CHUMEY HIGHER SECONDARY SCHOOL.
BUMTHANG
Trail Examination 2022

Subject: Physics. **Time: 2Hrs**
Class: X **Full Mark: 100**
Index Code……..

Directions

- ✓ The first 15 minutes of the examination are for reading the QA papers only. You must not start writing during this time.
- ✓ This paper has two sections A and B.
- ✓ Section A contains objective questions and all questions are compulsory.
- ✓ Section B contains extended response questions, wherein you have to answer **ALL** the questions.
- ✓ The intended marks for questions are given in brackets ( ).

SECTION A [40 MARKS]
ANSWER ALL QUESTIONS

Question 1

a) **Directions: For each question, there are four alternatives A, B, C and D. Choose the correct alternative and circle with PEN.** **[25]**

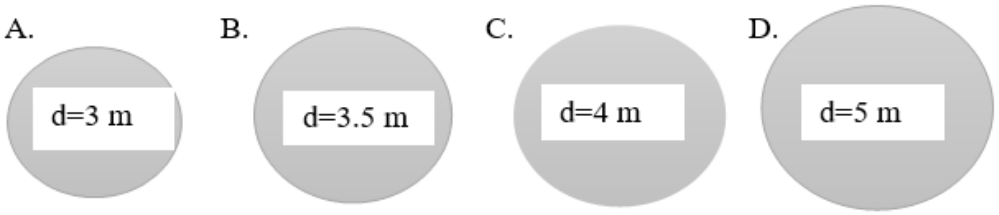
i. Center of gravity of a rectangle will be at its:
   A. Centre.
   B. At its periphery.
   C. At the corners.
   D. Intersection of its diagonal.

ii. What is the number of neutrons in this radioactive Plutonium element represented as $^{244}_{94}Pu$
   A. 94
   B. 188
   C. 150
   D. 244

iii. If the distance between the two bodies is doubled, then the force of gravity between them will
   A. increase by 2 times.
   B. decrease by 2 times.
   C. increase by 4 times.
   D. decrease by 4 time.

iv. A 50 kg bear climbed on the tree branch 10 meters above the ground. If the bear descends to 5 meters above the ground, its potential energy will be decreased by
   A. 4900 J
   B. 2450 J
   C. 2540 J
   D. 2500 J

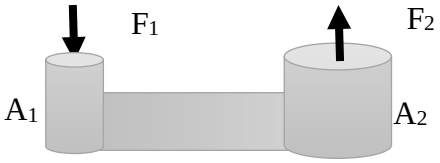
v. The same force is applied to four different circles with different diameters given below. Which circle will exert maximum pressure?



vi. Which one is TRUE about given hydraulic system?

I. $F_1 > F_2$
II. $F_2 > F_1$
III. $A_2 > A_1$
IV. $A_1 > A_2$

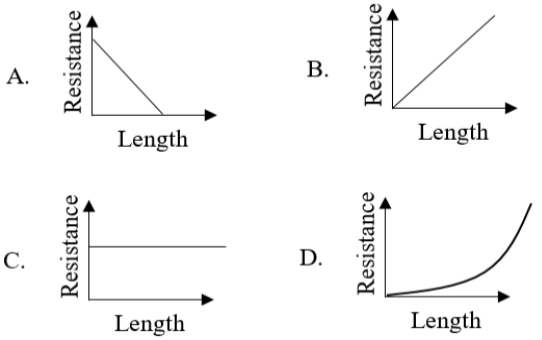
A. I and II
B. III and IV
C. II and III
D. IV and I



vii. In winter, it is terribly cold to be at high altitude places such as Lunana and Lingzhi. When we feel cold,

A. heat flow from surrounding to our body.
B. heat flow from our body to surrounding.
C. heat flows in both the directions.
D. there is no flow of heat.

viii. At a constant temperature, for a copper wire of uniform cross-sectional area, the relationship between the resistance and its length can be best represented by the graph



ix. Sangay applies a force of 5N on handle that is about 0.5 m away from window hinge. The moment of force will be

A. 4.5 Nm
B. 5.5 Nm
C. 7.5 Nm
D. 10 Nm

x. Ap Bokto uses an electric iron press to iron his gho. The resistance coil used in the iron has

A. high resistance and low melting point.
B. low resistance and low melting point.
C. low resistance and high melting point.

