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|--|--|---------------------------------|----------------------|-------------------|----------------|
|  |  |                                 |                      |                   |                |
| Chapter 4: Reflection and N  | <u>lirrors</u>   |                                 |                      |                   |                |
| 1 - The line perpendicular to t  | he reflective surface is the                                 |                                 |                      |                   |                |
| A) line of reflection  | B) line of incidence   | C) normal                       | D) li                | ne of refra       | ction          |
| 2 - How does light normally ti   | ravel?   |                                 |                      |                   |                |
| A) in a straight line  | B) in concentric circles                                     | C) always toward a dark a       | rea D)               | in a curve        | ed line        |
| 3 - Which statement about the  | e light rays in the figure below is                          | s true? Object point            | Diverging<br>rays    | Ima               | ige point      |
| A) The light originates from tl  | he boy's eyes.   | and a second                    |                      |                   | 2              |
| B) The light originates from the   | ne bird's image.   |                                 |                      | Diverging<br>rays |                |
| C) The image of the bird creat   | tes light rays.  | S.S.                            |                      |                   |                |
| D) The light originates from t   | he bird.   |                                 |                      |                   |                |
| 4 - In the figure below, if the f  | lame on the candle is 2 cm tall, I                           | now tall is                     | Mirror               |                   |                |
| the flame of the image?  |  | 0                               | d <sub>o</sub>       | di                |                |
| A) 1 cm  | B) 4 cm  | ho Rev                          | Ray 1 P <sub>1</sub> |                   | h <sub>i</sub> |
| C) 8 cm  | D) 2 cm  | AL .                            | θi P2                |                   | - ser          |
| 5 - Your image in a bathroom   | mirror results from  |                                 | θr                   |                   |                |
| A) diffuse reflection  | B) specular reflecti   | on                              |                      |                   |                |
| C) diffuse refraction  | D) specular refract  | ion                             |                      |                   |                |
| 6 - You are standing in front o  | f a bathroom mirror. Where is y                              | our image                       |                      |                   |                |
| located?   |  |                                 |                      |                   |                |
| A) behind you  | B) in front of t   | he mirror                       |                      |                   |                |
| C) behind the mirror   | D) between y   | ou and the mirror               |                      |                   |                |
| 7 - Which type of mirror prod  | uces an image that is always ere                             | ct, always the same height as t | he object, and       | always vir        | tual?          |
| A) diffuse   | B) concave   | C) plane                        | C                    | ) convex          |                |
| 8 - When an object is placed b   | between the focal point and a co                             | ncave mirror, the rays          | ·                    |                   |                |
| A) diverge and sight lines dive  | erge and form a real image                                   |                                 |                      |                   |                |
| B) converge and sight lines di   | verge and form a virtual image                               |                                 |                      |                   |                |
| C) diverge and sight lines con   | C) diverge and sight lines converge and form a virtual image |                                 |                      |                   |                |
| D) converge and sight lines co   | onverge and form a real image                                |                                 |                      |                   |                |
| 9 - A image is form  | ned when light rays converge an                              | d pass through the image.       |                      |                   |                |
| A) real  | B) virtual   | C) convex                       |                      | D) c              | critical       |
| 10 - In a concave mirror, an object placed will result in a virtual image. |  |                                 |                      |                   |                |
| A) past the focal point  | В)   | twice the distance of the foca  | l point              |                   |                |
| C) between the focal point ar  | nd mirror D)   | between the focal point and t   | twice the distar     | nce of the f      | focal point    |

| 11 - Spherical aberration ca    | n be avoided by using a           |                                     |                                       |
|---------------------------------|-----------------------------------|-------------------------------------|---------------------------------------|
| A) spherical mirror             | B) plane mirror                   | C) parabolic mirror                 | D) convex mirror                      |
| 12 - What is f if you have an   | object 2.0 m from the concav      | ve mirror, and the image is 4.0 m   | from the mirror?                      |
| A) 2.0 m                        | B) 1.3 m                          | C) 4.0 m                            | D) 0.67 m                             |
| 13 - If vou wanted to adjust    | the situation in the figure belo  | ow to produce a                     |                                       |
| real image, which one of the    | e following options by itself w   | ould work?                          | 1                                     |
| A) replace the mirror with a    | a convex mirror of the same fo    | ocal length                         | Ray 2                                 |
| B) replace the object with a    | larger object.                    | 5                                   | Ray 1                                 |
| C) move the object out past     | t the focal point                 |                                     | Object Image                          |
| D) replace the mirror with a    | another concave mirror of lon     | ger focal leng                      |                                       |
| 14 - A 10-cm object has a 20    | 0-cm image. What is the magr      | nification?                         |                                       |
| A) 10 B) 2                      | C) 20                             | D) 0.5                              |                                       |
| 15 is located be                | ehind a convex mirror.            |                                     |                                       |
| A) A ray                        | B) A real image                   | C) The object                       | D) The focal point                    |
| 16 - Real images produced l     | by mirrors have ma                | agnification.                       |                                       |
| A) massive                      | B) negative                       | C) opposite                         | D) positive                           |
| 17 - The distance from the f    | ocal point to the mirror is the   |                                     |                                       |
| A) focal length                 | B) foci                           | C) focus point                      | D) focal distance                     |
| 18 - What does the F on a ra    | ay diagram represent?             |                                     |                                       |
| A) the focal point              |                                   | B) the location of the virtu        | al image                              |
| C) the location of the objec    | t                                 | D) the center of the mirror         |                                       |
| 19 - In the figure below, if th | ne object is 4 times farther from | m the mirror than the image, wha    | at is the focal length of the mirror? |
| A) 0.75 m                       |                                   |                                     | Ray 1                                 |
| B) 0.80 m                       |                                   | 0.                                  |                                       |
| C) 1.25 m                       |                                   | -                                   | Ray 2                                 |
| D) 1.33 m                       |                                   | Object                              | Image                                 |
| 20 - The image from a conv      | ex mirror will                    | н—                                  |                                       |
| A) always be projected          | C) alw                            | vays be virtual                     |                                       |
| B) never be virtual             | D) alv                            | vays be real                        |                                       |
| 21 - In the figure below, if th | ne image is one-third the size o  | of the object and the object is 3.0 | m away from the mirror, what is the   |
| focal length of the mirror?     |                                   |                                     | Ray 1                                 |
| A) -1.5 m                       | B) 3 m                            |                                     | 01                                    |
| C) 0.75 m                       | D) 0.66 m                         |                                     | Ray 2                                 |
| 22 - In a ray tracing diagram   | n, two rays must pass through     | the to determine                    | Object Image                          |
| the location of the image.      |                                   |                                     |                                       |
|                                 |                                   |                                     |                                       |
|                                 |                                   |                                     |                                       |
| <b>_</b>                        |                                   |                                     |                                       |

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|--|---|-------------------------------|-------------------|--------------------------|--|--|
| A) image   | B) focal point  | C) lens edge                  |                   | D) object                |  |  |
|  |   |                               |                   |                          |  |  |
| Chapter 5: Refraction and Len  | ses   |                               |                   |                          |  |  |
|  |   |                               |                   |                          |  |  |
