Conceptual Physics **NAME:**

Homework 1a: Classical Mechanics Homeworks are due usually a day after the corresponding textbook part/lecture is completed. Due dates will be announced in class. Multiple-choice problems will all be marked. **USE** the answer table for these problems. The rest of the homeworks will be marked for apparent completeness and some full-answer problems will/may be marked in detail. Make the full-answer solutions sufficiently detailed that the grader can follow your reasoning. Solutions will be posted eventually after the due dates. The solutions are intended to be (but not necessarily are) super-perfect and often go beyond full answers. For an argument or discussion problem, there really is no single right answer. The instructor's answer reflects his long experience in physics, but there could be objections to his arguments, assumptions, nuances, style, facts, etc.

NAME:

Answer Table for the Multiple-Choice Questions

	a	b	c	d	e		a	b	c	d	e
1.	O	O	O	O	O	26.	O	O	O	O	O
2.	O	O	O	O	O	27.	O	O	O	O	O
3.	O	O	O	O	O	28.	O	O	O	O	O
4.	O	O	O	O	O	29.	O	O	O	O	O
5.	O	O	O	O	O	30.	O	O	O	O	O
6.	O	O	O	O	O	31.	O	O	O	O	O
7.	O	O	O	O	O	32.	O	O	O	O	O
8.	O	O	O	O	O	33.	O	O	O	O	O
9.	O	O	O	O	O	34.	O	O	O	O	O
10.	O	O	O	O	O	35.	O	O	O	O	O
11.	O	O	O	O	O	36.	O	O	O	O	O
12.	O	O	O	O	O	37.	O	O	O	O	O
13.	O	O	O	O	O	38.	O	O	O	O	O
14.	O	O	O	O	O	39.	O	O	O	O	O
15.	O	O	O	O	O	40.	O	O	O	O	O
16.	O	O	O	O	O	41.	O	O	O	O	O
17.	O	O	O	O	O	42.	O	O	O	O	O
18.	O	O	O	O	O	43.	O	O	O	O	O
19.	O	O	O	O	O	44.	O	O	O	O	O
20.	O	O	O	O	O	45.	O	O	O	O	O
21.	O	O	O	O	O	46.	O	O	O	O	O
22.	O	O	O	O	O	47.	O	O	O	O	O
23.	O	O	O	O	O	48.	O	O	O	O	O
24.	O	O	O	O	O	49.	O	O	O	O	O
25.	O	O	O	O	O	50.	O	O	O	O	O

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002 qmult 00100 1 4 4 easy deducto-memory: mechanics defined

1. "Let's play *Jeopardy*! For $100, the answer is: It is the branch of physics dealing with the motions of bodies."

   What is _____, Alex?

   a) electromagnetism b) thermodynamics c) engineering d) mechanics
   e) chemical reactions

   SUGGESTED ANSWER: (d)

   Actually, all branches of physics overlap with each other and are not clearly separated. But the core problems of each branch are clearly enough separated to make the categorization into branches useful.

   Wrong answers:
   a) As Lurch would say AAAARGH.

   Redaction: Jeffery, 2012jan01

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002 qmult 00110 1 1 1 easy memory: classical mechanics defined

2. _____ is the only mechanics theory known before about 1900 and then thought to be the fundamental physics of motion. Nowadays we know it is an approximate theory valid for size scales much larger than atomic, size scales much smaller than cosmological, speeds much slower than the vacuum light speed, and gravity much weaker than black holes. Within its realm of validity it is a very accurate theory and, in fact, in the inner region of that realm no experimental discrepancies can be detected. The center of that realm—which might be tricky to defined exactly—can be called the classical limit. In the classical limit, one can describe the theory as an exact true emergent physics—and many would consider this the useful way to describe rather than as an approximate theory. As one departs form the classical limit, the theory progressively becomes more and more approximate and eventually becomes inadequate as a theory of motion.

   a) Classical mechanics b) Quantum mechanics c) Quantum field theory
   d) Relativistic physics e) Aristotelian physics

   SUGGESTED ANSWER: (a)

   Wrong answers:
   e) That was thought fundamental before about 1600.