D. high resistance and high melting point.

xi. A sport person applies sun safe cream while playing in the sun. This is done to protect himself from the harmful effects of
A. radio waves.
B. microwaves.
C. infrared radiation.
D. ultraviolet radiation.

xii. Khenrab is a studying in a boarding school in Ura. He wants to call his parents in the USA using warden's mobile phone since he is in need of some money to buy stationaries for annual exam. Which of the following electromagnetic wave is used in mobile phones to transfer information?
A. Radio waves.
B. Microwaves.
C. Infrared radiation.
D. Gamma rays.

xiii. The nuclide notation for a generic element is represented by ${}^{A}_{Z}X$. Which of the following is the correct label of each term used?

	X	A	Z
A	element	Nucleon number	Proton number
B	Electron number	element	Nucleon number
C	element	Nucleon number	Electron number
D	Neutron number	element	Proton number

xiv. In a car lift, compressed air exerts a force F_1 on a small piston having a radius of 5 cm. This pressure is transmitted to the second piston of a radius of 15 cm. If the mass of the car to be lifted is 1350 kg. How much would be is F_1?
A. 14.7×10^3 N
B. 2.47×10^3 N
C. 1.47×10^3 N
D. 24.7×10^3 N

xv. A sky driver uses a parachute. When does the parachute reach terminal velocity?

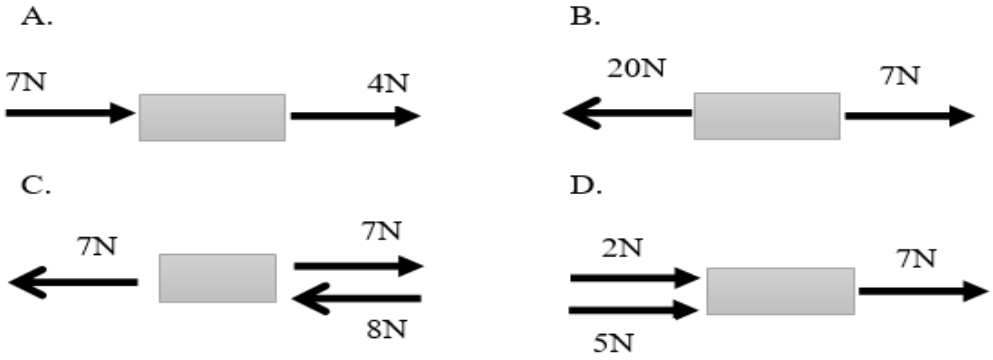
A. When the resultant force is negative.
B. When the resultant force is positive.
C. When the resultant force is zero.
D. When the body starts falling.

xvi. The velocity of ball at highest point when it is thrown vertically upward is
A. $-10\ ms^{-2}$
B. $10\ ms^{-2}$
C. maximum.
D. zero.

xvii. After the generation of electricity at a power station, electrical voltage is increased significantly for transportation across the country via the national grid. What is the advantage of transmitting electricity at very high voltages?
A. It makes the electricity flow more quickly.
B. It increases the efficiency of the electricity transfer.
C. It produces more power.
D. It is safer to transmit electricity at high voltage.

xviii. Pema uses 1100W microwave oven to heat the food at 220V. The voltage offered by the microwave oven is
A. 5 Ω
B. 20 Ω
C. 44 Ω
D. 220 Ω

xix. The following forces act on a block. Which one will have the greatest resultant force?



xx. Hydraulic machines are used in excavators because they
A. multiply work.
B. are user friendly.
C. are easy to use.
D. acts as force multiplier.

xxi. The correct increasing order of wavelength of visible light is
A. green → indigo → red → violet
B. violet → Green → Indigo → red
C. red → Indigo → green → violet
D. violet → Indigo → green → red

xxii. A rover is a space exploration device designed to
A. stay on the orbit of earth to observe the universe
B. fly around the unknown planet to collect information
C. move on the solid surface of the planet to collect information
D. explore the existence of varieties of life in the sea of the unknown planet

xxiii. A light wave of frequency ranging between $3x10^{13}$ Hz to $3x10^{14}$ Hz is used in television remote. The wave used is
A. X-rays
B. Gama rays
C. Ultraviolet rays
D. Infrared rays

xxiv. At equal area of base of support, which state of equilibrium is reached by a body when its centre of gravity is at its lowest position?
A. Stable equilibrium.
B. Neutral equilibrium.
C. Unstable equilibrium.
D. None of the above.

xxv. Dawa pushes a block with the force of 50N while Pema pulls the same block with the force of 70N as shown in the figure. Calculate the net force experienced by the block.