| 1 - How is information carried in  | an optical fiber?   |                               |                   |                          |  |  |
| A) by sound  | B) by different colors  | C) by electrical impulse      | :5                | D) by light              |  |  |
| 2 - For the situation shown in the   | e figure below, which of the subs   | stances listed below shou     | ld be chosen to   | o put in front of the    |  |  |
| pencil to make its "break" the mo  | ost pronounced?   |                               |                   |                          |  |  |
| A) flint glass   |   |                               |                   | 2                        |  |  |
| B) vacuum  |   |                               | and the second    | 4:                       |  |  |
| C) ethanol   |   |                               |                   |                          |  |  |
| D) water   |   |                               |                   | agend .                  |  |  |
| 3 - A light ray is traveling through an unknown material when it intersects ethanol (n =       |   |                               |                   |                          |  |  |
| 1.36) at an incident angle of 62.0°. If the angle of refraction is 46.4°, what is the index of |   |                               |                   |                          |  |  |
| refraction of the unknown mate   | rial?   |                               |                   |                          |  |  |
| A) 1.12  | B) 1.66   | C) 0.985                      |                   | D) 2                     |  |  |
| 4 - If a refracted ray moves away  | from the normal, the speed of li  | ght of the ray in this mate   | erial is          | that of the incident     |  |  |
| ray.   |   |                               |                   |                          |  |  |
| A) unrelated to  | B) less than  | C) greater than               |                   | D) the same as           |  |  |
| 5 - If a substance has a critical ar   | ngle of 50°, what happens to the  | light from an incident ang    | gle hitting the l | ooundary at 30°?         |  |  |
| A) It is stopped.  | B) It is reflected.   | C) It is diffused.            |                   | D) It is refracted.      |  |  |
| 6 - What is dispersion?  |   |                               |                   |                          |  |  |
| A) the separation of light into its  | spectrum  | B) the refra                  | action of light   |                          |  |  |
| C) the combining of colored ligh   | nt into white light   | D) the refle                  | ection of colore  | ed light                 |  |  |
| 7 - The incident angle that cause  | s a refracted ray to lie along the l  | ooundary of a substance i     | is the            |                          |  |  |
| A) refracted angle   | B) reflected angle  | C) critical angle             | D)                | normal angle             |  |  |
| 8 - What is the speed of light in a  | u diamond (n = 2.42)?   |                               |                   |                          |  |  |
| A) 2.42×10 <sup>8</sup> m/s  | B) 1.24×10 <sup>8</sup> m/s   | C) 7.26×10 <sup>8</sup> m/s   | D)                | 3.00×10 <sup>8</sup> m/s |  |  |
| 9 - Why would it be impossible t   | o have optical fibers filled with a   | vacuum?                       |                   |                          |  |  |
| A) there is nothing for light to tr  | avel through  | B) there is nothing l         | ess optically de  | ense than a vacuum       |  |  |
| C) because a vacuum is too opti  | C) because a vacuum is too optically dense D) because optical fibers must use glass |                               |                   |                          |  |  |
| 10 - A light ray traveling through   | r crown glass (n = 1.52) intersect  | s a sheet of flint glass (n = | = 1.61) at an ar  | igle of 27.3°. What is   |  |  |
| the angle of refraction?   |   |                               |                   |                          |  |  |
| A) 0.839°  | B) 33.0°  | C) 25.7°                      |                   | D) 0.433°                |  |  |
| 11 - In relation to a rainbow tha  | t you are looking at, where is the  | Sun?                          |                   |                          |  |  |

| A) in the center of the rainbox  | w B) behir                     | nd you         | C) directly overhead          | D) in front of you  |
|--|--------------------------------|----------------|-------------------------------|---|
| 12 - Water is more optically de  | ense than air. Therefore, th   | ne speed of li | ght in water is               |   |
| A) the same as the speed of li   | ght in a vacuum                | B) slo         | wer than the speed of light   | in air  |
| C) faster than the speed of lig  | ht in air                      | D) th          | e same as the speed of ligh   | t in air  |
| 13 - According to Snell's law, l   | ight traveling from a vacu     | um to glass w  | vill                          |   |
| A) speed up  | B) travel at the same sp       | eed            | C) stop completely            | D) slow down  |
| 14 - Because of refraction, the  | Sun actually sets              | we see it o    | disappear.                    |   |
| A) after   | B) before                      | C) at the      | same time as                  | D) hours before   |
| 15 - A beam of light travels the   | rough air (n = 1.0003) and     | strikes an ur  | nknown material at an angl    | e of 50.0°. The new angle of  |
| refraction is 25.0°. What is the   | e index of refraction of this  | material?      |                               |   |
| A) 0.643   | B) 1.2                         |                | C) 1.81                       | D) 0.709  |
| 16 - What happens to light du  | ring total internal reflectio  | n?             |                               |   |
| A) The angle of refraction is le   | ess than the critical angle.   |                |                               |   |
| B) The angle of incidence is g   | reater than the critical ang   | le.            |                               |   |
| C) The angle of incidence is 0   |                                |                |                               |   |
| D) The angle of reflection is the second sec | he same as the critical angl   | le.            |                               |   |
| 17 - Optical fibers are a techni   | ical application of            | <u> </u> .     |                               |   |
| A) diffraction   | B) dispersion                  | C) 1           | otal internal reflection      | D) refraction   |
| 18 - A ray of light striking perp  | pendicular to an optically d   | lense surface  | will                          |   |
| A) refract away from the norm  | nal B) reflect                 | (              | c) refract toward the norm    | al D) remain straight   |
| 19 - A ray of sunlight travels th  | nrough air and intersects tl   | he surface of  | water at a small incident a   | ngle. The ray is  |
| A) pure  | B) reflected                   | C)             | refracted                     | D) incident   |
| 20 - What causes a mirage?   |                                |                |                               |   |
| A) heatstroke  |                                |                |                               |   |
| B) a continuous change in the  | e index of refraction of air l | because n ind  | creases as air gets warmer    |   |
| C) water on the ground   |                                |                |                               |   |
| D) a continuous change in the  | e index of refraction of air   | because n de   | ecreases as air gets warmer   |   |
| 21 - In the figure below, if the   | incident angle is 35°, what    | t is the angle | of refraction in the glass? L | Jse 1.55 for the index of   |
| refraction of glass.   |                                |                | 2                             |   |
| A) 35°   |                                |                |                               | $\theta_2 < \theta_1$   |
| B) 68°   |                                |                |                               | $\begin{array}{c} \theta_1 \\ \theta_1' = \theta_2 \\ \theta_2' = \theta_1 \end{array}$ |
| C) 57°   |                                |                |                               | θ <sub>1</sub>  |
| D) 22°   |                                |                |                               | θ2'   |
| 22 - Through which medium i  | s the speed of light the fas   | test?          |                               |   |
| A) air I   | B) water                       | C)             | ) vacuum                      | Air Glass Air   |
| D) glass   |                                |                |                               | 2007 019191200 102080 001   |
|  |                                |                |                               | MR:ABDELKHALEK  |
|  |                                |                |                               |   |

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| 23 - What does Snell's law compare?          |                             |  |                                      |  |
|--|-----------------------------|--|--------------------------------------|--|
| A) the reflective nature of materials        |                             | B) the cosines of the refracted angles   |                                      |  |
| C) the density of the materials              |                             | D) the sines of the refracted angles   |                                      |  |
| 24 - In the figure below, if the bottom      | half of the lens is covered | , Ohiot Prul   |                                      |  |
| what will happen to the image?               |                             | Pay 2  |                                      |  |
| A) Nothing.                                  |                             | Ray 2  | F Image 2F                           |  |
| B) The bottom half of the image will d       | lisappear                   | 2F F   |                                      |  |
| C) The top half of the image will disap      | pear.                       |  |                                      |  |
| D) The image will become dimmer.             |                             | $a_0 = 30 \text{ cm} \longrightarrow$  | $a_i = 15 \text{ cm} \rightarrow 1$  |  |
| 25 - In the figure below, if the top half    | of the lens is covered,     |  |                                      |  |
| what will happen to the image?               |                             | Object Ray 1   |                                      |  |
| A) The top half of the image will disap      | opear.                      | Ray 2  |                                      |  |
| B) The bottom half of the image will d       | lisappear                   |  | F Image 2F                           |  |
| C) Nothing.                                  |                             | 2r r   | $\rightarrow$                        |  |
| D) The image will become dimmer.             |                             |  |                                      |  |
| 26 - An image of a flower is seen throu      | igh a lens. What is the     | $  \cdot  a_0 = 30 \text{ cm}   \cdot  $   | $-a_i = 15 \text{ cm} \rightarrow 1$ |  |
| object?                                      |                             |  |                                      |  |
| A) a flower B                                | ) an image                  | C) a lens  | D) a mirror                          |  |
| 27 - The refractive indices of lenses ar     |                             |  |                                      |  |
