B} = 0$							
19.	Three vectors $(\overline{A}), (\overline{B})$ and	(\overline{C}) will giv	es a triangle, if							
	a) $\overline{A} + \overline{B} = \overline{C}$		b) $\overline{A} + \overline{B} + \overline{C} = 0$							
	c) $\overline{A} + \overline{B} < \overline{C}$		d) $\overline{A} + \overline{B} > \overline{C}$							
20.	A quantity which is complete	ely describe b	y magnitude and direction is known as							
	a) Complex conjugate	b) So	alar quanits							
	c) Vector quantity	d) no	on of these							
21.	If \overrightarrow{A} and \overrightarrow{B} are two vectors	then scalar p	roduct is given as							
	a) AB $\cos \theta$	b) A	B $\sin \theta$							
	c) AB $\tan \theta$	d) A	B $\cot \theta$							
22	If \vec{A} and \vec{B} are two vectors	then vector p	product has magnitude							
	a) AB $\cos \theta$	b) A	B $\sin \theta$							
	c) AB $\tan \theta$	d) A	B $\cot \theta$							
23	Self cross product is equal to									
	a) 1 b) 2	c) 3	d) 0							
24	Area of parallelogram =									

	a) magnitude of scular product \overrightarrow{A} and \overrightarrow{B}							
	b) magnitude o	of vector produ	uct \overrightarrow{A} and \overrightarrow{B}					
	c) magnitude o	of \overrightarrow{A}						
	d) magnitude o	of \vec{B}						
25.	Scalar triple pro	oduct represen	nts					
	a) Volume of s	phers	b) Vo	olume of cube				
	c) Volume of p	arallelopipe	d) no	ne of these				
26.	Area of triangle	e =	•••••					
	a) $\frac{1}{2} \left \overrightarrow{\mathbf{A}} \times \overrightarrow{\mathbf{B}} \right $		b) $\frac{1}{2}$	$\left \overrightarrow{\mathbf{A}} \cdot \overrightarrow{\mathbf{B}} \right $				
	c) $\frac{\vec{A} \cdot \vec{B}}{\left \vec{A} \cdot \vec{B} \right }$		d) $\frac{\overline{A}}{ \overline{A} }$	$\overrightarrow{A} \times \overrightarrow{B}$ $\overrightarrow{A} \times \overrightarrow{B}$				
27	If scalar produc	ct of two vecto	ors is zero the	n two vectors must be to each other.				
	a) parallel		b) an	tiparallel				
	c) perpendicula	ar	d) no	ne of these				
28	$\hat{i} \times \hat{i} = \hat{j} \times \hat{j}$	$=\hat{k}\times\hat{k}=$						
	a) 0	b) 1	c) – 1	d) none of these				
29	If three vectors	are co-planer	then their sca	lar triple product is				
	a) zero	b) one	c) two	d) three				
30.	Two vectors \overline{A}	and $\overline{\overline{B}}$ are equ	ual if they hav	re				
	a) the same ma	gnitude and di	rection					
	h) 4h a aansa nsaa		1:66	direction				
	b) the same ma	gnitude but ha	iving differen	direction				

d) None of	these			
31) $\hat{i} \cdot \hat{i} = \hat{j}$	$\cdot \hat{j} = \hat{k} \cdot \hat{k} =$	= ?		
a) 0	b) 1	c) – 1	d) none of these	
32) $\hat{A} = 2\hat{i}$	$-\hat{j} + \hat{k}$ and \hat{B}	$3 = 2\hat{i} + 3\hat{j} +$	\hat{k} then $\overline{A} \cdot \overline{B} = ?$	
a) 2	b) – 2	c) 6	d) 10	
33 Direction of	of the vector pr	oduct of two	vectors is along	
a) Parallel	to the plane fo	rmed by the v	ectors	
b) Perpend	icular to the of	the given vec	tors	
c) Same di	rection as that	of the given v	ectors	
d) None of	these			
$34 \overline{A} \times \overline{B} = ?$				
a) $\overline{B} \times \overline{A}$	$b) - \overline{B} \times \overline{A}$	\overline{A} c) \overline{A} + \overline{B}	d) None of these	
35 If three vec	ctors are copla	nar, their scala	r triple product is	
a) Zero	b) Unit	c) Infinity	d) None of these	
36 The scalar	triple product	of three vector	rs is also known as the	
a) Dot prod	duct b)	Cross product	c) Box product	d) None of these
\overline{A} , \overline{B} and \overline{C}	_	volume of para	illelepiped whose edge	es are given vectors
a) $\overline{A} \times (\overline{B})$	$\times \overline{C}$ b)	$\overline{A} \times \left(\overline{B} \times \overline{C}\right)$	c) $\overline{A} + (\overline{B} \times \overline{C})$	d) $\overline{A} + (\overline{B} \times \overline{C})$
38 The vector	triple product	of three vector	rs is a	
a) Scalar	b)	Vector c)	Zero d) None o	of these
39 ca	an be expresse	d as scalar pro	duct of two different v	ector quantities