A. 120N in the direction of their force applied.
B. 120N in the opposite direction of their force applied.
C. 20N in the direction of their force applied.
D. 20N in the opposite direction of their force applied.

b) Fill in the blanks by writing suitable words. **[5]**

i. The catastrophic explosion caused when the stars collapse under their own gravity is called ……

ii. The waves of ……wavelengths cause greater harm when our body is exposed to it.

iii. Copper is chosen to construct a calorimeter as it has low ……. so that it takes only negligible heat from the system.

iv. The one who does a large amount of work in a short time is said to possess ……amount of power.

v. Kuzu FM uses a wave of frequency 88 to 105 Megahertz to broadcast its radio program. They modify their signal to match that of the carrier wave using …… modulation.

c) Write whether the following statement is TRUE or FALSE **[5]**

i. Stability of a body will increase if we reduce the position of center of gravity and area of base of support. ……..

ii. It is always easier to open the door from the farthest distance from the hinges. The moment of force will increase by two times if we double the distance of the point of application of force. ……..

iii. When two bodies are at thermal equilibrium, there will be no flow of heat between them. …….

iv. In a step-up transformer, the primary coil is made thicker compared to the secondary coil. …….

v. Radioactivity has a wide range of applications. However, they are also hazardous if not handled carefully. Alpha radiation is the most harmful form of radiation. …….

d) Match each item under Column A with the item in Column B. Rewrite the correct pairs by writing the alphabet against the number in the space provide. [5]

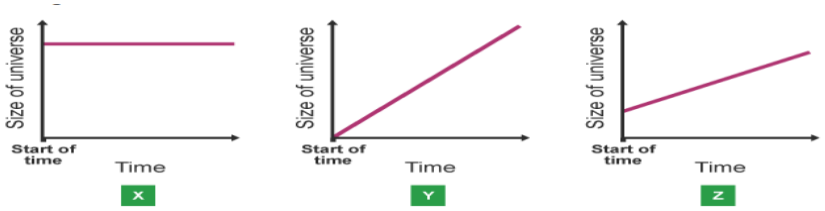
Column A	Column B	Answer
1. The Perseverance rover	a) Low ionizing power	1 =
2. Coolant in motor car's radiator	b) NASA's missions to look for signs of past water activity on Mars.	2 =
3. Nuclear energy	c) Short range communication	3 =
4. Radio waves	d) NASA's mission to hunt directly for these "bio-signatures".	4 =
5. α-particles	e) High specific heat capacity of water.	5 =
	f) Refraction and diffraction.	
	g) Radioactive wastes.	
	h) High ionizing power.	

SECTION B [60 Marks]
ATTEMPT ANY SIX QUESTIONS

Question 2

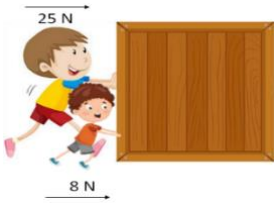
a) Calculate the gravitational force if two masses are 30 kg and 50 kg separated by a distance 4m. [Take G = 6.67259 x 10–11 N m^2/kg^2]. **[2]**

b) The 'Big Bang' theory is one theory explaining the origin of the Universe. The graphs X, Y and Z show how the size of the Universe may have changed with time. **[2]**



Which graph would the 'Big Bang' theory suggest is correct? Justify your choice.

c) Two students are planning for a new sitting arrangement in the physics laboratory. In doing so, they exert a force of 25 N and 8 N respectively to the same cupboard on a frictionless floor as shown below. If the cupboard is displaced by 7 m, what is the work done? **[2]**



d) School caretaker who is a regular listener to Kuzoo FM radio programmes experienced signal issues recently. He complained and engineers at the studio tried amplifying the signal. Engineers observed that each time the signal was amplified, the unwanted noise was also getting amplified, weakening the original radio broadcast. **[2]**

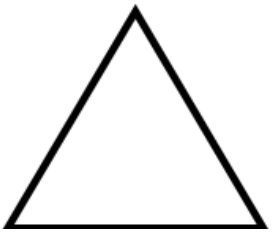
i. What kind of radio signal school caretaker is listening to?