| A) the same as air                           | B) le                       | ess than air   |                                      |  |
| C) independent of the refractive index       | c of air D) g               | greater than air   |                                      |  |
| 28 - The focal length of a concave lens      | is                          |  |                                      |  |
| A) negative                                  | 3) reduced                  | C) magnified   | D) positive                          |  |
| 29 - A concave lens is also known as a       | ılens                       |  |                                      |  |
| A) concave B) c                              | converging                  | C) diverging   | D) plane                             |  |
| 30 - In the figure below, if you wanted      | to make the virtual imag    | e  | 29                                   |  |
| larger, what could you do?                   |                             | Bay 2  | *                                    |  |
| A) Move the object further out, but no       | ot past the focal point.    | the second secon |                                      |  |
| B) Replace the object with a shorter object. |                             | F Ray 1  |                                      |  |
| C) Replace the lens with one of larger       | focal length.               | virtuai Object<br>image i⊷ d <sub>o</sub>  |                                      |  |
| D) Replace the lens with a taller one.       |                             | I← di  |                                      |  |
| 31 - Why are bigger lenses better for o      | bserving dim objects?       |  |                                      |  |
| A) they have better curvatures               | B) they refract light less  | 5  |                                      |  |
| C) they collect more light                   | D) they reduce spherica     | al aberration  |                                      |  |
| 32 - Unlike mirrors, lenses have             |                             |  |                                      |  |

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| A) one focal point                | B) no focal points                 | C) many focal points                  | D) two focal points                           |
|-----------------------------------|------------------------------------|---------------------------------------|---|
| 33 - An achromatic lens corre     | ects chromatic aberration using    | ·                                     |   |
| A) two convex lenses with th      | ne same index of refraction        |                                       |   |
| B) a combination of concave       | and convex lenses with differe     | nt indices of refraction              |   |
| C) two concave lenses with t      | he same index of refraction        |                                       |   |
| D) no lenses                      |                                    |                                       |   |
| 34 single lenses                  | have chromatic aberration.         |                                       |   |
| A) Only parabolic                 | B) Only concave                    | C) Only convex                        | D) All  |
| 35 - In nearsightedness, the i    | mage is focused                    |                                       |   |
| A) in front of the retina         | B) beyond the retina               | C) directly on the retina             | D) in front of the eye                        |
| 36 - Farsightedness can be co     | prrected with a                    |                                       |   |
| A) parabolic lens                 | B) convex lens                     | C) concave lens                       | D) plane lens                                 |
| Chapter 6 : Vibrations and        | Waves                              |                                       |   |
|                                   |                                    |                                       | $T = 2 - \sqrt{1}$                            |
| 1 - The formula represents th     | e period of a pendulum, I. Wha     | it is the period of a 3.5 m-long pend | dulum on Earth? $I = 2\pi \sqrt{\frac{2}{g}}$ |
| A) 3.2 s                          | B) 4.6 s                           | C) 3.8 s                              | D) 1.4 s                                      |
| 2 - In the figure below, if the s | spring's constant is 20.0 N/m ar   | nd x has a value of 0.25              | 2 2 2   |
| m, what is m equal to?            |                                    |                                       | M 3 2   |
| A) 0.06 kg                        |                                    | 0 m                                   | -   |
| B) 0.63 kg                        |                                    | <i>x</i> m —                          |   |
| C) 0.51 kg                        |                                    | 2x m —                                | mg Z  |
| D) 5.0 kg                         |                                    |                                       | 2 <i>mg</i>                                   |
| 3 - In the figure below, if you   | doubled the mass of the pendu      | lum, what effect, if any,             |   |
| would it have on its period?      |                                    |                                       |   |
| A) The new period would be        | half the old period.               | _                                     | E.  |
| B) The new period would be        | the old period, divided by the s   | quare root of two.                    | FT FT   |
| C) The new period would be        | the old period, times the square   | e root of two.                        | Fnet Fnet                                     |
| D) It would have no effect.       |                                    |                                       | rg Fg   |
| 4 - In the figure below, if the   | scale of the graph is 1 block = 1( | ) N on the vertical axis and one      | ·   |
| block = 2 cm on the horizont      | al axis, what is the spring consta | int?                                  |   |
| A) 500 N/m                        |                                    |                                       |   |
| B) 250 N/m                        |                                    |                                       | F (N)   |
| C) 5 N/m                          |                                    |                                       |   |
| D) 20 N/m                         |                                    |                                       |   |
| 5 - In the figure below, if you   | quadrupled the length of the st    | ring, what effect, if any, would it   | 0 x (m)                                       |
|                                   |                                    |                                       | MR : ABDELKHALEK                              |

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| have on its period?   |                                  |                            |                           |  |
| A) The period would be halved   |                                  |                            |                           | 10   |
| B) The period would be double   | ed.                              |                            |                           | 菜  |
| C) It would have no effect.   |                                  |                            |                           |  |
| D) The period would be quadr  | upled.                           |                            | FT                        | FT   |
| 6 - If a wave's frequency increa  | ses, its period                  |                            |                           | FT   |
| A) fluctuates   | B) remains the same              |                            | Fg                        | Finet Fg   |
| C) decreases  | D) increases                     |                            |                           | Fg   |
| 7 - Mechanical waves require _  |                                  |                            |                           |  |
| A) a gas  | B) a solid                       | C) a medium                | D) a                      | ıvacuum  |
| 8 - What mathematical express   | ion relates frequency to period  | ?                          |                           |  |
| A) f = 1/T  | B) 1/f = 1/T                     | C) f = 2T                  | D) f                      | = T  |
| 9 - In the figure below, how mu   | ch time elapses between pictur   | es                         | ith a piece of tape at po | int P. is attached to  |
| a and c?  |                                  | a blade vibrating 25 ti    | imes per second.          |  |
| A) 25 s   |                                  |                            |                           |  |
| B) 0.02 s   |                                  |                            | -p                        |  |
| C) 0.04 s   |                                  | Vibrating                  | $\cup$                    |  |
| D) Not enough information is  | given to answer this question.   | biade                      |                           | 2  |
| 10 - A wave with a frequency o  | f 10 Hz and a wavelength of 2 r  | n 🚺 🔿                      |                           | $1 \cap C$   |
| has a speed of  |                                  | -/                         |                           | ~~-/   |
| A) 20 m/s   | B) 0.2 m/s                       |                            |                           | V V  |
| C) 5 m/s  | D) 2 m/s                         |                            | 1                         | ,  |
| 11 - The of a wave c  | an be used to determine how n    | nuch energy is being trans | ferred by the wave        |  |
| A) speed B) fre   | quency (                         | C) period                  | D) amp                    | litude   |
| 12 - What does a wave carry?  |                                  |                            |                           |  |
| A) matter   | B) particles                     | C) energy                  | D) ł                      | neat   |
| 13 - Surface waves move in a p  | osition to the direct            | ion of the wave motion.    |                           |  |
| A) both parallel and perpendic  | ular B) in a cir                 | cular motion relative      |                           |  |
| C) parallel   | D) perper                        | ndicular                   |                           |  |
| 14 - A single bump or disturbar   | ice that travels through a mediu | um is a                    |                           |  |
| A) wave pulse   | B) surface wave                  |                            | °                         | and a second sec |
| C) compressional wave   | D) continuous wave               |                            |                           |  |
| 15 - In Figure 14-14, how do the frequencies of the waves in pictures a and c |                                  |                            |                           |  |
| compare?  |                                  |                            |                           |  |
| A) a's frequency is twice c's.  | B) a's frequency is fo           | our times c's              |                           | $\sim$   |

| C) a's frequency is half of c's. D) a's   | frequency is one-quarter of c's.              |                             |  |  |  |
|---|---|-----------------------------|--|--|--|
| 16 - A trough is of a wave.   |   |                             |  |  |  |