   Redaction: Jeffery, 2012jan01

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002 qmult 00200 1 4 5 easy deducto-memory: geometry defined

3. "Let's play *Jeopardy*! For $100, the answer is: The branch of mathematics concerned with shapes in space and the properties of space."

   What is _____, Alex?

   a) real analysis b) number theory c) calculus d) algebra e) geometry

   SUGGESTED ANSWER: (e)

   Wrong answers:
   a) Ah, the good old days with Prof. Cima in real analysis—"the sets are compact and . . . .

   Redaction: Jeffery, 2012jan01

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002 qmult 00210 1 1 3 easy memory: Euclidean geometry

4. The geometry of everyday life 3-dimensional space and a vast realm beyond everyday life 3-dimensional space is:

   a) hyperspherical. b) hyperbolic. c) Euclidean. d) curved. e) very curved.

   SUGGESTED ANSWER: (c)

   Wrong answers:

d) Exactly wrong.

Redaction: Jeffery, 2012jan01

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002 qmult 00250 1 1 2 easy memory: 2-d curved space of a sphere

5. The 2-dimensional surface of a sphere is not a flat space (i.e., not a Euclidean 2-dimensional space). One sign of this is that lines parallel at an equator:

   a) never meet. b) meet at the poles. c) meet 3 times.
   d) diverge from each other away from the equator. e) meet at the equator.

SUGGESTED ANSWER: (b)

Wrong answers:
c) They meet twice: one time at each pole
e) Only if they are coincident.

Redaction: Jeffery, 2012jan01

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002 qmult 00300 1 4 1 easy deducto-memory: displacement defined

6. "Let's play *Jeopardy*! For $100, the answer is: It is the vector quantity specifying position relative to some origin. It has length which is the straightline distance from the origin to the position and a direction which is the direction from the origin to the position."

   What is _____, Alex?

   a) displacement b) velocity c) acceleration d) force e) time

SUGGESTED ANSWER: (a)

Wrong answers:
b) As Lurch would say AAAARGH.

Redaction: Jeffery, 2012jan01

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002 qmult 00330 1 3 3 easy math: displacements in Vegas 1

Extra keywords: physci

7. You are in Las Vegas at the intersection of the Strip and Tropicana (where the MGM Grand, New York, New York, Excalibur, and Tropicana are). You go about **1 mile north** on the east side of the Strip to the Harley-Davidson Cafe, cross the Strip to the west side, and go about **half a mile south** to the Monte Carlo and there lose **most** of your of $100 stake at the roulette table.

   a) Your total travel distance is about **1.5 miles**, total displacement about **1 mile north**, and you have **more** than $50 left.
   b) Your total travel distance is about **1.5 miles**, total displacement about **0.5 miles north**, and you have **more** than $50 left.
   c) Your total travel distance is about **1.5 miles**, total displacement about **0.5 miles north**, and you have **less** than $50 left.
   d) Your total travel distance is about **1.5 miles**, total displacement about **1.5 miles north**, and you have **more** than $50 left.
   e) Your total travel distance is about **0.5 miles**, total displacement about **1.5 miles north**, and you have havn't got **bus fare** left.

SUGGESTED ANSWER: (c)

Ah, I remember the corner well from my days in Vegas working at UNLV (1998–1999).

Wrong answers:
a) The displacement is only 0.5 miles north.
b) You have less than $50 left, not more.
d) The displacement is only 0.5 miles north.
e) Distance and displacement numbers are interchanged and may or may not have bus fare: there's not enough information to tell; the question doesn't suggest you're broke though.

Redaction: Jeffery, 2001jan01

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002 qmult 00430 1 1 3 easy memory: clocks defined

8. A system exhibiting a periodic motion (i.e., a repeating motion where the repetitions take equal amounts of time) can be used as a _____. Some physical theory is needed to guarantee that the motion is periodic.

    a) motion sensor b) meter stick c) clock d) crock e) hourglass

    SUGGESTED ANSWER: (c)

    There are clocks that do not have periodic motions in an obvious sense: hourglasses and water clocks. In those clocks, there is a fairly steady flow that is used to measure time. Of course, a complete filling of the catching vessel could be considered as periodic motion.

