***JINJA JOINT EXAMINATIONS BOARD***

***MOCK EXAMS 2019***

***535/2***

***PHYSICS PAPER TWO***

***MARKING GUIDE.***

Q1 a i) A machine is a device by means of which a force applied at one point is used to overcome another force at another point. (Accept a device which simplifies work) (1mark)

ii) Efficiency of a machine is the ratio of power output to power input expressed as a percentage. Accept ratio of mechanical advantage to velocity ratio expressed as a percentage) (1mark)

b i) or

EE

LL

ii) VR = de/dL → 3 = 2.4/dL → dL = 0.8 m.

iii) MA = L/E → 2.4 = 960/E → E = 400 N.

c i) let 1cm represent 2 cm,

2cmI (4 marks)

ii) Real, inverted, magnified. (1 mark)

iii) Magnification, m = hI/ho = v/u = 3.5cm / 2.5cm =1.4 (1 mark)

iv) When the hole is made larger, too much light enters the camera and many images are formed. The images merge and the final image becomes blurred. (2marks)

Q2 a) i) moment of a force is the product of the force and its perpendicular distance from the turning point. (1 mark)

ii) G Gd1 P d2

* Meter rule knife edge
* Balance the meter rule on a knife edge,
* Note the balance point G,
* Tie the known mass m near one end of the meter rule,
* Balance the meter rule again on the knife edge,
* Note the new balance point P of the meter rule,
* Record the distances d1 and d2 of P from G and m from P respectively,
* Then if M is the mass of the meter rule, then Mgd1 = mgd2

From which M = md2/d1 (6marks)

b) R1 50cm R2

A 500N 50N B

Total force down wards = total force upwards

50+500 = R1 + R2 …………..(i)

Taking moments at A,

50 x 100 + 500 x 50 = R2 x 200 ………….(ii)

From (ii) R2 = 150N

Sub in (i) 550 = 150 + R1

From which R1 = 400N.( 5 marks)

c) i) Unstable equilibrium is when an object is slightly displaced, it topples. When it is displaced, the center of gravity is lowered. (2 marks) ii) stability of a body can be increased by increasing the base area and lowering the center of gravity.( 2marks)

Q3 a) Equation of state of a gas is the expression which shows the relationship between, pressure, volume and absolute temperature of a fixed mass of the gas. ( 1mark)

b) i)

volume

-273 0 temperature (0 C)

from the graph above, absolute zero of temperature is the temperature at which the volume of the gas is zero. (2 marks)

(ii) V1 = 2500cm3 V2 = ?

P1 = 730mmHg P2 = 760mmHg

T1 = 273+67 = 340 K T2 = 273 K

From P1V1/T1 = P2V2/T2

(2500 x 730)/340 = (V2 x 760)/273

From which V2 = (2500 x 730 x 340)/ (760 x 273) = 2991 cm3

3 c stirrer

Conc. H2SO4 thermometer

Air column water

Capillary tube glass beaker

Rubber band

heat

The water is stirred and its temperature is recorded. Air is trapped in a capillary tube which is attached to a mm scale. The length of the air column is recorded. It is then placed in the water bath. Heat is supplied to the bath. Lengths are recorded for higher temperatures.

A graph of length of the air column against temperature is plotted.

The graph is a straight line showing volume increases with temperature linear. (6marks)

d) from Q = mcƟ, m1c1Ɵ1 = m2 c2Ɵ2

from which c1/c2= (m2 Ɵ2)/(m1Ɵ1) = (12x2)/(5x3) = 8/5

or c1: c2 = 8 : 5 (3 marks)

Q4 a) i) An echo is reflected sound.( 1 mark)

ii) the waves must be travelling with same speed, same frequency and same wavelength, traveling through the same medium cross each other. (2marks)

b) - length of string, - tension of the string, - mass per unit length of string (3marks)

c) vibrating tuning fork

resonance tube water

tap

reserve tank

-Fill the resonance tube with water when the tap is closed,

- set the tuning fork of known frequency f, to vibrate and bring it close to the mouth of the tube,

- open the tap so that the water runs out slowly. At some stage a loud sound is heard. Close the tap and measure the length l1, of the air column. This is the first resonance and it occurs when 1 +c ……….i

- open the tap again. Another loud sound will be heard. Close the tap and measure the new length l2 . This is the second resonance and it occurs when 2 +c ………..ii

Then ii - i , = l2 - l1 →𝛌 = 2 (l2- l1)