	b) F	orce ac	ting on a	moving	g charge	ed partio	cle in a	magnet	ic field		
	c) moment of force										
	d) N	None of	these								
An	swers:										
	1.	d)	2.	a)	3.	b)	4	c)	5.	b)	
	6	a)	7.	b)	8.	c)	9.	a)	10.	b)	
	11.	c)	12.	a)	13.	b)	14.	d)	15.	a)	
	16.	c)	17.	b)	18.	d)	19.	a)	20.	c)	
	21	a)	22	b)	23	d)	24	b)	25	c)	
	26	a)	27	c)	28	a)	29	a)	30	a)	
	31	b)	32	a)	33	b)	34	b)	35	a)	
	36	c)	37	b)	38	b)	39	a)			
Un	it 1 Vec	tors									
1)	A quan	tity wh	ich is co	mplete	ly descr	ribe by	magnit	ude an	d direct	ion is known a	s
•••	••••••										
	a) Com	plex co	njugate l	o) Scala	ar quanti	ities c)	Vector	quantit	У	d) none of the	ese
2)	If \vec{A} a	nd $\vec{\mathrm{B}}$ a	re two v	ectors	then sca	alar pr	oduct is	given	as	······································	
	a) AB c	os θ	l	o) AB s	sin θ	c)	AB tan	θ	d) Al	3 cot θ	
3)	If → a	nd R g	re two v	ectors	then ve	ctor nr	oduct h	as mac	mitude	••••••	
<i>J</i>											
	a) AB c	os θ	l	o) AB s	an ⊎	c)	AB tan	Ð	d) AB	cot ⊎	
4)	Self cro	oss proc	luct is eq	qual to	•••••	••••					

a) Work done

	a) 1	b) 2	c) 3	d) 0
5)	Area of parallelogran	m =		
	a) magnitude of scular	r product \overrightarrow{A} and \overrightarrow{B}		b) magnitude of vector product
\vec{A}	and \vec{B}	c) m	agnitude of \overrightarrow{A}	d) magnitude of \vec{B}
6)	Scalar triple product	represents	•••	
	a) Volume of sphers		b) Volume of cul	pe
	c) Volume of parallelo	ppipe	d) none of these	
7)	Area of triangle =	•••••		
	a) $\frac{1}{2} \left \overrightarrow{\mathbf{A}} \times \overrightarrow{\mathbf{B}} \right $		b) $\frac{1}{2} \left \overrightarrow{A} \cdot \overrightarrow{B} \right $	
	c) $\frac{\overrightarrow{A} \cdot \overrightarrow{B}}{\left \overrightarrow{A} \cdot \overrightarrow{B} \right }$		$d) \ \frac{\overrightarrow{A} \times \overrightarrow{B}}{\left \overrightarrow{A} \times \overrightarrow{B} \right }$	
8)	If scalar product of t	wo vectors is zero t	hen two vectors n	nust be to each other.
	a) parallel	b) antiparallel	c) perpendicular	d) none of these
9)	$\hat{i} \times \hat{i} = \hat{j} \times \hat{j} = \hat{k} \times \hat{j}$	$\hat{\mathbf{k}} = \dots$		
	a) 0	b) 1		c) -1 d) none of these
10)	If three vectors are c	o-planer then their	scalar triple prod	luct is
	a) zero	b) one	c) two	d) three
11)	Two vectors \overline{A} and \overline{B}	are equal if they h	ave	
	a) the same magnitude	and direction		
	b) the same magnitude	e but having differen	t direction	

	d) None of these				
12	$\hat{\mathbf{i}} \cdot \hat{\mathbf{i}} = \hat{\mathbf{j}} \cdot \hat{\mathbf{j}} = \hat{\mathbf{k}} \cdot$	$\hat{\mathbf{k}} = ?$			
	a) 0	b)	1	c) – 1	d) none of these
13	$) \hat{A} = 2\hat{i} - \hat{j} + \hat{k} \text{ and}$	$d\hat{B} = 2\hat{i} + 3\hat{j} +$	$\stackrel{\wedge}{k}$ then $\overline{A} \cdot \overline{B} = ?$		
	a) 2	b)	-2	c) 6	d) 10
14	Direction of the vect	or product of two	o vectors is along		
	a) Parallel to the plane	e formed by the vo	ectors		
	b) Perpendicular to th	e of the given vec	tors		
	c) Same direction as t	hat of the given v	ectors		
	d) None of these				
15	$\overline{A} \times \overline{B} = ?$				
	a) $\overline{B} \times \overline{A}$	$b) - \overline{B} \times \overline{A}$	c) $\overline{A} + \overline{B}$	d) None	e of these
16) If three vectors are c	oplanar, their sc	alar triple product	is	

c) the different magnitude and having same direction

18) represents the volume of parallelepiped whose edges are given vectors $\overline{A}\,,\overline{B}$ and \overline{C}