    Wrong answers:
    d) That too.

    Redaction: Jeffery, 2012jan01

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002 qmult 00530 1 1 3 easy math: travel time from distance/speed: Knoxville 1

Extra keywords: physci

9. You have just traveled the back roads from Knoxville to Nashville. Your average speed was 60 mi/h, but you occasionally hit an instantaneous speed of 130 mi/h. (Could be you're hauling white lightning.) Your odometer travel distance is 250 miles. How long have you been on the road?

    a) 1/4 hours. b) 10 hours. c) 4.17 hours. d) 6 hours. e) about 2 hours.

    SUGGESTED ANSWER: (c)

    The students have to be clear on how you get a time from a distance and speed: distance/speed. The question is a remnant of my hillbilly days in Tennessee. Actually, the only time I drank white lightning in Tennessee it was imported from Romania by friends. Alas, the great days of *Thunder Road* are mostly over.

    Wrong answers:

    Redaction: Jeffery, 2001jan01

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002 qmult 00534 1 3 1 easy memory: average velocity: Knoxville 3

10. You have just traveled 400 km on a trip to Knoxville and back. Knoxville is due east of your starting point. It took 8 hours. Your average **VELOCITY** (with velocity definitely meaning a vector here) was:

    a) 0 km/h with an indeterminate direction. b) 50 km/h west. c) 100 km/h east.
    d) 200 km/h west. e) 400 km/h north.

    SUGGESTED ANSWER: (a)

    Note that it doesn't matter what the actual path to Knoxville and back was. All the little displacement vectors in a loop add up to zero and zero divided by a non-zero time is still zero.

    Wrong answers:
    e) North? C'mon.

    Redaction: Jeffery, 2008jan01

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002 qmult 00600 1 4 5 easy deducto-memory: acceleration defined

11. "Let's play *Jeopardy*! For $100, the answer is: It is the rate of change of velocity with respect to time. It is important to note that it is a vector and since velocity is a vector, the quantity is non-zero if velocity changes in either or both magnitude and direction."

    What is _____, Alex?

    a) time b) force c) displacement d) velocity e) acceleration

    SUGGESTED ANSWER: (e)

    Wrong answers:

a) As Lurch would say AAAARGH.

Redaction: Jeffery, 2012jan01

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002 qmult 00620 1 1 3 easy memory: magnitudes of x,v,a

12. The magnitudes of displacement, velocity, and acceleration are usually called distance, speed, and:

a) acceleration speed. b) deceleration. c) acceleration. d) accelmag.
e) the unnameable.

SUGGESTED ANSWER: (c)

The terminology of kinematics is not entirely regular. But that's true of most fields in life.

Wrong answers:
d) Maybe this should be the name.

Redaction: Jeffery, 2008jan01

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002 qmult 00700 1 1 4 easy memory: inertial frame defined

13. A/An _____ is a physics defined frame of reference in which accelerations are caused by forces. In modern theory, this kind of frame is **NOT** accelerated relative to the local frame that participates in the mean expansion of the universe.

a) accelerated frame b) rotating frame c) non-inertial frame d) inertial frame
e) decelerated frame

SUGGESTED ANSWER: (d)

Wrong answers:
c) Exactly wrong.

Redaction: Jeffery, 2012jan01

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002 qmult 00800 1 1 1 easy memory: force defined

14. A/An _____ is the cause of accelerations of bodies relative to inertial frames. In modern physics, we understand _____s to be themselved caused by fields which are continuous functions of space. Fields themselves are often caused by bodies nearby to the body being affected the _____ they cause. So one often speaks of _____ as relationships between bodies omitting as a simplification mention of the mediating field. This is especially true in classical mechanics discussions.

a) force/forces. b) displacement/displacements c) velocity/velocities
d) acceleration/accelerations e) momentum/momenta

SUGGESTED ANSWER: (a)

Wrong answers:
d) Doesn't sound right.

