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**Physics - I**

**m<uq jdr mßlaIKh - 2019**

**First Term Examination- - 2019**

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13 fY%aKsh

GRADE 13

meh 02

02 hours

**MCQ Paper**

**g = 10 N kg -1**

**Answer all questions.**

01. The Vander Waal’s equation of state for some gases can be expressed as,

(v - b) = RT

Where P is the pressure of gas, V is the volume of the gas, R is the universal gas constant and T is the

absolute temperature. The dimensions of constants *a* and b are.

i. M L5 T-2 , L6  ii. M L-1 T-2 , L3 iii. M L5 T-2 , L3

iv. M L-5 T-2 , L6 v. Dimensionless

02. Which of the following properties of light could not be demonstrated by sound travelling in air?

i. Reflection ii. Refractioniii. Diffraction

iv. Polarizationv. All the above properties

03. A laboratory cart with mass of m and velocity v runs headlong in to a stationary spring bumper and

compress the spring. If the spring constant of the spring is k, the maximum compression of spring is, the

maximum compression of spring is,

i. ii. iii. iv. mv v.

04. A police car with siren of frequency 8 kHz is moving with a uniform velocity of 36 kmh-1 towards tall

building. If the speed of sound in air is 320 ms-1, the frequency of the siren heard by the car driver is,

i. 9.50 kHz ii. 8.50 kHziii. 7.75 kHz iv. 6.37 kHz v. 5.25 kHz

05. A mixture of two moles of helium gas (atomic mass = 4 amu) and one mole of argon gas (atomic mass

= 40 amu) is kept at 27oc in a container. The ratio of root mean speeds (r.m.s.)

i. 0.32 ii. 0.45iii. 2.24 iv. 3.16 v. 4.05

06. Two wheel with fixed hubs, each having a mass of 1kg, start from rest and forces are applied as shown

in the figure. Assume the hubs and spokes are with negligible mass. In order to impact identical angular

accelerations about their respective hubs, the value of F2 should,

R = 1 m

F2

F1

R = 0.5 m

i. 0.25 N ii. 0.50 Niii. 1.00 N iv. 2.00 N v. 4.00 N

07. 100 g of water is hearted from 30oc to 50oc. Ignoring the slight expansion of water, the change in its

internal energy is, (specific heat capacity of water = 4200 Jkg-1 k-1)

i. 2.1 kJ ii. 4.2 kJiii. 5.6 kJ iv. 7.2 kJ v. 8.4 kJ

08. Water flowing continuously from a tap having an internal diameter 8x10-3 m. The velocity of water as it

leaves the tap is 0.4 ms-1. The diameter of the water stream at a distance 0.2 m below tap is,

i. 3.54 mm ii. 5.00 mm iii. 7.55 mm iv. 9.60 mm v. 10.25 mm

09. A prism of refracting angle 30o is coated with a film of transparent material of refractive index 2.2 on

AC face of the prism. A light ray is incident on face AB such that the angle of incidence is 60o. If the

refractive index of material of prism is , the angle of emergence of ray is,

60o

i. 0o

ii. 30o

iii. 45o

iv. 60o

v. 90o

10. A shell explodes and many pieces fly off in different directions. If air resistance is ignored,

A – Kinetic energy of the system is conserved.

B – Momentum of the system is conserved.

C – Total energy of the system is conserved.

Of above statements,

i. Only (A) is true  ii. Only (B) is true iii. Both (A) and (B) are true

iv. Both (B) and (C) are true v. All (A) , (B) and (C) are true

11. A cricket ball of mass 0.15 kg travels with a speed of 20 ms-1 just before batted by a batsman. When he

batted, the variation of the force (F) exerted by the bat on the ball with time (t) is shown in the graph. If

the ball bounces back in the opposite direction the speed of the cricket ball just after batting is,

13500

13500

t(s)

F (N)

i. 20 ms-1

ii. 25 ms-1

iii. 65 ms-1

iv. 70 ms-1

v. 110 ms-1

12. Heat flowing through two cylindrical rods of the same material. The diameters of rods are in ratio 1 : 2

and their lengths in ratio 2 : 1. If the temperature difference between their two ends are the same, then

the ratio of the amount of heat conducted through per unit time will be,

i. 8 : 1  ii. 16 : 3 iii. 1 : 8 iv. 2 : 3v. 3 : 4

13. An object is dropped from a height equal to the radius of earth. Mass of the is man a radius is R. The

velocity of the object on reaching the surface of earth will be, (G – Gravitational Constant)

i. ii. iii. iv. v.