c) Infinity

d) None of these

c) Box product d) None of these

b) Unit

17) The scalar triple product of three vectors is also known as the

b) Cross product

a) Zero

a) Dot product

a)
$$\overline{A} \times \left(\overline{B} \times \overline{C} \right)$$
 b) $\overline{A} \times \left(\overline{B} \times \overline{C} \right)$ c) $\overline{A} + \left(\overline{B} \times \overline{C} \right)$ d) $\overline{A} + \left(\overline{B} \times \overline{C} \right)$

b)
$$\overline{A} \times (\overline{B} \times \overline{C})$$

c)
$$\overline{A} + (\overline{B} \times \overline{C})$$

d)
$$\overline{A} + (\overline{B} \times \overline{C})$$

19) The vector triple product of three vectors is a

- a) Scalar
- b) Vector
- c) Zero
- d) None of these

20) can be expressed as scalar product of two different vector quantities

- a) Work done
- b) Force acting on a moving charged particle in a magnetic field
- c) moment of force
- d) None of these

Answers:

1) c

2) a

- 3) b
- 4) d

5) b

6) c

- 7) a
- 8) c

9) a

10) a

- 11) a
- 12) b

13) a

- 14) b
- 15) b
- 16) a

17) c

- 18) b
- 19) b
- 20) a

Unit2 Differential equation

Multiple Choice Questions (1 mark each)

1.	 In Physics, the rate of change of dependent variables, w.r.t. the independent variable is called as 						
	a) Function	b) Derivative					
	c) Integration	d) None of these					
2.	A physical quantity (f) depends upon as	n other physical quantities (x & y) can be symbolised					
	a) F = F(x, y)	b) $F = \sum (x + y)$					
	c) F = x + y	d) None of these					
3.	In a differential term $\frac{dy}{dx}$, y & x are	variables respectively.					
	a) dependent & independent	b) independent & dependent					
	c) both are dependent	d) both are independent					
4.	A mathematical equation, which in equation.	volves the function & its derivatives, is called as a					
	a) differential	b) kinematical					
	c) mass-energy	d) None of these					
5.	A differential equation consists of at	least one					
	a) Integration	b) derivative					
	c) both of these	d) None of these					
6.	Newton's second law of Motion can	be written as					
	a) $F = m \stackrel{\square}{P}$	b) $F = m \stackrel{\square}{P}$					
	c) $\mathbf{F} = \overrightarrow{\mathbf{P}}$	d) $\overrightarrow{F} = \overrightarrow{2P}$					
7.	$\overrightarrow{F} = \overrightarrow{P}$ is a equation.						
	a) kinematical	b) differential					
	c) both of these	d) none of these					
8.	In a different equation $v = \frac{d\vec{x}}{dt}$, t	variable.					
	a) dependent	b) independent					
	c) both of these	d) none of these					
9.	A differential equation, which const	ists of only independent variable, is called as					

	an ordinary differential equation.	
	a) 0	b) 1
	c) 2	d) 3
1	0. A differential equation, which consi	sts of more than independent variable, is called
	as an partial differential equation.	
	a) 0	b) 1
	c) 2	d) 3
1	1. In a differential equation, $\frac{d^2f}{\partial x^2} + \frac{d}{\partial x^2}$	$\frac{f^2}{y^2} = 0$, there are independent variable.
	a) 0	b) 1
	c) 2	d) 3
1	2. In a differential equation, $\frac{d^2f}{\partial x^2} + \frac{d^2f}{\partial x^2}$	$\frac{\partial^2 f}{\partial y} + \frac{d^2 f}{\partial z^2} = 0$, there are independent variable.
	a) 1	b) 2
	c) 3	d) 4
1	3. The Laplace's equation is	
	a) $\nabla \psi = 0$	b) $\nabla^2 \psi = 0$
	c) $\nabla \psi \neq 0$	d) $\nabla^2 \psi \neq 0$
1	4. Laplace's equation in 1-D is	differential equations.
	a) ordinary	b) partial
	c) total	d) None of these
1	5. The Laplace's equation in 2-D and 3	3-D are differential equations.
	a) ordinary	b) partial
	c) total	d) None of these
1	6. The power of the highest derivative is called as the of differential	, after the differential equation has been reationalised, equation.
	a) degree	b) order
	c) power	d) None of these
1	7. The differentiable equation $L \frac{d^2q}{dt^2}$ +	$-R\frac{dq}{dt} + \frac{q}{c} = 0 \text{ is } \underline{\hspace{1cm}}.$
	a) first order, first degree	b) first order, second degree
	c) second order, first degree	d) second order, second degree
1	8. The order of the derivative differential equation.	in a differential equation is called as the order of a