Redaction: Jeffery, 2012jan01

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002 qmult 00810 1 5 3 easy thinking: what forces do

15. Forces can cause accelerations relative to inertial frames or cancel other forces. Another manifestation (which actually follows from their property of causing acceleration) is that they can cause:

a) velocity (without causing acceleration).
b) mass.
c) bodies to distort: i.e., flex, compress, stretch, etc.
d) bodies to live
e) bodies to rule.

SUGGESTED ANSWER: (c)

Forces do so much that with suitable qualification almost anything can be a predicate here. But in a definitional general sense "cause acceleration relative to inertial frames" and "cancel other forces" are the main properties. They also distort bodies. This is not really an independent property of force. If accelerations of a body happen relative to other parts of a body, then there will

be deformations. Constant velocity deformations can happen too, but an acceleration was needed to create the velocity doing the deforming in the first place.

If we don't see either an acceleration or a distortion, then how do we know or measure force? Well we often use the 2nd or 3rd law in cases where acceleration zero and distortion is invisible: but distortion is there even if we don't see it. For instance, the normal force of a macroscopically rigid body may not manifest itself either way. But there is a microscopic distortion with the normal force surface nonetheless.

Wrong answers:
a) This is one thing they don't cause. You could twist the meaning of the words to make it true, but it would just be a twisted case.
b) Arguable in some far-out high energy physics way.
d) Again sure, but they don't have to.
e) Nonsense answer.

Redaction: Jeffery, 2001jan01

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002 qmult 00900 1 4 5 easy deducto-memory: mass defined

16. "Let's play *Jeopardy*! For $100, the answer is: It is the quantity of resistance to the acceleration caused by a force. It is often called the quantity of matter, but this definition doesn't seem to add much to our understanding. It's true that the quantity in question is in many cases approximately proportional to the number of protons and neutrons in a body. If you consider number of protons and neutrons, the quantity of matter then the quantity in question is a measure of the quantity in question."

What is _____, Alex?

a) displacement b) velocity c) acceleration d) weight e) mass

SUGGESTED ANSWER: (e)

Wrong answers:
d) As Lurch would say AAAARGH.

Redaction: Jeffery, 2012jan01

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002 qmult 01000 1 4 5 easy deducto-memory: center of mass defination 1

17. "Let's play *Jeopardy*! For $100, the answer is: It is the mass-weighted mean position of an object."

What is _____, Alex?

a) center of weight b) the ordinary mean position c) acceleration d) mass
e) center of mass

SUGGESTED ANSWER: (e)

Wrong answers:
b) Exactly wrong.

Redaction: Jeffery, 2012jan01

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002 qmult 01020 1 4 2 easy deducto-memory: center of mass, reference frame

18. The center of mass (i.e., the actual physical position of the center of mass in space relative to the physical system it is the center of mass of) is:

a) a function of the coordinate system.
b) independent of the coordinate system.
c) dependent on the coordinate system.
d) both independent of and a function of the coordinate system.
e) neither independent of nor a function of the coordinate system.

SUGGESTED ANSWER: (b)

Wrong answers:
a) Absolutely wrong.
c) Absolutely wrong and meaning the same thing as answer (a).
d) Not logically possible.

e) Not logically possible again.

Redaction: Jeffery, 2001jan01

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002 qmult 01040 1 1 3 easy memory: cm at geometric center 1

19. An object with symmetric in three dimensions about a geometric center has its center of mass at its:

a) center of mass b) outer surface c) geometric center d) inner surface e) nowhere

SUGGESTED ANSWER: (c)

Wrong answers:

a) A sort of useless answer.

Redaction: Jeffery, 2012jan01

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002 qmult 01044 1 5 5 easy thinking: hoop center of mass

20. Where is the center of mass of a hoop?

a) At the end of the hoop.
b) At the top of the hoop.
c) At the left side of hoop.
d) Nowhere since a center of mass must be physically inside an object to be a center of mass.
e) On the axis of the hoop at the geometrical center of the hoop.

SUGGESTED ANSWER: (e)

Wrong answers:

a) The end of a hoop?