| A) the starting point B) the mid  | point C) the low point                        | D) the high point           |  |  |  |
| 17 - A pulse traveling along a bullwhip is an exa   | mple of a wave.                               |                             |  |  |  |
| A) surface B) longitudinal  | C) compressional wave                         | D) transverse               |  |  |  |
| 18 - The speed of a wave depends on the   |   |                             |  |  |  |
| A) frequency B) med   | um C) energy                                  | D) amplitude                |  |  |  |
| 19 - A(n) is a line perpendicular to a  | reflective surface.                           |                             |  |  |  |
| A) incidence B) reflection  | C) normal                                     | D) angle                    |  |  |  |
| 20 - Waves become inverted if they reflect off a  | medium that is than the initial mediu         | ım.                         |  |  |  |
| A) less dense B) softer   | C) more gaseous                               | D) more dense               |  |  |  |
| 21 - The principle of superposition states that _   |   |                             |  |  |  |
| A) waves from different mediums can combine   | to form a new wave                            |                             |  |  |  |
| B) the energy of a wave depends on its positior   |   |                             |  |  |  |
| C) waves can never combine  |   |                             |  |  |  |
| D) two or more waves can combine to form a r  | ew wave                                       |                             |  |  |  |
| 22 - The superposition of waves with equal but  | opposite amplitueds causes                    |                             |  |  |  |
| A) constructive interference B) co  | nsonance C) dissidence                        | D) destructive interference |  |  |  |
| 23 - When a continuous wave meets a boundary that transmits the wave at a lower speed, the wavelength |   |                             |  |  |  |
| A) increases B) decreases   | C) interferes with itself                     | D) becomes negative         |  |  |  |
| 24 - A standing wave appears to be  |   |                             |  |  |  |
| A) moving very fast B) fluctuatin   | g C) standing still                           | D) moving very slowly       |  |  |  |
| 25 - When a wave pulse strikes a wall, it reflects  | back and is                                   |                             |  |  |  |
| A) changed from compressional to transverse   | B) inverted                                   |                             |  |  |  |
| C) amplified  | D) reduced to zero                            |                             |  |  |  |
| 26 is the point of the largest displa   | cement where two waves meet.                  |                             |  |  |  |
| A) A node B) A period   | C) A crest                                    | D) An antinode              |  |  |  |
| 27 - A wave that reflects off a flat surface will re  | flect at                                      |                             |  |  |  |
| A) a different angle from which it struck the su  | face B) an angle of zero                      |                             |  |  |  |
| C) the same angle at which it struck the surface  | D) a right angle to the sur                   | face                        |  |  |  |
| 28 is the change in direction of a w  | ave when it intersects a boundary between two | different media.            |  |  |  |
| A) Refraction B) Diffusion  | C) Diffraction                                | D) Reflection               |  |  |  |
| 29 - A wave bounces off a boundary  |   |                             |  |  |  |
| A) incident B) surface  | C) transverse                                 | D) reflected                |  |  |  |
| Chapter 7 : Thermal Energy  |   |                             |  |  |  |
|   |   | MR: ABDELKHALEK             |  |  |  |

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|--|----------------------------|--|-----------------------------|---------------|--|--|
| 1-If the final temperature of  | a system is greater than t | he initial temperature, $\delta$ t is  |                             |               |  |  |
| A) positive  | B) eliminated              | C) negative                            | D) reduced                  | ł             |  |  |
| 2 is the amount  | of energy that must be ac  | lded to a material to raise one unit c | of mass by one temperatur   | e unit.       |  |  |
| A) Temperature   | B) Specific Heat           | C) Radiation                           | D) Hot                      | ness          |  |  |
| 3- In the figure below, if you   | doubled the amount of z    | inc put into the beaker, which of th   | e                           |               |  |  |
| following effects would it ha  | we on the final equilibriu | m temperature?                         |                             |               |  |  |
| A) This question can not be a  | 20.0 kg                    | y6                                     |                             |               |  |  |
| B) The final equilibrium tem   | perature of the water and  | d zinc would be greater.               | 10.0°C                      | 10.           |  |  |
| C) It would have no effect; the final equilibrium temperature would be the same as before. |                            |  |                             |               |  |  |
| D) The final equilibrium temperature of the water and zinc would be lower.                 |                            |  |                             |               |  |  |
| 4 - Thermodynamics is the s  | tudy of                    |  |                             |               |  |  |
| A) heat  | B) light                   | C) stars                               | D) sour                     | nd            |  |  |
| 5 - What does a calorimeter  | measure?                   |  |                             |               |  |  |
| A) change in radiation   |                            | B) change in thermal energy            |                             |               |  |  |
| C) change in kinetic energy  |                            | D) change in temperature               |                             |               |  |  |
| 6 - Looking at the situation i   | n the figure below, and us | sing the same color scheme as in the   | e figure, how would the blo | ock in part b |  |  |
| be shaded after a really long  | time? Assume the two bl    | ocks have the same mass.               | 1                           |               |  |  |
| A) The left half would be yel  | llow and the right half wo | ould be blue.                          | AB                          |               |  |  |
| B) The whole block would b   | e red.                     |  |                             |               |  |  |
| C) The left half would be blu  | ue and the right half woul | d be yellow.                           |                             |               |  |  |
| D) The whole block would be green.   |                            |  |                             |               |  |  |
| 7 - In which direction does h  | eat flow?                  |  |                             |               |  |  |
| A) from hot to cold  | B) from left to right      | C) from light to dark                  | D) from cold to h           | ot            |  |  |
| 8 - Absolute zero is   | ·                          |  |                             |               |  |  |
|  |                            |  | MR · ABDELKH                | tal EK        |  |  |

| A) 273 K  | B) -273°F                            | С) -273 К               |                                       | D) -273°C  |  |  |
|---|--------------------------------------|-------------------------|---------------------------------------|--|--|--|
| 9 - You have equal masses of four of the substances listed in Table 12-1. All are at the same initial temperature, and then you |                                      |                         |                                       |  |  |  |
| place them in a hotter room. W  | Vhich of the objects' temperature    | es will increase the mo | st rapidly?                           |  |  |  |
| A) Iron   | B) Aluminum                          | C) Lead                 |                                       | D) 2   | Zinc   |  |
| 10 - The Sun warms, us by   | ·                                    |                         |                                       |  |  |  |
| A) conduction   | B) convection                        | C) induction            |                                       | I  | D) radiation   |  |
| 11 - You have equal masses of   | four of the substances listed in     | Table 12-1. All are     |                                       |  |  |  |
| at the same initial temperature   | e, and then you place them in a h    | otter room. Which       | Heats of Fusio                        | on and Vaporization of Heat of Fusion  | of Common Substances<br>Heat of Vanorization   |  |
| of the objects' temperatures w  | ill increase the most slowly?        |                         | Material                              | H <sub>f</sub> (J/kg)  | H <sub>v</sub> (J/kg)  |  |
| A) Brass  | B) Glass                             |                         | Copper<br>Mercury<br>Gold<br>Methanol | $2.05 \times 10^{5}$<br>$1.15 \times 10^{4}$<br>$6.30 \times 10^{4}$<br>$1.09 \times 10^{5}$<br>$2.00 \times 10^{5}$ | 5.07×10 <sup>6</sup><br>2.72×10 <sup>5</sup><br>1.64×10 <sup>6</sup><br>8.78×10 <sup>5</sup> |  |
| C) Zinc   | D) Aluminum                          |                         | Silver                                | 2.66×10 <sup>5</sup>   | 6.29×10 <sup>5</sup><br>2.36×10 <sup>6</sup>   |  |
| 12 - Heat is transferred by   | when objects touch.                  |                         | Lead<br>Water (ice)                   | 2.04×10 <sup>4</sup><br>3.34×10 <sup>5</sup>   | 8.64×10 <sup>3</sup><br>2.26×10 <sup>6</sup>   |  |
| A) convection   | B) radiation                         | C) thermoduction        |                                       | D) co  | onduction  |  |
| 13 - Water boils at 100° on the   | e temperature scale.                 |                         |                                       |  |  |  |
| A) Celsius  | B) Molecular                         | C) Kelvin               |                                       | D) Fal   | hrenheit   |  |
| 14 - Which of the following is  | ordered from the least thermal e     | nergy to the most?      |                                       |  |  |  |
| A) ice to steam to water  | B) water to ice to steam             | C) ice to wa            | ter to steam                          | D) steam   | to water to ice  |  |
| 15 - The thermal energy neede   | ed to boil a liquid is the heat of _ |                         |                                       |  |  |  |
| A) condensation   | B) specific                          | C) fusio                | n                                     | D) ν   | aporization  |  |
| 16 - When disorder increases,   | entropy                              |                         |                                       |  |  |  |
| A) decreases  | B) fluctuates                        | C) reaches              | zero                                  | D)   | increases  |  |
| 17 - The average kinetic energy of ice particles as ice melts.  |                                      |                         |                                       |  |  |  |
| A) decreases  | B) increases                         | C) reduces to zero      |                                       | D) rema  | ins constant   |  |