14. A horizontal force of 10 N necessary to just hold a block stationary against a wall. The coefficient of the

friction between the block and the wall is 0.2. The weight of the block is,

10N

i. 2 N

ii. 20 N

iii. 50 N

iv. 100 N

v. 180 N

15. Which of the following graph shows the variation of kinetic energy (KE) of a molecule of an ideal gas

with Celsius (oC) temperature () is best represented by,

KE

(oC)

KE

(oC)

KE

(oC)

i. ii. iii.

KE

(oC)

KE

(oC)

iv. v.

16. Two thin lenses in contact focus a parallel beam of light to a point 10cm away from the combination.

The lens combination will consists of,

i. A convex lens of focal length 10cm and a concave lens of focal length 10cm.

ii. A convex lens of focal length 10cm and concave lens of focal length 20cm.

iii. A convex lens of focal length 20cm and concave lens of focal length 10cm.

iv. Two concave lenses of focal length 20cm each.

v. Two convex lenses of focal length 20cm each.

17. The moment of inertia of a ring of mass M made of a uniform thin wire about an axis through the point

A (figure I) perpendicular to the plane of the ring is 2MR2. When the ring is bent to a S shape as shown

in figure II, the moment of inertia about the same axis is,

A

R

A

R

R

i. 0  ii. MR2 iii. MR2 iv. MR2 v. 2 MR2

18. Two vibrating strings under the same tension would beats is,

**A** - The wavelength of their sounds differ only slights.

**B** - Their lengths differ slightly but linear densities are the same.

**C** - Their linear densities differ slightly but lengths are same.

Of the above statements,

i. Only (A) and (B) are true ii. Only (B) and (C) are true

iii. Only (A) and (C) are true iv. All (A), (B) and (C) are true

v. All (A), (B) and (C) are false.

19. A ball of mass 0.5 kg is attached to the end of a string having length of 0.5m. The ball is rotated on a

horizontal circular path about vertical axis. The maximum tension of the string can bear is 324 N. The

maximum possible angular velocity of the ball in rad S-1 is,

i. 9

ii. 18

iii. 27

iv. 30

v. 36

20. Two identical copper calorimeters of specific heat capacity 400 J kg-1 K-1 of mass 100g, each contain

60g of water and 140 g of another liquid respectively. Under similar conditions, both calorimeters are

found to take 40 minutes to cool from 67oC to 27oC. The specific heat capacity of liquid is, (Specific

heat capacity of water = 4200 Jkg-1 K-1)

i. 600 J kg-1 K-1  ii. 1200 J kg-1 K-1 iii. 1800 J kg-1 K-1

iv. 2400 J kg-1 K-1 v. 3000 J kg-1 K-1

21. Two symmetric, identical pulses of opposite amplitude travel along a stretched string in opposite

directions as shown in the figure below.

*x*

*x*

Consider following statements,

A - There is an instant when string

B - When the two pulses interfere completely, the energy of the wave is zero

C - There is a point on the string that does not move up or down

Of the above statements,

i. Only (A) is true ii. Only (B) is true iii. Only (A) and (B) are true

iv. Only (A) and (C) are true iv. All (A), (B) and (C) are true.

22. Two uniform brass rods of lengths and 12 and radius 2r and r respectively are at same initial

temperature. When the rods are heated to some final temperature the ratio of

is,

i. 1:1  ii. 1:2 iii. 1:4 iv. 2:1v. 4:1

23. A spaceship is launched into a circular orbit close to the surface of the earth. The velocity should impart

to the space ship in the orbit to overcome gravitational pull is, (Radius of earth is 6400 km)

i. 11.2 kms-1  ii. 8.0 kms-1 iii. 3.2 kms-1 iv. 2.5 kms-1 v. 1.3 kms-1

24. A heavy block of mass M is slowly placed on a conveyor be H moving with speed V. The coefficient of

friction between block and belt is . Through what distance will the block slide on the belt before it start

moving along the belt?

i. ii. iii. iv. v.

