

# PHYSICS 1 1996 - NECTA FORM FOUR

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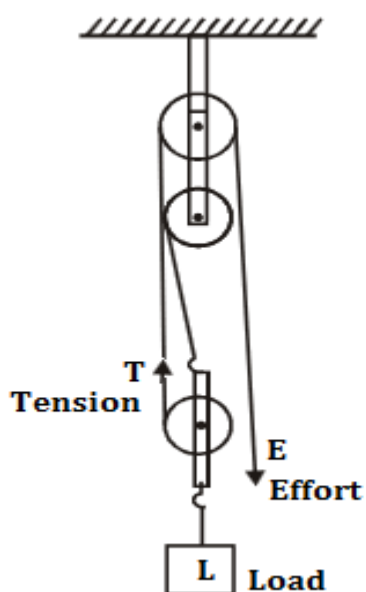
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1.

i	ii	iii	iv	v	vi	vii	viii	ix	x	xi	xii	Xiii	xiv	xv
D	C	D	B	C	B	C	D	A	B	B	B	C	B	A

xvi	xvii	xviii	xix	xx	xxi	xxii	xxiii	xxiv	xxv	xxvi	xxvii	xxviii	xxix	xxx
D	A	C	A	C	B	C	B	C	C	D	A	A	B	B

2.(a) Pulley system with velocity ratio of 3.



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(b) efficiency = 80%, effort = 200N

From, eff. =  $VR/MA \times 100$

$0.8 = 3/MA$ , mechanical advantage is 3.75.

But, load =  $MA \times \text{effort}$

$$= 3.75 \times 200$$

Required load = 750N

3. In order for the balloon to float, upthrust = total downward force, so

$$(1500 + 100 + 70) \times 9.81 = 2000 \times 0.09.$$

$$16382.81 \neq 180$$

Since the downward force is greater than the upthrust, then the balloon will not float.

4.(a) Limiting friction is the friction that occurs when the moving force equals to the force opposing the motion.

(b) From, coefficient of friction =  $fr/mg$

$$0.25 = fr/(25000 \times 9.81)$$

Frictional force is 122625N

5. Let us take some pure water in a test tube and dip a piece of wax in it after wrapping it in wire. Then we hold the test tube in an inclined position and start heating water in the upper part of the tube. We will observe that wax does not melt even when the upper part of water starts boiling. Thus, we can conclude that water being a poor conductor of heat is unable to melt the wax.

6. (a) Electromagnetic radiation consists of waves of the electromagnetic field, propagating through space, carrying electromagnetic radiant energy. It includes radio waves, microwaves, infrared, light, ultraviolet, X-rays, and gamma rays. All of these waves form part of the electromagnetic spectrum.

(b) It is because the white colour reflects sun's rays, hence does not absorb infra-red rays easily.

(c) Cooking utensils are painted black to absorb more heat and get heated quickly.

7.

- i. Real
- ii. Real
- iii. Virtual
- iv. Real
- v. Virtual

8. (a) Electromotive force is the potential difference of the cells when the circuit is open

-Internal resistance is the resistance within the cell.

(b) total parallel resistor =  $\frac{1}{R} = \frac{1}{15} + \frac{1}{30}$  ,  $R = 10\Omega$

Then,  $e = I (R + r)$

$12 = I (10 + 0.5)$ , current = 1.142A

9. (a) Factors that determine the resistance of the conductor,

- ☐ Temperature
- ☐ Length of wire
- ☐ Cross-section area of conductor
- ☐ Nature of the material.

(b) From,  $R = \frac{\text{resistivity} \times \text{length}}{\text{cross-section area}}$  , Area =  $3.14 \times (0.56 \times 10^{-3})^2 / 4 = 2.46 \times 10^{-7} \text{ m}^2$