| 18 - An increase in heat in a sy  | stem                                 |                         |                                       |  |  |  |
| A) less kinetic energy  | B) decreases entro                   | ору                     |                                       | ~  |  |  |

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|-----------------------------------|---------------------------------|---------------|----------------------------|--|------------------------------|---|----------|
| C) increases entropy              | D) reduces temp                 | peratur       |                            |  |                              |   |          |
| 19 - Which of the following pro   | cesses is NOT like the dye spr  | reading thro  | ough the be                | aker in the figure   | below?                       |   |          |
| A) Shortly after your mother pu   | ts cookies in the oven to bake  | e you can sn  | nell them in               | your bedroom.  |                              |   |          |
| B) Dandilion seeds spread from    | one yard into several others.   |               |                            |  |                              |   |          |
| C) At a restaurant, you notice si | noke in the air from the cigare | ette of a per | son several                | tables away.   |                              |   |          |
| D) You use the vacuum cleaner     | to suck the dirt out of the car | pet.          |                            |  |                              |   |          |
| 20 - Which has the highest entr   | ору?                            |               |                            |  |                              |   |          |
| A) a diamond                      | B) a fire                       | C) an ice     | cube                       | D)   | a stack of b                 | ooks  | i        |
| 21 - Using information from the   | e table below, determine whic   | ch of the fol | lowing prod                | cesses will require  | e the most e                 | nergy   | y be     |
| ıdded.                            |                                 |               |                            |  |                              |   |          |
| A)1 kg of iron is changed from l  | iquid to gas                    | -             | Heats of Fusi<br>Material  | Heat of Fusion   | of Common Sul<br>Heat of Vap | orizati<br>ka)  | on       |
| 3)2 kg of water is evaporated.    |                                 |               | Copper<br>Mercury<br>Gold  | 2.05×10 <sup>5</sup><br>1.15×10 <sup>4</sup><br>6.30×10 <sup>4</sup> | 5.07×<br>2.72×<br>1.64×      | 10 <sup>6</sup><br>10 <sup>5</sup><br>10 <sup>6</sup> |          |
| C)1 kg of liquid mercury is froze | en.                             |               | Methanol<br>Iron<br>Silver | $1.09 \times 10^{5}$<br>$2.66 \times 10^{5}$<br>$1.04 \times 10^{5}$ | 8.78×<br>6.29×<br>2.36×      | 10 <sup>5</sup><br>10 <sup>6</sup><br>10 <sup>6</sup> |          |
| D)1 kg of copper is converted f   | rom solid to liquid.            |               | Lead<br>Water (ice)        | $2.04 \times 10^{4}$<br>$3.34 \times 10^{5}$                         | 8.64×<br>2.26×               | 10 <sup>5</sup><br>10 <sup>6</sup>                    |          |
| 22 - Heat spontaneously flowir    | ng from a cold body to a hot bo | ody violates  | the                        | ·  |                              |   |          |
| A) law of conservation of energ   | gy B) kin                       | etic-molecu   | ılar law                   |  |                              |   |          |
| C) first law of thermodynamics    | D) sec                          | ond law of    | thermodyn                  | amics  |                              |   |          |
| 23 - The first law of thermodyn   | amics is a restatement of whic  | ch law?       |                            |  |                              |   |          |
| A) gravity B) secon<br>aw         | nd law of thermodynamics        | C) (          | conservatio                | n of energy  | D) kinet                     | ic-mo   | oleculai |
| 24 - Friction that you feel when  | you rub your hands together     | was chang     | ed from                    | to heat.   |                              |   |          |
| A) sound energy                   | B) thermal energy               | C)            | ) nuclear ei               | nergy  | D) kir                       | netic   | energy   |
| 25 - A perpetual motion machi     | ne violates which law?          |               |                            |  |                              |   |          |
| A) third law of conservation      |                                 | B ) first law | of thermod                 | lynamics   |                              |   |          |
|                                   |                                 |               |                            |  |                              |   |          |

| C) third law of thermodynam         | ics                               | D) first law of gravity                |                               |
|-------------------------------------|-----------------------------------|--|-------------------------------|
| 26 - Which is an example of a       | heat engine?                      |  |                               |
| A) windmill                         | B) automobile engine              | C) solar panels                        | D) volca                      |
| <u>Chapter 8 : States of Matter</u> |                                   |  |                               |
| 1 - Which state of matter is th     | e most common in the univers      | e?                                     |                               |
| A) solid                            | B) gas                            | C) liquid                              | D) plasma                     |
| 2 - As water cools below 4°C,       | what happens?                     |  |                               |
| A) it changes to an amorphou        | is solid B) it contr              | acts C) it melts                       | D) it expands                 |
| 3 - What causes air pressure?       |                                   |  |                               |
| A) air particles vaporize           | B) a                              | air particles flow through an object   |                               |
| C) air particles hit an object      | D) a                              | air particles suck away from an objec  | ct                            |
| 4 - What are the four stages of     | f matter in order from least kin  | etic energy to most kinetic energy?    |                               |
| A) plasma, gas, liquid, solid       | B) plasma, solid, gas, liqu       | id C) solid, liquid, gas, plasma       | D) solid, liquid, plasma, gas |
| 5 - What are the particles in pl    | asma?                             |  |                               |
| A) free nuclear particles of pr     | otons, neutrons, and electrons    | B) positively charged ions and         | negatively charged electrons  |
| C) negatively charged ions an       | d positively charged protons      | D) free neutrons                       |                               |
| 6 have no definit                   | e shape and flow.                 |  |                               |
| A) Crystals                         | B) Solids                         | C) Metals                              | D) Fluids                     |
| 7 - Pressure is measured as         | ·                                 |  |                               |
| A) FA                               | B) F/A                            | C) A/F                                 | D) F+A                        |
| 8 - A particle is moving so fast    | in a liquid that it escapes the l | iquid's cohesive force. This is an exa | mple of                       |
| A) condensation                     | B) sublimation                    | C) evaporation                         | D) melting                    |
| 9 - Surface tension is a result o   | of in a fluid.                    |  |                               |
| A) nuclear forces                   | B) adhesive forces                | C) cohesive forces                     | D) kinetic force              |
| 10 is the force the                 | at acts between particles of dif  | ferent substances.                     |                               |
| A) Rehesion                         | B) Cohesion                       | C) Elasticity                          | D) Adhesion                   |
| 11 - Which of the following do      | oes pressure in water not depe    | nd on?                                 |                               |
| A) depth                            | B) density                        | C) shape                               | D) gravity                    |
| 12 - The buoyant force is in w      | hich direction?                   |  |                               |
| A) toward higher pressures          | B) upward                         | C) circular                            | D) downward                   |
| 13 - In the figure below, if the    | chunk of steel were cut in half   | and one of the pieces were placed i    | n the                         |
| same liquid, how would it beh       | nave?                             |  | buoyant                       |
| A) It would float mostly subm       | erged. B) It would s              | sink to the bottom of the container    | F <sub>g</sub>                |

| C) There is insufficient information to answer the question.       D) It would float almost entirely above the surfac         14 - If you wanted to use a setup like the one in the figure below to create an upward force triple that of the downward force         you wanted to use a setup like the one in the figure below to create an upward force triple that of the downward force         you wanted to use a setup like the one in the figure below to create an upward force triple         () r <sub>1</sub> , 0, 033 m <sub>1</sub> r <sub>2</sub> , 1 m         () hyo and the following combination of piston radii could accomplish this?         () increase air pressure       D) displace less water         () outgo is law       B) Pacal's principle         () Galieo's law       B) Pacal's principle         () Galieo's law       B) Au, 6 m², Au, 18 m²         () Au, 6 m², Au, 10 m²,  | AL EBTIKAR SCHOOL  | PHYSICS G10 GENERAL   | REVISION SEM 2&3         |  |  |  |  |
|--|--|---|--------------------------|--|--|--|--|
| 14 - If you wanted to use a setup like the one in the figure below to create an upward force triple that of the downward force use a setup like the one in the figure below to create an upward force triple that of the downward force use a setup like the one in the figure below to create an upward force triple that of the downward force use a setup like the one in the figure below to create an upward force triple that of the downward force use a setup like the one in the figure below to create an upward force triple that of the downward force use a setup like the one in the figure below to create an upward force triple that of the downward force use a setup like the one in the figure below to create an upward force triple that of the downward force use as trip like the one in the figure below to create an upward force triple that of the downward force use as trip like the one in the figure below to create an upward force triple that of the downward force use as trip like the one in the figure below to create an upward force triple that of the downward force use as triple to the oblight this?  A) to 6n <sup>2</sup> / <sub>1</sub> to 2n <sup>2</sup> to 2n <sup>2</sup> to 2n <sup>2</sup> / <sub>2</sub> to 2n <sup>2</sup> to 2n <sup>2</sup> / <sub>2</sub> to 2 | C) There is insufficient informa   | C) There is insufficient information to answer the question. D) It would float almost entirely above the surfac |                          |  |  |  |  |