Redaction: Jeffery, 2001jan01

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002 qmult 01050 1 4 5 easy deducto-memory: hanging center of mass

21. "Let's play *Jeopardy*! For $100, the answer is: If one hangs a rigid object from a freely turning pivot point and lets it come to stable static equilibrium, the center of mass is directly below the pivot point. Thus, center of mass can be found from the intersection of two lines through the object that start at two points used as pivot points and that go in the direction through the object that was downward when each of the points was the pivot point. The method fails if the two pivot points and the center of mass happen to be collinear."

a) What is an **EMPIRICAL** method for finding gravitational torque, Alex?
b) What is a **THEORETICAL** method for finding gravitational torque, Alex?
c) What is gravitational torque, Alex?
d) What is a center of mass, Alex?
e) What is an **EMPIRICAL** method for finding the center of mass of a rigid object, Alex?

SUGGESTED ANSWER: (e)

Wrong answers:

d) The answer is not a definition of center of mass, but only a way of determining it.

Redaction: Jeffery, 2001jan01

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002 qmult 01100 1 4 2 easy deducto-memory: dynamics defined 1

22. "Let's play *Jeopardy*. For $100, the answer is: The branch of physics that explains motion and acceleration in terms of forces and masses."

What is _____, Alex?

a) kinematics b) dynamics c) statics d) economics e) cinematics

SUGGESTED ANSWER: (b)

Wrong answers:

Redaction: Jeffery, 2001jan01

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002 qmult 01130 1 1 3 easy memory: number of Newton's laws

23. How many laws of motion did Newton posit?

    a) 1. b) 2. c) 3. d) 4. e) 5.

SUGGESTED ANSWER: (c)

Wrong answers:

b) Logically he needed only two: his 2nd and 3rd laws. The 1st law is a special case of the 2nd. But for historical and heuristic reasons he must have felt he needed the 1st law.

Redaction: Jeffery, 2008jan01

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002 qmult 01140 3 5 3 tough thinking: 1st law redundant

24. Newton's 1st law is.

a) **PHYSICALLY INDEPENDENT** of the other two laws of motion and **CANNOT** be dispensed with as an axiom of Newtonian physics.
b) **PHYSICALLY INDEPENDENT** of the other two laws of motion, but nonetheless it **CAN** be dispensed with as an axiom of Newtonian physics.
c) actually a **SPECIAL CASE** of the **2ND LAW**. The case when the net force is zero. Therefore logically we need only two laws of motion. Perhaps for clarity Newton formulated his explicit 1st law and perhaps for the same reason physicists have retained it.
d) actually a **SPECIAL CASE** of the **3RD LAW**. The case when the net force is zero. Therefore logically we need only two laws of motion. Perhaps for clarity Newton formulated his explicit 1st law and perhaps for the same reason physicists have retained it.
e) is **INCORRECT**, but is kept in the books for historical reasons.

SUGGESTED ANSWER: (c)

A tough thinking question. The students really have to grasp Ockham's razor (which could be painful) and recognize how many basic principles are needed.

Actually, I'm getting tired of the 1st law. Despite the weight of history, maybe we should just junk it from the textbooks and talk of the two laws of motion with $F = ma$ having the special case of $a = 0$.

Wrong answers:

e) Oh, c'mon.

Redaction: Jeffery, 2008jan01

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002 qmult 01150 1 1 3 easy memory: Newton's 2nd law: 1

25. Newton's 2nd law is:

a) $m = \vec{F}_{\rm net}\vec{a}$.
b) $\vec{a} = m\vec{F}_{\rm net}$.
c) $\vec{F}_{\rm net} = m\vec{a}$.
d) For every force there is an equal and opposite force.
e) For every acceleration there is an equal and opposite acceleration.

SUGGESTED ANSWER: (c) "All I ever learnt in physics was $\vec{F}_{\rm net} = m\vec{a}$."

Wrong answers:

Redaction: Jeffery, 2001jan01

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002 qmult 01154 1 4 5 easy deducto-memory: center of mass in Fnet=ma

26. "Let's play *Jeopardy*! For $100, the answer is: The mass-weighted average position of a system of particles: a system being any specified set of material mass elements. This position's acceleration obeys $\vec{F}_{\rm net} = m\vec{a}$, where $\vec{F}_{\rm net}$ is the net force (and also the net external force) acting on the system."