25. A volume v of a certain has relative humidity of 100% A dry air (without water vapor) of volume

at same temperature and pressure as above is mixed with air of relative humidity 100% Then if the final

volume is equal to sum of two volumes, the relative humidity of mixture is approximately,

i. 33%  ii. 40% iii. 67% iv. 70%v. 88%

26. A hollow pipe of length 0.8 m closed at one end. At its open end a 0.5 m long uniform string is vibrating.

String vibrates in its second harmonic and it resonates with the fundamental frequency of the pipe. If the

tension of the wire is 50 N and the speed of sound is 320 ms-1, the mass of the string is,

i. 40 g  ii. 20 g iii. 10 g iv. 5 gv. 2 g

27. A gas is expanded from volume vo to 2vo under three different processes. Process A is isobaric process,

B is isothermal process and C is adiabatic process. Let UA , UB and UC be the change in internal

energy of gas in these processes, then,

P

A

B

C

V

Vo

2Vo

i. UA > UB > UC

ii. VA < UB < UC

iii. UB < UA < UC

iv. UB < UC < UA

v. UA > UC > UB

28. As shown in the following figure, a monochromatic ray of light travelling in air is incident perpendicular

to the side a of a equilateral prism with index of refraction 1.5. Which side will the light ray emerge and

what is the angle () between the incident ray and the emerging ray ?

|  |  |
| --- | --- |
| **Emergent side** |  |
| i. b  ii. b  iii. c  iv. c  v. b | 60o  30o  60o  30o  120o |

*a*

b

c

29. A mass M is attached to a horizontal spring executes simple harmonic motion with amplitude A1 When

the mass M passes through equilibrium (mean) position, a smaller mass m is placed over it and both of

them move together with amplitude A2. The ratio is,

i. ii. iii.

iv. v.

30. A particle is projected out time t = 0 from a point into a uniform gravitational field of the earth surface

with an angle with horizontal. The graph of velocity of practical (V) against the time (t) is,

V

t

V

V

t

i. ii. iii.

t

V

t

V

t

iv. v.

31. Two identical cylinders roll from rest on two identical planes of slant lengths S and 2S, but of the same

height h then, the velocities V1 and V2 acquired by the incline are related as,

h

2s

s

i. V1 = 2V2 ii. V1 = V2

iii. 2V1 = V2 iv. V1 =

v. V1 = V2

32. In given thermodynamic process PA = 3104 Pa, VA = 210-3 m3, PB = 8104 Pa and VD = 5 10-3 m3

In AB and BC processes 600 J and 200 J heat is added to the system respectively. What is the change

in internal energy in process AC,

P (Pa)

V (m3)

B

A

C

D

i. 400 J ii. 560 J

iii. 600 J iv. 640 J

v. 800 J

33. Figure shows the variation of difference h, between dry and wet bulb hug rometer reading in time t,inside

the room which is kept at constant temperature.

h

t

Which of the following curves best represent the variation of the relative humidity (RH) inside the room

with t?

RH

t

RH

t

RH

t

i. ii. iii.

RH

t

iv. v.

RH

t

34. A massless platform is kept on a light elastic spring as shown in the figure. When a particle of mass

0.1 kg is dropped on the pan from a height of 0.24 m, the particle strikes the pan and the spring is

compressed by 0.01 m. The height from the particle be dropped to cause a compression of 0.04 m is,

i. 3.96 m

ii. 2.25 m

iii. 1.48 m

iv. 1.35 m

v. 0.30 m

35. The figure shows a transverse wave at a particular instant in time. If the point F is moving downwards

at that time, we can deduce that,

**G**

**F**

**E**

**D**

**C**

**B**

**A**

**H**

1. The wave is travelling towards the right.

2. C will reach the equilibrium position earlier than B.

3. The point H is moving in the same direction as point F.

4. The acceleration at D at this point is the maximum.

5. A is not moving at all.

36. A ball of mass m is moving with a velocity u rebounds from a wall. The collision is assumed to be elastic

and the force of interaction between ball and wall varies as shown in the figure then the value of Fo is,

F

Fo

0.5 T

t

i. ii.

iii. iv.

v.

37. A geostationary satellite is orbiting the earth at height of 6 R above the surface of the earth, R being

radius of earth. What will be the time period of another satellite at a height 2.5 R from the surface of the

earth?

i. 6 hours ii. 6 hours iii. 6 hours

iv. 6 hours v. 6 hours

38. Shown in the diagram is the movement of air layers around a spinning ball. Which of the following

would correctly represent the direction of motion of the ball relative to air, and the direction of rotation

of the ball.

|  |  |
| --- | --- |
| Direction of motion of ball | Direction of rotation of the ball |
|  |  |

(A)

(B)

(C)