	a) Lowest				b) hi	ghest					
	c) any one				d) N	one of th	iese				
19	An equation	$\frac{\mathrm{dy}}{\mathrm{dx}} - 3x$	= 2 is _	or	rder differential equation.						
	a) first				b) se	cond					
	c) third				d) fo	urth					
20.	A differential first power, is	-			-			and it's	derivative appear in th	e	
	a) linear				b) no	on-linear					
	c) homogeneo	ous			d) in	homoge	neous				
21.	The equation	$m\frac{d^2y}{dt^2}$	$+R\frac{dy}{dt}$	⊦ky=sin	wt is _	(differer	ntial equ	aation.		
	a) linear				b) no	on-linear					
	c) homogeneo	ous			d) N	one of th	iese				
22.	If the power	of depe	ndent v	ariable	or it's	derivat	ives is	equal to	o or greater than 2, suc	h	
	equation is	dif	ferentia	ıl equati	on.						
	a) linear				b) no	on-linear					
	c) homogeneo	ous			d) no	on-homo	geneou	.S			
23.	The equation	$\frac{d^2y}{dx^2} + y$	$\frac{dy}{dx} + 3y$	$y=0$ is _		differen	itial equ	uation.			
	a) linear				b) no	on-linea	r				
	c) non-homog	geneous			d) None of these						
Answe	rs:										
	1. b)	2.	a)	3.	a)	4.	a)	5.	b)		
	1. b) 6. c)	7.	b)	8.	b)	9.	b)	10.	b)		
	11. c)	12.	c)	13.	b)	14.	a)	15.	b)		
	16. a)	17.	c)	18.	b)	19.	a)	20.	a)		
	21. a)	22.	b)	23.	b)						
Unit 2	Differential 1	Equation	ons								
1) In I	Physics, the ra	te of ch	ange of	one var	iable	with resp	pect to	another	is known as		
a) c	lerivative	b)	integra	tion		c) entity		d)) none of these		
2) An	equation cont	aining d	lerivativ	ves of or	ne var	iable wit	h respe	ect to an	other variable is called		
as -	equation	on.									

	a) linear	b) differential	c) homogeneous	d) non linear
3)	An ordinary different	ial equation is containir	ng indepen	dent variable.
	a) more than one	b) two	c) only one	d) none of these
4)	A differential equation	n containing more than	one independent varia	able is called
	differential equation.			
	a) ordinary	b) linear	c) homogeneous	d) partial
5)	An order of differenti	al equation is the order	of derivative	in the equation.
	a) highest	b) lowest	c) same	d) none of these
6)	$x^2 \frac{d^2 y}{dx^2} + \frac{dy}{dx} - 2x^3 y$	= 0, This is a d	lifferential equation,	
	a) non homogeneous	b) partial	c) homogeneous	d) none of these
7)	$\frac{d^3 \cdot y}{dx^3} + 6 \frac{dy}{dx} + 3 y =$	is differential	equation.	
	a) first degree and sec	cond order	b) third degree and f	irst order
	c) second degree and	first order	d) first degree and th	ird order
A	nswers:			
	1) a 2) b 3)	c 4) d 5) a 6	6) c 7) d	

Unit 3 Laws of Motions

- 1. A stationary object has no forces acting on it. True or false.
- 2. Inertia is the property of mass in which An object at rest wants to stay at rest and an object that is moving wants to --
 - a. Stay at rest.
 - b. Stay moving in a straight line unless acted upon by another force.
 - c. Stay moving in a circular motion unless acted upon by another force.
 - d. Stay moving in a straight line but only if it has been acted upon by another force.
- 3. Frame of references are classified in to two types are
 - a. True and fictional.
 - b. Fast and slow.
 - c. Inertial and non inertial.
 - d. Real and imaginary.
- 4. Force that produces an acceleration of 1 m/s2 in a body of mass 1 K, is called.
 - a. One Newton b. Zero Newton. c. Slow Newton. D. Two Newton.
- 5. Mass of object is quantitative measure of its inertia stated law is Newton's
 - a. Newton's first law. b. Newton's second law. c. Newton's Third law d. none
- 6. Mass of a body into acceleration is equal to.
 - a. Inertia b. displacement c. force d. momentum.
- 7. If two balls of same masses are dropped on sand, the depths of penetration is same if
 - a. Heavier ball is dropped faster than lighter ball
 - b. Lighter ball is dropped faster than heavier ball
 - c. The product 'mv' is same for both bodies
 - d. None of these
- 8. The rate of change of momentum of an object is proportional to
 - a. Mass of the body
 - b. Velocity of the body
 - c. Net force applied on the body
 - d. None of these
- 9. A football and a stone has same mass
 - a. Both have same inertia.
 - b. Both have same momentum.
 - c. Both have different inertia.
 - d. Both have different momentum.
- 10. Action and reaction forces
 - a. Act on the same body
 - b. Act on different bodies
 - c. Act in same direction
 - d. Both I and III.
- 11. An observer on the ground sees a hot air balloon rise up in the air with a speed of 10 m/s. From which of these points of references does the balloon have the same speed?
 - a. A fellow observer on the ground
 - b. A bird flying in the sky.
 - c. A person running towards the direction of the balloon.