    What is the _____, Alex?

    a) center b) bottom end c) top end d) left end e) center of mass

SUGGESTED ANSWER: (e)

Wrong answers:
a) For many objects, center is an ill-defined quantity.

Redaction: Jeffery, 2001jan01

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002 qmult 01156 1 1 5 easy memory: net external forces and center of mass
Extra keywords: anticipates later chapters, but that's OK

27. If you know nothing about the internal forces of a body and only know the net external force that acts on the body and not where on the body the particular external forces act, then, by itself, Newton's 2nd law for a non-point mass only allows you to predict:

a) the **VELOCITY** of the body.
b) the **VELOCITY** of the center of mass of the body. You can know nothing about internal motions of the body or its rotational behavior.
c) the **ACCELERATION** of the top point of the body.
d) the **ACCELERATION** of the bottom point of the body.
e) the **ACCELERATION** of the center of mass of the body. You can know nothing about internal motions of the body or its rotational behavior.

SUGGESTED ANSWER: (e)

Wrong answers:
a) Oh c'mon.

Redaction: Jeffery, 2001jan01

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002 qmult 01158 1 1 5 easy memory: newton defined

28. The base SI unit of force is the:

a) farad (F); $1\,\mathrm{F} = 1\,\mathrm{kg\,m/s^2} \approx 0.22481\,\mathrm{lb} \approx 1/5\,\mathrm{lb}$.
b) henry (H); $1\,\mathrm{H} = 1\,\mathrm{kg\,m/s^2} \approx 0.22481\,\mathrm{lb} \approx 1/5\,\mathrm{lb}$.
c) watt (W); $1\,\mathrm{W} = 1\,\mathrm{kg\,m/s^2} \approx 0.22481\,\mathrm{lb} \approx 1/5\,\mathrm{lb}$.
d) joule (J); $1\,\mathrm{J} = 1\,\mathrm{kg\,m/s^2} \approx 0.22481\,\mathrm{lb} \approx 1/5\,\mathrm{lb}$.
e) newton (N); $1\,\mathrm{N} = 1\,\mathrm{kg\,m/s^2} \approx 0.22481\,\mathrm{lb} \approx 1/5\,\mathrm{lb}$.

SUGGESTED ANSWER: (e) This definition of the newton relies on the exact nature of Newton's 2nd law of motion in the classical limit.

Wrong answers:
a) The unit of capacitance.
b) The unit of inductance.
c) The unit of power.
d) The unit of energy.

Redaction: Jeffery, 2008jan01

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002 qmult 01162 1 5 1 easy thinking: acceleration and third law
Extra keywords: also physci KB-59-15

29. If Newton's 3rd law is true, why then does anything accelerate at all?

a) The equal and opposite forces **DO NOT** have to be on the same body.
b) The equal and opposite forces **DO** have to be on the same body.
c) Nothing moves at all as Parmenides argued in the 5th century BC. Motion is but seeming. Anyway Parmenides seems to have been a pretty smart guy since he's credited with the spherical Earth theory and the discovery that the Moon shines by reflected light.
d) Acceleration has nothing do with forces.
e) Forces have nothing do with acceleration.

SUGGESTED ANSWER: (a) I've provided some leading answers.

Wrong answers:
b) Straight nonsense, since it leads to the opposite conclusion.
c) Parmenides was not really saying that nothing moves at all. He was just arguing from certain premises which he did not necessarily affirm. Actually it is hard to quite know for sure about

the big P, since his own words only survive in fragments from his poem in which he lets the unnamed goddess speak for him in oracular manner. Shortly after Parmenides, natural philosophers gave up on poetry and the two have seldom overlapped since. Omar Khayyam (if he really was a poet) and Chaucer (really more of popularizer of science than a practitioner) are possible cases. See D. Furley, "The Greek Cosmologists", p. 36 ff, esp. 41.