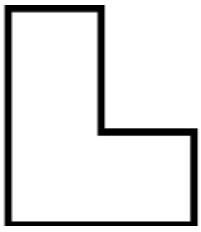
ii. Why is the signal in the radio not very clear?

e) State the law of universal gravitation. **[2]**

Question 3

a) Locate centre of gravity for the given diagram. **[2]**

a. 

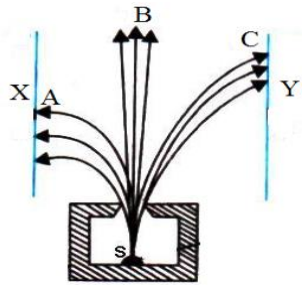
b. 

b) If you stand on loose sand, your feet go deep into the sand. However, if you lie down on the sand, you will be surprised to notice that your body will not go that deep in the sand. In both cases the force exerted on the sand is the weight of your body. Then, why do you think this kind of situation is happening? **[2]**

c) What quantity of heat is required to raise the temperature of 450 grams of water from 15°C to 85°C? The specific heat capacity of water is 4.2 J/g/°C. **[2]**

d) Study the diagram and answer the following: **[2]**

i. Name the radiations A, B and C



ii. Name the plates X and Y as either negative or positive

e) Why efficiency of a transformer is always less than 100%? What do we call a machine with 100% efficiency. **[2]**

Question 4

a) Drag force on a body increase with the increase in speed of the body. Justify with one example from everyday experiences. **[2]**

b) (i) A forester wants to keep records of different wild animals in a locality. In order to take photographs of the animals during day time is possible with his camera but finds difficult to get clear picture in the dark or during night. What type of camera would you recommend him to buy in order to illuminate images in the dark? Why? **[2]**

(ii) Define electromagnetic spectrum. **[1]**

c) A hydraulic car jack is used to lift a vehicle. The area of piston B holding the car is 40 m^2 and the area of piston A, which the mechanic presses, is 0.5 m^2. The mechanic exerts a force of 100N on her piston. What is the force exerted on the car by piston B? **[2]**

d) Differentiate between electromotive force and terminal voltage. **[1]**

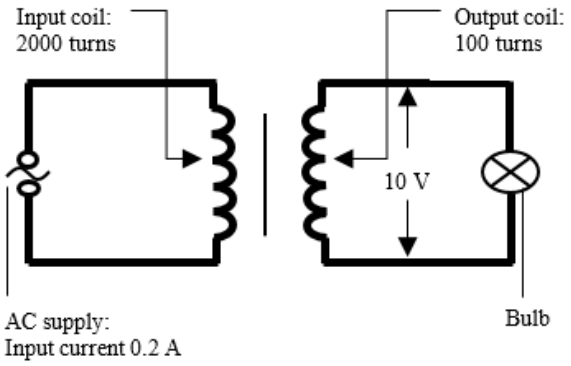
e) Hydraulic machines such as excavator has a broad area tyres compared to an Alto car. Why do you think it is designed in such a way? **[2]**

Question 5

a) Assuming that the transformer below has an efficiency of 100%, calculate: **[3]**

i. The supply voltage

ii. The current through the output coil.



b) Some people think that space exploration is a waste of resources while others think that it is essential for mankind to continue to explore the universe in which we live. Discuss both sides and give your opinion. **[2]**

c) Using the material of your choice, design an experimental setup to verify the Faraday's laws of electromagnetic induction. **[2]**

d) Why are water bodies, such as lakes, relatively slow to respond to heating or cooling compared to the land surrounding them? What kind of natural phenomenon will it cause? **[2]**

e) Write two advantages of telescope over eyes. **[1]**

Question 6

a) Suppose you are planning to launch a rocket to the moon. Mention at least two conditions required for successful launching. **[2]**

b) A radioactive element with an atomic mass number 238 and atomic number 92 emits a beta particle and then an alpha particle. How much will be the atomic mass number and atomic number of the daughter element formed? **[2]**