- d. A person in the balloon.
- 12. Ram is in a car of a roller coaster which is moving at a speed of 40 m/s. At which of these points of reference, will Ram seem to have zero speed?
 - a. An observer on the ground
 - b. A person cycling near the roller coaster.
 - c. A bird flying over the roller coaster.
 - d. A person sitting next to Ram.
- 13. Two cars, P and Q are traveling towards each other with a speed of 50 mph as observed by a pedestrian on the sidewalk. From which of these points of references will each of the cars have a speed of greater than 50 mph?
 - a. Only a passenger from Q.
- b. Only a passenger from P.
- c. From the observer.
- d. From any passenger in both car P and Q.
- 14. The net force on an object is denoted by Σ F and its acceleration is denoted by \bar{a} . Which of the following expressions is valid in an inertial frame?

a.
$$\sum F = 0$$
, $\overrightarrow{a} = \infty$.

b.
$$\sum F = 0$$
, $\overrightarrow{a} = 0$.

c.
$$\sum F \neq 0$$
, $\overrightarrow{a} = 0$.

d.
$$\sum F = 0$$
, $\overrightarrow{a} \neq 0$.

- 15. Which of these statements is correct if Frame 2 is stationary and Frame 1 moves with a constant acceleration with respect to frame 2?
 - a. Frame 1 is noninertial and frame 2 in inertial.
 - b. Frame 1 in inertial and frame 2 is noninertial
 - c. Both frames are noninertial.
 - d. Both frames are inertial
- 16. If Frame 2 is stationary and Frame 1 moves with a constant velocity with respect to frame 2 then which of the following statement is correct?
 - a. Frame 2 in inertial and frame 1 is noninertial.
 - b. Frame 1 in inertial and frame 2 is noninertial
 - c. Both frames are noninertial.
 - d. Both frames are inertial.
- 17. The net force on an object is denoted by Σ F and its acceleration is denoted by \overline{a} . Which of the following can be an inertial frame?

a. Frame 1:
$$\sum F \neq 0$$
, $\overrightarrow{a} = 0$.

b. Frame 2:
$$\Sigma F = 0$$
, $\overrightarrow{a} = 0$.

c. Frame 3:
$$\sum F = 0$$
, $\overrightarrow{a} \neq 0$.

	18	. W	hat is a ref	erence	frame?								
		a. I	Frame of id	leas rela	ated to	science	. b. A	set of pl	nysical	laws.			
		c. 7	The center	of syste	em.		d. Ar	observ	ational	point of	f view.		
	19. Why do we use reference frames?												
		a. 7	Γο extrapol	late resi	ult.								
		b. '	Γo reduce o	calculat	ions.								
		c. 7	Го make ap	proxin	nations	about tl	he prob	lem.					
		d.	Γο specify	an appı	ropriate	point o	of refere	ence.					
	20	. Th	e maximun	n numb	er of fr	ames p	er proce	ess is de	fined b	y:			
		a) t	the amount	of ava	ilable p	hysical	memor	y					
		b) (operating S	System									
		c) i	nstruction	set arcl	nitectur	e							
		d) 1	none of the	mentio	oned								
Ar	sw	ers:											
		2.	false	2.	b)	3.	c)	4.	a)	5.	a)		
		6.	c)	7.	c)	8.	c)	9.	a)	10.	b)		
			b)	12.	d)	13.	d)	14.	b)	15.	d)		
		10.	d)	17.	b)	18.	d)	19.	d)	20.	c)		
		_											
Ur	it 3	La	ws of moti	on									
1)	Ine	ertia	I frame of 1	referenc	ce impl	ies that							
	a)	New	ton's laws	of moti	on hold	good f	or real f	orces. b) the fra	ames acc	celerating uni	formly	
	c)	New	ton's laws	of mot	ion do	not hol	d good	Ċ	l) none	of these	;		
2)	A	fram	e of refere	nce wh	ich mo	ves with	h consta	ant velo	city wit	th refere	nce to a station	onary fra	me
	of	refe	rence is cal	lled as		•							
	a)	non	– inertial f	rame of	f refere	nce	b) i	inertial t	frame o	of referen	nce		
	c)		ting frame	of refe	rence					(d) absolute	frame	of
3)	Δ.			attach	ed to th	ne earth	with re	espect to	an oh	server in	space		
٦)			inertial fra					-			-	• • • • • • • •	
			i inertial fr				s laws		ni aic a	іррпсаві	ic III It.		
	U)	is al	i ilici tiai II	апс оу	acmin	1011							

	c) can not be inertial frame because earth is rotating about its axis.								
	d) none of these								
4)	Newton's second law	gives the measure o	f						
	a) acceleration	b) force	c) momentum	d) angular momentum					
5)	If two balls at same ter	mperature collides t	henis conserve	d.					
	a) temperature	b) velocity	c) kinetic energy	d) momentum					
6)	A body is acted upon l	by a constant force t	hen it will have a uniforr	n					
	a) acceleration	b) momentum	c) velocity	d) speed					
7)	A person standing on	the floor of an elev	rator drops a coin. The co	oin reaches the floor of the					
	elevator in a time t ₁	if the elevator is st	ationary and in time t ₂	if it is moving uniformly.					
	Then								
	a) $t_1 < t_2$	b) $t_1 = t_2$							
	c) $t_1 > t_2$	d) $t_1 < t_2$ or $t_1 > t_2$ de	pending on whether the l	ift is going up or down					
8)	A reference frame atta	ched to the earth							
	a) is an inertial frame	by definition							
	b) is an inertial frame because Newton's laws are applicable in this frame.								
	c) cannot be an inertial frame because the earth is rotating about its axis								
	d) none of the above								
9)	A particle stays at rest	s at rest as seen in a frame. We can conclude that							
	a) the frame is inertial								
	b) resultant force on the	resultant force on the particle is zero							
	c) the frame may be in	ertial but the resulta	ant force on the particle is	s zero					
	d) none of the above								
10)	A particle is found	to be at rest when	seen from a frame S_1	and moving with constant					
	velocity when seen from	om another frame S ₂	. State the possible option	n					
	a) both the frames are	inertial	b) S_1 is inertial and S_2 is	s non inertial					
	c) S ₁ is non inertial and	d S ₂ is inertial	d) none of the above						
11)	The force exerted by	the floor of an elev	vator on the foot of a per	son standing there is more					
	that the weight of the I	person if the elevator	or is						
	a) going up and slowir	ng down	b) going up and speeding	ig up					
	c) going down and spe	eeding up	d) none of the above						