(D)

i. A, B and C only ii. A and C only iii. B and D only

iv. A and D only v. D only

39. A volume V of air saturated with water vapour exerts a pressure P. Pressure of saturated vapour is Po. If

volume made isothermally, the final total pressure will be,

i. P ii. 2P + Poiii. 2P - Po iv. 2 (P –Po) v. Po

40. Figure below shows two pulses moving in opposite directions along a string.

1 ms

- 1

What will the pulse look like after 3.25 s? (1 unit = Width of a small square)

41. Consider following situations explained using convection.

A. Hearts used to warm houses during winter season is normally fixed near the floor.

B. An air conditioner normal fixed at the top of the place. (near the roof)

C. Exhaust fans used to remove hot air out of a factory should fixed near the floor.

Of above statements,

i. Only (A) is true. ii. Only (B) is true.

iii. (A) and (C) are true. iv. (A) and (C) are true.

v. All (A), (B) and (C) are true.

42. Earth receives 1400 Wm-2 of solar power. If all the solar energy falling on a lens of area 0.2 m2 is focused

on to a block of ice of mass 280g, the time taken (in minutes) to melt the ice will be (Latent heat of

fusion of ice = 33 105 Jkg-1)

i. 3.5 ii. 5.5iii. 7 - 5 iv. 9.5 v. 11.5

43. A wheel of mass m and a block also of mass m are each given an initial push such that each has the same

initial translational velocity Vo. Suppose the wheel rolls without slipping up the incline and the block

slides up an identical incline without friction which one will make it higher up the incline?

Vo

m

Vo

m

i. The wheel, because it has more kinetic energy, it has the same amount of translational energy as the

block but in addition it has rotational

ii. The block, because all its initial energy is in the form of translation kinetic energy.

iii. The block, because it doesn’t have any frictional force acting on it but the wheel has a force of

static friction acting on it.

iv. The wheel, because it is rolling frictional force is smaller than block.

v. They both reach the same height.

44. A convex lens produces an image of the real object on screen with magnification . When the lens is

moved 30 cm, the magnification of the image on the screen is 2. The focal length is,

i. 60 cm ii. 45 cmiii. 30 cm iv. 20 cm v. 15 cm

45. Two pendulums each of length are initially situated as shown in the figure. The first pendulum is

released and strikes the second. Assume that the collision completely inelastic and neglect the mass of

the string and any frictional effects. How high does the centre of mass rises after the collision?

m1

m2

d

i. d ii. d

iii. d iv. d

v. d

46. A tube leads from a flask in which water is boiling under atmospheric pressure to a calorimeter. The

mass of calorimeter is 150g, its specifics heat capacity is 0.1 calg-1 oc-1 and it originally contains 340 g

of water at 15oC. Steam is allowed to condensed in the calorimeter until its temperature increases to

71oC, after which total mass of calorimeter and contents are found to be 525 g. The latent heat of

condensation of steam is (specific heat capacity of water = 1 cal g-1 oC-1)

i. 325 cal g-1 ii. 380 cal g-1 iii. 417 cal g-1

iv. 492 cal g-1 v. 539 cal g-1

47. The variation of temperature with time when -20oC ice is converted to 110oC steam is best represented

by (Assume that rate heat supplied is constant)

(oC)

t

t 1 > t2

100

0

-20

t1

t2

(oC)

t2 > t1

110

100

0

-20

t1

t2

t

i. ii.

(oC)

t

t 2

t 1

-20

0

100

110

t 1 = t 2

(oC)

110

t 1 = t 2

100

0

- 20

t 1

t 2

t

iii. iv.

(oC)

110

100

0

-20

t 1

t 2

t

t 1  = t 2

v.

48. An artificial satellite is moving in a circular orbit around the earth of radius R. Height of the satellite

above the surface of the earth R. Suppose the satellite is stopped in its orbit and allowed to fall freely.

On reaching earth its speed will be,

i. ii. 2 iii. 3 iv. 4 v. 5

49. An object is performing simple harmonic motion with amplituted A and time period T. Variation of its

acceleration (a) with time (t) is shown as below.

O

T

t

Which one of the following graphs show the variation (v) with time (t) ?

V

O

T

t

V

O

T

t

i. ii.

V

O

t

V

O

T

t

iii. iv.

v.

T

t

50. Two immiscible liquids of density d1 and d2 are contained in a container. Four small spheres A, B, C

and D of densities dA, dB, dC and dD are released from the bottom of the container. If dA < d1 < dB < dC

< dD , the correct positions of spheres are given by,

d1

d2

d1

d2

d1

d2

i. ii. iii.

d1

d2

iv. v.

d1

d2