| you exer, which of the following combination of piston radii could accomplish this?  A) r <sub>0</sub> , 3 m; r <sub>0</sub> , 1 m  B) r <sub>0</sub> , 0.577 m; r <sub>2</sub> , 1 m  D) r <sub>1</sub> , 1.73 m; r <sub>2</sub> , 1 m  C) r <sub>0</sub> , 0.333 m; r <sub>2</sub> , 1 m  D) r <sub>1</sub> , 1.73 m; r <sub>2</sub> , 1 m  C) for sie in water, a fish uses its air bladder to  C) increase water pressure C) increase air pressure C) displace more water C) increase water pressure C) displace more water C) increase water pressure C) displace more water C) increase water pressure C) displace more water C) displace more water C) increase water pressure C) displace more water C) increase water pressure C) displace more water C) displace more w   | 14 - If you wanted to use a setup like the one in the figure below to create an upward force triple that of the downward force |   |                          |  |  |  |  |
| A) r <sub>0</sub> 3 m; r <sub>0</sub> 1 m B) r <sub>0</sub> 0.577 m; r <sub>0</sub> 1 m D) r <sub>0</sub> 1.73 m; r <sub>0</sub> , 1 m D) r <sub>0</sub> 1.73 m; r <sub>0</sub> , 1 m D) r <sub>0</sub> 1.73 m; r <sub>0</sub> , 1 m C) r <sub>0</sub> 0 r <sub>0</sub> 0.333 m; r <sub>0</sub> , 1 m D) r <sub>0</sub> 1.73 m; r <sub>0</sub> , 1 m C) displace more water Pressure D) displace less water pressure C) increase air pressure D) displace less water pressure C) increase in pressure D) displace less water pressure C) increase that any change in pressure applied to any point on a confined fluid is ransmitted undiminished throughout the fluid .<br>A) Boyle's law B) Pascal's principle C Galledo's law D) Dalton's law T1 - If you wanted to use a setup like the one in the figure bellow to create an upward force triple that of the downward force you exert, which of the following combination of piston areas could accomplish this?<br>A) r <sub>0</sub> , 6 m <sup>2</sup> , A <sub>2</sub> , 10 m <sup>2</sup> B) A <sub>10</sub> , 6 m <sup>2</sup> , A <sub>2</sub> , 18 m <sup>2</sup> C) A <sub>10</sub> 6 m <sup>2</sup> , A <sub>2</sub> , 20 m <sup>2</sup> D) A <sub>10</sub> 6 m <sup>2</sup> , A <sub>2</sub> , 8 m <sup>2</sup> T<br>A) positive B) neutral C) changing the setup S (C) changing D) negative T<br>T9 - Why does ice floats S (C) hy dinait properties.<br>C) It has a lower density than water.<br>D) It has a higher density than water.<br>C) Noth is an amorphous sold C B) by toroplaning wheels C D) thas a higher density than water.<br>C) which is an example of Pascal's principle?<br>A) a straw B) hydroplaning wheels C) hydraulic brakes D) a sipho<br>21 - According to Archimedes' principle, an object immersed in fluid has an upward force on it equal to <u>conditioned</u> .<br>A) the weight of the fluid displaced minus the weight of the object B) the weight of all the fluid in the container<br>C) the weight of the fluid displaced minus the weight of the object B) the object condition the container<br>C) the weight of the fluid displaced minus the weight of the object C) D) the weight of the object C) C which sight are thermal expansion to account when building bridges?<br>A) so the bridge will not move at all<br>B) on the bridge materials expand and contract with the changes in weather<br>C) it bends for an enterials expand and contract with the changes in weather<br>C) so the bridge materials expa   | you exert, which of the followin   | ng combination of piston radii could accomplish t   | his?                     |  |  |  |  |
| C)       r <sub>x</sub> 0.333 m; r <sub>x</sub> , 1 m       D)       r <sub>x</sub> 1.73 m; r <sub>x</sub> , 1 m         15 - To rise in water, a fish uses its air bladder to   | A) r <sub>1</sub> , 3 m; r <sub>2</sub> , 1 m  | B) r <sub>1</sub> , 0.577 m; r <sub>2</sub> , 1 m   | 15 F2                    |  |  |  |  |
| <ul> <li>15 - To rise in water, a fish uses its air bladder to</li></ul>   | C) r <sub>1</sub> , 0.333 m; r <sub>2′</sub> , 1 m   | D) r <sub>1</sub> , 1.73 m; r <sub>2</sub> , 1 m  |                          |  |  |  |  |
| A) displace more water       B) increase water pressure       D) displace less water         C) increase air pressure       D) displace less water       Image: Complete the complete to any point on a confined fluid is transmitted undiminished throughout the fluid.         A) Boyle's law       B) Pascal's principle       Image: Complete the complete the complete the complete to create an upward force triple that of the downward force you exert, which of the fluid rest to create an upward force triple that of the downward force you exert, which of the downward force triple that of the downward force you exert, which of the glue bellow to create an upward force triple that of the downward force you exert, which of the glue bellow to create an upward force triple that of the downward force you exert, which of the glue bellow to create an upward force triple that of the downward force you exert, which of the glue bellow to create an upward force triple that of the downward force you exert, which of the glue bellow to create an upward force triple that of the downward force you exert, which of the glue bellow to create an upward force proteins.         C) A, b, Gm², A, D M²       B) A, b, Gm², A, D M²       D) negative         A) positive       B) neutral       C) changing       D) negative         P - Why does ice float?       B) It has strong cohesive properties.       D) a sipho         19 - Why does ice float?       B) hydroplaning wheels       C) hydraulic brakes       D) a sipho         21 - According to Archimede's principle, an object immerset in fluid has an upward force on it equal to  | 15 - To rise in water, a fish uses   |   |                          |  |  |  |  |
| C) increase air pressure       D) displace less water         16   | A) displace more water   | B) increase water pressure  |                          |  |  |  |  |
| 16   | C) increase air pressure   | D) displace less water  |                          |  |  |  |  |
| transmitted undiminished throughout he fluid. A) Boyle's law B) Pascal's principle C) Galileo's law D) Daton's law T7 - If you wanted to use a setup like the one in the figure bellow to create an upward force triple that of the downward force you exert, which of the following combination of piston areas could accomplish this? A) A <sub>1</sub> , 6 m², A <sub>2</sub> , 10 m² B) A <sub>1</sub> , 6 m², A <sub>2</sub> , 18 m² C) A <sub>1</sub> , 6 m², A <sub>2</sub> , 2 m² D) A <sub>1</sub> , 6 m², A <sub>2</sub> , 8 m² C) A <sub>1</sub> , 6 m², A <sub>2</sub> , 2 m² D) A <sub>1</sub> , 6 m², A <sub>2</sub> , 8 m² B) Paston 1 B - What type of buoyancy results in a feeling of weight desness? A) positive B) neutral C) changing B) neutral C) changing D) negative D) negative D) negative C) It has a lower density than water. D) It has a higher density than water. C) Huch a lower density than water. D) It has a higher density than water. C) Huch a lower density than water. D) It has a higher density than water. C) Huch displaced B) hydroplaning wheels C) hydraulic brakes D) a sipho C1 - According to Archimeter' principle, an object immersed in fluid has an upward force on it equal to A) the weight of the fluid displaced minus the weight of the object C) the weight of the fluid displaced minus the weight of the object C) the weight of the fluid displaced minus the weight of the object C) the weight of the fluid displaced minus the weight of the object C) the weight of the fluid displaced minus the weight of the object C) the weight of the fluid displaced minus the weight of the object C) the weight of the fluid displaced minus the weight of the object C) the weight of the fluid displaced minus the set etheres C) bit is an example C) a the bridge material set of the range sin weather C) a the bridge material set of the range sin weather C) is the object will not move at all B) so the bridge materials expand and contract with the changes in weather C) so the bridge materials car, change state as the weather changes C) a the bridge materials car, change state as the weather changes C) a the bridge materials car, change state as the weather change   | 16 states that any c   | change in pressure applied to any point on a conf   | ined fluid is            |  |  |  |  |
| A) Boyle's law B) Pascal's principle   C) Galileo's law D) Daton's law   17 - If you wanted to use a setup like the one in the figure bellow to create an upward force triple that of the downward force water, which of the following combination of piston areas could   accomplish this? B) A <sub>12</sub> . 6 m²; A <sub>22</sub> . 18 m²   A) A <sub>12</sub> . 6 m²; A <sub>22</sub> . 20 m² D)   A <sub>12</sub> . 6 m²; A <sub>22</sub> . 20 m² D) A <sub>12</sub> . 6 m²; A <sub>22</sub> . 8 m²   B) Positive B) neutral   C) A <sub>12</sub> . 6 m²; A <sub>22</sub> . 8 m² D)   R) Positive B) neutral   B) Positive B) neutral   C) A <sub>12</sub> . 6 m²; A <sub>22</sub> . 8 m² D)   A) positive B) neutral   C) A <sub>12</sub> . 6 m²; A <sub>22</sub> . 18 m² D)   A) positive B) neutral   C) A <sub>12</sub> . 6 m²; A <sub>22</sub> . 8 m² D)   A) positive B) neutral   D) Number (C) changing   D) Vith a sa namorphous solit. D)   C) It has a namorphous solit. D)   C) It has a lower density than water. D)   C) Nich a size principle; an object immersed in fluid has an upward force on it equal to  | transmitted undiminished throu   | ughout the fluid.   | Piston 1 Piston 2        |  |  |  |  |
| C) Galileo's law D) Dalton's law   17 - If you wanted to use a setup like the one in the figure bellow to create an upward force triple that of the downward force you exert, which of the following combination of piston areas could accomplish this?   A) A <sub>1</sub> , 6 m²; A <sub>2</sub> , 10 m² B)   A <sub>1</sub> , 6 m²; A <sub>2</sub> , 2 m² D)   A <sub>1</sub> , 6 m²; A <sub>2</sub> , 2 m² D)   A <sub>1</sub> , 6 m²; A <sub>2</sub> , 2 m² D)   A <sub>1</sub> , 6 m²; A <sub>2</sub> , 2 m² D)   A <sub>1</sub> , 6 m²; A <sub>2</sub> , 2 m² D)   A <sub>1</sub> , 6 m²; A <sub>2</sub> , 2 m² D)   A <sub>1</sub> , 6 m²; A <sub>2</sub> , 2 m² D)   A <sub>1</sub> be of buoyancy results in a feeling of weight essness?   A) positive   B) neutral   C) changing   D) negative   19 - Why does ice float?   A) B)   It is an amorphous solid.   B) B)   It has a lower density than water.   D) <td>A) Boyle's law</td> <td>B) Pascal's principle</td> <td>15</td>   | A) Boyle's law   | B) Pascal's principle   | 15                       |  |  |  |  |
| <ul> <li>17 - If you wanted to use a setup like the one in the figure bellow to create an upward force triple that of the downward force you exert, which of the following combination of piston areas could accomplish this?</li> <li>Ah, 6 m², A<sub>2</sub>, 10 m²</li> <li>B, Ah, 6 m², A<sub>2</sub>, 18 m²</li> <li>C) Ar, 6 m², A<sub>2</sub>, 2 m²</li> <li>D) A<sub>1</sub>, 6 m², A<sub>2</sub>, 8 m²</li> <li>B) neutral</li> <li>C) changing</li> <li>D) negative</li> <li>P- Why does ice float?</li> <li>A) It is an amorphous solid.</li> <li>B) It has strong cohesive properties.</li> <li>C) It has a lower density than water.</li> <li>D) It has a higher density than water.</li> <li>C) Which is an example of Pascal's principle?</li> <li>A) a straw</li> <li>B) hydroplaning wheels</li> <li>C) hydraulic brakes</li> <li>D) a sipho</li> <li>A the weight of the fluid displaced</li> <li>B) the object</li> <li>C) the weight of the fluid displaced minus the weight of the object</li> <li>C) the weight of the fluid displaced minus the weight of the object</li> <li>B) it so chesive properties decrease</li> <li>C) it bends</li> <li>D) it contracts</li> <li>C) why is it important to take thermal expansion into account when building bridges?</li> <li>A) is the bridge materials expand and contract with the changes in weather</li> <li>C) so the bridge materials can change state as the weather changes</li> </ul>   | C) Galileo's law   | D) Dalton's law   | ↓ <sup>F</sup> 1         |  |  |  |  |