12) If the tension in the cable supporting an elevator is equal to the weight of the elevator, the							
elevator may be							
a) going up with increasing speed	b) going down with increasing speed						
c) going up with uniform speed	d) going down with decreaing speed						
13) A particle is observed from two frames	S_1 and S_2 . The frame S_2 moves with respect to S_1						
with an acceleration 'a'. Let F ₁ and F ₂ be	the pseudo forces on the particle when seen from S_1						
and S ₂ respectively. Then are no	t possible.						
a) $F_1 = 0, F_2 \neq 0$ b) $F_1 \neq 0, F_2 = 0$	c) $F_1 \neq 0, F_2 \neq 0$ d) $F_1 = 0, F_2 = 0$						
14) A person says that he measured the acce	eleration of a particle to be non zero while no force						
was acting on the particle then							
a) he might have used non inertial frame.	a) he might have used non inertial frame. b) he is a liar						
c) his meter scale might have been longer than the standard d) his clock might have run							
slow							
Answers:							
1) a 2) b 3) c 4) b	5) d 6) a 7) b 8) b 9) c 10) a 11) b 12)						
c 13) d 14) a							

Unit 4 Momentum and energy

1.	The rate of change of displacement i	S
	a) Force	b) Velocity
	c) acceleration	d) Momentum
2.	The product of mass and velocity is	called as
	a) displacement	b) velocity
	c) momentum	d) work
3.	The product of mass and acceleration	n is
	a) momentum	b) force
	c) work	d) energy
4.	SI unit of acceleration is	
	a) m/s	b) m/s^2
	c) M·s	d) m \cdot s ²
5.	SI unit of linear momentum is	
	a) kg·m·s	b) kg·m/s
	c) kg/m·s	d) kg m^2/s
6.	Dimensions of linear momentum are	
	a) $[M^1L^1T^1]$	b) $[M^1L^1T^{-1}]$
	c) $[M^1L^{-1}T^{-1}]$	d) $[M^1L^1T^{-2}]$
7.	SI unit of work is identical with SI u	nit of
	a) Force	b) Energy
	c) velocity	d) Displacement
8.	SI unit of work is	
	a) Joule	b) Erq
	c) Newton	d) N. m/s
9.	SI unit of work is	
	a) N. m	b) N. m/s
	c) N/m	d) N. m/s^2
10.	CGS unit of work is	

	c) dyne	d) N/m
11.	SI unit of energy is	
	a) Joule	b) Erq
	c) dyne	d) N/m^2
12.	The ability or capacity to do work is	
	a) Force	b) Power
	c) Energy	d) Momentum
13.	The work done is positive, then K.E	
	a) Increases	b) decreases
	c) Remains constant	d) None of above
14.	When K.E decreases, then the work of	done is
	a) Positive	b) Negative
	c) zero	d) None of above
15.	For zero work, K.E	
	a) Increases	b) Decreases
	c) Remains constant	d) none of above
16.	According to Newton's second law o	of motion, \vec{F} is equat to
	, , ,	$d\vec{P}$
	a) P	b) $\frac{dP}{dt}$
	c) $\frac{d^2 \overrightarrow{P}}{dt^2}$	d) $\overrightarrow{P} \cdot \overrightarrow{V}$
17.	Newton's second can be described by	$y \overrightarrow{F} = \dots$
	a) $m \cdot \overrightarrow{V}$	b) m·a
	c) $m\vec{S}$	d) m
18.	Principle of conservation of linear me	omentum is applicable to
	a) Isolated system	b) Non-isolated system
	c) Any kind of system	d) None of the above.
19.	The recoil velocity of a gun is directly	y promotional to
	a) Velocity of gun	b) Velocity of an operator
	c) position of anoperator	d) none of above