Redaction: Jeffery, 2001jan01

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002 qmult 01164 1 1 4 easy memory: internal force pairwise cancellation

30. Why do internal forces not affect the center of mass acceleration of a system? Because:

a) they cancel out in threesomes. b) they are all zero. c) we just ignore them. d) they cancel out pairwise. e) the external force cancels them out.

SUGGESTED ANSWER: (d)

We are assuming that Newton's third law is strictly obeyed. Actually, there are special exceptions, but they take some explaining and the suggested answer is the best answer. See Go3-8.

Wrong answers:
e) Specious.

Redaction: Jeffery, 2001jan01

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002 qmult 01170 1 4 5 easy deducto-memory: force laws needed

31. "Let's play *Jeopardy*! For $100, the answer is: Laws that prescribe forces for physical systems. They must exist independent of Newton's 3 laws of motion in order for Newtonian physics to be useful."

What are _____, Alex?

a) Newton's 3 laws b) accelerations c) velocities d) force inequalities e) force laws

SUGGESTED ANSWER: (e)

Wrong answers:
a) As Lurch would say AAAARGH.

Redaction: Jeffery, 2008jan01

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002 qmult 01180 1 4 3 easy deducto-memory: classical point particles defined

32. "Let's play *Jeopardy*! For $100, the answer is: They have no size, but do have mass, and obey classical mechanics."

What is _____, Alex?

a) any solid object b) quantum mechanical particles c) classical point particles
d) any blob of fluid e) any blob of gas

SUGGESTED ANSWER: (c)

Classical point particles are an idealization. They are useful for thinking about classical mechanics sometimes and one can approximate quantum mechanical particles (e.g., electrons and protons) by them for some purposes. But one can't form atoms or chemical bonds with them since classical mechanics fails for those thing which is why quantum mechanics was needed.

Wrong answers:
b) Exactly wrong.

Redaction: Jeffery, 2012jan01

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002 qmult 01200 1 5 1 easy thinking: statics defined

33. The area of physics dealing with **ONLY** cases of balanced forces (or equilibrium) is called:

a) statics. b) dynamics. c) kinematics. d) kinesiology. e) cinema.

SUGGESTED ANSWER: (a)

An easy thinking question. Statics may not have been mentioned explicitly in class. Technically the torques needed to be balanced too, but mentioning that would obscure the question. See French, p. 119. Memory and deduction should help here. But the name alone should be enough.

Wrong answers:
e) As Lurch would say, AAAAARGH.

Redaction: Jeffery, 2008jan01

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002 qmult 01210 1 4 3 easy deducto-memory: equilibria defined

34. "Let's play *Jeopardy*! For $100, the answer is: Stable, unstable, neutral, and metastable."

    What are _____, Alex?

    a) forces b) disequilibria c) equilibria d) laws of motion e) horses

SUGGESTED ANSWER: (c)

Wrong answers:
e) Well, I suppose.

Redaction: Jeffery, 2012jan01

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002 qmult 01230 1 1 1 easy memory: normal force calculation

35. A uniform pillar of density ρ, height h, and horizontal area A has normal force _____ at a height y above the ground.

    a) $(h-y)A\rho$ b) $yA\rho$ c) $(y/A)\rho$ d) $(h-y)/A]\rho$ e) $1/(yA\rho)$

SUGGESTED ANSWER: (a)

Wrong answers:
b) Poor guess.

Redaction: Jeffery, 2012jan01

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002 qmult 01250 1 3 5 easy math: F=ma to find a brick's mass to find a force
Extra keywords: physci KB-60-23

36. A 50 N net force gives a brick an acceleration of 5 m/s. What net force is need to give it an acceleration of 10 m/s?

    a) 50 N. b) 5 N. c) 10 N. d) 200 N. e) 100 N.

SUGGESTED ANSWER: (e)

The brick's mass is invariant one assumes. Thus, by $F_{\text{net}} = ma$, the acceleration is proportional to the net force. If the acceleration is doubled, so the force must be doubled. Incidentally, the mass of the brick is 10 kg.

Wrong answers:
a) As Lurch would say: "Aaaarh."

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