| that of the downward force you exert, which of the following combination of piston areas could<br>accomplish this?<br>A) A <sub>0</sub> , 6 m²; A <sub>2</sub> , 10 m² B) A <sub>10</sub> , 6 m²; A <sub>2</sub> , 18 m²<br>C) A <sub>0</sub> , 6 m²; A <sub>2</sub> , 2 m² D) A <sub>10</sub> , 6 m²; A <sub>2</sub> , 8 m²<br>18 - What type of buoyart results in a feeling of weightlessness?<br>A) positive B) neutral C) changing D) negative<br>19 - Why does ice float?<br>A) It is an amorphous solid. B) It has strong cohesive properties.<br>C) It has a lower density than water. D) It has a higher density than water.<br>20 - Which is an example of Pascal's principle?<br>A) a straw B) hydroplaning wheels C) hydraulic brakes D) a sipho<br>21 - According to Archimeders' principle, an object immersed in fluid has an upward force on it equal to<br>A) the weight of the fluid displaced minus the weight of the object D) the weight of all the fluid in the container<br>C) the weight of the fluid displaced minus the weight of the object D) the weight of all the fluid in the container<br>C) the weight of the fluid displaced minus the weight of the object D) the weight of the object C<br>22 - What happens to a bimetallic strip when it is heated?<br>A) is the comes elastic curb when it is heated?<br>A) is the dense weight of the fluid displaced minus the weight of the object D) it contracts<br>3 - Why is it important to take thermal expansion into account when building bridges?<br>A) so the bridge materials expand and contract with the changes in weather<br>C) so the bridge materials can change state as the weather changes in weather   | 17 - If you wanted to use a setu   | p like the one in the figure bellow to create an up   | ward force triple        |  |  |  |  |
| accomplish this? A) A <sub>1</sub> , 6 m²; A <sub>2</sub> , 10 m² B) A <sub>1</sub> , 6 m²; A <sub>2</sub> , 18 m² C) A <sub>1</sub> , 6 m²; A <sub>2</sub> , 2 m² D) A <sub>1</sub> , 6 m²; A <sub>2</sub> , 8 m² D) A <sub>1</sub> , 6 m²; A <sub>2</sub> , 8 m² D) A <sub>1</sub> , 6 m²; A <sub>2</sub> , 8 m² D) a <sub>1</sub> , 6 m²; A <sub>2</sub> , 8 m² D) apositive B) neutral C) A <sub>1</sub> , 6 m²; A <sub>2</sub> , 8 m² D) negative C) bit has an amorphous solid. B) thas strong cohesive properties. C) I thas a lower density than water. D) I thas a higher density than water. C) Which is an example of Pascal's principle? A) a straw B) hydroplaning wheels C) hydraulic brakes D) a sipho C1 - According to Archimedes' principle, an object immersed in fluid has an upward force on it equal to A) the weight of the fluid displaced minus the weight of the object C) the weight of the fluid displaced minus the weight of the object C) the weight of the fluid splaced minus the weight of the object C) the weight of the fluid splaced minus the weight of the object C) it bends D) it contracts C) it bends D) it contracts C) it bends D) it contracts C) or the bridge materials expand and contract with the changes in weather C) so the bridge materials expand and contract with the changes in weather C) so the bridge materials expand and contract with the changes in weather C) so the bridge materials expand and contract with the changes in weather C) so the bridge materials expand and contract with the changes in weather C) so the bridge materials expand and contract with the changes in weather C) and the object materials expand and contract with the changes in weather C) and the bridge materials expand and contract with the changes in weather C) and the bridge materials expand and contract with the changes in weather C) and the bridge materials expand and contract with the changes in weather C) and the bridge materials expand and contract with the changes in weather C) and the bridge materials expand and contract with the changes in weather C) and the bridge materials expand and contract with the changes in weather C) and th  | that of the downward force you   | exert, which of the following combination of pis  | ton areas could          |  |  |  |  |
| A)A <sub>1</sub> , 6 m²; A <sub>2</sub> , 10 m²B)A <sub>1</sub> , 6 m²; A <sub>2</sub> , 18 m²Piston 1C)A <sub>1</sub> , 6 m²; A <sub>2</sub> , 2 m²D)A <sub>1</sub> , 6 m²; A <sub>2</sub> , 8 m²Piston 118What type of buoyarcy results in a feeling of weightlessness?D)negativeA)positiveB)neutralC)changingD)9Why does ice float?B)It is an amorphous solid.B)B)It has strong cohesive properties.C)19Which is an example of Pascal's principle?D)It has a lower density than water.D)It has a higher density than water.20Which is an example of Pascal's principle?D)a strawB)hydroplaning wheelsC)hydraulic brakesD) a sipho21- According to Archime des' principle, an object immersed in fluid has an upward force on it equal to  | accomplish this?   |   |                          |  |  |  |  |
| C) A <sub>1</sub> , 6 m²; A <sub>2</sub> , 2 m² D) A <sub>1</sub> , 6 m²; A <sub>2</sub> , 8 m² Piston 1 Piston 2   18 - What type of buoyancy results in a feeling of weightlessness? D) negative D) negative   19 - Why does ice float? B) neutral C) changing D) negative   19 - Why does ice float? B) It has a trong cohesive properties. C) lt has a noorphous solid. B) B) It has a trong cohesive properties.   C) It has a lower density than water. D) It has a higher density than water. D) a sipho   20 - Which is an example of Pascal's principle? D) a trong to Archimedes' principle, an object immersed in fluid has an upward force on it equal to  | A) $A_1$ , 6 m <sup>2</sup> ; $A_2$ , 10 m <sup>2</sup>  | B) A <sub>1</sub> , 6 m <sup>2</sup> ; A <sub>2</sub> , 18 m <sup>2</sup>                                       |                          |  |  |  |  |
| 18 - What type of buoyary results in a feeling of weightsenses?       D) negative         A) positive       B) neutral       C) changing       D) negative         19 - Why does ice float?       B) It has strong cohesive properties.       D) It has a lower density than water.       D) It has a lower density than water.         C) It has a lower density than water.       D) It has a ligher density than water.       D) a sipho         20 - Which is an example of Pascal's principle?       D) a sipho       D) a sipho         A) a straw       B) hydroplaning wheels       C) hydraulic brakes       D) a sipho         21 - According to Archimeters' principle, an object immerset in fluid has an upward force on it equal to  | C) $A_1$ , 6 m <sup>2</sup> ; $A_2$ , 2 m <sup>2</sup>   | D) A <sub>1</sub> , 6 m <sup>2</sup> ; A <sub>2</sub> , 8 m <sup>2</sup>  | Piston 1 Piston 2        |  |  |  |  |
| A) positive       B) neutral       C) changing       D) negative         19 - Why does ice float?       B) thas atrong hous sold.       B) thas strong converties.       D) thas a higher does ive properties.         A) It is an amorphous sold.       B) thas a lower density than water.       D) It has a higher does ive properties.       D) a sipho         C) Which is an example of Pascal's principle?       D) It has a higher does ive properties.       D) a sipho         A) a straw       B) hydroplaning wheels       C) hydraulic brakes       D) a sipho         C1 - According to Archimeters' principle, an object immeter to fluid has a upward force on it equal to       B) the weight of the fluid in the container         A) the weight of the fluid displaced minus the weight of the object       D) the weight of the fluid in the container         C) it bends       B) it contracts       D) it contracts         C) it bends       D) it contracts       D) it contracts         C) it bends       D) it contracts       So the bridge will not move at all         B) so the bridge material expansion intract with the arges in weather       So the bridge material expansion intract weather         C) so the bridge material contract with the arges in weather       So the bridge material expansion intract weather   | 18 - What type of buoyancy res   | ults in a feeling of weightlessness?  |                          |  |  |  |  |
| 19 - Why does ice float?   A) It is an amorphous solid.   B) It has strong cohesive properties.   C) It has a lower density than water.   20 - Which is an example of Pascal's principle?   A) a straw   B) hydroplaning wheels   C) hydraulic brakes   D) a sipho   21 - According to Archimeder' principle, an object immersed in fluid is placed minus the weight of the fluid is placed minus the weight of the object   B) the weight of the fluid isplaced minus the weight of the object   C) the weight of the fluid isplaced minus the weight of the object to be the weight of the fluid in the container   C) it bends   A) it becomes elastic   B) its cohesive properties decrease   C) it bends   D) it contracts   23 - Why is it important to take thermal expansion into account when building bridges?   A) so the bridge will not mere at all   B) so the bridge materials expand and contract with the tanges in weather   C) so the bridge materials can change state as the weather changes  | A) positive B)   | neutral C) changing   | D) negative              |  |  |  |  |
| A) It is an amorphous solid.       B) It has strong cohesive properties.         C) It has a lower density it water.       D) It has a higher density than water.         20 - Which is an example of Pascal's principle?       D) a sipho         A) a straw       B) hydroplaning wheels       C) hydraulic brakes       D) a sipho         21 - According to Archiwes' principle, an object immersed in fluid has an upward force on it equal to       A) the weight of the fluid displaced minus the weight of the object       B) the weight of all the fluid in the container         C) the weight of the fluid displaced minus the weight of the object       D) the weight of the object       D) the weight of the object         22 - What happens to a bimetallic strip when it is heated?       B) it contracts       E       E         A) it becomes elastic       B) its cohesive properties decrease       E       E         C) it bends       D) it contracts       D) it contracts       E         23 - Why is it important to take thermal expansion into executive hermoliding bridges?       E       E         A) so the bridge will not meet at all       E       E       E         B) so the bridge materials to charact with the executive to according to the object is the executive to according to the object is the executive to the obj  | 19 - Why does ice float?   |   |                          |  |  |  |  |