c) Sonam is watching a Facebook live streaming of Bhutan Broadcasting Service news from Australia. Explain how the transfer of information takes place from Bhutan to Australia. **[2]**

d) Lowering the centre of gravity (C.G) and increasing the area of base of support (B.S) are considered as two important factors affecting stability of the body. Justify with some examples. **[2]**

e) Karma and Penjor load a 1.2m high truck with the bags of rice. Karma loaded 10 bags weighing 25kg each in 50 seconds while Penjor loaded 7 bags of maize each weighing 30kg in 40 seconds. Who is more powerful? [Take g= $9.8ms^{-2}$] **[2]**

Question 7

a) Describe the life cycle of a star by highlighting on it's different phases. **[2]**

b) You are working in a nuclear power plant. Mention at least two precautions that you must take to get rid of harmful effect of nuclear radiations. **[2]**

c) Doji enjoys watching English Premier League coverage on Star Sport HD channel. It is because his TV is connected using a digital signal. List two advantages of digital signal over an analogue signal. **[2]**

d) Bhutan has constructed many small and large hydropower plants from which it generates 1615 Megawatts to 1623 Megawatts of hydroelectricity. Do you think Bhutan should construct more of such hydropower plants? Support your answer with justifications. **[3]**

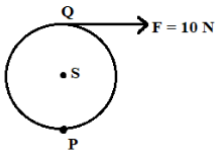
e) What is a carrier wave? **[1]**

Question 8

a) Thermal energy was first discovered in 1847 by James Prescott Joule, after whom the unit of heat energy is named. While experimenting with fluids by agitating it, he found that its temperature increased. However, different substances have different heat capacity. Describe a substance with low heat capacity and a substance with high heat capacity. **[2]**

b) *"The amount of energy in the universe is always the same."* **[2]**
State the law that supports the given statement and justify the law with the help of an example.

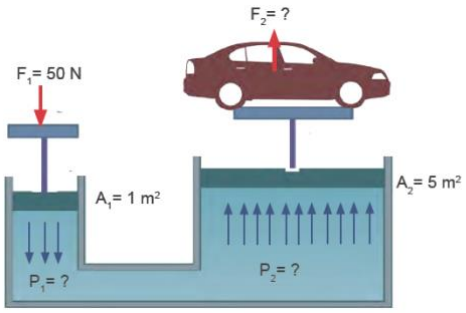
c) A wheel of diameter 2 m is shown in the figure with axle at S. If the 10 N force is applied at the point Q, calculate the moment of force about **[2]**



i) Point S

ii) Point P

d) c) The concept of transmission of pressure in a confined liquid has wide applications in daily life. One of the applications is in hydraulic machine. Observe the given diagram carefully and calculate: **[2]**



i. Pressure P1. [0.5]

ii. Pressure P2. [0.5]

iii. Force F2. [1]

e) "Space exploration is sending people or machines into space to visit other planets and objects in space. Mankind has dreamed of visiting the space for hundreds of years, but it wasn't until 1969 that the first person walked on the Moon." **[2]**

With the advancement in technology, there are various methods of space exploration. What type of exploration would you prefer? Why?

Question 9

a) A pair of equal and parallel forces, acting in opposite directions is called a couple. Draw a diagrammatic representation of a couple from our day to day activities showing the point of application of forces. **[2]**

b) The relationship between current (I), voltage (V), and resistance R was established by German physicist *Georg Simon Ohm* in 1827. However, Ohm's law is not a universal law. Differentiate between ohmic conductor and non-ohmic conductor. **[2]**

	Ohmic-conductor	Non-ohmic conductor
Definition		
Graphical Representation		

c) In terms of the construction of an electric motor and a.c generator, both of them consist of similar parts such as magnetic field, armature coil, slip rings and brushes. How are they different from one another? **[2]**

d) When a number of forces acting on a body produces no change in its state of rest or uniform motion, the body is said to be in equilibrium. Write two conditions that are true to the body at equilibrium. **[2]**

e) In the electromagnetic spectrum, all the radiation has some useful applications and harmful impacts. Imagine that you have discovered a new radiation and named it "POGEL." List two properties, a use and a harmful impact of the new radiation. **[2]**