From v = f 𝛌, v = 2f(l2 – l2). (5 marks)

d)

d1cm

d2 cm

From v = d/t, v = 2d1/t1→ d1 = vt1/2 = (330 x 4.0)/2 = 660m

Also v = 2d2/ t2 → d2 = vt2/2 = (330 x6.0)/2 = 990m

Hence distance between the cliffs = 990 - 660 = 330 m (5 marks)

Q5 a) The joule is the work done when a force of 1 newton moves its point of application through a distance of one meter in its direction. (1mark)

b) i) linear momentum of an object is the product of its mass and its velocity. (1 mark)

ii) the law of conservation of linear momentum states that if no external act on a system of colliding bodies, total momentum before collision is equal to total momentum after collision (1 mark)

c) i)Let velocity of bullet be v, then momentum of bullet before collision =(20/1000) x v

After collision, total mass =400 +20 = 420 g = (420/1000)kg

And momentum after collision (420/1000)x20

By the law of conservation of linear momentum, (20/1000) x v = (420/1000) x 20

V = 420ms (4 marks)

ii) kinetic energy of bullet before collision = mv2/2 = 20 x (420)2/(2 x 1000) = 1764 J

kinetic energy of block with bullet = 420 x (20)2/(2 x 1000) = 84 J

loss in KE = 1764 - 84 = 1680 J (6 marks)

d) kinetic energy of bullet → kinetic energy of wood + heat energy + sound ( 3 marks)

Q 6 a) A B

HX Y

DH – Heater

C G A1A2 X2Y2C – Cathode

G – Grid

A – Electron Gun A1, A2 – anodes

B – Deflecting system X1, X2 ; Y1, Y2 metal plates

D - Display system D- fluorescent screen

( 5 marks)

6 b) i) - A hot filament heats the cathode which emits electrons that are accelerated as cathode rays by the anodes.

* When the cathode rays reach the deflecting system, the X plates deflect the electron beam horizontally and the Y plates deflect the electron beam vertically.
* When the electron beam strikes the fluorescent screen, a bright light is produced. (4 marks)

ii) When the electron beam strikes the screen , the kinetic energy of the electrons is converted into light and the beam is rendered visible. (2 marks)

c) i)

Bright spot at centre.

c) ii)

Horizontal line across the screen

ciii)

vertical line

6 d) - for measuring potential difference,

* For displaying wave forms,
* For detecting phase differences,
* For measuring frequency of the wave. ( 3 marks)

Q7 a) E, r E,r

V A

R V

The emf E of the cell is first measured on open circuit. Then the pd V across the terminals of the cell is measured when the cell is driving current I through a standard resistor R. Then if r is the internal resistance of the cell, from which (4 marks)

b) i) R1 and R3 are in parallel, there effective resistance = = 2.4Ω

R and R3 are in series,

Total resistance of the circuit = R3 + R = 2.4 + 2.6 = 5 Ω (3 marks)

ii) current I through R3 = = 2A

then H = I2 R = 22 x 2.6 = 10.4 J (3 marks)

c)i) –eddy currents which can be minimized by laminating the core.

-hysteresis loss which can be minimized by using a core of low hysteresis loss.

- flux leakage which is minimized by winding the coils such that there are no air gaps,

- ohmic loss which is minimized by using thick copper wires. (3 marks)

d) From P = I V, P = Power, I = current and V = pd.

If R is total resistance of the cables, power converted into unwanted energy = I2 R. This loss is minimized when I is as low as possible. Then V must be as high as possible. Hence power loss is minimized when I is low and V very high. (3 marks)

Q8 a) i) A region around a magnet where a magnetic force is experienced (1 mark)

ii) Like pole repel, unlike pole attract. (1mark)

b)

N path

Steel bar

The steel bar is stroked from end to end repeatedly with one pole of a bar magnet. At the end of the bar, the magnet is lifted off high to come and repeat the stroking from starting point along the path shown by the arrows. The domains in the bar are attracted to face same direction hence magnetized.(4marks)

abcd- rectangular coil

8c N b c S N-S permanent pole pieces

A dB1, B2 spring loaded carbon brushes

L load

S1 B1

S2 B2 L

When the coil is rotated in a clockwise direction, side ab moves upwards while cd moves downwards. The sidesab and cd cut magnetic field lines between the N- and S- poles. As a result an emf is induced in the coil. Current flows from ato b and from c to d. When the coil reaches the vertical position, no emfis induced instantaneously, but due to momentum, the coil moves on, the sides interchange directions of movement. The direction of the current reverses. The current produced is alternating and can be picked up from the slip rings using carbon brushes. (6 marks)