| C) It has a lower density than water.<br>20 - Which is an example of Pascal's principle?<br>A) a straw B) hydroplaning wheels C) hydraulic brakes D) a sipho<br>21 - According to Archimete's principle, an object immersed in fluid has an upward force on it equal to<br>A) the weight of the fluid displaced minus the weight of the object B) the weight of all the fluid in the container<br>C) the weight of the fluid displaced minus the weight of the object D) the weight of the object<br>22 - What happens to a bimetallic strip when it is heated?<br>A) it becomes elastic A b) it becomes elastic B) its cohesive properties decrease<br>C) it bends D) it contracts<br>23 - Why is it important to take thermal expansion into account when building bridges?<br>A) so the bridge will not move at all<br>B) so the bridge materials contract with the contract wether building bridges to a bimeter bound of the bridge materials and contract with the contract wether building bridges.<br>C) so the bridge materials contract with the contract wether building bridges.<br>C) so the bridge materials contract with the contract wether building bridges.<br>C) so the bridge materials contract with the contract wether building bridges.<br>C) so the bridge materials contract with the contract wether building bridges.<br>C) so the bridge materials contract with the contract wether building bridges.<br>C) so the bridge materials contract with the contract wether building bridges.<br>C) so the bridge materials contract with the contract wether building bridges.<br>C) so the bridge materials contract with the contract wether building bridges.<br>C) so the bridge materials contract with the contract wether building bridges.<br>C) so the bridge materials contract with the contract wether building bridges.<br>C) so the bridge materials contract with the contract wether building bridges.<br>C) so the bridge materials contract wether building bridges.<br>C) so the bridge materials contract wether building bridges.<br>C) so the bridge materials contract wether building bridges.<br>C) so the bridge mater   | A) It is an amorphous solid.   | B) It has strong cohesiv  | e properties.            |  |  |  |  |
| 20 - Which is an example of Pascal's principle?       D) a sipho         A) a straw       B) hydroplaning wheels       C) hydraulic brakes       D) a sipho         21 - According to Archimedes' principle, an object immersed in fluid has a sight of the fluid of the fluid base of the fluid has placed minus the weight of the object       B) the weight of all the fluid to container         A) the weight of the fluid displaced minus the weight of the object       D) the weight of the object       D) the weight of the object         22 - What happens to a birtig when it is heated?       B) its cohesive properties decrease       E         A) it becomes elastic       B) its cohesive properties decrease       E         C) it bends       D) it contracts       E         23 - Why is it important to take thermal expansion into account when birdige sill not move at all       D) it contracts         B) so the bridge materials and contract with the kerses in kerses in kerses in the site site site site site site site sit  | C) It has a lower density than water. D) It has a higher density than water.   |   |                          |  |  |  |  |
| A) a straw B) hydroplaning wheels C) hydraulic brakes D) a sipho   21 - According to Archimedes' principle, an object immersed in fluid has an upward force on it equal to   | 20 - Which is an example of Pas  | scal's principle?   |                          |  |  |  |  |
| 21 - According to Archimedes' principle, an object immersed in fluid has an upward force on it equal to   A) the weight of the fluid displaced   B) the weight of all the fluid in the container   C) the weight of the fluid displaced minus the weight of the object   D) the weight of the object   22 - What happens to a bimetallic strip when it is heated?   A) it becomes elastic   B) its cohesive properties decrease   C) it bends   D) it contracts   23 - Why is it important to take thermal expansion into account when building bridges?   A) so the bridge materials expand and contract with the charges in weather   C) so the bridge materials can change state as the weather changes   | A) a straw B)  | hydroplaning wheels C) hydrauli   | ic brakes D) a sipho     |  |  |  |  |
| A) the weight of the fluid displaced       B) the weight of all the fluid in the container         C) the weight of the fluid displaced minus the weight of the object       D) the weight of the object         22 - What happens to a bimetallic strip when it is heated?       B) its cohesive preties decrease         A) it becomes elastic       B) its cohesive preties decrease         C) it bends       D) it contracts         23 - Why is it important to take thermal expansion into account when building bridges?       A) so the bridge materials expand and contract with the containt weather         B) so the bridge materials expand and contract with the contract set of the object       C) so the bridge materials can change state as the weather  | 21 - According to Archimedes' p  | principle, an object immersed in fluid has an upwa  | ard force on it equal to |  |  |  |  |
| C) the weight of the fluid displaced minus the weight of the objectD) the weight of the object22 - What happens to a bimetallic strip when it is heated?22 - What happens to a bimetallic strip when it is heated?A) it becomes elasticB) its cohesive properties decreaseC) it bendsD) it contracts23 - Why is it important to take thermal expansion into account when building bridges?A) so the bridge will not move at allB) so the bridge materials expand and contract with the charges in weatherC) so the bridge materials can change state as the weather changes  | A) the weight of the fluid displaced   B) the weight of all the fluid in the container   |   |                          |  |  |  |  |
| 22 - What happens to a bimetallic strip when it is heated?A) it becomes elasticB) its cohesive properties decreaseC) it bendsD) it contracts23 - Why is it important to take thermal expansion into account when building bridges?A) so the bridge will not move at allB) so the bridge materials expand and contract with the charges in weatherC) so the bridge materials can change state as the weather  | C) the weight of the fluid displaced minus the weight of the object D) the weight of the object                                |   |                          |  |  |  |  |
| A) it becomes elasticB) its cohesive properties decreaseC) it bendsD) it contracts23 - Why is it important to take thermal expansion into accurt when building bridges?A) so the bridge will not move at allB) so the bridge materials expand and contract with the charges in weatherC) so the bridge materials can change state as the weather changes   | 22 - What happens to a bimetallic strip when it is heated?   |   |                          |  |  |  |  |
| <ul> <li>C) it bends D) it contracts</li> <li>23 - Why is it important to take thermal expansion into account when building bridges?</li> <li>A) so the bridge will not move at all</li> <li>B) so the bridge materials expand and contract with the changes in weather</li> <li>C) so the bridge materials can change state as the weather changes</li> </ul>   | A) it becomes elastic  | B) its cohesive prope   | rties decrease           |  |  |  |  |
| <ul> <li>23 - Why is it important to take thermal expansion into account when building bridges?</li> <li>A) so the bridge will not move at all</li> <li>B) so the bridge materials expand and contract with the changes in weather</li> <li>C) so the bridge materials can change state as the weather changes</li> </ul>  | C) it bends  | D) it contracts   |                          |  |  |  |  |
| <ul><li>A) so the bridge will not move at all</li><li>B) so the bridge materials expand and contract with the changes in weather</li><li>C) so the bridge materials can change state as the weather changes</li></ul>  | 23 - Why is it important to take thermal expansion into account when building bridges?   |   |                          |  |  |  |  |
| <ul><li>B) so the bridge materials expand and contract with the changes in weather</li><li>C) so the bridge materials can change state as the weather changes</li></ul>  | A) so the bridge will not move at all  |   |                          |  |  |  |  |
| C) so the bridge materials can change state as the weather changes   | B) so the bridge materials expand and contract with the changes in weather   |   |                          |  |  |  |  |
|  |  |   |                          |  |  |  |  |
| D) so the bridge materials don't deteriorate   | D) so the bridge materials don't   | t deteriorate   |                          |  |  |  |  |

| 74   | Amorphous solids have no   |   |   |  |  |  |  |  |
|--|--|---|---|--|--|--|--|--|
| 24<br>A)   | volume B) lig  | <br>ud phase (                              | ) crystalline pattern   | D) shape   |  |  |  |  |
| 7 y<br>25  | 25 In terms of the kinetic molecular theory why do substances expand when heated?  |   |   |  |  |  |  |  |
| 23<br>A)   | A) The particles with the loss and push other particles away   |   |   |  |  |  |  |  |
| R) The particles on the surface vibrate faster   |  |   |   |  |  |  |  |  |
| с)   | b) The particles vibrate more causing air processes to compare the substance   |   |   |  |  |  |  |  |
| (ס<br>(ח   | C) The particles vibrate more, causing air pressure to compress the substance.   |   |   |  |  |  |  |  |
| 26 Which example demonstrates electicity?  |  |   |   |  |  |  |  |  |
| $20^{-1}$ which example demonstrates elasticity:<br>(A) a snapping rubber band (B) a boot iron bar (C) a broken stick (D) a meltod stick of butter |  |   |   |  |  |  |  |  |
| /  | $r_{y}$ a snapping rubber band $D_{y}$ a bent from bar $C_{y}$ a broken slick $D_{y}$ a mented slick of Dutter   |   |   |  |  |  |  |  |
| Δ)   | A) 1 cm $P$ 0.1 cm $P$ 0.1 cm $P$ 0.2 cm $P$ |   |   |  |  |  |  |  |
| / )  |  | 0.1 cm                                      | c) 0.05 cm  | <i>D</i> ) 0.2 cm  |  |  |  |  |
| i  | قوانين عاشر عام ف2 + ف3  |   |   |  |  |  |  |  |
|  |  | Reflection and Mir                          | الإنعكاس والمرايا rors  |  |  |  |  |  |
|  | $f = \frac{r}{2}$  | $\frac{1}{f} = \frac{1}{di} + \frac{1}{do}$ | $m = \frac{hi}{ho} = \frac{-di}{do}$                                |  |  |  |  |  |
|  | 2  | Refraction and Lense                        | الإنكسار والعدسات es  |  |  |  |  |  |
|  | $n = \frac{c}{-}$  | $n_1 \sin \theta_1 = n_2 \sin \theta_2$     | $A = \sin^{-1} \frac{n_2}{2}$                                       | $\frac{1}{-} = \frac{1}{-} + \frac{1}{-}$                      |  |  |  |  |
|  | v  |   | $n_c = sin n_1$   | f di do  |  |  |  |  |
|  | $m - \frac{hi}{dt} - \frac{-di}{dt}$   |   |   |  |  |  |  |  |
|  | $\frac{111 = \frac{1}{ho} = \frac{1}{do}}{1}$  |   |   |  |  |  |  |  |
|  | الإهتزازات والموجات Vibrations and waves<br>ع  |   |   |  |  |  |  |  |
|  | $f = \frac{1}{T}$  | $f = \frac{1}{T}$ $\lambda = \frac{1}{f}$   |   |  |  |  |  |  |
|  | الطاقة الحرارية Thermal Energy   |   |   |  |  |  |  |  |
|  | $T_{K} = T_{C} + 273$  | $T_f = \frac{m_A C}{m_B}$                   | $AT_A + m_B C_B T_B$  | $Q = mH_f$   |  |  |  |  |
|  | $\Delta U = Q - W$   | $e = \frac{W}{W}$                           | $\Lambda S = \frac{Q}{2}$   | $Q = mn_v$   |  |  |  |  |
|  |  | QH  | <i>T</i>  |  |  |  |  |  |
|  | حالات المادة States Of Matter  |   |   |  |  |  |  |  |
|  | $P = \frac{r}{A}$  | $P_1V_1 = P_2V_2$                           | $\frac{v_1}{T_1} = \frac{v_2}{T_2}$                                 | $\frac{r_1 v_1}{T_1} = \frac{r_2 v_2}{T_2}$                    |  |  |  |  |
|  | DU DT  | F. F.                                       | D = ask   | E  |  |  |  |  |
|  | $rv = n\kappa r$   | $\frac{A_1}{A_1} = \frac{A_2}{A_2}$         | $r = \rho g n$  | $r_{Buoyant} = \rho_{flouid} V g$                              |  |  |  |  |
|  | $F_{net} = F_g - F_{buoyant}$  | $F_g = mg = \rho_{solid} V g$               | $\alpha = \frac{\Delta L}{L_2 - L_1} = \frac{L_2 - L_1}{L_2 - L_1}$ | $\beta = \frac{\Delta V}{V_1 + m} = \frac{V_2 - V_1}{V_2 + m}$ |  |  |  |  |
|  |  |   | $L_1 \Delta T = L_1 (T_2 - T_1)$                                    | $V_1 \Delta T = V_1 (T_2 - T_1)$                               |  |  |  |  |
|  | الثوابت  |   |   |  |  |  |  |  |
|  | C = 3×10 <sup>8</sup> m/s  | g = 9.81 m/s <sup>2</sup>                   | 1 atm = 1.01×10 <sup>5</sup> Pa                                     | R = 8.31 Pa·m <sup>3</sup> /(mol·K)                            |  |  |  |  |
|  | Avogadro no = $6.022 \times 10^{23}$   |   |   |  |  |  |  |  |
|  | -  |   |   | l  |  |  |  |  |