$100 = \text{length} \times 10^{-6} / (2.46 \times 10^{-7})$

Length is 24.6m

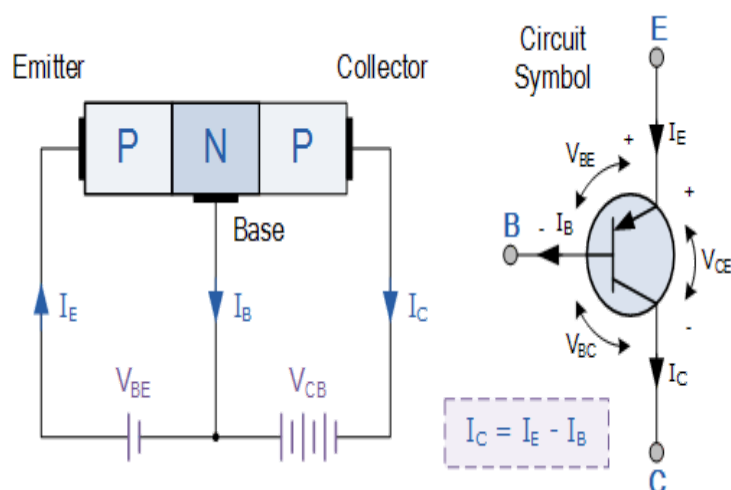
10. (a)-heating effect

-magnetic effect

(b) DC cannot be converted to AC

(c) AC is cheaper to generate and has fewer energy losses than the DC.

11. PNP transistor.



[https://www.electronics-tutorials.ws/transistor/tran\\_3.html](https://www.electronics-tutorials.ws/transistor/tran_3.html)

(b) Transistor has a function of amplifying signals.

(c) Germanium and silicon

12. since  $250 = 30^0$ ,  $300 = ?$

$$= 250/300 \times 30^0 = 25^0$$

Law is the law of refraction.

13. (a) Linear momentum is the product of mass and velocity of the body, while kinetic energy is the energy possessed by the body due to its motion.

(b) From conservation of linear momentum,

$$(8 \times 45) = ((3.5 \times 2) \times v$$

(i) Initial velocity is 51.43 m/s

$$(ii) KE \text{ of truck} = \frac{1}{2} \times 8000 \times 12.5^2 = 625000J$$

$$KE \text{ of two trucks} = \frac{1}{2} \times 7000 \times 51.43^2 = 9257657.17J$$

$$\text{Energy lost} = 9257657.17J - 625000J = 8632657.15J$$

(iii) Collision leads to energy losing.

(iv) No, does not support.

14. (a)-ice

-liquid

-vapor

$$(b) \text{ sensible heat} = 100 \times 4.2 \times (0 - -10) = 4200J$$

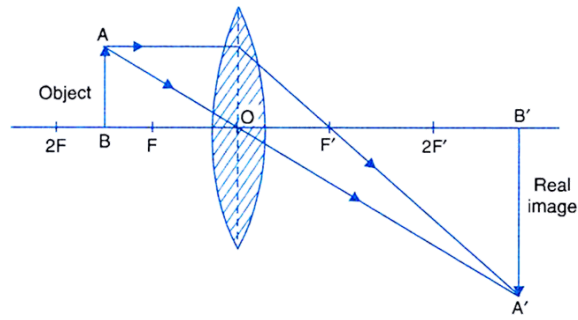
$$\text{-heat of water} = 100 \times 4.2 \times (100 - 0) = 42000J$$

$$\text{-latent heat of vaporization} = 100 \times 2268 = 226800J$$

$$\text{Total energy} = 4200 + 42000 + 226800 = 273,000J$$

15. (a)-Focal point is the point at which converging light rays cross.

(b) (i) When the object is placed outside the focal point, the image formed is real and inverted.



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16.(a) By series combination.

(b)The current will be obtained by application of the formula that;

$$E = I (R + r)$$

17. (b) First process  ${}_{92}^{238}\text{U} \longrightarrow {}_x^{234}\text{Th} + {}_y^{230}\text{Ra} + {}_z^{226}\text{Rn} \longrightarrow {}_{84}^{222}\text{P}$

Second process,  ${}_{84}^{222}\text{P} \longrightarrow {}_{86}^q\text{Rn} + {}_{-1}^0\text{e}$

Then,  $x = 92 - 2 = 90$

$$Y = 90 - 2 = 88$$

$$Z = 88 - 2 = 86$$

Also, for beta emission,  $q = 222$

(c)-isotopes = P and Rn.

-isobars are Th, Ra

18.(a)Eddy currents are formed when anything which results in the intensity or direction of a magnetic field.

(b)-Advantages of eddy currents

- They are more useful at the inspection process
- Used in induction furnace process

-Disadvantages of eddy currents

- Causes leakage of magnetic fluxes
- More heat loss

(c) the cores are designed as a set of thin sheets or laminations, in parallel to the magnetic field.

(d) It is not possible due to loss of energy.