20. If the angle between the direction done will be positive.	of force and direction of motion is, the work
a) $< 90^{\circ}$	$b) > 90^{\circ}$
$c) = 90^{\circ}$	d) 0°
21. The work done is positive, when θ is	S
a) $< 90^{\circ}$	$b) > 90^{\circ}$
c) 90°	d) 0°
22. The work done is negative, when θ is	s
a) $< 90^{\circ}$	$b) > 90^{\circ}$
c) 90°	d) 0°
23. The work done is zero, when θ is	
a) $< 90^{\circ}$	$b) > 90^{\circ}$
c) 90°	d) 0°
24. 1 Joule =	
a) 10^{7} erg	b) 10^{-7} erg
c) 10^{17} erg	d) 10^{-17} erg
25. 1 Kg .m =	
a) 9.8 J	b) 98 J
c) 980 J	d) 980 cm/s^2
26. 1.9 cm =	
a) 9.8 erg	b) 98 erg
c) 980 erg	d) 9.8 J
27. The relation between K.E (E) and lin	near momentum (P) is
a) $P = \sqrt{2mE}$	b) $P = 2 \text{ mE}$
$c) P = (2mE)^2$	d) none of above
28. Gravitational P.E on earth's surface	is
a) Maximum	b) Minimum
c) Zero	d) none of above
29. The potential energy is directly prop	portional to
a) Height of a man	b) Height above the earth surface

	c) He	eignt be	low ear	tn's sur	тасе	a) no	d) none of above						
	30. K.E i	is direct	tly prop	ortiona	l to								
	a) Ve	elocity				b) (V	b) (Velocity) ²						
	c) (V	/elocity	$(7)^{1/2}$			d) N	one of a	bove.					
					red from		a gun of mass 2 kg with recoil velocity of 5 m/s, then						
	a) 50	0 m/s				b) 10	b) 1000 m/s						
	c) 15	00 m/s				d) 20	000 m/s						
	32. A ma	an tries	to push	the wa	ll and fa	ils to d	isplace i	t, the h	e perfor	medwork.			
	a) Po	sitive				b) N	egative						
	c) ze	ro				d) N	one of a	bove					
	33. Mutu	ıal ener	gy is no	thing b	ut								
	a) K.	E				b) P.	E						
	c) K.	E + P.E	E			d) K	.E – P.E	E					
An	swers												
	1.	b)	2.	c)	3.	b)	4.	b)	5.	b)			
	6.	b)	7.	b)	8.	a)	9.	a)	10.	b)			
	11.	a)	12.	c)	13.	a)	14.	b)	15.	c)			
	16.	b)	17.	b)	18.	a)	19.	a)	20.	a)			
	21.	a)	22.	b)	23.	c)	24.	a)	25.	a)			
	26.	c)	27.	a)	28.	c)	29.	b)	30.	b)			
	31.	d)	32.	c)	33.	b)							
Un	it 4 Mom	entum	and en	ergy									
1)	The pro	duct of	mass ar	nd velo	city is ca	alled as							
	a) Force b) Work				C	c) Energy) Momentum				
2)	SI units	of line	ar mom	entum i	is								
	a) Kg m	S	1	b) Kg n	n/s	C	e) Kg m	$^{\square 1}/_{\mathrm{S}}$	d) Kg m ² /s			
3)	Dimens	ion of l	inear m	omentu	ım								
	a) [M ¹ L	$^{1}T^{1}$]	1	b) [ML	$\mathbf{T}^{\square 1}$]	C	(M^1L^1)	$^{1}T^{\square 1}$]	d) $[ML^1T^{-2}]$			
4)	SI unit of Energy is												

	a) Erg	b) dyne	c) Joule	d) Newton			
5)	The capacity or ability	y to do work is called	I				
	a) Frequency	b) Energy	c) Power	d) Period			
6)	When K.E increases t	the work done is					
	a) Zero	b) Negative	c) Positive	d) none of them			
7)	When K.E. decreases	the work done is					
	a) Positive	b) Zero	c) Negative	d) None			
8)	A bullet of mass 10 g	gm is fired from a gur	n of mass 1 kg with red	coil velocity of 5 m/s then			
the							
	muzzle velocity of bu	ıllet is					
	a) 30 km/min	b) 60 km/min	c) 30m/s	d) 500 m/s			
9)	A man pushes a wall	and fails to displace it	t, he does				
	a) negative work		b) no work at all				
	c) positive work but r	not maximum	d) maximum positive	work			
10)	A work performed on	the object does not d	epend upon				
	a) force applied		b) angle at which force is inclined				
	c) initial velocity of the	he object	d) displacement				

Answers

1) d, 2) b, 3) b, 4) c, 5) b, 6) c, 7) c, 8) d, 9) b, 10) c

Unit 5 Rotational Motion

Multiple Choice Questions:

1)) Dimensions of angular displacement are					
	a) [MLT]	b) $[M^0L^0T^0]$				
	c) $[M^1LT^{-1}]$	d) $[M^2LT]$				
2)	Unit of angular displacement is					
	a) Degree	b) Degree/s				
	c) radian	d) Rad/s				
3)	Dimensions of angular velocity are					
	a) [MLT]	b) $[M^0L^0T^{-1}]$				
	c) $[M^1LT^{-1}]$	d) $[M^2LT]$				
4)	Unit of angular velocity is					
	a) Degree	b) Degree/s				
	c) radian	d) rad/s				
5)	Dimensions of Angular momentum a	are				
	a) $[ML^2T]$	b) $[M^0L^0T^{-1}]$				
	c) $[M^1L^2T^{-1}]$	d) $[M^2LT]$				
6)	S I Unit of angular momentum is	-				
	a) Kg/s	b) kgm/s				
	c) kgm ² s ⁻¹	d) erg/s				
7) CGS Unit of angular momentum is						
	a) Kg/s	b) kgm/s				
	c) Nm/s	d) gcm ² /s				
8) I	Dimension of torque is					

a) $[ML^2T]$	b) $[ML^2T^{-2}]$
c) $[M^1L^2T^{-1}]$	d) $[M^2LT]$
9) S I Unit of torque is	
a) Kg/s	b) dynecm/s
c) Nm	d) gcm ² /s
10) CGS unit of torque is	
a) Nm/s	b) kg/s
c) dyne cm	d) gcm ² /s
11) The moment of momentum is called	<u> </u>
a) force	b) lever arm
c) angular acceleration	d) impulse
12) Torque produces	
a) Linear motion	b) rotational motion
c) both a & b	d) None of above
13) Which of the following has unit Jou	le-sec?
a) Moment of Inertia	b) torque
c) angular momentum	d) power
14) A couple produces	
a) pure linear motion	b) translational motion
c) pure rotational motion	d) no motion
15) In an orbital motion, the angular m	omentum vector is
a) in orbital plane	b) parallel to linear momentum
c) along the radius vector	d) perpendicular to orbital plane

16) An earth satellite is moving arou	nd the earth in circular orbit, in such a case what
is conserved ?	
a) Velocity	b) linear momentum
c) angular momentum	d) none of above
17) A steel bob of mass m is tied to a	string of length l is rotating in a circular path with
constant speed v. The toque on the	e bob is
a) mvl	b) zero
c) mv^2l	d) mv/l
18) In rotary motion, the linear veloci	ties of all particles of the body are
a) same	b) different
c) zero	d) cannot say
19) A mass is moving with constant v	velocity along the line parallel to the axis away
from the origin. Its angular mome	entum w.r.t to the origin is
a) zero	b) constant
c) goes on increasing	d) goes on decreasing
20) Two particles having mass (M) a	nd m are moving in a circular path having radius (R)
and (r). If their time periods are	e same, then the ratio of angular velocities will be
a) r/R	b) R/r
c) 1	d) $\sqrt{R/r}$
21) When a torque on a system is z	ero, which of the following will be constant
a) force	b) linear momentum
c) linear impulse	d) none of these
22) Angular momentum of the bod	y is defined as the product of
a) mass and angular velocity	b) centripetal force and radius
c) linear velocity and angular ve	elocity d) Moment of Inertia and angular velocity
23) On applying a constant torque of	on a body

	a) linear velocity increases						b) angular velocity increase				
	c) it will rotate with constant velocit						y d) it will move with constant velocity				
	24) If wh	eels o	of two veh	icles a	are made	thicke	er at the a	axel an	d thinne	r at the rim,	the
	momer	nt of t	Force to ro	tate it	will						
	,	crease					e zero				
	c) deci			• . •		,	ot chang				C .1
			II rotating s conserve		an angul	ar spec	ed of ω .	if a chi	ild sits of	n it, which o	of the
	a) Kinetic energyc) Linear momentum					b) Potential energyd) Angular momentum					
Ans	swers: 1)	b,	2)	c,	3)	b,	4)	d,	5)	c,	
	6)	c,	7)	d,	8)	b,	9)	c,	10)	c,	
	11)	b.	12)	b,	13)	c,	14)	b,	15)	d,	
	16)	c,	17)	b,	18)	b,	19)	b,	20)	c,	
	21)	d,	22)	d,	23)	b,	24)	c,	25)	d	
Uni	t 5 Rotati	onal	Motion								
1)	Dimensio	on of	torque								
	a) [MLT]		b)	$[M^1L$	⁻¹ T]	c)	$[ML^2T^-]$	2]		$d) [M^1L^1]$	
2)	SI Unit o	f torc	ue is			-					
	a) Joule n	neter	b)	dyne	cm	c)	Nm			d) none of	them
3)			Angular N								
	a) [ML ² T				² T ⁻¹]			0]		d) [ML ³ T ⁻²]
4)			ngular M								,
~ \	a) Kgm ² /s			gcm ² /		,	nm/s			d) erg dyne	/sec
5)			ular Mon							d) V ~~2/a	
6)	a) erg dyr		ŕ	gcm ² /		C)	nm/s			d) Kgm ² /s	
<i>0)</i>	a) dyne cm				meter	c)	dyne cn	n		d) Nm	

7) The moment of inerti	a of body does not depend on						
a) mass of the body body) position of axis of rotation c) velocity of the body d) shape of the						
8) The moment of momentum is called as							
a) couple b) torque c) impulse d) angular momentum							
Answers:							
1) C 2) c 3) a 4)	b 5) d 6) a 7) c 8) d						

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